

been till now no Indian periodical entirely devoted to entomological science. Papers on general entomology were being published either in the *Records of the Indian Museum*, the *Journal of the Bombay Natural History Society* or the *Journal of the Royal Asiatic Society of Bengal*, or in foreign periodicals, especially in the United Kingdom. Results of work done on applied entomology, on the other hand, found entry generally into the publications of the Agricultural, Forest or Medical Departments. As only finished work could be accepted in these journals, there has been till now no scope for the record of occasional observations or stray notes by amateur entomologists or beginners in entomology. The *Indian Journal of Entomology* has been designed to meet a long-felt want of entomological workers in India. Whatever the line of work they are engaged in, whether they be systematists or morphologists, whether they be amateur collectors or applied workers on agricultural, medical, veterinary or forest problems, the Journal will be equally open to them for purposes of publication. The

Entomological Society of India has established branches at important centres in different parts of India, wherein local members could meet periodically, read and discuss and exhibit any interesting finds.

We may congratulate the editorial staff of the Journal on the excellent get-up of its first number (Parts 1 and 2), which was received sometime ago. It includes, besides the Introduction, the congratulatory messages received from foreign entomologists, an interesting "Retrospect of Entomology in India", and several articles of high scientific value. There are, besides, various interesting notes in connection with the exhibits and communications made at the Branch Meetings of the Entomological Society of India. Reviews of recent research work and of books and monographs offer items of great value to workers—especially such as are beyond the reach of good scientific libraries. "News and Announcements" provide a very welcome fare for the entomological readers, full of human interest. We wish the new Journal a long and successful career.

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## Cosmic Ray Symposium at the University of Chicago

By P. S. Gill

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**D**URING the last week of June, there was held at the University of Chicago a notable Symposium on Cosmic Rays under the Chairmanship of Professor Arthur H. Compton. Among the leading workers on cosmic rays who took part in the discussions were Professors V. F. Hess, Fordham University; Carl D. Anderson, California Institute of Technology; W. Heisenberg, Leipzig; W. Bethe, Heidelberg; J. Clay, Amsterdam; M. S. Vallarta, Massachusetts Institute of Technology; and Bruno Rossi, formerly of Padua.

Since the early balloon experiments of Hess in Austria in 1912, by which he estab-

lished the existence of the rays, the study of cosmic rays has contributed much to the fundamentals of physics. Carl D. Anderson discovered positive electrons among his cosmic rays and found evidence for the presence also of the new sub-atomic particle, the meson. Cosmic rays provide a very effective tool for studying the components of atoms and how their nuclei are put together. The discussions were followed with seriousness and interest.

Among the major findings reported may be mentioned conclusive evidence for the existence of mesons, new data with regard to their remarkable penetration, evidence that

they can be formed as rays in the atmosphere by the impact of energetic particles with atoms, and apparently also of their spontaneous disintegration by a kind of radioactive process. Neutrons are much more abundant in cosmic rays than had previously been suspected. It now seems probable that the incoming cosmic rays consist partly of protons, and that these come from our own galaxy.

Studies on the intensity of cosmic rays on the Pacific Ocean reported by A. H. Compton and P. S. Gill reveal that the atmospheric temperature coefficient of cosmic ray intensity is a function of latitude, having a lower value at lower latitudes, a result predicted both by Blackett from his theory of disintegration of mesons and by an alternative method by Vallarta and Godart. M. S. Vallarta and O. Godart of the Massachusetts Institute of Technology discussed their theory of world-wide periodic variations of the intensity of cosmic radiation, based on the interaction of sun's magnetic field with the magnetic field of the earth. Cosmic ray intensity measurements carried out in unmanned balloons at high altitudes by Millikan and Neher at Omaha and W. P. Jesse at Chicago indicate that the intensity is less in summer than in winter.

Investigations carried out by C. D. Anderson and Seth Neddermeyer using a vertical cloud chamber in a strong magnetic field show that the energy loss of shower particles in heavy materials is in accordance with the Bethe-Heitler theory. The experiments reveal further the existence of particles which are more penetrating than electrons but whose specific ionization is not as much as is to be expected if they were protons. P. Auger's experiments at Paris show that electrons and photons often occur in widely spread showers sometimes as far as a thousand feet apart, all appearing to originate from the same parent ray high in the atmosphere. The energy of the original ray which gives rise to such a shower of photons and electrons must sometimes be greater than a million billion electron volts. Dr. S. Korff of the Bartol Research Foundation described a series of his high altitude balloon flights in which

associated with these photons and electrons he found the existence of a large number of neutrons. The rate of increase of neutrons is even more rapid with altitude than is the increase in the main body of cosmic rays. It appears possible that the neutrons result from the disintegration of the nuclei of nitrogen atoms when struck by the primary cosmic rays that come from outside the atmosphere. T. H. Johnson also adduces arguments to show that the primaries of the hard component are presumably protons or another type of heavy nuclear particle. A discussion of the mechanism of the production of mesons, however, by W. Heisenberg of Leipzig, indicated that very probably protons should be more important in affecting atomic nuclei than should any of the lighter types of particles. Studies of energy distribution of bursts made by P. S. Gill and M. Schein of Chicago pointed out that at sea level under 12 cm. of lead, the large bursts are produced by mesons because of the similarity of the energy spectrum of a burst-producing radiation to that of the energy spectrum of cosmic rays at great depths as measured by V. C. Wilson of Chicago. They also calculated the cross-section of  $2 \times 10^{-30}$  cm.<sup>2</sup> per nuclear particle (proton or neutron). The latter value is comparable to that estimated by Heisenberg in his theory of nuclear explosions.

V. C. Wilson of the University of Chicago reported measurements of cosmic rays made in various underground locations, which revealed the existence of the penetrating meson at least to a depth of 400 feet. On the basis of his own new experiments at great depths, J. Clay of Amsterdam suggested that below 400 feet the predominant form of radiation may be protons. Whether this view is correct remains to be answered by further experiments.

The Symposium has not only brought together the leading workers in the field of cosmic rays but the discussions have given many new ideas for further investigation. The generosity and the hospitality of the Chairman, Professor A. H. Compton, added greatly to the success of the Symposium.

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