# Scientific Meetings

## Conference on Elementary Particles

An international conference on "Elementary Particles" was held at Pisa, Italy, 12–18 June under the joint auspices of the Italian Physical Society (which was celebrating the first centennial of *Il Nuovo Cimento,* its leading journal) and the International Union of Pure and Applied Physics. Nearly 500 persons attended the conference with the Italians, of course, predominating, although there were large delegations from England (50) and from France (30). The United States delegation was the next largest—about 15—whereas the U.S.S.R. was represented by two physicists, M. Marcov and S. Vernov. The other countries represented at the conference were Austria, Belgium, Chile, Denmark, Germany, Holland, India, Ireland, Israel, Japan, Mexico, Norway, Poland, Sweden, and Switzerland.

The scientific activity of the conference was carried out at three simultaneous sessions: section A on "Heavy unstable particles," section B on "Quantum field theory and meson-nucleon interactions," section C on "Miscellaneous subjects." The first two sections, which essentially constituted the international conference, were conducted in English. The third section, which was obviously intended to take care of the special interests of the Italian Physical Society, was conducted chiefly in Italian. It is perhaps worthy of note that half of the sessions in sections A and B were chaired by Americans: W. B. Fretter (Berkeley), R. E. Marshak (Rochester), G. T. Reynolds (Princeton), M. Schein (Chicago), J. Schwinger (Harvard), R. W. Thompson (Indiana), and E. P. Wigner (Princeton). The remaining sessions were chaired by Italians—E. Amaldi, G. Bernardini, and G. Occhialini—and by C. C. Butler (England), W. Heisenberg (Germany), L. Leprince-Ringuet (France), and E. Schrodinger (Ireland).

Since I attended chiefly the sessions of section A, I shall confine my remarks to this section. Much progress in elementary-particle research was reported since the Fifth Rochester Conference on High Energy Physics was held in January 1955. The chief factors contributing to this progress were (i) further analysis of a giant cosmic-ray nuclear emulsion stack by a team of European laboratories, in particular the Italian groups at Genoa, Milan, Padua, Rome, and Turin, and by the Bristol, Dublin, and Paris groups; (ii) initiation of elementary-particle research with the bevatron at the University of California by the Berkeley group and by the Bristol and Paris groups in Europe (through the exposure of nuclear emulsions to the K-meson beams from the bevatron); (iii) further cloud-chamber work by many American, British, and French groups.

The second item was particularly significant, since it heralded the beginning of a new era in elementary-particle research. It was clear that—just as in the case of pions—the center of attention would now shift to investigations carried out with artificially produced K mesons and hyperons. And it was precisely because the Bristol and Paris nuclear emulsion laboratories had anticipated this development and had arranged for exposures in the bevatron that the contributions of these two laboratories added so much to the Pisa conference. Indeed, one of the gratifying incidents at the Pisa conference was the vote of thanks adopted by acclamation expressing appreciation to American scientists for making these exposures possible—a resolution that was initially suggested by C. F. Powell of Bristol and presented as a formal motion by M. Conversi, secretary general of the Pisa conference.

Some of the experimental results that were presented in a definitive form for the first time at the Pisa conference were as follows. (i) All K mesons, both charged and neutral, possess the same rest mass within experimental error ($965 \pm 10$ electron masses); this holds true for the neutral $\theta$ meson and the charged $\tau$, $\tau'$, $K_{\pi 2}$, $K_{\mu 2}$, $K_{\mu 3}$ and the $K_{e3}$ mesons. (ii) The lifetimes of all the charged K mesons, within experimental error, are the same—in the neighborhood of $1 \times 10^{-8}$ second. (iii) Among the charged K mesons, the most abundantly produced are the $K_{\mu 2}$ and the $K_{\pi 2}$, ending up with the much rarer $\tau$, $\tau'$, $K_{\mu 3}$ and $K_{e3}$ mesons. (iv) The cross section for the production of positively charged K mesons (of any variety) is much larger than the cross section for the production of negatively charged K mesons (of any variety), the production ratio being about 100 to 1 at bevatron energies. (v) The interaction mechanism for positively charged K mesons with nuclear matter is completely different from that for negatively charged K mesons, the former yielding only elastic and inelastic scatterings and disappearances in flight, whereas the latter in addition participate in absorption processes that give rise to several types of hyperons. (vi) Evidence has been found for the production of a cascade-type hyperon in association with two neutral $\theta$ mesons.

The summary theoretical talk on the heavy unstable particles was given by M. Gell-Mann (California Institute of Technology). He summarized the remarkable extent to which his phenomenological scheme for the heavy unstable particles —to which A. Pais (U.S.) and K. Nishijima (Japan) have contributed—was supported by all the available experimental data. Gell-Mann's scheme consists in considering four classes of particles—baryons (which include the nucleon and various types of hyperons), mesons (which include the pion and the various types of K mesons), electrons (which include the muon, electron, and neutrino), photons—and three types of interaction—strong, electromagnetic, weak.

Gell-Mann assumes that all strong interactions—which appear to involve only baryons and mesons—are charged independent, so that all strongly interacting particles split up into charged multiplets. However, it is not necessary that the different types of baryons possess the same center of charge as the nucleon. Indeed, the displacement of the center of charge from $e/2$ (the normal nucleon position) for a given type of hyperon, in units of $e/2$, is called the strangeness quantum number $S$. In a similar fashion, a strangeness quantum number can be defined for mesons; for these particles it is the displacement of the center of charge from 0 (the normal pion position). It is then postulated that both the strong and electromagnetic interactions (assigning $S = 0$ to the photon) conserve the total strangeness quantum number, whereas the weak interactions (in particular, the various decay modes for the different classes of K mesons and hypersons) involve a change in the total strangeness quantum number of $\pm 1$. It is a remarkable fact that all the experimental results cited here and all prior results on the heavy unstable particles can be fitted into this scheme.

Although the Gell-Mann scheme supplies a satisfying coherence to the existing experimental data on the heavy unstable particles, it is admittedly far from being a full-fledged theory. Several reports at the Pisa conference, particularly by B. D'Espagnat and J. Prentki (C.E.R.N.)

and J. Rayski (Poland) attempted to provide a more fundamental theory of elementary particles, but it is perhaps fair to say that a satisfactory theory of elementary particles is still far off.

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## Meeting Notes

■ A symposium on tuberculosis in infancy and childhood will take place at the National Jewish Hospital in Denver, Colo, 9–12 Nov. Some 150 specialists from France, Great Britain, Greece, Italy, Norway, and Sweden, as well as the Americas, will consider the 21 papers that are scheduled.

France will be represented by Robert Debre of the Hôpital des Enfantes Malades and the University of Paris, and Georges Canetti and Noel Rist of the Pasteur Institute. The British participants will be K. Neville Irvine, Oxford Regional Hospital Board; Charles H. Lack, Royal National Orthopedic Hospital, London; and D. A. Mitchison, Postgraduate Medical School, London. Others from Europe will be C. Choremis, Athens University Clinic; Cesare Cocchi, Pediatric Clinic, University of Florence, Italy; Hans Jacob Ustvedt, Ullevaal Hospital and the University of Oslo School of Medicine, Norway; and Lars Strom, Karalinska Sjukhuset, Sweden.

Heading the American participants will be Rene Dubos, of the Rockefeller Institute, New York, whose address will open the symposium.

■ The Nederlandse Natuurkundige Vereniging will hold an International Conference on Nuclear Reactions 1–7 July 1956 in Amsterdam. Among the topics that will be discussed are elastic and inelastic scattering, capture- and photoreactions, stripping- and pick-up reactions, and fission. Further information may be obtained from the conference committee's secretary, Dr. S. A. Wouthuysen, Zeeman Laboratorium, Pl. Muidergracht 4, Amsterdam (C), Netherlands.

■ A special conference on Nutritional and Metabolic Considerations in Disease will be held on 9 Nov. in Philadelphia, Pa. The conference, which will report on nutrition as it affects cardiovascular diseases, neurology and psychiatry, surgery, and nutritional disturbances, is being sponsored by the commissions on nutrition of the Medical Society of the State of Pennsylvania and the Philadelphia County Medical Society in cooperation with the National Vitamin Foundation.

Among the scientists from various parts of the country who will participate are Norman Jolliffe, City of New York Department of Health; Garfield G. Duncan, Jefferson Medical College; Irvine H. Page, Cleveland Clinic, Cleveland, Ohio; Campbell Moses, University of Pittsburgh; Peter T. Kuo, University of Pennsylvania; Douglas Gordon Campbell, University of California, Berkeley; Ivan F. Bennett, Veterans Administration Hospital, Coatesville, Pa.; I. S. Ravdin, University of Pennsylvania; and William T. Fitts, Jr., University of Pennsylvania. Cochairmen of the meeting are R. S. Goodhart and M. G. Wohl. For information, write to the College of Physicians, 19 S. 22 S., Philadelphia, Pa.

■ More than 80 foreign scientists who have made major contributions in the field of solar energy research will participate in the World Symposium on Applied Solar Energy in Phoenix and Tucson, Ariz., 31 Oct.–4 Nov. At least 1000 scientists, engineers, educators, and industrialists are expected to attend the meeting, which is sponsored by the Association for Applied Solar Energy, Stanford Research Institute, and the University of Arizona. Many conferees will also attend an earlier scientific conference on solar energy at the University of Arizona, Tucson, 31 Oct.–1 Nov.

Participation of foreign scientists has been made possible by financial support from the National Academy of Sciences, the National Science Foundation, the Ford Foundation, the Rockefeller Foundation, the Office of Naval Research, the U.S. Air Force, and UNESCO. The list of visitors from abroad that follows includes the first Soviet physical scientist to visit the United States since World War II.

*Algeria*: G. A. Betier and M. A. Guillemonat, Commission de l'Energie Solaire; and J. Savornin, University d'Algiers.

*Australia*: Roger N. Morse and B. W. Wilson, Commonwealth Scientific and Industrial Research Organization; A. H. Willis, New South Wales University of Technology; and J. E. Cummins, Australian Scientific Liaison Office, Washington, D.C.

*Austria*: Hans Thirring, Vienna.

*Belgium*: Leon Crespin, Technique de la Chaleur, and M. V. Migeotte, Institut d'Astrophysique.

*Brazil*: Jerome F. Harrington, IBEC Research Institute.

*Canada*: E. A. Allcut and M. Hooper, University of Toronto; J. W. Hodgins, Royal Military College of Canada; Frederik Krug, Montreal; and G. B. Tebo, Ontario Hydro.

*Cuba*: O. M. Cherenzilind, Economic, Industrial and Technological Guide of Cuba, and Luis Parajon e Hijo.

*Egypt*: Mostafa Elnesr, Cairo University; Mohammed Mamdouh Fikry, Alexandria; Mostafa Mahmoud Hafez, National Research Council; and Alex Schoenberg, Fouad I University.

*England*: E. C. Bullard, National Physical Laboratory; R. Fitzmaurice, Guildford; the Earl of Halsbury, National Research Development Corp.; Harold Heywood, Imperial College of Science and Technology; Willis Jackson, Metropolitan Vickers, Ltd.; J. K. Page, Department of Scientific and Industrial Research, Building Research Station; W. H. Pearsall, University College, London; N. W. Pirie, Rothamsted Experimental Station; Jack Pritchard, London; and C. P. Wittingham, Botany School, Cambridge.

*France*: Paul Jean Bergeron and Jean Maurice Horace Guerin of the Scientific Action Committee for National Defense of France; P. Chouard, Sorbonne; R. Donn, French Embassy, Washington, D.C.; Pierre Donzelot, French universities representative, New York; G. Dupouy, Centre National de la Recherche Scientifique; Marcel Floret, Electricité de France; Marc Foex, Laboratoire de l'Energie Solaire, Citadelle de Montlouis; François LeBras, Bureau d'Organisation des Ensembles Industriels Africains, Paris; Werner F. Moller, UNESCO, Paris; Felix Trombe, Laboratoire de l'Energie Solaire, Ecole Normale Supérieure de Chimie; and P. L. Schereschewsky, French Office of Power Stations, Washington, D.C.

*French West Africa*: Henri Masson, Institut des Hautes Etudes de Dakar.

*Germany*: Fritz Gummert, Maria Meffert, and A. Stratmann, Kohlenstoffbiologische, Essen; Richard Harder, Botanisches Institut, University of Göttingen; Hans Lagoni, Physical Institute for the Federal Station on Milk Products, Kiel; Hermann F. Mueller, Gesellschaft für Praktische Energie, Kunde, Technische Hochschule; C. P. Tingwaldt, Physikalisch-Technische Bundeanstalt; Friedrich Tonne, Institut für Tageslicht Technic; and H. T. Witt, Physikalisch-Chemisches Institut der Universität Marburg.

*India*: M. L. Khanna, K. S. Krishnan, and K. N. Mathur of the National Physical Laboratory of India.

*Israel*: D. Ashbel, Hebrew University; Rudolph Block, Dead Sea Works, Ltd.; Nathan Robinson, Solar Radiation Laboratory, Israel Institute of Technology; H. Tabor, National Physical Laboratory; and Louis F. Yissar, Holon.

*Italy*: Giuseppi R. Badoni, Consigliere Delegato; Gino Bozza, and Mario Dornig, Polytecnico de Milano; Franco Castelli, Steam Power Division, Società Edison; Luigi D'Amelio, Naples University; F. Filippi, Centro Nazionale Meccanico Agricolo, Consiglio Nazionale delle Ri-

cerce; F. Grassi, Somor Company; and G. Parravano, the James Forrestal Research Center, Princeton University.

*Japan*: S. Goto, Goto Optical Mfg. Company; Taro Hisada, Government Industrial Research Institute; Hirotoshi Lamejimas, Yuji Morimura, and Hiroshi Tamiya of the Tokugawa Institute for Biological Research; Fusaco Mizoshiri, Mizoshiri Optical Industry Company; Tsuneo Momota, Electrotechnical Laboratory; Eliji Munekata, Noguchi Institute; I. Tanashita, Keio University; Issei Yamamoto, Yamamoto Observatory; and Masanosuke Yanagimachi, Takasago Thermal Engineering Co.

*Lebanon*: Adnan Tarcisi, Yemen Office for Syria and Lebanon.

*Malaya*: Gerald T. Ward, physics department, University of Malaya.

*Mexico*: Nabor Carillo, Universidad Nacional de Mexico; Michel Fournier de Alba, Instituto de Geofísica, Torre de Ciencia, Universidad Nacional Autonoma de Mexico; J. K. Jennings, the Mexican Light & Power, Ltd.; and David Matson, Compania Impulsora de Empresas Electricas S.A.; George S. McLaughlin, Cuadrante de San Francisco 48.

*Morocco*: R. Ambroggi, Centre des Etudes Hydrogeologiques, Direction de la Production, Industrielle et des mines.

*Netherlands*: L. N. M. Duysens, Physisch Laboratorium der Rijks Universiteit, Utrecht, and B. Kok and E. C. Wassink of the Laboratorium Voor Plantenphysiologish, Onderzoek der Landbouwogeschool, Wageningen.

*Netherlands West Indies*: P. C. Henriques, Curaçao.

*New Zealand*: C. J. Banwell, Dominion Physical Laboratory.

*Thailand*: Ravi Pavelai and Sukum Sritanyarantana, Chulalongkorn University.

*Union of South Africa*: Arthur E. H. Bleksley, University of Witwatersrand, and Austin Whillier, South African Council for Scientific and Industrial Research.

*U.S.S.R.*: V. A. Baum, deputy director, G. M. Krzhizhanov Power Institute, Academy of Sciences of the U.S.S.R.

## Forthcoming Events

### November

*28–1.* White House Conf. on Education, Washington, D.C. (C. Pace, Director; Comm. for White House Conf. on Education; South Health, Education and Welfare Bldg.; Washington 25.)

*29–2.* American Medical Assoc., clinical, Boston, Mass. (G. F. Lull, AMA, 535 N. Dearborn St., Chicago 10, Ill.)

*29–2.* Entomological Soc. of America, Cincinnati, Ohio. (R. H. Nelson, 1530 P St., NW, Washington 5.)

### December

*2.* American Alpine Club, annual, New York, N.Y. (J. C. Oberlin, 900 Leader Bldg., Cleveland 14, Ohio.)

*2–3.* American Federation for Clinical Research, Eastern, Philadelphia, Pa. (C. R. Shuman, Temple Univ. Hospital, Broad and Ontario Sts., Philadelphia 40, Pa.)

*2–3.* Oklahoma Acad. of Science, Norman. (D. E. Howell, Dept. of Entomology, Oklahoma A. & M. College, Stillwater.)

*2–4.* American Psychoanalytic Assoc., New York, N.Y. (J. N. McVeigh, 36 W. 44 St., New York 36.)

*4.* American Acad. of Dental Medicine, 10th mid-annual, New York, N.Y. (G. J. Witkin, 45 South Broadway, Yonkers 2, N.Y.)

*8–10.* Concept of Development, Minneapolis, Minn. (D. B. Harris, Inst. of Child Welfare, Univ. of Minnesota, Minneapolis 14.)

*8–10.* Florida Acad. of Sciences, Miami. (R. A. Edwards, Geology Dept., Univ. of Florida, Gainesville.)

*9–10.* Assoc. for Research in Nervous and Mental Disease, 35th annual, New York, N.Y. (C. C. Hare, 710 W. 168 St., New York 32.)

*9–10.* Texas Acad. of Science, annual, Waco. (G. P. Parker, P.O. Box 7488, College Station, Texas.)

*9–13.* American Acad. of Optometry, Chicago, Ill. (C. C. Koch, 1502 Foshay Tower, Minneapolis 2, Minn.)

*10–16.* Nuclear Cong. and Atomic Exposition, Cleveland, Ohio. (A. F. Denham, 931 Book Bldg., Detroit 26, Mich.)

*10–16.* Radiological Soc. of North America, Inc., Chicago, Ill. (D. S. Childs, Sr., 713 East Genesee St., Syracuse 2, N.Y.)

*11–14.* American Soc. of Agricultural Engineers, Chicago, Ill. (F. B. Lanham, ASAE, St. Joseph, Mich.)

*11–14.* American Soc. of Refrigerating Engineers, New York, N.Y. (R. C. Cross, ASRE, 234 Fifth Ave., New York 1.)

*14.* Operations Research Symposium, Philadelphia, Pa. (R. V. D. Campbell, Operations Research Symposium Registration, Burroughs Research Center, Paoli, Pa.)

*15–17.* Acoustical Soc. of America, Providence, R.I. (W. Waterfall, ASA, 57 E. 55 St., New York 22.)

*15–17.* International Union of Scientific Radio, U.S. national, Gainesville, Fla. (J. P. Hagen, Code 7100, URSI, Naval Research Lab., Washington 25.)

*16–21.* Interamerican Cong. of Psychology, 3rd, Austin, Tex. (W. Holtzman, Univ. of Texas, Austin.)

*26–29.* Biometric Soc., Eastern N. American Region, New York, N.Y. (A. M. Dutton, Box 287, Station 3, Rochester 20, N.Y.)

*26–31.* American Assoc. for the Advancement of Science, Atlanta, Ga. (R. L. Taylor, AAAS, 1025 Connecticut Ave., NW, Washington 6.)

*27–29.* American Mathematical Soc., 62nd annual, Houston, Tex. (J. H. Curtiss, AMS, 80 Waterman St., Providence 6, R.I.)

*27–29.* Archaeological Inst. of America, Chicago, Ill. (C. Boulter, 608, Univ. of Cincinnati Library, Cincinnati 21, Ohio.)

*27–29.* Assoc. for Symbolic Logic, Rochester, N.Y. (J. Barlaz, Rutgers Univ., New Brunswick, N.J.)

*27–29.* Linguistic Soc. of America, Chicago, Ill. (A. A. Hill, 1719 Massachusetts Ave., NW, Washington 6.)

*27–29.* Western Soc. of Naturalists, Davis, Calif. (D. Davenport, Univ. of California, Santa Barbara.)

*27–30.* American Statistical Assoc., New York, N.Y. (E. M. Bisgyer, 1757 K St., NW, Washington 6.)

*27–30.* Inst. of Mathematical Statistics, New York, N.Y. (K. J. Arnold, Dept. of Mathematics, Michigan State Univ., East Lansing.)

*27–1.* Phi Delta Kappa, 50th anniversary, Bloomington, Ind. (J. C. Whinnery, 324 N. Greenwood Ave., Montebello, Calif.)

*28–29.* Northwest Scientific Assoc., Spokane, Wash. (F. J. Schadegg, Eastern Washington College of Education, Cheney.)

*28–30.* American Economic Assoc., New York, N.Y. (J. W. Bell, Northwestern Univ., Evanston, Ill.)

*28–30.* American Historical Assoc., Washington, D.C. (B. C. Shafer, Study Room 274, Library of Congress Annex, Washington 25.)

*28–30.* American Philological Assoc., Chicago, Ill. (J. P. MacKendrick, Bascom Hall, Univ. of Wisconsin, Madison 6.)

*28–30.* Low Temperature Physics and Chemistry, Baton Rouge, La. (J. G. Daunt, Dept. of Physics, Ohio State Univ., Columbus 10.)

*28–30.* American Philosophical Assoc., Eastern Div., Boston, Mass. (W. H. Hay, Dept. of Philosophy, Univ. of Wisconsin, Madison.)

*28–30.* American Physical Soc., winter meeting, Los Angeles, Calif. (K. K. Darrow, Columbia Univ., New York 27.)

*28–30.* Econometric Soc., New York, N.Y. (R. Ruggles, Box 1264, Yale Station, Yale Univ., New Haven, Conn.)

*29.* Metric Assoc., Inc., annual, Washington, D.C. (V. G. Shinkle, 1916 Eye St., NW, Washington 6.)

*29–30.* American Folklore Soc., Washington, D.C. (M. Leach, Bennett Hall, University of Pennsylvania, Philadelphia 4.)

*29–30.* History of Science Soc., Washington, D.C. (T. S. Kuhn, 74 Buckingham St., Cambridge 38, Mass.)

*30.* Mathematical Assoc. of America, 39th annual, Houston, Tex. (H. M. Gehman, University of Buffalo, Buffalo 14, N.Y.)

*(See 21 Oct. issue for comprehensive list)*