Journal notes

Apparent Size of Small Objects

Studies of small objects such as bacteriophage with the electron microscope show that the image sizes of objects before and after shadowing are different by a larger factor than can be accounted for by the actual thickness of the metal layer and by the greater contrast provided by shadow coatings.

Since particles of Dow polystyrene latex No. 580G were reported to have remarkably uniform sizes it was decided to investigate, and if possible to explain, this effect. Taking into account the known causes of image size variation such as an increase in size on shadowing, contamination in the shadowing chamber and in the electron microscope, and possible magnification variations from one exposure to another, the unshadowed particles still appeared to be about ten percent smaller than the shadowed particles.

A possible explanation of this phenomenon has been based on the idea that objects under electron bombardment can become charged. It is assumed that unshadowed polystyrene and phage particles, for example, take on a negative charge and in consequence act as very small "negative lenses". The size increase can be accounted for by the dissipation of the charge when the particles and supporting membrane surfaces are made conducting by the metallic film. Support is lent to this assumption by some observation on the optics of image formation of shadowed and unshadowed particles.

However, many questions remain. One of the more obvious has to do with the magnitude of a charge necessary to produce such an effect. One also wonders if such a charge can be produced by electron bombardment. If so, it becomes necessary to determine whether the image size of all objects is a function of the amount of charge carried by the object during observation. S.F.K., R.A.K.

The Size of Objects as Determined from Electron Microscopy. By Stanley F. Kern and R. A. Kern. *J. App. Phys., 21: 705, July, 1950.*

Cosmic Ray Telescope

Since the initial measurements of the east-west asymmetry of cosmic radiation by B. Rossi, T. H. Johnson, and J. C. Street, many elaborate instruments have been employed to determine the nature of asymmetry and associated phenomena. One characteristic which is common to many measurements is that the data are obtained over a relatively short period time interval. Other measurements have been handicapped by the need for manual operation. In order, therefore, to obtain a versatile instrument for directional cosmic ray studies and to investigate possible correlations of the components of cosmic radiation with the present cosmic ray burst studies and solar studies being carried on at the University of Colorado, a dual cosmic ray counter telescope was constructed.

The instrument consists of two banks of Geiger counters, each bank containing 5 trays of counters and each tray containing 9 counters. The trays are connected in triple coincidence schemes with coincidences 1–2–3, 2–3–4, and 3–4–5 being recorded for each telescope bank. In order that the characteristics of the soft, medium, and hard components of the radiation can be investigated, lead blocks 8 centimeters in thickness are mounted between trays 3 and 4 and between 4 and 5.

The operation of the telescope is fully automatic. The banks are positioned in zenith at 15 degree intervals from the vertical to 75 degrees from the vertical, and in azimuth at two positions 180 degrees apart. The recording of the operation of the telescope is accomplished by photographing the instrument panel.

Calculation of the east-west asymmetry and the variation of intensity with zenith angle can be made directly from the readings of the telescope. However, directional intensities are calculated from the telescope data by means of the measured counting efficiency and a mathematical analysis of Witmer and Pomerantz which enables the reduction of the wide angle indications of the telescope to directional intensity.

At the present time only a part of the data has been analyzed and these are to be reported elsewhere. J.E.C.

Instrument for Directional Studies of Cosmic Ray Intensity. By H. W. Boehmer and J. E. Coolidge. *Rev. Sci. Inst., 21: 633, July, 1950.*

Spin and Angular Correlation

One of the main interests of experimental nuclear spectroscopy has been the determination of the spins (i.e. angular momenta) of atomic nuclei, for this information is important for any theory of nuclear structure. Thus far the most effective techniques for this purpose have been the molecular beam and magnetic resonance methods. These rather intricate techniques have been useful, however, only with stable isotopes or with long-lived, excited states of nuclei. Recently a new type of experiment for obtaining information about spins of very short-lived, excited nuclear states has been made practicable by the development of high efficiency counters. This is the *angular correlation* experiment, in which all that one measures is the relative number of coincidence counts between the successive radiations emitted in cascade nuclear transitions as a function of the angle between their respective directions of emission.

In this paper a general theory of angular correlations is developed which, properly specialized, may be applied to natural or induced alpha, beta, or gamma radioactivities as well as to nuclear reactions. It is shown how the directional correlations for the emitted particles depend on the angular momenta of the nuclear states involved and of the radiations emitted in the successive transitions.