SCIENCE

16 October 1964
Vol. 146, No. 3642

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

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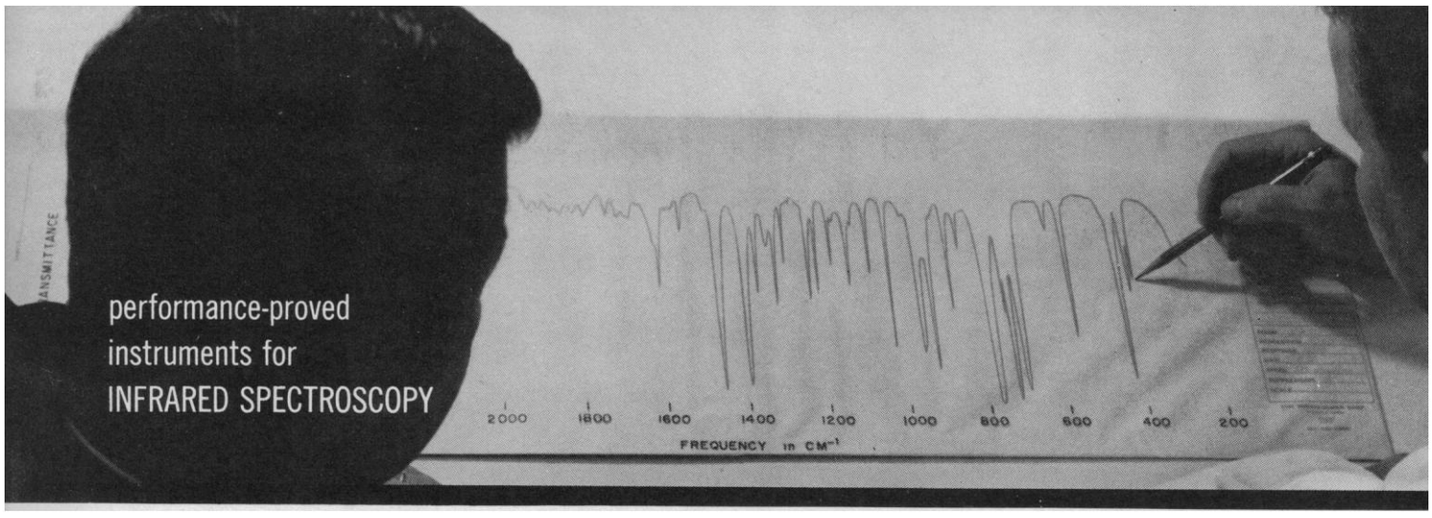

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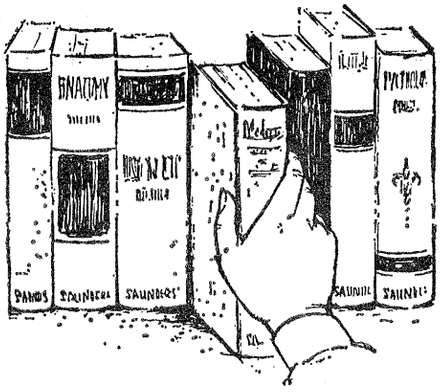

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COVER

View of the Austerdal Glacier (Austerdalsbre) in western Norway, just north of the Sogne Fjord, the longset fjord in Norway. The ice accumulates on the high plateau (background) and then descends in two precipitous ice falls. The falls join at the bottom and form a typical valley glacier. The dark and light banding on the surface represents the outcrop of a pervasive internal structure in the glacier ice. See page 353.

Kodak reports on:

ytterbium in glass... making prints under tension... what learned people of non-commercial motivation have discovered

A goal for the customers

Hereby offered for sale is a new KODAK Laser Glass, Type Yb-20, a borate glass doped with 3% of ytterbium. This rare earth has been waiting offstage many years for this day of possible glory. A certain tourist guide to Sweden claims ytterbium and yttrium were named after the town of Ytterby near Göteborg. Nonsense. They were named for the old Ytterby quarry near Vaxholm fortress, only three miles from Stockholm. It may take more than that, however, to make Yb desirable in the eyes of prospective purchasers. What can they do with it?

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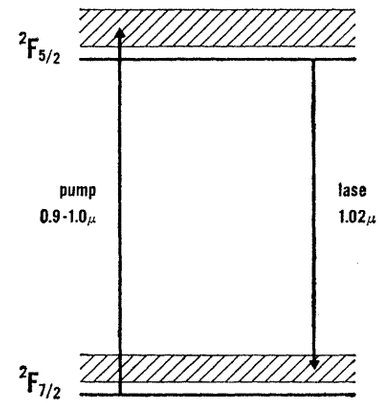

The situation in ytterbium

band just above the $^2F_{7/2}$ ground state emptied by cooling to 77°K, a xenon or argon arc with its forest of lines in the 0.8-1.0μ region readily pumps the system. Little else from these arcs can be absorbed to heat the glass and fight the refrigerant. From the upper energy band a short non-radiative drop feeds the $^2F_{5/2}$ state and keeps it nicely populated for laser action at 1.02μ.

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Science in the New Political Climate

In this October of 1964, the Cuban crisis of two years ago seems almost like a bad dream. The Nuclear Test Ban Treaty of a year ago has been quite effective in easing world tensions. While vestiges of apprehension remain, billions of people lead freer, happier lives in the new political climate. If this relaxation continues, a variety of adjustments will surely follow. For instance, the urgency for defense spending will diminish. At the same time, there will be a change in the public's attitude toward science.

For nearly 20 years, most people have identified science closely with defense. To a large degree these public attitudes were conditioned by wartime technological developments and especially by the atomic bomb. A measure of the extent of the people's faith in science as a shield was the reaction to Sputnik—not only at the time, but also subsequently. One indication was the suddenly enhanced position of scientists in the high councils of government; for example, elevation of the status of the President's Science Advisory Committee. A second and perhaps more significant measure was the grass-roots response with respect to education. This has produced changes in school curriculums and course content that may be the most important long-time residue of the event.

With imminent mortal peril receding from view, how will the public regard science? In a large measure this will depend on the values which, to scientists themselves, characterize their work.

There are practical reasons why science should have an honored place in society. The base of our present prosperity rests on science and associated technology. While our attention has been over-focused on military problems, new competition and new rivals have appeared. In international trade the Germans and the Japanese are increasingly successful as they skillfully exploit applied science. In this arena they leave the Russians far behind. I shall never forget the half-frightening impact of an international industrial fair at Frankfurt and conversations there with Americans who were in competition with West Europeans.

An especially important area where science will continue to be the servant of progress is medicine. All mankind faces deadly enemies in the disease processes which have killed and maimed far more individuals than have died in wars. While there have not been recent major dramatic practical consequences of medical research, our improving basic understanding of biological processes guarantees future benefits for all. At the same time, multiple small victories have lessened the menace of even such formidable enemies as cancer and cardiovascular disease.

The most neglected but perhaps the most important reason for carrying on scientific work lies in the spiritual sphere. Today most of the earthly land frontiers have been explored. Where can society look for innovation? For new challenges? We must change continuously to some degree, or we shall stagnate. One of our best sources of innovation is science and technology, for the spirit of science is innovation. One other value of science has not been discussed much of late. It stems from man's hunger to know. Even today we are faced with many unknowns. These represent an invigorating incentive to man and to science. When science drives back the frontiers of ignorance, it does so for all men, and all men can enjoy a greater sense of human dignity for it.

If we are to move forward toward a great society, we must have great challenges, great thinkers, and great innovators. Science can furnish its share of them.—PHILIP H. ABELSON

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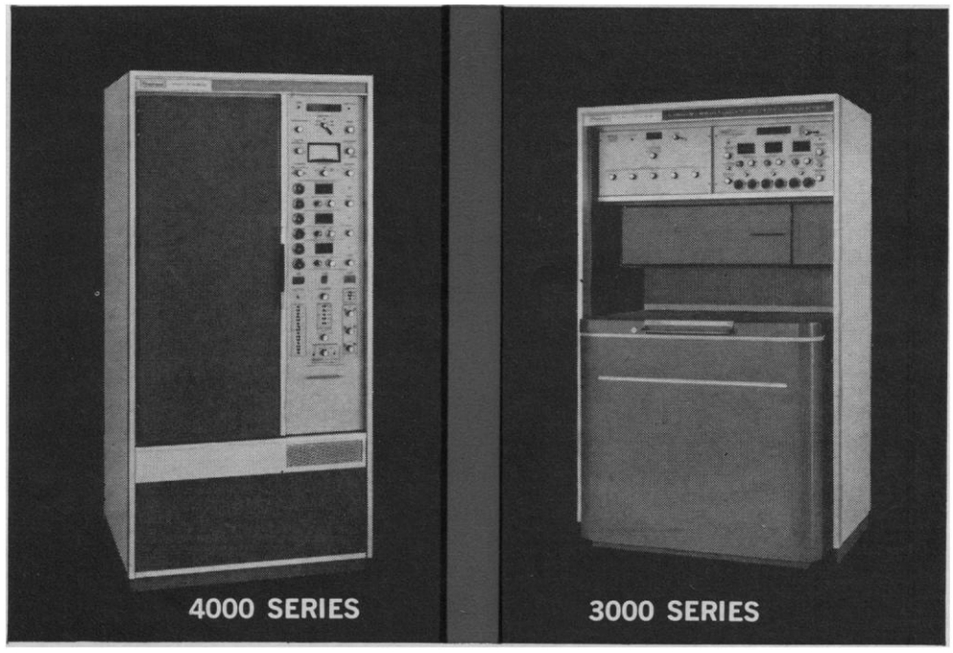

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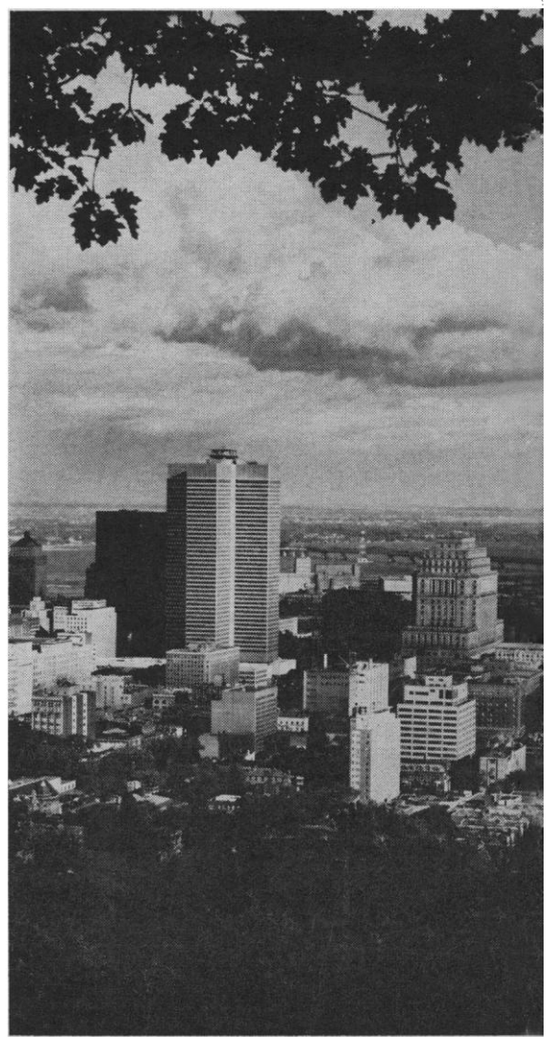

Program Highlights

Moving Frontiers of Science V. C. Wynne-Edwards on self-regulating systems in animal populations; J. M. Harrison on nonrenewable world resources; Philip Morrison, "New Channels in Astronomy"; and Clement L. Markert on role of genes in embryonic development.

Interdisciplinary Symposia Possible meteoric or lunar influences on meteorological phenomena; basic concepts of biochemical differentiation; medical geology and geography; history of the popularization of science.

Special Sessions AAAS Presidential Address by Alan T. Waterman; the Joint Address of Sigma Xi and Phi Beta Kappa by René Dubos; the George Sarton Memorial Address by Lloyd G. Stevenson; the National Geographic Society Illustrated Lecture; and the AAAS Distinguished Lecture by Lord Brain, retiring president, British AAS.

International Conference on Primate Behavior Three AAAS sections and the combined ESA and ASZ Section on Animal Behavior and Sociobiology are sponsors. Six sessions, open to the public, will include 37 speakers from four continents.

AAAS Committees Sessions of the AAAS Committee on Meetings, including two sessions on the sociology of science arranged and chaired by Robert K. Merton; and the Commission on Science Education.

Sections and Societies The 20 AAAS Sections and some 76 participating societies are scheduling specialized symposia; some have sessions for contributed papers.

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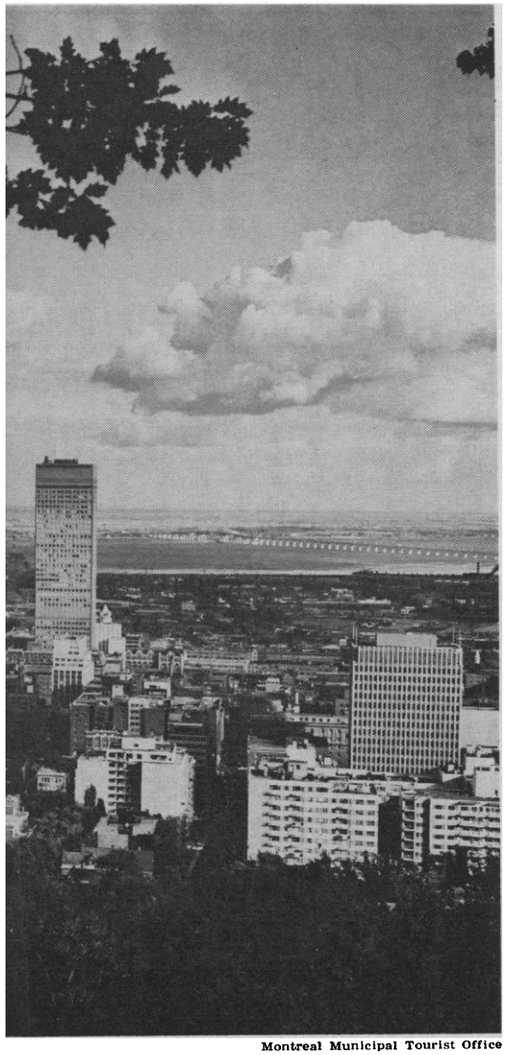

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Make sure you have the accommodations you prefer. A list of headquarters hotels of participating societies appears on page 299, 17 July, SCIENCE. The AAAS headquarters is the Queen Elizabeth.

The hotels for the AAAS Montreal meeting have established special, low rates and have reserved large blocks of rooms for the meeting.

Use the coupon below to make your hotel reservation in Montreal. **Send your application to the AAAS Housing Bureau in Montreal, not to any hotel**. Give a definite date and estimated hour of arrival, and also probable date of departure. The Housing Bureau will make the assignment and send you a confirmation promptly.

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HOTEL RATES

For a list of the headquarters of each participating society and section, see page 299, 17 July, SCIENCE.

Hotel	Single	Double	Twin	Suite
*Queen Elizabeth	$ 8.50, 10.00	$15.00	$15.00	$30.00–$50.00
*Sheraton-Mount Royal	8.50, 10.00	15.00	15.00	25.00– 45.00
Windsor	8.50	15.00	15.00	25.00– 45.00
*Laurentien (Sheraton)	7.50	12.00	12.00	21.00– 30.00
Ritz Carlton	10.00	15.00	15.00	35.00
Berkeley	7.00	10.00	10.00	17.50

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Montreal 2, Que., Canada

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Please reserve the following accommodations for the 131st Meeting of the AAAS in Montreal, 26–31 December 1964

First Choice Hotel ..... **Second Choice Hotel** ..... **Third Choice Hotel** .....

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DATES: ARRIVAL ..... A.M. .....P.M. ..... DEPARTURE .....
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the lipoprotein complex that has been shown to be important for alveolar stability.

Deposition of aerosols in the human lung was comprehensively reviewed by L. Dautrebande (Brussels, Belgium) and W. Walkenhorst (Silicosis Research Institute, Bochum, Federal Republic of Germany). The authors' review included experimental human data obtained in their laboratory; such data showed that particles sampled from the deep alveolar air were between 0.05 and 0.4 μ in diameter and never exceeded 1 μ.

The biologic processes involved in the clearance and retention of insoluble aerosols were reviewed by P. Gross (Industrial Hygiene Foundation, Pittsburgh). He separated pulmonary clearance into two processes. The physiologic process that accounts for 90 percent of the cleared dust involves the transport of dust from the alveoli or site of deposition to the pharynx where it enters the gastrointestinal tract. He then described the pathologic mechanism by which dust is transported into the lung interstitium and subsequently to satellite lymph nodes. L. J. Casarett (University of Rochester) postulated that alveolar epithelial cells are phagocytic and may carry phagocytized material into either the alveolar spaces or the interstitial tissue. He further suggested that the rate of clearance of particles from the alveoli is partially dependent on the phagocytic process which is influenced by the physical and chemical properties of the particle.

In a paper which will undoubtedly have an important bearing on evaluating inhalation hazards, C. N. Davies (London School of Hygiene and Tropical Medicine, London) presented evidence showing that the deposition of dust in human alveoli has been much overestimated. Because of the impossibility of making direct measurements, calculations regarding alveolar deposition have been based on respiratory gas exchange. Since aerosol particles possess a coefficient of diffusion negligible compared to gas, the actual aerosol dead space is significantly greater than gas-determined dead space.

New experimental techniques were described in several papers. The apparatus used to measure canine inhalation exposure utilizes a whole-body plethysmograph and shows promise for directly correlating deposition of aerosols with respiratory patterns (B. B. Boecker, Lovelace Foundation). A similar method for rats was used by R. Lie (Lovelace Foundation) to study the inhalation of Cs^{137}. Her data provided an interesting comparison with data obtained in man by whole-body counting techniques (C. E. Miller, Argonne National Laboratory). The longest biological half-lives observed in man were 73 and 84 days for inhaled $Cs^{137}SO_4$, as compared with about 13 days in rats for inhaled $Cs^{137}Cl$ and $Cs^{137}NO_3$.

B. Kahn (U.S. Public Health Service, Cincinnati) reported on the intake and retention of Sr^{89} and Sr^{90}, as airborne particles, by infants during the period April to July 1963. The intake of Sr^{89} and Sr^{90} varied from 3 to 14 pc/day and 0.6 to 1.7 pc/day, respectively. From these studies he computed a daily inhaled air volume, for infants, of 11 ± 4 m^3, which is greatly in excess of the generally reported values of 0.8 to 2.8 m^3.

In an examination of the problem of inhaled insoluble plutonium, W. S. Snyder (Oak Ridge National Laboratory) suggested the possibility that over long periods a significant fraction of the retained plutonium may be translocated to the skeleton and that this tissue, rather than lung, might be the critical organ.

A number of papers dealt with the uranium mine problem. H. E. Palmer (Hanford Laboratories) reported on studies conducted at mine sites with a mobile whole-body counter. Measurements of the radon daughter, Bi^{214}, in human beings showed nearly 100 percent retention of inhaled radon daughters during an exposure in a nonoperating mine. However, less deposition occurred when the same subjects were exposed to the air of an operating mine containing diesel exhaust fumes. The difference was attributed in part to the larger particles on which the radon daughters were adsorbed in the operating mine in comparison with the nonoperating mine. In both mines almost all of the inhaled radioactivity was associated with particles less than 0.5 μ.

Estimates of the radiation dose delivered to human respiratory tracts by inhaled radon and radon-daughter products were carefully detailed in separate papers by B. Altshuler (New York University Medical Center) and by W. Jacobi (Hahn-Meitner Institut für Kernforschung, Berlin, Federal Republic of Germany). Altshuler calculated that the alpha doses to the basal cells of the segmented bronchi would be 30 rads/working year of 2000 hours

in a mine atmosphere containing 100 pc of radon, 200 pc of total daughters, and 150 unattached daughter atoms per liter. Jacobi's estimate was about 30 percent lower.

G. Saccomanno (St. Mary's and Veterans Administration Hospitals, Grand Junction, Colorado) reported on the incidence of lung cancer among miners on the Colorado uranium mining plateau; he emphasized the difference in tumor cell types between miners and non-miners. In uranium miners, 56 percent of the lung tumors were of the undifferentiated type, primarily oat cell, compared with about 15 percent in non-miners. It was also found that uranium miners contracted lung cancer at an earlier age than non-miners. V. O. Archer (U.S. Public Health Service, Salt Lake City, Utah) also reported that long exposures within uranium mines resulted in decreased pulmonary function; however, other factors such as silica dust, age, and cigarette smoking were also implicated.

The work at Hanford Laboratories on inhaled $Ce^{144}O_2$ and $Pu^{239}O_2$ in beagle dogs was reported by B. O. Stuart and J. F. Park. Deposition of 2 mc $Ce^{144}O_2$ resulted in lung damage and death 8 months after exposure. The most consistent effect of inhaled $Pu^{239}O_2$ in dogs is an absolute lymphopenia. Other later effects include blood-gas changes and right heart enlargement. Four dogs that died 3½ to 4 years after deposition of 5 to 10 μc $Pu^{239}O_2$ showed bronchiolo-alveolar tumors. (Both papers were progress reports of long-term studies.)

Papers by I. Schmidtke (Robert-Koch-Klinik, Freiburg, Federal Republic of Germany), F. Gensicke (German Academy of Sciences, Berlin, German Democratic Republic), and E. G. Tombropoulos (Hanford Laboratories) illustrated the effectiveness of certain chelating agents such as diethylenetriaminepentaacetic acid and hexametaphosphate in removing the inhaled radionuclides, Ce^{144} and Y^{91}. It was stressed that work on the development of therapeutic procedures for removal of inhaled radionuclides has been long neglected and further work is urgently needed.

Lung models were discussed by a panel composed of J. N. Stannard (University of Rochester), G. L. Helgeson (General Electric Company, Pleasanton, California), H. A. Kornberg (Hanford Laboratories), K. Z. Morgan (Oak Ridge National Laboratory), H. Schulte (Los Alamos Scien-

tific Laboratory), and L. S. Taylor (National Bureau of Standards). It was generally concluded that there are two needs for models—one for the practicing health physicist, and the second, a research model, should serve to improve the first by suggesting avenues of needed research.

One of the highlights of the meeting was a "soul searching" banquet address by J. N. Stannard (associate dean of Graduate Studies, University of Rochester) on the subject "Gentlemen, scholars, and scientists." Stannard pointed out that since the scientist is often asked to make "scientific decisions" which are not really scientific (and which differ from other decisions only in that they are made by scientists), he is obligated to make it clear that the decision was not arrived at by the scientific method.

The symposium was jointly sponsored by the U.S. Atomic Energy Commission and the Hanford Laboratories of the General Electric Company. The proceedings will be published as the 1964 December issue of *Health Physics* and will be available in book form from Pergamon Press Limited, Oxford, England.

Session chairmen were H. D. Bruner (U.S. Atomic Energy Commission), G. H. Crook (General Electric Company, Richland, Washington), M. Eisenbud (New York University), J. L. Liverman (U.S. Atomic Energy Commission), T. Rich (General Electric Company, Schenectady, New York), J. N. Stannard (University of Rochester), and B. Wagner (New York Medical College).

WILLIAM J. BAIR

Hanford Laboratories, Richland, Washington

Forthcoming Events

October

19–21. National **Electronics** Conference, Chicago, Ill. (NEC, Inc., 228 N. LaSalle St., Chicago, 60601)

23–24. American **Physical** Soc., Chicago, Ill. (R. G. Sachs, Argonne National Laboratory, Argonne, Ill. 60440)

23–25. Association of **Clinical Scientists**, Washington, D.C. (R. P. MacFate, 300 N. State St., No. 5422, Chicago, Ill. 60610)

23–25. Experimental **Gerontology**, symp., Basel, Switzerland. (Prof. Verzar, Inst. de Gerontologie Experimentale, Nonnenweg 7, Basel, Switzerland)

24–29. American Acad. of **Pediatrics**, annual, New York, N.Y. (AAP, 1801 Hinman Ave., Evanston, Ill.)