

Meetings

Pittsburgh Conference

On Medium Energy Nuclear Physics

The field of medium energy nuclear physics, though now less spectacular than in those ancient times when medium energy was high energy, continues to yield results of fundamental interest and importance. This is surely the sense of the papers and discussion at a conference on medium energy nuclear physics June 4-6, 1953, sponsored by The University of Pittsburgh, and attended by some 150 physicists.

There were five sessions, the first being devoted to the subject of beta decay. L. Langer (Indiana University) reviewed the evidence for a unique beta interaction. Such an interaction, if it can be found, must explain all features of beta decay, including the shapes of allowed and forbidden spectra, selection rules, and the angular correlation between the emitted electron or positron and recoil nucleus. He concluded that it is not unlikely that all known experimental information can be accounted for in terms of a linear combination of scalar, tensor, and perhaps pseudoscalar interactions (*STP*), with polar vector (*V*) and axial vector (*A*) interactions absent. In the following paper M. E. Rose (Oak Ridge National Laboratory) discussed critically the maximum admixtures, of *V* and *A* with the dominant *S* and *T*, which are inferred from the straightness of allowed Kurie plots and pointed out that the relative amounts of *S* and *V* could be determined from the angular correlation in the O^{14} decay. The final paper of the session by H. Primakoff (Washington University, St. Louis) was on the subject of double beta decay. The present theory of elementary particles is consistent with the existence of (a) neutrinos and their distinguishable antiparticles—antineutrinos, or (b) neutrinos alone. The theoretical lifetimes for double beta decay are much larger for case (a) than (b), but both cases yield lifetimes so large and so uncertain that the meager data available permits no definite conclusion. An accurate determination of the shape of the electron spectrum in μ -meson decay may clarify this question.

The second session was opened by I. Talmi (Princeton University) who offered a justification, assuming short range forces, of the empirical rule that in even-even nuclei the spins and parities of excited states are either both odd or both even. The next paper, by E. Gerjuoy (University of Pittsburgh), summarized the status of Butler's theory of (*d, p*) and (*d, n*) reactions. This theory has been of great service in determining the spins and parities of many nuclear levels. It is not,

however, in complete agreement with observed angular distributions, nor are reasons for the validity of Butler's assumptions altogether apparent. Arbitrariness in fitting the observations could be reduced by comparing experimental and theoretical absolute differential cross sections. In the third paper E. B. Paul (Chalk River) described his work on the gamma-ray yields in the reactions $Be^9(p, \gamma)B^{10}$, $Al^{27}(p, \gamma)Si^{28}$, and $P^{31}(p, \gamma)S^{32}$. As in (*n, \gamma*) reactions, the observed intensities often prove difficult to interpret. (*n, \gamma*) reactions were reported on by G. Bartholomew (Chalk River Laboratory), who discussed mainly results he had obtained in collaboration with B. B. Kinsey. It appears to be established, in the lighter nuclei at any rate, that electric dipole radiation is quite strong, and that the electric dipole moments are not appreciably reduced by correlations. Coincidentally there is obtained very beautiful confirmation of the validity of Butler's theory for excited states. In $Si^{28}(n, \gamma)$ and $Mg^{24}(n, \gamma)$, for example, the most intense γ -ray following neutron capture goes to precisely the level for which, according to the Butler analysis of the $Si^{38}(d, p)$ and $Mg^{24}(d, p)$ reactions, the radiation is electric dipole.

V. Telegdi (University of Chicago) presented the first paper of the third session. Confirmation of the hypothesis of charge independence of nuclear forces can be obtained from observations of photon-induced reactions. The special symmetry of the nuclear forces results in isotopic spin selection rules for photon emission or absorption, akin to the selection rules on ordinary spin and parity. The yields of (γ, α) reactions, produced in photographic plates, are in full agreement with the expectations from these selection rules. L. Katz (University of Saskatchewan) gave the other paper of this session. His studies of (γ, n) yields, taking advantage of his very accurately controlled betatron energy, enable him to determine the nuclear-level structure. As the betatron energy is increased, breaks are observed in the yield curve as transitions to new levels become possible.

The first three papers of the fourth session were devoted to inelastic neutron scattering. J. Beyster (Los Alamos Scientific Laboratory) described the spherical-shell method for measuring inelastic cross sections. The interpretation of these experiments was discussed by H. A. Bethe (Cornell University). Properly taking into account the elastic scattering, which increases the path length in the shell, yields experimental cross sections independent of the geometry used. T. Bonner (Rice Institute) discussed spherical-shell measurements at higher neutron energies, where the elastic scattering corrections were not important. In general, the inelastic cross sections measured by Beyster and Bonner are not far from the geometrical πR^2 , but are definitely smaller for the magic nuclei Bi and Pb. F. Ajzenberg (Massachusetts Institute of Technology) closed the session with a comprehensive review of the energy levels of light nuclei, emphasizing the evidence favoring charge independence of nuclear forces. She took pains to point out the numerous remaining gaps in the energy-level diagrams.

H. Feshbach began the last session with a discussion

of an inconsistency in present estimates of nuclear radii. Electron scattering, isotope shift, and μ -mesic x-rays all provide a measure of the average electrostatic potential within the nucleus, and all correspond to a nuclear radius of $1.2 \times 10^{-13} A^{1/3}$ cm. The differences in the binding energies of mirror nuclei equated to the difference in electrostatic energy give $1.45 \times 10^{-13} A^{1/3}$ cm. Possibly the difficulty is reconcilable by the observation that the smaller value is obtained principally from measurements on heavy nuclei and the larger value from light nuclei. Next H. Barschall (University of Wisconsin) described his experiments on the scattering of neutrons by heavy nuclei. This work and its interpretation by the next speaker, V. F. Weisskopf (Massachusetts Institute of Technology), in terms of a "cloudy crystal ball" model of the nucleus has already received considerable attention (see report of Brookhaven Mev neutron cross section conference in June 1953, *Physics Today*). Weisskopf assumes the interaction between neutron and nucleus is a universal complex potential $V = 19 \text{ Mev } (1 + 0.05 i)$ with radius $1.45 \times 10^{-13} A^{1/3}$. It gives remarkably good agreement with experiment over a wide range of energy and mass number. The last paper of the conference, by C. Goodman (Massachusetts Institute of Technology), presented some evidence for nuclear excitation by the electrostatic field of an incident proton.

Discussion leaders for the various sessions were Drs. D. C. Peaslee, T. Bonner, E. Gerjuoy, D. Inglis, and R. K. Adair. A report of the conference, containing expanded abstracts of the papers presented, is in preparation by Dr. P. Stehle of the University of Pittsburgh, and may be obtained from him. This participant felt that one of the more pleasing features of the conference was the strong Canadian representation, in the audience and on the speakers platform. The scientific community, like other communities, is healthiest when it has healthy neighbors.

E. Gerjuoy

University of Pittsburgh

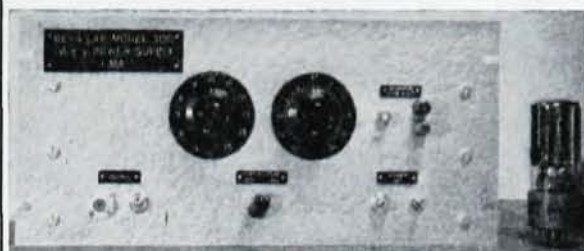
AAPT

Summer Meeting at Pittsburgh

The regular summer meeting of the American Association of Physics Teachers was held at Pittsburgh, Pennsylvania, June 25-27. One hundred and fourteen members were registered. About fifty other persons attended the sessions or participated in trips to local points of interest.

All sessions were held in the air-conditioned auditorium of the Mellon Institute of Industrial Research. In the lobby, where the local Convention Bureau assisted with registration, fourteen publishers and three apparatus companies exhibited books and equipment. In the auditorium fourteen contributed papers were presented, and there were four symposia, with titles and invited papers as follows: Physics in Medicine—Physics in Physiology, Applications of Physics to Medical Research Problems, Premedical Courses in Physics (Ad-

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