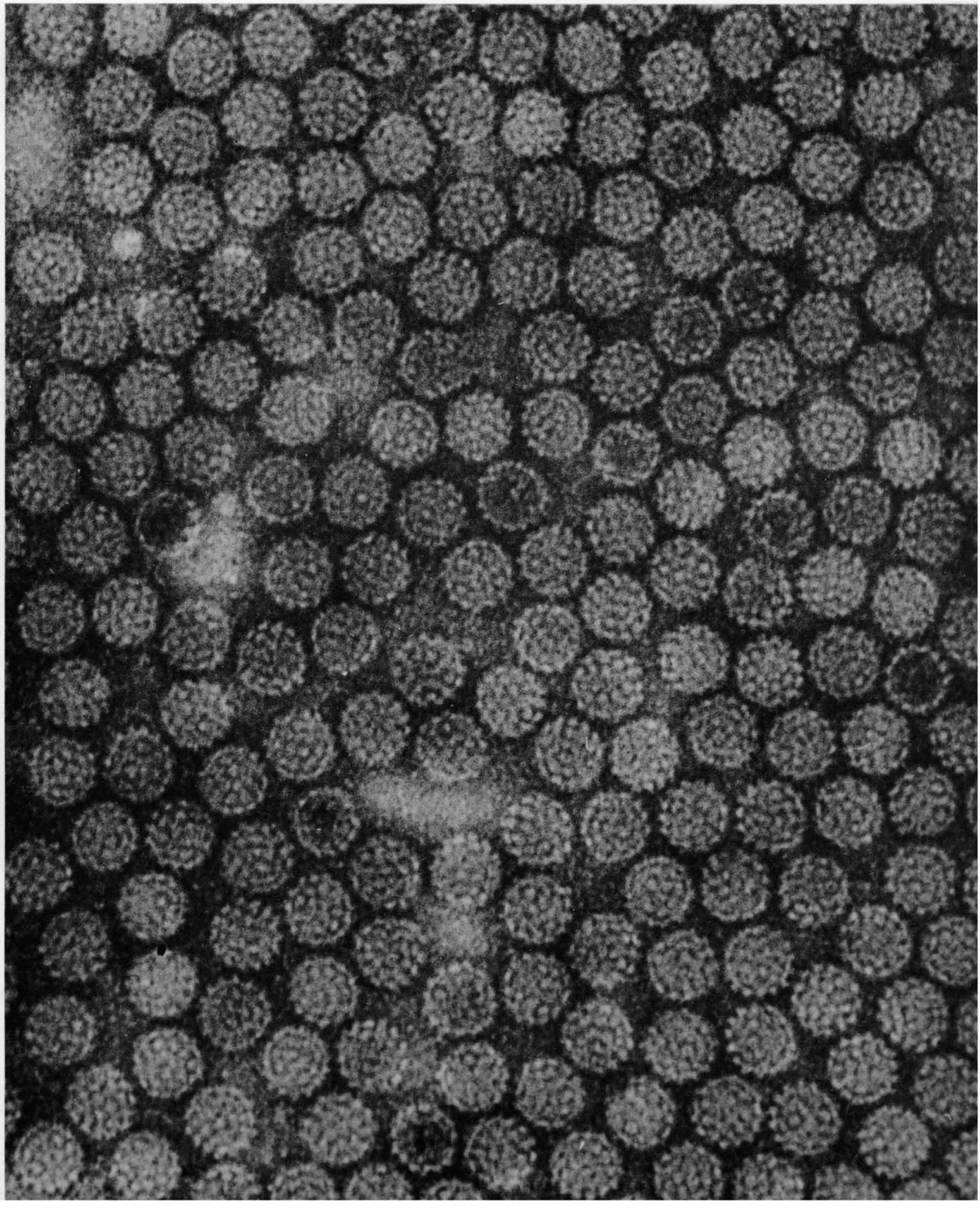
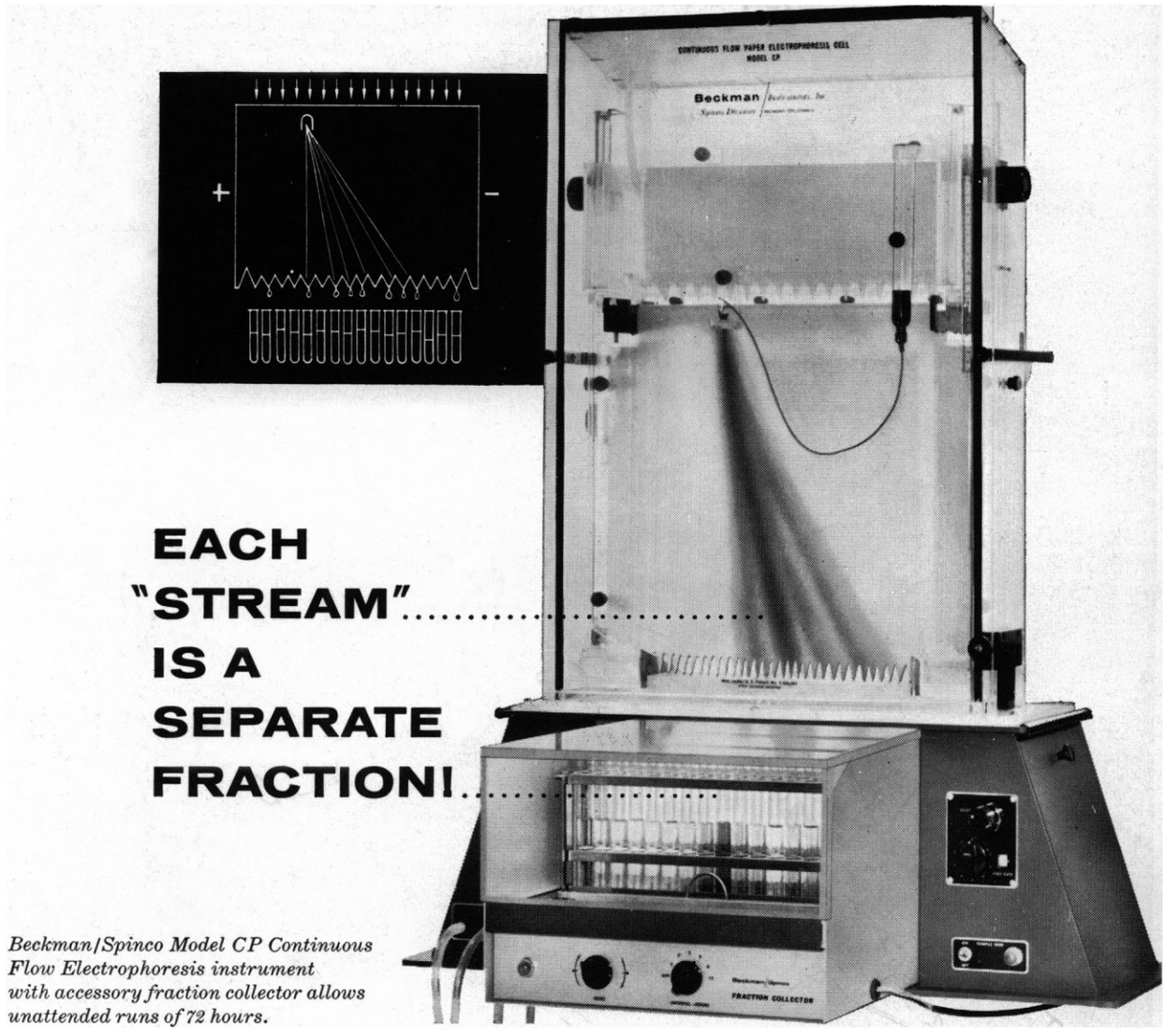
SCIENCE

23 February 1962

Vol. 135, No. 3504

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE





EACH "STREAM"..... IS A SEPARATE FRACTION!.....

Beckman/Spinco Model CP Continuous Flow Electrophoresis instrument with accessory fraction collector allows unattended runs of 72 hours.

As long as your biochemical or organic mixture is water-soluble and the fraction you want is ionized — chances are our Model CP Continuous Electrophoresis can separate it — and in quantity.

In the field for three years, the CP has solved a wide array of fractionating and purifying problems. In biochemistry the Spinco Model CP separates amino acids, peptides, hormones, sterols, bacteria, viruses, serum proteins and lipoproteins... is used in processing antibiotics and concentrating vaccines.

In organic chemistry the CP can isolate the end product in many types of reactions, in quantities up to a gram of pure material a day. Often the various side products can be separated as well.

If you face the problem of preparing pure fractions in volume, investigate the CP Continuous Electrophoresis now. Fill in the coupon and you will receive literature by return mail.

TO: Spinco Division, Beckman Instruments, Inc.
Stanford Industrial Park, Palo Alto 5, Calif.

☐ Please send me applications bulletin 6055 giving typical operating conditions and literature references.

☐ Please send descriptive literature and prices on the CP.

NAME_____

TITLE OR DEPARTMENT_____

FIRM OR INSTITUTION_____

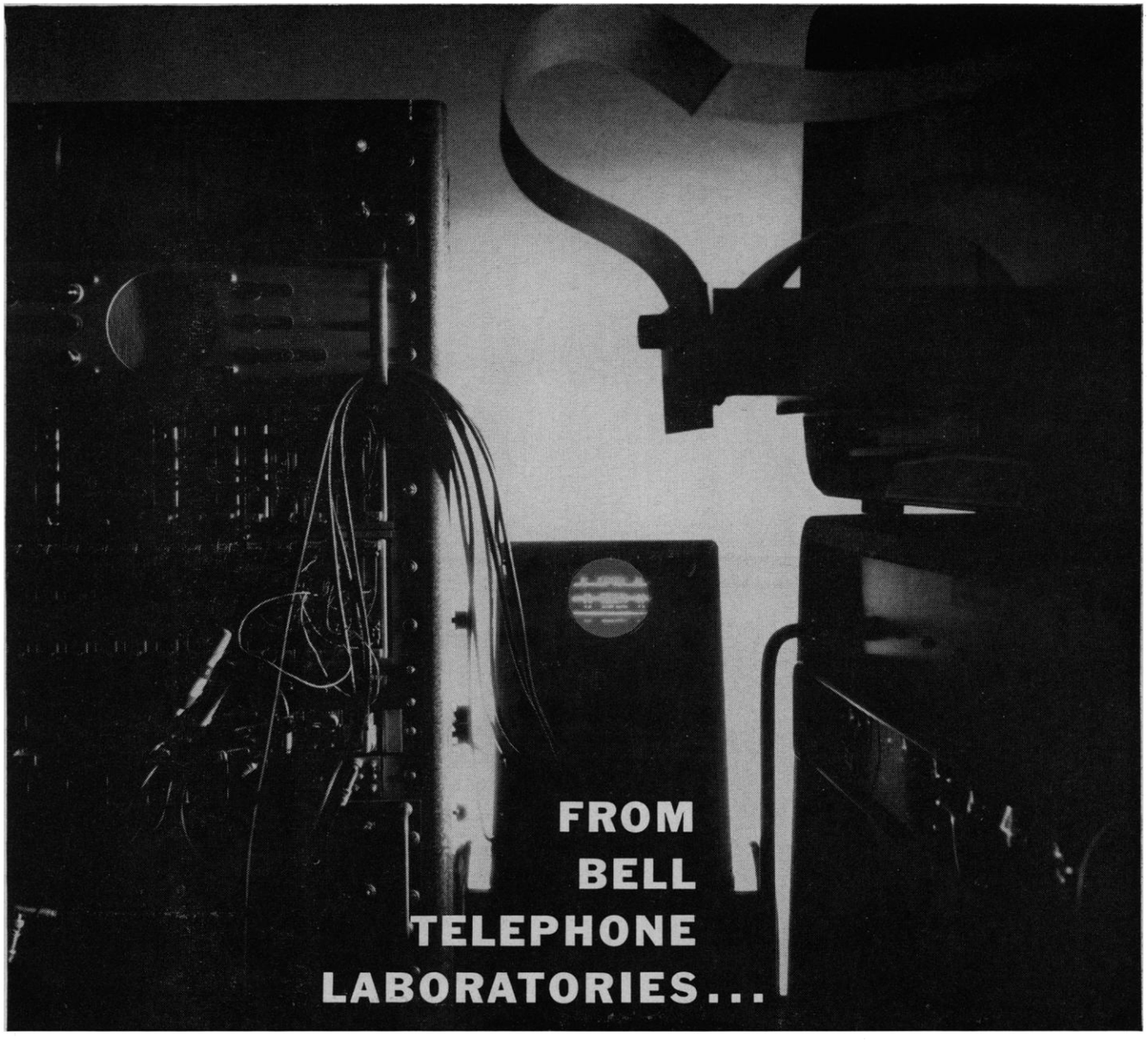
ADDRESS_____

CITY_____ STATE_____

Beckman® INSTRUMENTS, INC.

SPINCO DIVISION,
Stanford Industrial Park,
Palo Alto 5, California

S-65A



The fundamental capabilities of pulse transmission are under study at Bell Laboratories. At a transmission rate of 200 million bits per second, for example, PCM could simultaneously transmit 3000 telephone conversations on a single circuit.

AN INTRIGUING DEVELOPMENT IN TELEPHONE TRANSMISSION

Bell Laboratories engineers have applied a method of transmitting telephone conversations which uses a series of ON-OFF pulses rather than the continuous electrical signals generally used since the time of Alexander Graham Bell's first famous message.

The method is called Pulse Code Modulation. With PCM the telephone caller's voice is sampled every 1/8000th second. Each sample is then encoded into a series of ON or OFF pulses, and these pulse groups are sent over the regular telephone line. Spaced periodically along the line are repeaters which clean up and amplify the pulses. At the receiving end the pulse groups are decoded and the caller's voice is reconstructed.

Since the pulses are of very short duration, it is possible to interlace many different voice messages and send them all over one line. For example, in a PCM system now operating between Newark and Passaic, N. J., a single pair of wires carries as many as 24 one-way voice signals.

Other systems for carrying more than one voice signal over a single telephone line have been developed and are in widespread use. PCM, however, provides special advantages, for example, in cable circuits connecting telephone offices in a congested metropolitan area.

PCM in its present practical form for cable circuits has been made feasible by Bell Laboratories' invention and development of the transistor, the key element necessary for a small economical system.

Currently, PCM systems carrying much larger bundles of communication channels are under study at Bell Laboratories. The goal as always is the improvement of Bell System communication services.

BELL TELEPHONE LABORATORIES

World center of communications research and development

SCIENCE is published weekly by the AAAS, 1515 Massachusetts Ave., NW, Washington 5, D.C. Second-class postage paid at Washington, D.C., and additional mailing office. Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢.

23 February 1962, Volume 135, Number 3504

SCIENCE

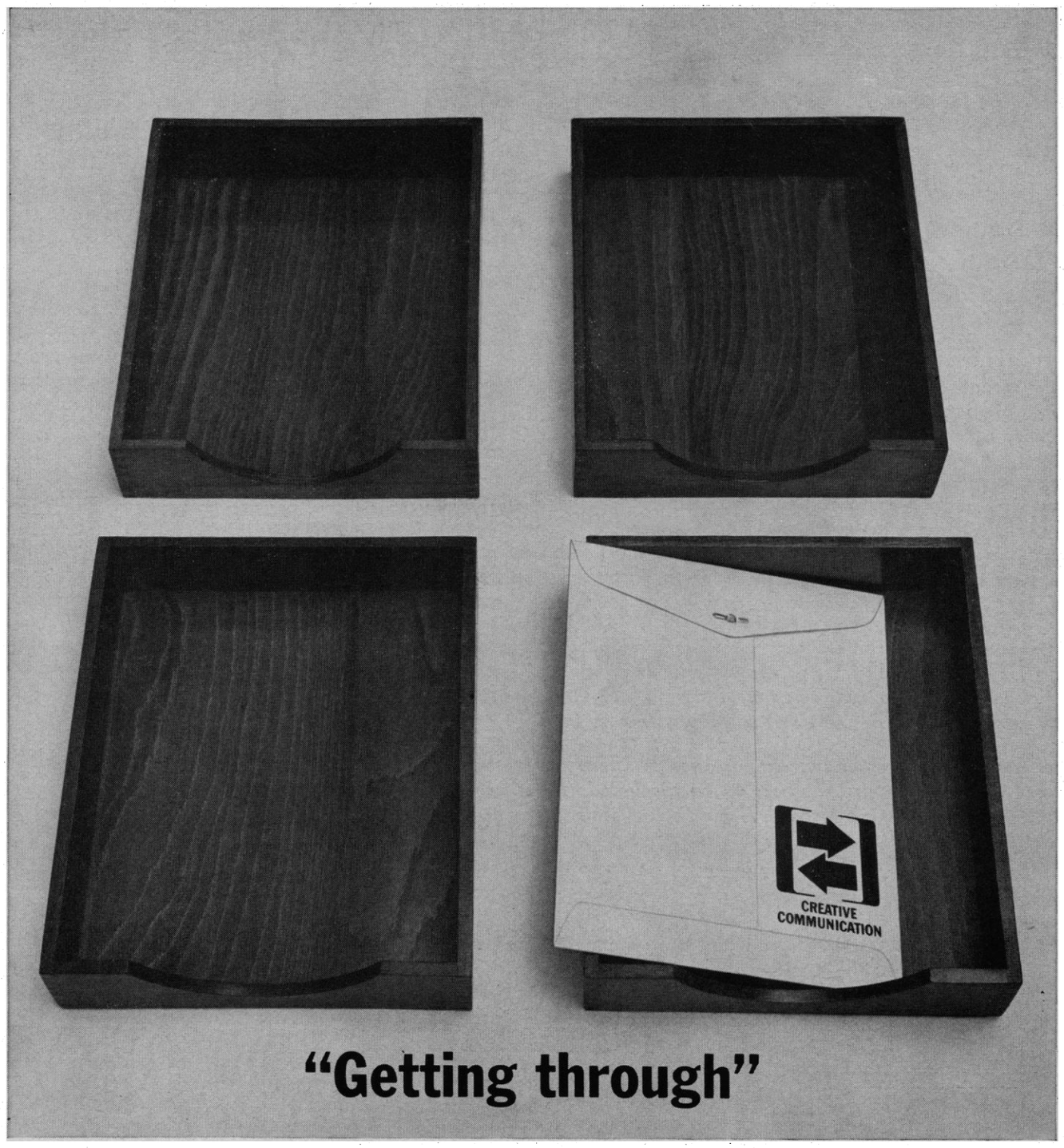
Cover Virus particles isolated from a human wart. The preparation was treated by the negative staining method. There are 42 subunits (capsomeres) on the protein coat (the capsid) arranged in 5 : 3 : 2 axial symmetry (× 250,000). [A. F. Howatson, Department of Medical Biophysics, University of Toronto, Toronto, Ontario, Canada]

Bettman Archive

Reeve Angel's broad spectrum of technical knowledge and extensive experience in filtration is always available to assist you with your individual problems...Technical assistance is an integral part of Reeve Angel's service.

How can RA service help you? **Write today for free facilities brochure.**

reeve angel
9 Bridewell Place
Clifton, New Jersey



"Getting through"

One of the frustrating problems of communication involves "getting through" to the right party. This is as true in our industry as it is in any other. Important and informative technical facts frequently are not made available to those immediately concerned. Or information gets "lost" and arrives too late to be incorporated into new product plans or sales programs. At CYANAMID FINE CHEMICALS DEPARTMENT this communicative obstacle is resolved early in client relations and maintained clear throughout. This proper channelling of information is an important first step toward establishing an effective and constructive system of communication—another of the many unique services you can expect when you communicate with . . .

CYANAMID | AMERICAN CYANAMID COMPANY · FINE CHEMICALS DEPARTMENT · Pearl River, New York

23 February 1962, Volume 135, Number 3504

SCIENCE

SCIENCE, now combined with THE SCIENTIFIC MONTHLY, is published each Friday by the American Association for the Advancement of Science at National Publishing Company, Washington, D.C. SCIENCE is indexed in the *Reader's Guide to Periodical Literature*.

Editorial correspondence should be addressed to SCIENCE, 1515 Massachusetts Ave., NW, Washington 5, D.C. Manuscripts should be typed with double spacing and submitted in duplicate. The AAAS assumes no responsibility for the safety of manuscripts. Opinions expressed by authors are their own and do not necessarily reflect the opinions of the AAAS or the institutions with which the authors are affiliated. For detailed suggestions on the preparation of manuscripts, see *Science* **125**, 16 (4 Jan. 1957).

Advertising correspondence should be addressed to SCIENCE, Room 1740, 11 West 42 St., New York 36, N.Y.

Change of address notification should be sent to 1515 Massachusetts Ave., NW, Washington 5, D.C., 4 weeks in advance. Furnish an address label from a recent issue. Give both old and new addresses, including zone numbers.

Annual subscriptions: $8.50; foreign postage, $1.50; Canadian postage, 75¢. Single copies, 35¢. School year subscriptions: 9 months, $7.00; 10 months, $7.50. Cable address: Advancesci, Washington.

A Mystery Story without the Mystery

The measurement of time was the subject of the latest, hour-long, TV program in the Bell System Science Series—"About Time," on view one evening earlier this month over NBC. In the mythical kingdom of Planet Q, where time is unknown, the King (played by actor Les Tremayne) asks a scientist (played by Frank C. Baxter) to tell him where to set the hands on the new throne-room clock. Before answering the question, Dr. Baxter finds it necessary, using documentary films and animated diagrams, to touch on many things, including the evolution of the calendar, techniques of timing down to billionths of a second, time sense in animals, and some of the lore of relativity theory. The information is graciously imparted to the King, who is ever amazed and ever willing to learn.

"About Time" is the eighth in the Bell System Science Series, which began in 1956 with "Our Mr. Sun." The format of the earlier programs is followed, but without some of the earlier attempts at comic relief. Thus, at one point in an earlier show, the man running the hidden film projector, confused by all the orders emanating from Dr. Baxter, suddenly emerged with his hair awry and his reels unwound. Actually, this proved funny, but it was also distracting. As an effort to reach children and the general TV viewer *with science*, the present show is quite an improvement. Some irrelevant business is still present, however, and it is present because something else is missing.

One view of scientific research is that it is like a detective story. Both the scientist and the detective start with a puzzle, discover clues, link them together, and then offer a solution. This view may be a stereotype but it also happens to be accurate, and the drama inherent in science is what is missing in the show. In consequence, to avoid a dry recital of facts and explanations, the producers of "About Time" found it necessary to offer their tale of Planet Q. The program does begin with a question about how to set a clock, but this is more a device to start the show than the first step in a scientific inquiry. To illustrate what is missing, let us take a famous detective story and give it the same treatment that the producers gave scientific research.

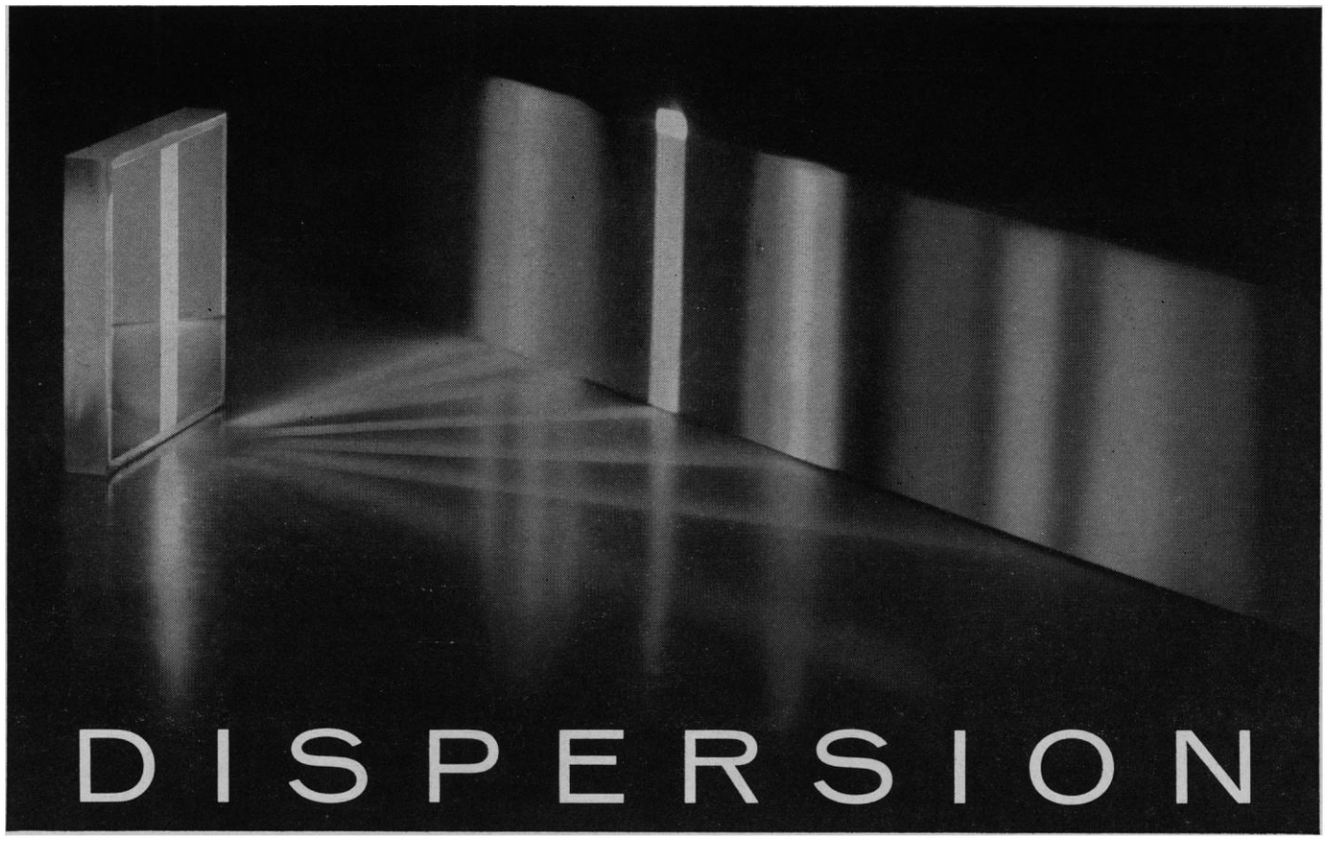
Take Poe's "The Murders in the Rue Morgue." The story begins with the discovery in a house in the Rue Morgue of two horrible yet astonishing murders. The corpse of a young woman is found forced a considerable distance up a chimney. The corpse of her mother is on the ground outside, her head almost cut off. The furniture in the house is smashed. A bloody razor lies on a chair. The police are getting nowhere until Dupin interests himself in the case.

In our special treatment, of course, we would not be content to tell only one Poe story, we would want to tell them all. But the portion of the program devoted to this story might, in its entirety, go something like this.

SCENE. *A college professor is explaining things to the straight man. Both are standing before a large screen. The professor flips a switch, causing a picture of an orangutan to appear on the screen.*

COLLEGE PROFESSOR (*pointing to screen*). An orangutan is the guilty party in this one. (*Turns off picture*) Who would have thought that one day one of these beasts would escape with its master's razor, enter a house in the Rue Morgue, and do in the two ladies who lived there when they resisted its efforts to play barber?

STRAIGHT MAN. Good heavens, not I!—J.T.



for faster, dependable spectro-analysis with Bausch & Lomb

CERTIFIED-PRECISION GRATINGS

Distinct separation between light rays of wavelengths less than one billionth of an inch apart!—this is standard performance with B&L plane diffraction gratings. Over 100 different reflectance and transmission gratings are available, from 30×32mm to 153×203mm; from 40 to 2160 grooves per mm; widest range of blaze angles. Written certification of detailed specifications and precision.

FREE DATA BOOK

BAUSCH & LOMB
SINCE 1853

Made in America, to the world's highest standards

BAUSCH & LOMB INCORPORATED
85626 Bausch St., Rochester 2, N.Y.

Please send me Catalog D-261 which explains theory and mechanics of use of gratings in light dispersion.

Name.....

Company.....

Address.....

City..... Zone..... State.....

guage that can be understood by the instructor of Latin and Greek, by the housewife, by the truck driver, and perhaps even by the congressman.

I fail to see how calling for an interdisciplinary group to recognize this need and to begin doing something about satisfying it could contribute "little to science or to survival," or how it could possibly "do some mischief," as you charge that it might. Your editorial, however, is another matter. As a small voice of unreason, it could do considerable mischief, if listened to; and the human race (even the largely scientific audience of *Science*) has demonstrated itself often prone to listen to the voice of unreason. I can only hope that your voice will fall on deaf ears, at least with respect to this matter, while the AAAS committee's voice falls upon responsive ones.

PAULA FOZZY

Bulletin of the Atomic Scientists, Chicago, Illinois

The editorial of 12 January is to be commended for promoting discussion of the statement by members of the AAAS Committee on Science in the Promotion of Human Welfare, calling for a "science of human survival." Yet I feel that its attack on the statement is unjustified.

The editorial seems to say that the statement misleads the general public, at whom it is indirectly aimed, by suggesting that a concerted scientific effort could solve the problem of avoiding modern war, when in fact success in such an effort is precluded by a lack of comprehensive and accepted social theories. Probably no one would argue the need for more powerful theories of social behavior. But surely the history of science is dotted with episodes when attention was drawn to urgent problems for which there were no good theories. Often general theories arose out of concentrated effort on just such problems. Is is unimaginable that the same process might occur in the area of human conflict; that efforts of a large number of scientific intellects, from a variety of disciplines, concentrated on the urgent problems caused by the threat of modern war, might lead to new and more powerful theories of social behavior in general?

If the statement is aimed indirectly at the general public, it addresses itself directly to scientists and invokes their responsibility for the problems posed by modern war, the power for

which comes from the products of science. By outlining these problems with clarity, and by calling on scientists to respond to the possibilities of their solution, the statement serves a constructive purpose that outweighs any possible sense of exaggerated confidence in the powers of science which the general public might read into it.

THOMAS G. SPIRO
419 South Washington Avenue, Whittier, California

The article on a "new collaborative science, the science of human survival," and the editorial on the same topic are both stimulating and welcome.

The call to natural scientists and social scientists to solve the complex problems of modern war, before that problem dissolves human beings on a mass scale, might be more complete if the call to action included appropriate reference to research in nonviolence, to which M. K. Gandhi devoted his life, and to research in conflict resolution, such as that being carried on at the University of Michigan. Experiments in conflict resolution by a number of groups, such as the Society of Friends (Quakers), to mention only one, contribute to a basis for the "new . . . science of human survival."

Out of the work of Gandhi and various research and extension teams active in the field of conflict resolution has come a body of comprehensive theory for the science of human survival (see the *Journal of Conflict Resolution*). The fact that this theory does not appear to command general acceptance in the natural sciences does not place the existence of the body of theory in doubt, but rather points to the phenomenon of human resistance to application of nonviolence concepts and techniques in new areas and on a global scale. The conversion of this resistance into enthusiasm for free and responsible experimentation in the science of human survival can surely not be attempted without the philosopher and the saint, as well as the social scientist and the natural scientist. Two or more of these are occasionally to be found combined in a rare individual, who is by virtue of this versatility particularly useful in the endeavor to resolve international conflict without nuclear war.

FRANCIS D. HOLE
Soil Survey Division, Geological and Natural History Survey, University of Wisconsin, Madison

I wish to express strong support for the statement of the Committee on Science in the Promotion of Human Welfare and disappointment that your editorial regarding this statement was rather lacking in enthusiasm.

This is no longer a period of history where there can be "business as usual." The dangers and promises were never greater. It is the responsibility of individuals who by training and endowment are equipped to recognize this and to see their obligations, to themselves and to civilization, to act. Formation, activation, and support for such a committee at-large.

EUGENE KAELLIS
775 Avenue Z, Brooklyn, New York

I would like to comment on the editorial of 12 January, which was critical of the call for "a new collaborative science, the science of human survival."

It seems premature to say that because no such science exists as yet, none can be developed. We know that the cross-fertilization of one scientific discipline by another can lead to new developments which could not be conceived within the isolated field. One well-known example is the solution of the important problem of DNA structure. Another is the burgeoning use of the computer sciences in almost every field one can think of. In both of these instances there was a specific problem to solve, of importance to human progress—in the first case, an obstacle in the way of understanding the nature of life, and in the second case, a need to save human time and effort.

The problem of human survival is a concrete problem deserving more consideration than many lesser goals. In fact one might say that all other goals must be lesser, by definition.

In this light, could we not regard all sciences not only as ends in themselves but also as tools to be used in the solution of the problems of the human race?

With the last paragraph of the editorial I must especially disagree. The image of science in the public mind is becoming more and more an image of weaponry and destruction. This call by scientists for a solution to wars is one of the few steps taken so far to counteract that image.

SIDNEY O. KASTNER
39-F Ridge Road, Greenbelt, Maryland

I want to reply to Fozzy and to Spiro.

In reply to Fozzy: the six authors, in the concluding section of their document, argue that scientists have two special responsibilities, (i) to inform the public about the technical facts relevant to the character of modern war, and (ii) to establish a "new collaborative science, the science of human survival."

Fozzy addresses herself to the first matter. I agree that scientists have a responsibility to interpret science to the public, although I do not think that anyone deserves a medal these days for simply *saying* that scientists have this obligation. My editorial, however, was concerned with the second matter.

The six authors, speaking explicitly as scientists and seeking indirectly to reach the general public, say flatly: "It lies within the power of science . . . to discover new social inventions to replace [modern war]." But how can the six authors know this? I hope that science proves to have such power, or even that politicians and moral leaders prove to have this power. I do not know, however, whether science *does* have this power. I do not even know whether science, if called upon, would have the power to get, say, the Administration's bill for federal aid to education through the House Rules Committee.

In reply to Spiro: I found it necessary to remind readers that there are no theories in the social sciences which are comprehensive and which at the same time command the general acceptance so common in the natural sciences, because I wanted to show the poor quality of one of the document's illustrations. The six authors cite the International Geophysical Year as something illustrative of the proposed collaborative science. But the IGY illustrates nothing relevant to the proposed science. Electromagnetic theory and other comprehensive physical theories were on hand to guide the study of the earth, but no counterparts to such theories exist to direct the work of the science of survival.

I did not go on to discuss how one encourages the production of comprehensive theories in physics or in other sciences. But even the staunchest enthusiasts of the IGY do not believe that this same kind of coordinated, massive assault would be the best way to proceed in physics in an effort to produce, say a meaningful unified field theory.

As a kind of general reply to my critics, let me be clear about one point. I make so much of the extravagance of the authors' claims because the document is addressed indirectly to the general public. I do not mean to say that a science of man and his institutions is impossible. Such a claim would just substitute one extravagance for another. I am not against hope, only against misinformation. Elsewhere in the document the six authors are not quite so extravagant in their claims. They ask: "Can such a complex scientific assault . . . really succeed? No one knows." But inconsistency in claims is just as irresponsible in a document as extravagance of claims.—J.T.

Adaptive Radiation

The principle of adaptive radiation, early championed by Henry Fairfield Osborne, and later by Matthew, Lull, and Romer, states that the descendants of a generalized ancestral type spread out into many different environments with a great variety of adaptive characters. The variations in structure are to be correlated with adaptation to different habits, as much as to the habitat. The general principle has provided a sound basis for understanding the evolution of the tetrapods.

Adaptive radiation has also occurred in flowering plants, as shown by Andrews of Australia (1913, 1914) and Bews of Africa (1925, 1927). In general, however, botanists have largely ignored the phenomenon even though it is one of the most important and fundamental aspects of all evolution. In this connection there have recently appeared two discussions of adaptive radiation in flowering plants. The one by me [in *Evolution of Life* (University of Chicago Press, 1960), pp. 237–243] devotes several pages to it in an analysis of the larger problem of the evolution of flowering plants. The paper by Hui-Lin Li [*J. Wash. Acad. Sci.* **50**, (1960)] is an essay devoted solely to the problem. These discussions are sufficiently similar to require comment.

The similarity is attributable to the fact that I had access to Li's manuscript in the early 1950's, at which time I was asked to appraise it. At that time I was giving part of a general course in paleontology in which adaptive radiation of flowering plants, as discussed by Bews (1927), was reviewed for the students. Since some of Li's examples nicely supplemented those that I was already using, I incorporated some of them in my lecture material. Several years later, when writing my article on the evolution of flowering plants which appeared in 1960, I included the data from Li's manuscript in that discussion. Through an inadvertent oversight, I failed to credit Li. This was indeed unfortunate, and I deeply regret the omission. I am therefore writing this letter to insure that Li receives credit for his contribution.

DANIEL I. AXELROD
Department of Geology, University of California, Los Angeles

Carbon Dioxide Production in Asparagus

Dedolph, Wittwer, and Tuli, in "Senescence inhibition and respiration" [*Science* **134**, 1075 (1961)], reported rates of CO_2 production for asparagus in the range of about 1.5 to 3.0 mg of CO_2 per kilogram per hour at 21°C. These values are about 1/100 as large as those reported in the literature for about that temperature [see H. Platenius, *Plant Physiol.* **17**, 179 (1942); S. Tewfik and L. E. Scott, *J. Agr. Food Chem.* **2**, 415 (1954); J. Schweigart *et al., Vorratspflege u. Lebensmittelforsch.* **2**, 28 (1939)]. Insertion of a correction in *Science* is desirable, to prevent the apparently erroneous data from permanently entering the literature.

WERNER J. LIPTON
U.S. Agricultural Marketing Service, Fresno, California

Pictorial Atlas

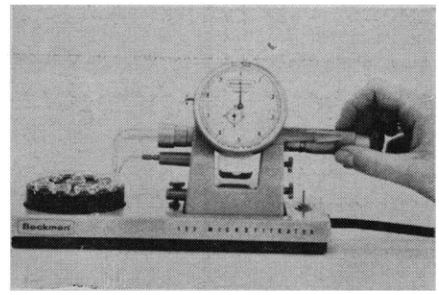
Walter Deshler (University of Maryland), in his review of *Life Pictorial Atlas of the World* [*Science* **134**, 1234 (1961)], regrets that "the price is sufficiently high to limit its distribution to institutions." I doubt that this will be true, particularly in view of the fact that 300,000 individuals have already purchased this atlas, sight unseen, at prepublication prices of approximately $14, $20, or $21 (as compared to the publication price of $30).

ROBERT T. JORDAN
Council on Library Resources, Washington, D.C.

New Products

Microtitrator consists of a microburette with a large, easily read dial and a vibrating stirrer mounted on a base plate that holds the samples in a rotating turntable to provide rapid, convenient titration of samples in the ultramicro range. In this instrument, titrant is held in a horizontal glass burette. The turning of a micrometer-type screw moves a Kel-F rod into the burette reservoir, forcing a measured amount of liquid out of the delivery tip. The amount delivered is read directly in microliters on a dial; a touch resets the dial to zero at the end of each titration. Delivery accuracy is ± 0.01 μl.

Samples are held in small, disposable plastic cups; these cups fit into a ten-cup turntable, which can be rotated by hand to place each successive cup under the delivery tip. Two turntables are supplied: white for color endpoints and black for viewing turbidity or



fluorescence. Each has a central hole which can be used for a reference color. During titration a built-in vibration stirrer mixes the cup contents thoroughly, allowing a rapid, precise approach to endpoint.—R.L.B. (Beckman Instruments, Inc., Spinco Division, Dept. S30, Palo Alto, Calif.)

Tuned amplifier–null detector (model 1232-A) is a transistorized instrument with 1-μv full-scale sensitivity. It tunes continuously from 20 cy to 20 kcy/sec with additional fixed frequencies of 50 and 100 kcy/sec. Continuous tuning is provided by a resistance-capacitance null circuit. The amplifier can be switched to have either linear or logarithmic amplitude characteristics. Total gain of the amplifier is about 120 db. A full-wave rectifier is used in the meter circuit to double the ripple frequency that passes through the meter in order to prevent the needle from vibrating visibly at 20 cy/sec.—J.S. (General Radio Co., Dept. S23, West Concord, Mass.)

Radiation detector uses a multi-plate spark-chamber system to provide three-dimensional tracking of cosmic rays. The spark chamber consists of sets of parallel conducting plates in a gas atmosphere. Alternate plates are connected to opposite sides of a high-voltage pulser that produces a potential of about 10,000 volts between each pair of plates. If a pulse is applied between the plates shortly after the passage of an ionizing particle, the ionized path acts as a nucleus for the formation of a localized spark that jumps from one plate to the next. The sparks can be observed visually. The aluminum plates used are 3 mils thick and measure 13 by 28 inches.—J.S. (Republic Aviation Corp., Dept. S43, Farmingdale, N.Y.)

Acoustic serial memory uses a fused-silica acoustic delay line with a temperature coefficient of ± 2 parts per million, maximum. Pulse delays range from 20 to 100 μsec at operating frequencies of 8 to 16 Mcy/sec. The delay line is contained in the bottom half of an enclosure 4 by 3 by 1 inch high, the upper half of which contains an associated output amplifier with a fine delay adjustment of 100 nsec (10^{-9} sec). The delay line itself has crystal transducers bonded at the input and output terminations. Data-input rate is as high as 16 megabits per second.—J.S. (Computer Control Co., Inc., Dept. S44, 983 Concord St., Framingham, Mass.)

Microscope digitizer converts the translational motions along three orthogonal axes of a film-scanning microscope into coded digital data on punched paper tape. Each of the three axes uses one encoder assembly. These provide 1000 counts per input-shaft revolution and have a total count capacity of 100,000 counts. Accuracy is ± 1 count. A light bank provides display of the total count on any selected axis and identifies the axis displayed.—J.S. (Datex Corp., Dept. S20, 1307 Myrtle Ave., Monrovia, Calif.)

The material in this section is prepared by the following contributing writers:

Robert L. Bowman (R.L.B.), Laboratory of Technical Development, National Heart Institute, Bethesda 14, Md. (medical electronics and biomedical laboratory equipment).

Joshua Stern (J.S.), Basic Instrumentation Section, National Bureau of Standards, Washington 25, D.C. (physics, computing, electronics, and nuclear equipment).

The information reported is obtained from manufacturers and other sources considered reliable. Neither *Science* nor any of the writers assumes responsibility for the accuracy of the information.

Address inquiries to the manufacturer, mentioning *Science* and the department number.

Meetings

Blood Preservation and Blood Substitutes

A symposium of the Edward Mallinckrodt, Jr., Foundation on Blood Preservation and Blood Substitutes was held at Endicott House, Dedham, Massachusetts, on 11 and 12 December, with 28 participants. Shields Warren served as general chairman. The subjects and discussion leaders were as follows: "The physical properties of blood as a hydrodynamic fluid," John L. Oncley (Harvard Medical School); "Blood preservation by physical means," James L. Tullis (Protein Foundation); "Blood preservation by chemical means," Eugene P. Cronkite (Brookhaven National Laboratory); "Advantages and handicaps of presently available blood substitutes," Scott N. Swisher (University of Rochester School of Medicine); and "Desirable characteristics of blood substitutes," William H. Crosby (Walter Reed Army Institute of Research).

Recent advances in the knowledge of hemic osmotic pressure and viscosity were related to problems of the blood vascular system.

The key to the flow of blood lies in the size and type of capillary network through which it must pass. The flow through the capillaries has a fairly flat front, the blood moving largely as a unit with slippage along the walls. A normal sedimentation rate of red blood cells is important for smooth flow. The sedimentation rate tends to be increased by the presence of most long molecules, such as those of the plasma extenders.

The plasma proteins, in addition to maintaining proper osmotic balance and viscosity, act significantly as binding agents; for example, serum albumin binds one molecule of fatty acid strongly, and ten or more loosely. This action helps to maintain proper suspension of fats in the blood. Blood fats supply important nutrient material to vital organs, particularly the heart, which derives over 70 percent of its energy from fatty acids.

Of interest from the pharmaceutical standpoint is the fact that many drugs are bound by albumin, which helps to prevent their too rapid excretion. Hormones such as insulin and thyroglobulin are also bound by blood proteins.

Albumin also plays a role in the binding of ions. One albumin ion normally binds eight chloride ions. On the other

hand, albumin is a poor binder of calcium; the ratio is only one to one.

Because of recent interest in the use of cold for anesthesia and in other fields, the effects of lowered temperature on the blood were considered. The cryoglobulins do not contribute much to the total properties of blood, so a drop in temperature has relatively little effect on whole blood.

The normal viscosity of blood has an index of 3. In certain pathologic states this can go up to as high as 10. Fibrinogen is responsible for roughly 20 percent of the total viscosity of the blood. Deviation in viscosity can usually be readily handled by the homeostatic mechanisms of the blood.

Polyamino acids have potential value as a blood expander.

Reconstituted preserved plasma must be used rapidly, especially because the lipoprotein linkage has been broken down. In contrast to plasma, albumin can be frozen and thawed repeatedly without change. The major requirements in plasma expanders are freedom from antigenicity and homogenity of molecular size. Since a blood substitute must fulfill a number of functions, there is no single measurement that can be used to establish desirable criteria.

A much-discussed question was whether it is better, in order to obtain molecules of optimal size (about 35 angstroms) for use as blood substitutes, to split preexisting long molecules or to synthesize smaller molecules to a polymer.

Dextran is slightly antigenic. About 4 percent of normal persons react because of cross immunity. Dextran may slightly prolong bleeding time, but this is not serious or lasting. It rarely occurs if less than 1500 cubic centimeters of a 6-percent suspension are used. A greater disadvantage in the use of dextran is the difficulty of obtaining proper and uniform molecular size. Dextran is slowly metabolized, and the bulk is excreted in 2 to 4 weeks. Polyvinyl pyrrolidone is effective and cheap; however, it does persist in the liver. Because of the risk of serum hepatitis from whole-blood transfusions, it is quite possible that the use of whole blood is more dangerous than utilization of dextran or even polyvinyl pyrrolidone.

A number of plasma products are available. Four units of plasma are roughly equivalent to one unit of albumin. It was pointed out that despeciated bovine or equine plasma is used widely throughout the world.

There was extensive discussion of the preservation of blood by freezing, and of the role of glycerol in the protection of red blood cells during the freezing and thawing processes. The method developed by the Protein Foundation and the Chelsea Naval Hospital and utilized at the Naval Hospital has proved of great value. The mean period of survival of transfused washed red cells preserved by glycerol and freezing is over 30 days in the recipient's body. Glycerol is effective for successful freezing of washed red cells. Only 1 percent of the blood cells are lost with each successive freezing and thawing.

The plasma expanders are of very little use in civilian practice; their chief usefulness is in emergencies. One of the basic questions is, "Can one increase the supply and lower the cost of human albumin?"

SHIELDS WARREN

Cancer Research Institute,
New England Deaconess Hospital,
Boston, Massachusetts

Forthcoming Events

March

5–9. Analytical Chemistry and Applied Spectroscopy, conf. and exposition of modern laboratory equipment, Pittsburgh, Pa. (C. F. Glick, Applied Research Laboratory, United States Steel Corp., Monroeville, Pa.)

5–16. United Nations Economic and

Social Council, Committee for Industrial Development, New York, N.Y. (U.N., New York)

8. Problems Relating to Food and Feed Additives, Assoc. of Vitamin Chemists, Chicago, Ill. (H. S. Perdue, Abbott Laboratories, N. Chicago)

9–14. National Science Teachers Assoc., annual, San Francisco, Calif. (R. H. Carlton, NSTA, 1201 16th St., Washington, D.C.)

10–13. Microminiaturization Congr., New York, N.Y. (C. G. Sedan, American Watchmakers Inst., 18465 James Couzens Hwy., Detroit 35, Mich.)

11–17. American Congr. on Surveying and Mapping—Amer. Soc. of Photogrammetry, annual, Washington, D.C. (G. K. Emminizer, Jr., 106 Valley Rd., Ellicott City, Md.)

12. Wildlife Soc., Denver, Colo. (C. Gordon Fredine, 5921 Anniston Rd., Bethesda 14, Md.)

12–14. North American Wildlife and Natural Resources Conf., Denver, Colo. (Wildlife Management Inst., 709 Wire Bldg., Washington 5)

12–16. Society of Automotive Engineers Detroit, Mich. (R. W. Crory, SAE, 485 Lexington Ave., New York 17)

12–23. International Radio Consultative Committee, Study Group on Space Systems, Washington, D.C. (Palais Wilson, Geneva, Switzerland)

13–14. Packaging of Chemical Products, symp., annual, St. Louis, Mo. (Manufacturing Chemists' Assoc., 1825 Connecticut Ave., NW, Washington 9)

13–15. Application of Statistics and Computers to Fuels and Lubricants Research Programs, symp., San Antonio, Tex. (R. Quillian, Southwest Research Inst., 8500 Culebra Rd., San Antonio 6)

13–15. Electronic Industries Assoc., Washington, D.C. (Chief of Information, Dept. of the Army, Washington 25)

14–16. National Missiles and Space Conf., Washington, D.C. (Chief of Information, Dept. of the Army, Washington 25)

15–16. Textile Research Inst., annual, New York, N.Y. (P. C. Alford, TRI, Princeton, N.J.)

15–16. Western Industrial Writing Inst., 7th, Los Angeles, Calif. (R. M. Winters, American Industrial Writing Inst., P.O. Box 5453, Pasadena, Calif.)

15–17. Optical Soc. of America, Washington, D.C. (M. E. Warga, OSA, 1166 16 St., NW, Washington 6)

15–18. International Assoc. for Dental Research, St. Louis, Mo. (J. C. Muhler, Indiana Univ. Medical Center, 1120 W. Michigan St., Indianapolis 7)

15–23. American Soc. of Tool Engineers, annual, Detroit, Mich. (H. E. Conrad, ASTE, 10700 Puritan Ave., Detroit 38)

17–18. Etiology of the Neuroses, symp., Soc. of Medical Psychoanalysts, New York, N.Y. (D. B. Friedman, SMP, Fifth Ave. and 106 St., New York 29)

18–21. American Assoc. of Dental Schools, St. Louis, Mo. (R. Sullens, 840 N. Lake Shore Dr., Chicago 11, Ill.)

18–22. Bilharziasis, symp., Cairo, Egypt. (A. H. Mousa, Ciba Foundation, 41 Portland Pl., London, W.1, England)

18–22. International Anesthesia Research Soc., Bal Harbour, Fla. (Scientific Liaison Office, Natl. Research Council, Sussex Dr., Ottawa, Ont., Canada)

19–23. International Conf. on Equatorial Geophysics, Lima, Peru. (J. A. Broggi, Instituto Geofisico de Huancayo, Apdo. 46, Huancayo, Peru)

19–23. National Assoc. of Corrosion Engineers, Kansas City, Mo. (T. J. Hull, NACE, 1061 M&M Bldg., Houston, Tex.)

20–21. Hypervelocity Techniques, symp., Denver, Colo. (A. M. Krill, Mechanics Div., Univ. of Denver Research Inst., Denver 10)

20–23. American Assoc. of Anatomists, annual, Minneapolis, Minn. (C. B. Heggestad, Dept. of Anatomy, Univ. of Minnesota, Minneapolis 14)

20–23. High-Temperature Solution Chemistry, symp., Washington, D.C. (J. W. Cobble, Purdue Univ., Lafayette, Ind.)

20–23. Institute of Metals, London, England. (R. E. Moore, 17 Belgrave Sq., London, S.W.1)

20–29. American Chemical Soc., natl., Washington, D.C. (A. T. Winstead, ACS, 1155 16 St., NW, Washington 6)

21–23. Audio Engineering Soc., Los Angeles, Calif. (AES, P.O. Box 12, Old Chelsea Station, New York 11)

21–24. American Orthopsychiatric Assoc., annual, Los Angeles, Calif. (AOA, 1790 Broadway, New York 19)