Scientific Meetings

Peacetime Uses of Atomic Energy

Although the topic of thermonuclear reactions was not on the program of the International Conference on the Peaceful Uses of Atomic Energy, Homi J. Bhabha, president of the conference and chairman of the Atomic Energy Commission of India, suggested in his opening speech on 8 Aug. that means for controlling the fusion reaction might be found within 20 years. Two days later, in a press conference, John Cockcroft, chairman of the United Kingdom delegation, stated that British scientists had been investigating this reaction, and George Thomson (United Kingdom) spoke of power from fusion within a generation. Then, on 11 Aug., Lewis L. Strauss, chairman of the United States delegation, stated in another press conference that U.S. scientists had been studying the possibility on a moderate scale for a considerable length of time, but that there had been no "breakthrough." He did not speculate about the time element. Bhabha returned to the subject in a press conference on 12 Aug. He suggested that thermonuclear reactions might be induced at temperatures considerably lower than those now required, that these temperatures could perhaps be attained with high-current accelerators, but that the problem of controlling the reaction would still remain to be solved. Bhabha concluded by stating that he thought fission reactors would not be made obsolete by the harnessing of the fusion reaction and that his estimate of 20 years still stood. On the last day, D. V. Skobeltzin, a Soviet delegate, announced that scientists in the U.S.S.R. had also been considering the problem "for a number of years."

The technical sessions of the conference were divided into three groups that met simultaneously each day to consider the following general topics: (i) physics and reactors; (ii) chemistry, metallurgy, and technology; and (iii) biology, medicine, and radioisotopes.

United Nations reports on the physics sessions called attention to the fact that scientists from the United Kingdom, the Soviet Union, and the United States were in close agreement on two measurements that previously had been classified in all three nations, namely, the number of neutrons emitted per fission, and nuclear cross sections. R. B. Leachman (U.S.) opened the way for this discussion when he summarized a paper, "Determination of fission quantities of importance to reactors," and reported the measurements of the numbers of neutrons per fission that had been made with large tanks of liquid scintillator. In the discussion that followed Leachman's paper, J. E. Sanders (United Kingdom) and M. S. Kozodaev (U.S.S.R.) reported measurements that were almost identical. The discussion of the number of fission neutrons was continued at a later session, when it was also revealed that scientists from the same three nations had found that thorium can be used in breeder reactors. H. Palevsky (U.S.) and W. R. Kanne (U.S.) presented new data on the "alpha" quantity—the ratio of the number of neutrons that are absorbed to those that cause fission. The nuclear cross sections about which precise measurements very nearly coincided applied to low-energy neutrons only. In a discussion that followed the papers, it was agreed that the work should be extended to high-energy neutrons, which will be used in some new types of reactors. H. Hurwitz (U.S.) summarized the present status of cross-section measurements and what still remains to be done. After the formal session, several participants met to prepare a set of world average values for several cross sections in the low-energy region. The values agreed on are reported on page 409 of this issue.

Theories of the fission process were described by A. Bohr (Denmark) and J. A. Wheeler (U.S.). Among the fundamental physical factors discussed were inelastic scattering of fast neutrons, measurement of the speed of neutrons, equipment and techniques used in measuring cross sections in both fissionable and nonfissionable materials, integral measurements, resonance integrals, zero energy and exponential experiments, and reactor kinetics. G. R. Keepin (U.S.) described measurements of delayed neutrons and J. A. Harvey (U.S.) gave the results of measurements of the absorption cross sections of several materials. Minute data on the absorption cross section of xenon-135, which is produced in fission of uranium and which absorbs neutrons so readily that it becomes a major problem in reactor operation, was presented by S. S. Bernstein (U.S.). The physics sessions were concluded with a group of papers on reactor theory.

Descriptions of the design, use, and operating experience of various types of research and power reactors occupied a large portion of the time in the reactor sessions. L. Kowarski (UNESCO) and E. Bretscher (United Kingdom) summarized the available information about the types of research reactors that have been built, and A. H. Snell (U.S.) surveyed the uses of research reactors in basic science. Comparisons were made among the graphite, heavy water, boiling water, and swimming pool types. Operating research reactors in Norway, France, Switzerland, the United Kingdom, the U.S.S.R., and the United States were described in detail. The U.S. reactors described were the materials-testing reactor, the Brookhaven reactor, and several boiling water reactors. In addition, J. R. Dietrich (U.S.) presented details of the construction and operation of a water-cooled and -modulated reactor that was made to "run away" in more than 200 safety experiments. These tests, he said, showed that such a reactor will automatically shut itself down before excessively high temperatures that would cause destruction of the reactor are attained. Motion picture records showed that the heat liberated by the run-away fission caused steam to form around the fuel plates; the resultant absence of neutron-moderating water immediately reduced the reactor power to a low point. After the test series had been completed, the reactor was sacrificed in an experiment that was violent enough to melt the fuel plates. The resultant explosion was "relatively mild," but it was "much more severe than any that might occur in operation." The reactor was destroyed. Most fuel-element fragments fell to the ground within a radius of 200 feet, and there was no appreciable radioactive fallout at distances greater than a few hundred feet.

Design details of power reactors capable of producing electricity at costs from 7 to 11 mills per kilowatt hour were presented in two sessions. C. Starr (U.S.) described a sodium-graphite reactor now under construction near Los Angeles that will be able to utilize either uranium or thorium as fuel. J. J. Went and H. de Bruyn (Netherlands) proposed the replacement of uranium rods in a homogeneous reactor by a suspension of powdered uranium oxide. C. Williams (U.S.) discussed the design for a large central power station that should produce 210 megawatts of electricity for an amount of heat that corresponds to 500 megawatts, which is an efficiency of 42 percent. The fuel would be a solution

of uranium in molten bismuth that would permit the production of steam at a temperature of approximately 900°F.

Both W. H. Zinn (U.S.) and J. W. Kendall (United Kingdom) described fast neutron reactors. Another session was devoted to design details of a fast neutron reactor under construction at Dounreay, Scotland, to the pressurized water reactor now being built at Shippingport, Pa., and to other reactors designed in France, Norway, the United Kingdom, the U.S.S.R., and the United States.

The chemistry, metallurgy, and technology sessions were opened by P. H. Kerr (U.N.), who summarized 94 papers on the natural occurrence of uranium and thorium that had been submitted from 23 countries. Kerr said that these papers provided assurance of the adequacy of these resources for many, many years to come. Detailed consideration of prospecting methods, techniques, and instruments followed.

A session on the construction of laboratories and facilities for handling radioactive materials was followed by several sessions on the chemistry of the fission process. Included were discussions of the solvent-extraction and ion-exchange processes for separating and purifying the radioactive by-products of reactor operation. Separation of chemical elements into their individual isotopes was also considered.

Two new words, *einsteinium* and *fermium,* were used for elements No. 99 and 100 by A. Ghiorso (U.S.) in a discussion of the chemistry of heavy elements. Both elements were first discovered in debris from the Oct. 1952 H-bomb explosion by G. Seaborg. Both einsteinium, symbol E, and fermium, symbol Fm, have since been formed in the University of California cyclotron and in nuclear reactors at Argonne National Laboratory and Los Alamos, N.M. All discovered elements through No. 101, mendelevium, have now been named.

The weakening and destruction of fuel, moderator, and construction materials in an operating reactor was considered in one session, and it was suggested that the use of alloys of uranium and molybdenum, uranium and magnesium, or others, might reduce this effect. Radiation-induced chemical changes in water were emphasized in the session on the effects of radiation on liquids, and the choice of materials for reactor construction was the chief topic in the session on the effects of radiation on solids.

Some other topics considered were the techniques for recovering uranium and thorium from their ores, and the production technology of special materials, which is made complicated by the fact that extreme purity is necessary. Graphite, heavy water, zirconium, and beryllium received particular attention. M. Benedict (U.S.) discussed both the technical and cost details of the production of heavy water by each of three methods, distillation, electrolysis of water, and chemical exchange. Methods for measuring purity received attention from J. Gaunt (United Kingdom), who described molecular spectra methods, and from K. V. Vladimirsky (U.S.S.R.), who described a weighing method that he said was suitable for use by relatively unskilled technicians.

Methods of fabricating reactor fuel elements for some of the reactors now in operation in the United States were described. Descriptions of techniques and actual designs were supplemented by detailed information on the basic metallurgy involved. Possibilities for improving heat transfer from inside the fuel element to the outside where it can be removed by the coolant were discussed by F. Boeschoten (Netherlands).

Liquid metal technology was the title of a session that was devoted to methods of handling liquid metals, liquid metal heat transfer, and corrosion in liquid metal systems. Sodium, sodium-potassium alloy, lead, and bismuth were discussed by British, Soviet, U.S., and Swedish scientists. This session was followed by two on the chemical processing of irradiated fuel elements. The chemistry, metallurgy, and technology sessions were concluded with discussions of the separation, storage, and disposal of fission products. Aspects of disposal in the ground and in the sea were considered.

United Nations summaries of conference proceedings stated that the production of radioisotopes for research in many fields is, for many nations, the most immediately available peacetime use of nuclear energy. Many papers described medical applications of isotopes, ways and means for handling these materials, and clinical and diagnostic work.

R. A. Silow (FAO) surveyed the uses of nuclear energy in biology and future prospects in this field against a background of a world population that increases by about 100,000 per day. He cited two chief ways by which supplies of food and other agricultural raw materials could be increased—the prevention of the vast wastage that now occurs, and the increase of production through investigation of both the fundamental processes of plant and animal physiology and soil and water problems. A. L. Kursanov (U.S.S.R.) summarized studies of root nutrition that had shown that carbon dioxide in soil is translocated to the leaf system.

A. Gustafsson (Sweden) discussed the use of isotopes to irradiate seeds to obtain mutants of crop plants that would be suitable for cultivation under the particular conditions under which it was desired to produce the crop. A. J. Riker (U.S.) reported studies of the extent of root grafting among forest trees and the speeds with which materials are translocated in individual trees, and, through root grafts, in families of trees. The materials studied included water, nutrients, and disease-inducing organisms. Experimental results obtained with the help of isotopes in other studies of plant physiology, animal physiology, and biochemistry were also presented.

The biological effects of radiation were considered at length. Discussions of modes of injury, mechanisms of injury, and bone-seeking isotopes were followed by papers on the human implications of radiation for human genetics. Two other sessions were devoted to safety standards and health aspects of the large-scale use of atomic energy. W. V. Mayneord (United Kingdom) reported that the International Commission for Radiological Protection had established the maximum permissible radiation for human beings at 0.3 roentgens per week. Other papers dealt with measurements of the uptake of radioactive materials by animals and plants in the neighborhood of reactors. V. L. Troitsky (U.S.S.R.) presented measurements of the effects of radiation on immunity, D. E. Clark (U.S.) considered the effects of the use of x-rays on the head and neck of children, and L. and W. L. Russell (U.S.) described the effects of x-irradiation on the embryos of mice. Studies of the effects of several types of radiation on microorganisms were presented by R. Latarget (France) and A. Hollaender (U.S.). In the discussions it was suggested that a comprehensive, long-range study of the effects of radiation should be instituted and that the World Health Organization should make efforts to coordinate the results of the investigations. It was also suggested that the proper disposal of atomic wastes will be a big problem in a world that generates large amounts of electric power with nuclear reactors and that a disposal code might have to be set up by international agreement.

The sessions that were entitled "Radioisotopes" in the program were devoted to techniques of production, methods of handling, methods of counting, and the uses of isotopes in industrial research, metallurgy, measurements of thickness, measurements of wear on parts, process and quality control, polymerization, and food sterilization.

In his review of conference highlights at the closing plenary session, H. J. Bhabha, conference president, stated, "The feasibility of generating electricity by atomic energy has been demonstrated beyond all doubt." Bhabha also mentioned the clarification of the economics

of nuclear power, the demonstration that the thorium-uranium-233 system is superior in several ways to the uranium-238-plutonium system, and the possibilities of breeding nuclear fuel in fast neutron reactors. He called for "concerted and massive research efforts" in the study of the genetic effects of radiation and suggested that it would be wise, wherever possible, not to permit people to be subjected to more than about one-tenth of the radiation dose considered safe at present. Bhabha closed with comment on the scientific and objective atmosphere of the conference and on the reestablishment of channels of international communication in science.

Meeting Notes

■ The Society of American Bacteriologists has announced that members desiring to suggest symposium topics for the Houston, Tex., meeting 29 Apr.–3 May, 1956, are requested to send their ideas to the chairman of the program committee, Dr. Orville Wyss, University of Texas, Austin 12, Tex. Because the 1956 meeting will be held almost 2 weeks earlier than usual, suggestions should be sent as soon as possible and *not later than 25 Sept.*

■ The American Society of Mechanical Engineers' diamond jubilee meeting will be held 13–18 Nov. in Chicago, Ill., at the Congress, Conrad Hilton, and Sheraton-Blackstone hotels. Special features commemorating ASME's 75th anniversary have been planned. More than 300 technical papers will be presented at 110 sessions covering a variety of subjects: aviation, applied mechanics, management, materials handling, oil and gas power, fuels, safety, hydraulics, metals engineering, heat transfer, process industries, production engineering, machine design, petroleum, nuclear engineering, railroad, power, textile, gas turbine power, wood industries, rubber, plastics, instruments and regulators.

The American Rocket Society, an affiliate of ASME that is celebrating its 25th anniversary this year, is holding its sessions within the ASME meeting.

At a special honors luncheon, the five major joint engineering awards will be conferred: the Hoover medal to Charles F. Kettering; the John Fritz medal to Philip Sporn; the Elmer A. Sperry award to William F. Gibbs; the Henry L. Gantt memorial medal to Walker L. Cisler; and the Daniel Guggenheim medal, recipient to be announced. Retiring president David W. R. Morgan will be toastmaster at the banquet.

Sidelighting the 75th anniversary celebration will be the Exposition of Power and Mechanical Engineering at the Chicago Coliseum, 14–18 Nov. Under the auspices of ASME, the exposition will feature displays that show the most recent developments in equipment power generation and distribution, automatic control, and mechanical power transmission and utilization. In addition there will be an exhibit devoted to atomic power.

■ The Oak Ridge Institute of Nuclear Studies has arranged a series of work conferences in cooperation with state academies of science. These meetings are designed to give inspiration and instruction in the area of science fairs as educational tools for the advancement of science. The conferees will be elementary and secondary teachers, instructional supervisors, educational administrators, and representatives from institutions of higher learning, industry, and the communication media.

The conference schedule follows: Florida Science Fair Work Conference, University of Florida, Gainesville, 25–26 Aug.; Georgia Work Conference on Science Fairs, University of Georgia, Athens, 30 Sept.–1 Oct.; Texas Science Fair Work Conference, University of Texas, Austin, 6–8 Oct.; West Virginia Science Fair Work Conference, Jackson's Mill, Weston, 30 Oct.–1 Nov.; North Carolina Fair Work Conference, North Carolina State Agricultural and Technical College, Greensboro, 18–19 Nov.

Society Elections

■ Southern Association of Science and Industry: pres., Frank J. Soday, Chemstrand, Decatur, Ala.; sec., George D. Palmer, University of Alabama; treas., Clayton D. McLendon, C. and S. National Bank, Atlanta, Ga.; research director, executive staff, and representative to the AAAS Council, H. McKinley Conway, Jr., SASI, North Atlanta, Ga. The vice presidents at large are Edwin Cox, Virginia-Carolina Chemical Corp., Richmond, and Les M. Taylor, Mississippi Power and Light Co., Jackson.

■ Society for Nondestructive Testing: pres., William C. Hitt, Douglas Aircraft Co., Inc., Santa Monica, Calif.; v. pres., Hamilton Migel, Magnaflux Corp., Chicago; sec., Philip D. Johnson, 1109 Hinman Ave., Evanston, Ill.; treas., Richard F. Holste, General Electric Co., Milwaukee, Wis.

■ American Institute of Industrial Engineers, Inc.: pres., E. L. Slagle, Columbia-Geneva Steel Division, United States Steel Corp., Pittsburg, Calif.; treas., Frank T. Geyer, 187 Garden Rd., Columbus 14, Ohio; exec. sec., J. L. Southern, Commercial Motor Freight, Inc., Columbus, Ohio; asst. exec. sec., Stephen D. Veirs, F. & R. Lazarus & Co., Columbus, Ohio. The vice presidents are William N. Egan, 3710 Bangor St., SE, Washington 20, D.C. (northeast region); Dale Jones, Georgia Institute of Technology, Atlanta (southeast region); John M. Farnbacher, G. H. R. Foundry Division, Dayton Malleable Iron Co., Dayton, Ohio (central region); Frederick D. Macy, 3710 Odin Court, Houston 21, Tex. (southwest region); and W. Grant Ireson, Stanford University (west region).

■ Society of Exploration Geophysicists: pres., R. C. Dunlap, Jr., Geophysical Service, Inc., Dallas, Tex.; v. pres., Dave P. Carlton, Humble Oil and Refining Co., Houston, Tex.; sec-treas., George A. Grimm, Tide Water Associated Oil Co., Midland, Tex.

■ Institute of Mathematical Statistics: pres., Henry Scheffé, University of California, Berkeley; pres.-elect, David Blackwell, University of California, Berkeley; sec., George E. Nicholson, Jr., University of North Carolina; treas., Albert H. Bowker, Stanford University.

■ American Industrial Hygiene Association: pres., N. V. Hendricks, Esso Research and Engineering Co., Linden, N.J.; pres-elect, Lester V. Cralley, Aluminum Co. of America, Pittsburgh, Pa.; past pres., Herbert T. Walworth, Lumbermens Mutual Casualty Co., Chicago, Ill.; sec., Norton Nelson, New York University Medical Center, New York; treas., Joseph F. Treon, Kettering Laboratory, Cincinnati, Ohio; exec. sec., George D. Clayton, 14125 Prevost, Detroit 27, Mich. Representative to the AAAS council is Lester M. Petrie, Georgia Health Department, Atlanta.

Forthcoming Events

October

3–5. National Electronics Conf., 11th annual, Chicago, Ill. (Executive Secretary, NEC, 84 E. Randolph St., Chicago 1.)

3–6. Soc. of Exploration Geophysicists, 25th annual, Denver, Colo. (C. Campbell, SEG, 624 S. Cheyenne, Tulsa, Okla.)

3–7. American Inst. of Electrical Engineers, fall general, Chicago, Ill. (N. S. Hibshem, 33 W. 39 St., New York 18.)

4–6. American Meteorological Soc., Stillwater, Okla. (K. C. Spengler, 3 Joy St., Boston 8, Mass.)

4–6. International Assoc. of Milk and Food Sanitarians, Augusta, Ga. (H. L. Thomasson, IAMFS, Box 437, Shelbyville, Ind.)

6–8. Academy of Psychosomatic Medicine, 2nd annual, New York, N.Y. (E. A. Brown, 75 Bay State Rd., Boston, Mass.)

6–8. Optical Soc. of America, Pittsburgh, Pa. (A. C. Hardy, Room 8-203, Massachusetts Inst. of Technology, Cambridge 39.)

6–8. Soc. of Industrial Designers, 11th annual, Washington, D.C. (S. G. Swing, SID, 48 E. 49th St., New York 17.)

6–8. Texas Science Fair Work Conf., Austin. (D. E. Large, Science Fair Program, P.O. Box 117, Oak Ridge, Tenn.)

9–13. Electrochemical Soc., Pittsburgh, Pa. (H. B. Linford, 216 W. 102 St., New York 25.)

9–14. American Acad. of Ophthalmology and Otolaryngology, Chicago, Ill. (W. L. Benedict, 100 First Avenue Bldg., Rochester, Minn.)

10–12. American Acad. for Cerebral Palsy, annual, Memphis, Tenn. (R. A. Knight, AACP, 869 Madison Ave., Memphis 3.)

10–12. American Oil Chemists' Soc., Philadelphia, Pa. (Mrs. L. R. Hawkins, AOCS, 35 East Wacker Drive, Chicago 1, Ill.)

10–12. National Prestressed Concrete Short Course, 1st, St. Petersburg, Fla. (A. M. Ozell, Civil Engineering Dept., Univ. of Florida, Gainesville.)

10–13. National Clay Conf., 4th, University Park, Pa. (T. F. Bates, College of Mineral Industries, Pennsylvania State Univ., University Park.)

10–21. New York Acad. of Medicine Graduate Fortnight on Problems of Aging, New York (R. L. Craig, 2 East 103 St., New York 29.)

11. Illinois State Geological Survey, 50th anniversary, Urbana, Ill. (J. C. Frye, 121 Natural Resources Bldg., Univ. of Illinois, Urbana.)

12–13. Symposium on Phospholipids, London, Ontario. (R. J. Rossiter, Dept. of Biochemistry, Univ. of Western Ontario, London, Ont.)

13. Assoc. of Vitamin Chemists, Chicago, Ill. (M. Freed, 4800 S. Richmond, Chicago 32.)

13–15. Indiana Acad. of Science, Notre Dame. (W. A. Daily, Eli Lilly and Co., 740 S. Alabama St., Indianapolis 6, Ind.)

13–15. Canadian Physiological Soc., annual, London, Ontario. (J. M. R. Beveridge, Dept. of Biochemistry, Queen's Univ., Kingston, Ont.)

14–15. National Soc. of Professional Engineers, Memphis, Tenn. (K. E. Trombley, NSPE, 1121 15 St., NW, Washington 5.)

16. American College of Dentists, San Francisco, Calif. (O. W. Brandhorst, 4221 Lindell Blvd., St. Louis, Mo.)

16–19. Soc. of American Foresters, Portland, Ore. (H. Clepper, 425 Mills Bldg., Washington 6.)

17–19. Detroit Institute of Cancer Research, 8th annual, Detroit, Mich. (Wm. L. Simpson, 4811 John R St., Detroit 1.)

17–20. American Dental Assoc., annual, San Francisco, Calif. (H. Hillenbrand, 222 E. Superior St., Chicago 11.)

17–21. American Soc. of Civil Engineers, New York, N.Y. (W. N. Carey, ASCE, 33 W. 39 St., New York 18.)

17–21. National Metal Exposition and Cong., Philadelphia, Pa. (C. L. Wells, 7301 Euclid Ave., Cleveland 3, Ohio.)

18. American Soc. of Safety Engineers, annual, Chicago, Ill. (J. B. Johnson, 425 N. Michigan Ave., Chicago 11.)

18. Oak Ridge Inst. of Nuclear Studies, council meeting, Oak Ridge,Tenn. (W. G. Pollard, P. O. Box 117, Oak Ridge.)

18–19. National Acad. of Economics and Political Science, Washington, D.C. (D. P. Ray, Hall of Government, George Washington Univ., Washington 6.)

18–20. Entomological Soc. of Canada and the Acadian Entomological Soc., annual joint meeting, Fredericton, New Brunswick. (R. H. Wigmore, Science Service Bldg., Ottawa, Canada.)

18–21. American Dietetic Assoc., annual, St. Louis, Mo. (R. M. Yakel, ADA, 620 N. Michigan Ave., Chicago 11, Ill.)

19–21. Symposium on Applications of Radioactivity in Food and Food Processing Industries, Boston, Mass. (W. A. Stenzel, Tracerlab Inc., 130 High St., Boston 10.)

19–21. International Conf. on the Use of Antibiotics in Agriculture, Washington, D.C. (H. I. Cole, National Research Council, Div. of Biology and Agriculture, 2101 Constitution Ave., Washington 25, D.C.)

20–21. National Noise Abatement Symposium, 6th annual, Chicago, Ill. (R. W. Benson, Armour Research Foundation, Illinois Inst. of Technology, Chicago.)

(See 19 August issue for comprehensive list.)