PHYSICS

Chairman: R. E. MARTIN, Hanover College

Professor O. H. Smith, DePauw University, was elected chairman of the section for 1942.

ABSTRACTS

Atmospheric electricity and meteorological phenomena. JAMES F. MACKELL, Indiana State Teachers College.—Experiments are being conducted in an effort to determine the relationship which may exist between atmospheric electrical phenomena and certain meteorological phenomena, such as barometric pressure, relative humidity, temperature and sunshine. The method being employed makes use of an alpha ray electroscope designed for the purpose, an alpha ray source, and other similar apparatus. Measurements of the electric potential-gradient at points in the vicinity of Terre Haute and also of the electrical conductivity of the atmosphere at these points with simultaneous measurements of a meteorological character are being made. Data obtained so far are insufficient for final conclusions but indicate a positive relationship.

Continuation of investigations on radioactive manganese. ALLAN C. G. MITCHELL, PAUL W. MCDANIEL and L. M. LANGER, Indiana University. —Using strong sources of Mn^{56} (2.5 hours) produced by neutrons from the Indiana University cyclotron, we have repeated our earlier work on the beta and gamma rays from this element. Absorption of Compton electrons in aluminum gives a gamma ray energy of 2.1 MV. In addition experiments on the absorption of gamma-gamma coincidences by lead indicate that there is a gamma ray of lower energy. Our earlier experiments on beta-gamma coincidences have been extended, using thin-walled counters, so that electrons with energies as low as 70 k.v. can be counted. These experiments are in good agreement with our earlier ones and show that the beta ray spectrum is complex, consisting of two groups. No evidence for a third group at low energies has been found.

The shape of forbidden beta distributions. E. J. KONOPINSKI, Indiana University, and G. E. UHLENBECK, University of Michigan.—The well known lack of uniqueness of present day beta theory can not be eliminated by using evidence provided by measurements of allowed beta spectra. On the other hand, the various formulations of the theory give distinct results for forbidden beta spectra. These were computed for the five so-called "fundamental" forms which the theory can be given, for first and second forbidden beta transitions. Comparison with experimental energy distribution seems to eliminate all but two forms

of the theory, the "polar vector" and the "tensor". Even in these cases the theory predicts more beta particles near the upper limit than the experiments show, although the difference is still probably within the experimental error. One encouraging result is that the "K-U" shape found for radium E by the experimenters seems now to be accounted for by the "forbiddenness" of the activity.

Radiations from radioactive gold, tungsten and dysprosium. ARNOLD F. CLARK, Indiana University.—The radiations from radioactive gold (2.7 days), tungsten (24 hours) and dysprosium (2.5 hours) have been studied by means of coincidence counting methods. The gold and dysprosium were made active by neutrons produced in the Indiana University cyclotron. The radioactive tungsten was produced both by neutron capture and by bombarding it with 10 MV deuterons in the cyclotron. The beta ray end point of Au^{198} was found to be 0.87 MV by absorption in aluminum. Both beta-gamma and gamma-gamma coincidences were found and the data led to the conclusion that there are two gamma rays per disintegration. The data suggest that the beta ray distribution is simple and that the beta disintegration does not lead to the ground state. The beta ray end point of W^{187} was found to be approximately 1.3 MV. A gamma ray was also found whose energy was 0.9 MV. Gamma-gamma coincidences were found. The beta-gamma coincidence rate depended markedly on the energy, being zero for electrons of energy greater than 0.55 MV. The beta ray spectrum of W^{187} is complex with end points at 1.3 and 0.55 MV. A satisfactory level scheme can be deduced. It is shown that dysprosium emits a gamma ray of about 1.1 MV. Coincidence experiments were inconclusive.

The production, diffusion, and decay of mesotrons. J. F. CARLSON, Purdue University.—The recent work of Schein, Jesse, and Wollan has shown quite conclusively that the primary cosmic radiation is predominantly, if not entirely protonic in nature. On this basis a phenomenological set of equations has been set up to describe the production, diffusion and decay of the resultant mesotron component. The interpretation of these equations and their solutions will be discussed, and comparisons with the experiments will be made.

On the deceleration of heavy ions. J. H. M. BRUNINGS and J. K. KNIPP, Purdue University.—In the calculation of the momentum loss of a heavy ion in its passage through matter, an estimate is needed of the charge of this ion as a function of its velocity. The process of capture and loss of electrons in collisions is characterized by the velocity within the ion of the electron or electrons participating. This velocity is roughly proportional to the ion velocity. The factor of proportionality is introduced as a convenient parameter γ. Two methods are used to estimate the charge of the ion: (1) It is supposed that the characteristic velocity is that of the energetically most easily removable electron, which is calculated using the Thomas-Fermi model. Under this assumption γ tends to increase with atomic number ($\gamma = 1.3$ for $z = 6$ to $\gamma = 1.8$ for $z = 55$). (2) It is supposed that the characteristic velocity

is that of the outermost electron, which is also calculated from the Thomas-Fermi model. γ is found to decrease with atomic number ($\gamma = 0.6$ for $z = 6$ to $\gamma = 0.35$ for $z = 55$). The characteristic velocity probably lies between these extremes.

Hysteresis of wood. R. B. ABBOTT, Purdue University.—A simple method has been devised for measuring the hysteresis of wood or other material. It consists in measuring the displacement by some accurate gauge for each load given to a bending beam. When this operation is continued through a complete cycle, the loss in energy per cycle can be computed very accurately from the data.