# SCIENCE

23 January 1959

Volume 129, Number 3343



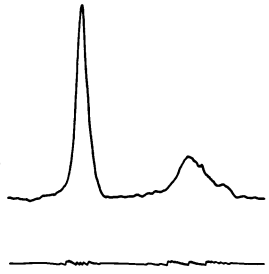
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

# PAPER ELECTROPHORESIS

*. . . now more useful than ever in analyzing biological materials*

Thousands of laboratories routinely run serum proteins by paper electrophoresis as an aid in diagnosing hepatitis, agammaglobulinemia, the myelomas and a variety of related pathologies. Now this simple diagnostic aid is being used to separate other serum components of medical significance.

**LIPOPROTEINS**

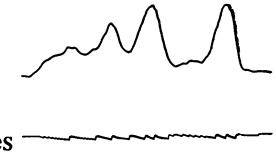


The relationship between these fat-protein molecules and atherosclerosis, liver diseases, diabetes and obesity has made lipoproteins an important field of research.

**HEMOGLOBINS**

Sickle cell anemia is revealed by the presence on the paper strip of both normal and sickle-cell hemoglobins.

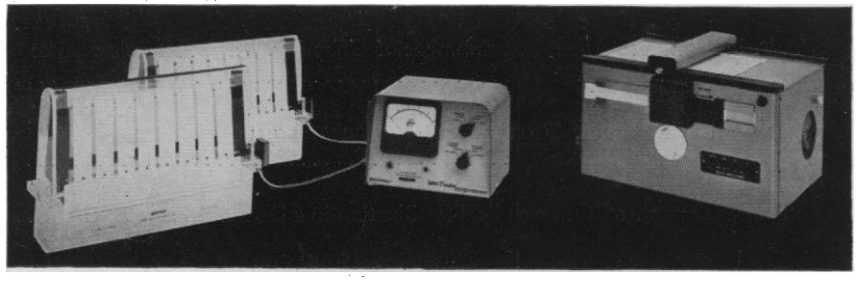
**GLYCOPROTEINS**



Changes in glycoproteins are often greater and more specific than changes in serum proteins. Indications of glycoprotein correlations are reported in studies of cancer, collagen diseases, acute and chronic infections and tuberculosis.

These new analyses can be performed on the same Model R equipment chosen by most laboratories using paper electrophoresis. The equipment is easy for technicians to use, gives uniform, reproducible results, and lends itself readily to different analyses, dyes and techniques. For more information, please return coupon below.

**Beckman®** / **Spinco Division**
*Beckman Instruments, Inc.*



*Beckman/Spinco Model R System: electrophoresis cell, power supply and scanner*

R-5H

*To:* Spinco Division, Beckman Instruments, Inc., Stanford Industrial Park, Palo Alto 5, California

☐ Please send me information on the clinical significance of paper electrophoresis, and a description of the equipment required.

☐ I own a Model R System and would like additional information on recently-reported methods.

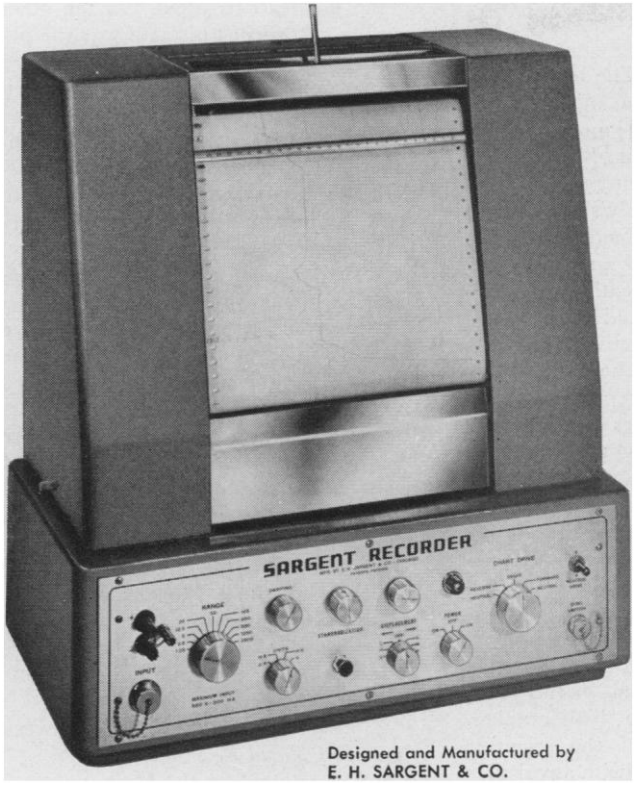
— NAME _____

— INSTITUTION _____

— ADDRESS _____

_____

# THE SARGENT



Designed and Manufactured by
E. H. SARGENT & CO.

# LABORATORY RECORDER

(Patents Pending)

An automatic, self-balancing potentiometric recorder which measures voltages or current and graphically records these variables as a function of time.

- **MULTI-RANGE—40 ranges.**
- **MULTI-SPEED—9 standard chart speeds with provision for optional 1-5 range multiplication or 5-1 range reduction.**
- **VOLTAGE OR CURRENT RECORDING—for measurement of voltage or current or any other variable which can be translated to voltage or current signals.**
- **FLEXIBILITY OF APPLICATION**
- **DESIGNED FOR BENCH OPERATION**

**Style:** Vertical strip chart recorder, designed for laboratory bench operation. Assembly of three individual, separable, and self contained units; viz., control panel assembly, amplifier and power supply chassis, and chart and pen drive chassis unit.

Automatic null balancing potentiometric system with standard cell standardization by panel control, conventional chopper-amplifier method with special Sargent high gain amplifier and high stability Sargent bridge power supply using combined or alternate dry cells and mercury cells. Use of the latter obviates need for standardization over very long periods.

**Ranges:** Multiple full scale ranges selected by panel range switch as follows: 1.25, 2.5, 5, 12.5, 25, 50, 125, 250, 500, 1250, 2500. All ranges are made direct reading as full scale deflection in millivolts, milliamperes, or microamperes by use of an associated units selector switch. All 33 scales provide true potentiometric measurement. An additional series of the same eleven ranges in terms of volts is provided by an additional selector switch position, this series using a divider input with an impedance of one megohm.

True potentiometric measurements are thus provided to a maximum of 2.5 volts, higher voltages only being measured through a divider.

**Accuracy:** 0.1% or 20 microvolts, whichever is greater.

**Chart:** Width, 250 mm; length, 120 feet. Ruling rational with all ranges on a decimal basis. Indexed for reference. Graduated steel scale provides for any necessary correction of calibration. Two-position writing plate, 15° or 40° from vertical.

**Chart Drive:** Forward drive recording, reverse drive recording, magnetic brake eliminating coasting when stopped and free clutch position with separate provision for rapid non-synchronous drive.

Recording speeds of ⅓, ½, 1, 1½, 2, 2⅔, 4, 8, and 12 inches per minute, selected by interchange of two gears on end of chassis.

Free clutch or neutral drive at the rate of approximately 20 feet per minute in either direction for rapid scanning of recorded information, chart reroll, or chart positioning.

Recording either by automatic take-up on roll or with free end chart and tear off.

Synchronous switching outlet for automatic synchronization of external devices with recording.

**Pen Speed:** 1 second full scale. Other speeds can be provided on special order with change of motors.

**Bridge:** Special Sargent specification. Provision for coupled transmitting potentiometer for output to integrating circuits, etc.

**Damping:** Dynamics controlled with single panel knob adjustment of amplifier gain.

**Dimensions:** Width, 21½ inches; depth, 13 inches; height, 24 inches; weight, about 75 pounds.

**S-72150 RECORDER — Potentiometric, Sargent** Complete with two S-72165 chart rolls; two each S-72175 pens; red, blue and green; one S-72176 wet ink pen, input cable assembly; synchronous switch cable assembly; plastic dust cover; spare ring for take-up mechanism; spare pen drive cable assembly; and fuses. For operation from 115 volt, A.C. single phase, 60 cycle circuits..... **$1725.00**

**SARGENT** *SCIENTIFIC LABORATORY INSTRUMENTS • APPARATUS • SUPPLIES • CHEMICALS*

E. H. SARGENT & COMPANY, 4647 W. FOSTER, CHICAGO 30, ILLINOIS
DETROIT 4, MICH. • DALLAS 35, TEXAS • BIRMINGHAM 4, ALA. • SPRINGFIELD, N. J.

# Letters

## Why Not "Get Lost?"

Under the caption, "The lost legion," the editorial of the issue of 3 October [*Science* **128**, 747 (1958)] mourns the effects of team replacement of individually directed effort in current research—(i) loss of contribution to published research results, (ii) loss of scientific freedom under the supervision of an administrator, (iii) loss of identification with specific accomplishment, and (iv) loss of recognition as a productive scientist—this by way of warning the young scientist to be wary of the conditions of his employment if he enters an industrial laboratory. The advantages of the industrial-team situation, "financial and otherwise," deserve closer examination.

"Of the making of many books there is no end." The sheer volume of published reports of bits-and-pieces "research findings," sometimes in multiple audience orientations, has become burdensome to the individual scientist or, in the team approach, to the reference librarian and the bibliographer. (Editorial evaluation of the scientific merit of the manuscripts with any degree of selectivity must be a nightmare!)

Not every young scientist is endowed with the genius, or has attained the breadth of outlook, the maturity in scientific discipline, and the self-discipline, to exercise freedom of research constructively, either for his own progress or for the expansion of scientific frontiers. To the immature scientist, the research administrator may seem a tyrannous instrument of management control, but in most instances, viewed more objectively, he is likely to be mentor, counselor, and friend, seeking to develop and nurture whatever aptitudes are present. This is as much a part of his "management" function as is the expeditious completion of specific projects or programs. The young scientist seeking employment in a research program, whether industrial, governmental, or institutional, should be concerned with both the scientific and managerial quality of the supervision he will receive.

The privilege of publishing and being identified with piddling, fortuitously planned, or uncritically guided and reviewed research is not one that would be highly prized by a young man with serious intentions toward a scientific career.

The notion that the published record of his research is the only acceptable, or even the best, evidence of his productivity as a scientist can be considered an undeserved slur on the perspicacity of senior scientists, research directors, and deans. A competent employment officer for a scientific facility will make a more thorough evaluation of an applicant's qualifications than is possible by mere inspection of his list of publications. An inordinately long list may invite more careful scrutiny of the scientific quality of the publications listed. On the other hand, a record of satisfactory participation in the work of an agency recognized for the quality of its output—supported by appropriate inquiries concerning the scope and nature of the individual's contribution to projects in which he has participated, his growth, and his ability to work harmoniously and constructively with associates—is likely to weigh heavily in making the employment decision. (The harmonious-relations item assumes that the value system of the man in the laboratory coat differs from that of the "man in the gray flannel suit.")

When major advances and "breakthroughs" in science are more and more based on intelligently directed efforts of teams comprising widely assorted varieties of scientists, technologists, and technicians, it may be better for the young scientist to "get lost" in the anonymity of such team efforts, with the prospect of emerging to recognition and identification with significant effort at a later, more mature, stage, rather than to be lost through isolation.

EUGENE D. CARSTATER
*Bureau of Naval Personnel,*
*U.S. Department of the Navy,*
*Washington, D.C.*

Young men entering upon their careers can draw their own conclusions as to whether they desire anonymity along with opportunities to do research. Will they knowingly enter laboratories where the "get lost" philosophy prevails? I think not. I believe they have the right to know the philosophy underlying the personnel policies of their employers. They should be encouraged to ask questions before accepting employment. That was the thesis of "The lost legion."

In regard to publication of research results, it is debatable whether there are too many books or scientific articles. That is not a question for research directors to decide. One may take the position that research is not completed until results are made available to other workers in the field. Carstater, I fear, is unduly concerned with the "burdensome" tasks of reference librarians, bibliographers, and editors. Let each attend to his own knitting. Release of research results may properly be delayed because of patent applications or for security reasons. Ultimately, I believe, research results should be in the public domain as known "contributions to the sum total of human knowledge." In passing, we should recognize that an employer runs certain risks when a member of his organization releases a report. A competitor may offer him a job at a higher salary or profit by his discovery. If the work of a scientist is not publicized, such dangers are minimized.

(*Continued on page 218*)

(*Continued from page 174*)

I agree with Carstater that the young scientist "should be concerned with both the scientific and managerial quality of the supervision he will receive." These are important considerations. A record of publication constitutes one type of evidence as to the caliber of the scientific output of a laboratory. The "managerial quality of supervision" is extremely difficult to evaluate unless one is personally involved in an organization.

I do not know what Carstater means by "the privilege of publishing." Publication is not a favor to be conferred upon good behavior. In my opinion, in discussing the publication of a research paper, the word *privilege* should be taboo. It is legitimate to ask a research director, "What is the policy of your organization regarding the publication of research results?" One should be guided by one's own ideals after an answer to that question is obtained. Verbal answers, no matter how sincere, may not be known to administrators who later may direct a man's work. Unless reduced to writing, "policy" can become a meaningless thing.

Carstater is ungracious in stating that "an undeserved slur on the perspicacity of senior scientists, research directors, and deans" was intended or implied in the thesis of "The lost legion" editorial. Selection, at best, is a difficult task. All evidence, even if remotely related to the problem, should be available for consideration before an appointment is made. A record of published research constitutes evidence. It should be used in conjunction with, and not as a substitute for, verbal reports on behavior, attitudes, and record searches. The published record of research most certainly would not constitute "the only acceptable, or even the best, evidence of his productivity as a scientist." But it would be an important item for consideration.

I am slightly amused by but very tolerant of Carstater's "father knows best" point of view. He refers to "the immature scientist" and the scientist at a "more mature stage." There may be organizations where the research administrator "is likely to be mentor, counselor, and friend, seeking to develop and nurture whatever aptitudes are present." It would be interesting to conduct attitude surveys to check this hypothesis.

RICHARD S. UHRBROCK
*College of Arts and Sciences,*
*Ohio University, Athens*



## Skin Diving in Rocket Ships

A person in a tank of water is able to withstand relatively great accelerations without damage or malfunction (even more than in a pilot's "G suit"). This could possibly be expected from the report on weightlessness by H. J. Muller [*Science* **128**, 772 (1958)].

Experiments demonstrating this were described to me by Carter Collins, about the time of the publication of my report "Some principles of self-contained underwater breathing apparatus" [*Science* **128**, 1001 (1958)]. Collins noted that an air-pressure regulator which is wrongly positioned with respect to the body is dangerous in high-acceleration situations because the density of the material separating the lungs and the regulator is effectively increased proportional to the acceleration, and thus the lungs are not necessarily supplied with air at the pressure surrounding them. The weight-compensated regulator described in my report effectively puts the regulator within the lungs, and it retains this ability under the action of most commonly experienced acceleration forces, whether compensation is by a weight or by a float. In a centrifugal field, if the center of rotation is near the person, departures from exact compensation can exist. Under changes in gravity, compensation in all positions can remain perfect. Compensation with a spring does not give these effects.

In this connection, it is relevant to

note that some early tests to determine the best location of a regulator (which indicated a location within the lungs) involved diving in a medium more dense than water and moving the regulator up or down to the most comfortable position relative to the body. An acceleration field effectively increases the density of the liquid and the compensating weight at the same rate, and so the required weight does not change as it would have to for diving in a different medium.

The concept of a "center of pressure" for the lungs, at which a regulator should effectively be positioned, probably loses much of its significance if a great pressure difference exists across the chest itself. (For example, one might expect difficulty in trying to breathe under mercury.)

R. STUART MACKAY
*Radiological Research Laboratory, University of California Medical Center, San Francisco*

## Strontium Content of Human Bone

In the issue of 1 August [*Science* **128**, 256 (1957)], Thurber, Kulp, Hodges, Gast, and Wampler report on their measurements on the common strontium content of human bones from urban populations. They deduce a ratio of Sr to Ca in bone of $(0.45 \pm 0.1) \times 10^{-3}$. Combining this with the figure they quote for the same ratio in average soil, one obtains a discrimination factor of $16 \pm 4$, which has a significantly higher error than they quote.

This perhaps makes less disturbing the discrepancy between their measured discrimination and the one which can be calculated on the basis of the discrimination factors they quote for the various biological systems. Using these numbers—namely, human calcium half derived from vegetation and half from milk, plant-to-soil discrimination equal to unity, plant-to-milk discrimination equal to 7, and milk or vegetation to human bone discrimination equal to 4—one estimates the over-all discrimination between soil and human bone to be about 7 (not 16 as quoted in the report). A discrepancy of a factor of 2 is perhaps not surprising in view of the roughness of the numbers and the simplifying assumptions which have been made.

The factor of $16 \pm 4$ is certainly an encouraging sign, but its relative constancy in these measurements, as Thurber *et al.* point out, is largely a function of the averaging of food sources in a modern urban environment. It would be interesting to see similar measurements on bones from isolated rural populations in calcium-rich and calcium-deficient regions.

R. G. GLASSER
*Nucleonics Division, U.S. Naval Research Laboratory, Washington, D.C.*

# Meetings

## Sensory Deprivation

A "Symposium on Sensory Deprivation" was held at Harvard Medical School in Boston on 20 and 21 June 1958. The meeting was jointly sponsored by the Physiological Psychology Branch of the Office of Naval Research, the Harvard Medical School, and the Boston City Hospital. The meeting consisted of a working group of some 80 scientists working directly or indirectly with problems of sensory deprivation, isolation, and confinement.

An outstanding feature of the meeting was the fact that representatives of a wide variety of disciplines and interests, ranging from neurophysiology, psychiatry, psychoanalysis, and psychology to biochemistry, pharmacology, mathematics, and engineering, could meet together and communicate meaningfully about a problem of common interest.

*Sensory deprivation* is the term applied to various experimental techniques designed to isolate the subject from his natural environment through the elimination, reduction, or stereotyping of sensation from vision, hearing, and touch. The effects of sensory deprivation have long been known in the accounts of explorers and shipwrecked sailors, more recently in "brainwashed" prisoners-of-war. They are varied and include boredom, restlessness, oppression, mental inefficiency, and aberrations in thinking. The specific determinants and consequences of sensory deprivation have recently come in for increasing systematic study in the laboratory.

Findings were reported at the symposium relevant to the effects of deprived or restricted environments upon intellectual function, opinions and attitudes, perceptual performance, reaction time, electroencephalograms, and physiological reactivity, as well as upon personality and emotions. The relevance of sensory deprivation to a variety of practical situations was examined, including its role in the treatment of psychiatric disorders, its effects on the performance of aviators, and its special utility in the study of stress. The particular relevance of questions raised by research in sensory deprivation for concepts, techniques, and theory in psychoanalysis was also discussed.

The mental disturbances produced by sensory deprivation were thought to be explained best in terms of interference with previously little understood neural mechanisms essential to alertness and attentiveness. The mind does not seem to function efficiently without constant contact with changing stimuli from the outside world. On the other hand, effects similar to those seen with sensory deprivation have been observed in situations

in which this same neural mechanism is taxed through overloading.

On the behavioral level it was suggested that decrease in environmental input (in terms of either absolute reduction or absence of change) has the effect of modifying the learned model of the world which each individual acquires in the form of expectancies or "programs" for dealing with reality. The understanding of the results of sensory deprivation clearly requires a functional, rather than a structural, view of behavior and its instrumentalities.

The classical conception of the human nervous system as essentially a switching mechanism appears increasingly to be losing ground. In its place has emerged a view of the nervous system, as characterized by W. Gray Walter, as a "complex, probabilistic, nonlinear system." This change in perspective has produced new emphases in research. For example, the previous total input-output history of the experimental organism, hitherto ignored, has become an important variable to be controlled. The functional view also points to a search for the parameters of sensory input along "meaning" dimensions as well as along physical dimensions for understanding resultant output or behavior.

The symposium included six papers reporting completed work, three theoretical papers, and a round-table discussion. The experimental papers were as follows:

1) "Cognitive and physiological effects of perceptual isolation," by Woodburn Heron.

2) "Individual differences in reaction to experimental interference with reality contact," by Leo Goldberger and Robert R. Holt.

3) "The effect of human isolation upon some perceptual and motor skills," by Jack Vernon, Thomas E. McGill, Walter Gulick, and Douglas K. Candland.

4) "Sensory deprivation in aviation," by A. M. H. Bennett.

5) "Physiological and psychological aspects of sensory deprivation—a case analysis," by Jack H. Mendelson, Philip Kubzansky, P. Herbert Leiderman, Donald Wexler, and Philip Solomon.

6) "Observations of anaclitic therapy during sensory deprivation," by Hassan Azima, R. Vispo, and Fern J. Azima.

The theoretical papers discussed sensory deprivation from the point of view of psychoanalysis, neurophysiology, and cognitive psychology, as follows:

1) "Theoretical considerations," by Lawrence S. Kubie.

2) "Are there common factors in sensory deprivation, sensory distortion and sensory overload?" by Donald B. Lindsley.

3) "The cognitive consequences of early sensory deprivation," by Jerome Bruner.

A concluding round-table discussion was held, with the following participants: Donald O. Hebb, Jerome S. Bruner, Ernst Gellhorn, Lawrence S. Kubie, John C. Lilly, Erich Lindemann, Donold B. Lindsley, Horace G. Magoun, W. Gray Walter, Norbert Wiener, and Heinz Werner. Among others who contributed significantly to the general discussion were Grete Bibring, Edwin Boring, Enoch Callaway III, Sanford I. Cohen, Joel Elkes, Charles Fisher, Robert Grenell, George Klein, Warren McCulloch, Sydney Margolin, Austin Riesen, Norman Rosenzweig, George Ruff, and Richard Trumbull.

The proceedings of the meetings are to be published.

PHILIP SOLOMON, PHILIP KUBZANSKY, P. HERBERT LEIDERMAN, JACK H. MENDELSON, DONALD WEXLER
*Psychiatric Research Laboratory, Boston City Hospital, Boston, Massachusetts*

## Forthcoming Events

### February

*23–27.* American Concrete Inst., 55th annual, Los Angeles, Calif. (W. A. Maples, A.C.I., 18263 W. McNichols Rd., Detroit 19, Mich.)

*25–26.* Midwest Industrial Radioisotopes Conf., Manhattan, Kan. (J. Kitchens, Dept. of Continuing Education, Kansas State College, Manhattan.)

*25–27.* Biophysical Soc., annual, Pittsburgh, Pa. (G. Felsenfeld, Dept. of Biophysics, Univ. of Pittsburgh, 325 Clapp Hall, Pittsburgh 13.)

*26–28.* American Acad. of Forensic Sciences, annual, Chicago, Ill. (W. J. R. Camp, AAFS, 1853 W. Polk St., Chicago 12.)

*26–28.* Genetics and Cancer, 13th annual symp. on fundamental cancer research, Houston, Tex. (Editorial Office. Univ. of Texas, M. D. Anderson Hospital and Tumor Inst., Texas Medical Center, Houston 25.)

*27–1.* National Wildlife Federation, 23rd annual convention, New York, N.Y. (NWF, 232 Carroll St., NW, Washington 12.)

### March

*1–2.* Pennsylvania Acad. of Sciences, Gettysburg. (K. Dearolf, Public Museum and Art Gallery, Reading, Pa.)

*1–5.* Gas Turbine Power Conf., Cincinnati, Ohio. (O. B. Schier, ASME, 29 W. 39 St., New York, N.Y.)

*7.* American Chemical Soc., Oklahoma Div., tetrasectional meeting, Tulsa. (J. W. Conant, ACS, Grand River Chemical Div. of Deere and Co., Pryor, Okla.)

*8–9.* American Broncho-Esophagological Assoc., Hot Springs, Va. (F. J. Putney, 1712 Locust St., Philadelphia, Pa.)

*8–9.* American Laryngological Assoc., Hot Springs, Va. (J. H. Maxwell, University Hospital, Ann Arbor, Mich.)

*8–12.* Aviation Conf., Los Angeles, Calif. (O. B. Schier, ASME, 29 W. 39 St., New York, N.Y.)

*10–12.* American Laryngological, Rhinological and Otological Soc., Hot Springs, Va. (C. S. Nash, 708 Medical Arts Bldg., Rochester 7, N.Y.)

*13–14.* American Otological Soc., Hot Springs, Va. (L. R. Boies, University Hospital, Minneapolis 14, Minn.)

*13–15.* Alabama Acad. of Sciences, Auburn, (H. M. Kaylor, Dept. of Physics, Birmingham-Southern College, Birmingham, Ala.)

*14–15.* Southwestern Soc. of Nuclear Medicine, 4th annual, New Orleans, La. (S. B. Nadler, SSNM, 1520 Louisiana Ave., New Orleans 15, La.)

*15–20.* American College of Allergists, San Francisco, Calif. (M. C. Harris, 450 Sutter St., San Francisco.)

*16–19.* American Assoc. of Petroleum Geologists, Soc. of Economic Paleontologists and Mineralogists, 44th annual, Dallas, Tex. (W. A. Waldschmidt, AAPG, 311 Leggett Building, Midland, Tex.)

*16–20.* American Inst. of Chemical Engineers, Atlantic City, N.J. (F. J. Van Antwerpen, AICE, 25 W. 45 St., New York 36.)

*16–20.* National Assoc. of Corrosion Engineers, 15th annual conf., Chicago, Ill. (NACE, Southern Standard Bldg., Houston, Tex.)

*16–20.* Western Metal Exposition and Cong., 11th, Los Angeles, Calif. (R. T. Bayless, 7301 Euclid Ave., Cleveland 3.

*17–19.* National Health Council, Chicago, Ill. (P. E. Ryan, 1790 Broadway, New York, 19.)

*18–25.* International Social Science Council, 4th general assembly (by invitation), Paris, France. (C. Levi-Strauss, Secretary-General, International Social Science Council 19, avenue Kleber, Paris.)

*19–21.* Society for Research in Child Development, NIH, Bethesda, Md. (Miss N. Bayley, Laboratory of Psychology, National Inst. of Mental Health, Bethesda 14, Md.)

*23–26.* Institute of Radio Engineers, natl. conv., New York, N.Y. (G. L. Haller, IRE, 1 E. 79 St., New York 21.)

*24–27.* American Meteorological Soc., general, Chicago, Ill. (K. C. Spengler, AMS, 3 Joy Street, Boston, Mass.)

*27–28.* Michigan Acad. of Sciences, East Lansing. (D. A. Rings, Univ. of Michigan, Dept. of Engineering, Ann Arbor.)

*28.* South Carolina Acad. of Sciences, Columbia. (H. W. Freeman, Dept. of Biology, Winthrop College, Rock Hill, S.C.)

*29–3.* Latin American Congress of Chemistry, 7th, Mexico D.F., Mexico. (R. I. Frisbie, Calle Ciprès No. 176, Zone 4, Mexico, D.F.)

*30–1.* American Orthopsychiatric Assoc., San Francisco, Calif. (M. F. Langer, 1790 Broadway, New York 19.)

*30–12.* Bahamas Medical Conf., 7th, Nassau. (B. L. Frank, 1290 Pine Ave., W. Montreal, Canada.)

*31–2.* American Power Conf., 21st annual, Chicago, Ill. (N. S. Hibshman, AIEE, 33 W. 39 St., New York 18.)

*31–2.* Symposium on Millimeter Waves, 9th, New York, N.Y. (H. J. Carlin, Microwave Research Inst., 55 Johnson St., Brooklyn 1, N.Y.)

*31–5.* International Committee of Military Medicine and Pharmacy, 21st session, Paris, France. (Comité International de Médecine et de Pharmacie Militaires, Hôpital Militaire, 79, rue Saint Laurent, Liège, Belgium.)



### April

*1–3.* American Assoc. of Anatomists, Seattle, Wash. (B. Flexner, Univ. of Pennsylvania Medical School, Philadelphia 4.)

*1–4.* National Council of Teachers of Mathematics, Dallas, Tex. (H. T. Karnes, Dept. of Mathematics, Louisiana State Univ., Baton Rouge 3.)

*1–4.* National Science Teachers Assoc., 7th natl. conv., Atlantic City, N.J. (R. H. Carlton, NSTA, 1201 16 St., NW, Washington 6.)

*1–4.* Neurosurgical Soc. of America, Hot Springs, Va. (F. P. Smith, 260 Crittenden Blvd., Rochester 20, N.Y.)

*1–29.* World Meteorological Organization, 3rd session of congress, Geneva, Switzerland. (WMO, Campagne Rigot, 1, avenue de la Paix, Geneva.)

*2–3.* Electrically Exploded Wires, conf., Boston, Mass. (W. G. Chace, Thermal Radiation Laboratory, CRZCM, Geophysics Research Directorate, Air Force Cambridge Research Center, Bedford, Mass.)

*2–4.* Association of American Geogra-