A hypothesis as to the origin of cosmic rays and the experimental testing of it in India and elsewhere (evening lecture): R. A. MILLIKAN, H. V. NEHER and W. H. PICKERING. The hypothesis here adopted as to the mode of origin of the cosmic rays makes possible the prediction of five definite cosmic-ray bands, each of which should reach the earth in a particular latitude, and of four plateaus of unchanging cosmic-ray intensity, these plateaus being delimited by the latitudes of entrance of the successive bands. The hypothesis rendering possible these predictions rests upon five major discoveries made by the workers in the Norman Bridge Laboratory of Physics at the California Institute of Technology at Pasadena. These discoveries are (1) that more than 60 per cent. of all incoming cosmic-ray energy is of the nature of electron bullets each of energy between 2 billion electron-volts and 15 billion electron-volts; (2) Neddermeyer and Anderson's discovery of the production of cosmic-rays within the atmosphere of meteorons which carry the energy farther down than incoming electrons alone could do; (3) Bowen's two remarkable discoveries: first, that atoms, when out in interstellar space, are able to undergo atomic transformations forbidden to them within the stars, and second, (4) that in ring-nebulae, trillions of miles away from the exciting star and therefore presumably reflecting conditions in interstellar space there are five of the atoms, namely, helium, carbon, nitrogen, oxygen and silicon, each of which is more than ten times more abundant than any other atom save hydrogen (which must be excluded from measurable cosmic-ray effects because of the smallness of its rest-energy), and (5) Lauritsen and Fowler's discovery in the Kellogg Radiation Laboratory that a part at least of the rest-energy of an atom has the power under suitable conditions of transforming itself directly into the creation of an "electron-pair." The hypothesis made in view of these five discoveries is that, while the evolution of energy by the stars is maintained, as Bethe has recently shown, by the partial transformation, within the stars of the rest-energy of hydrogen into radiant energy through

1 Held in the building of the National Academy of Sciences, Washington, April 28 and 29.
Editor's Summary

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