JOURNAL NOTES

The Neutrino

Probably the most obvious reason for introducing the concept of the neutrino is the need for the conservation of momentum and energy in beta decay. The existence of a continuous spectrum of beta energies from a typical radioactive element such as phosphorus-32 appears to contradict the assumption of transitions between discrete energy levels in both the initial and final elements. According to the neutrino hypothesis, the portion of the energy and corresponding momentum not carried off by the beta particle is removed by the neutrino. The most fruitful method of investigating the properties of the neutrino is a rather indirect one. In this indirect type of experiment, the energy and momentum of the recoiling nucleus and of all other particles emitted during the decay process, with the exception of the neutrino, can be measured. In general, it is found that energy and momentum are not conserved unless the neutrino is introduced to carry away the missing momentum and energy. More refined experiments of this type should yield information regarding the proper choice of the interaction between the electron-neutrino field and the nucleus.

The Search for the Neutrino through Nuclear Recoil Experiments. By James S. Allen. *Am. J. Phys. 16: 451, December, 1948.*

Measuring Polymer Molecules

The average molecular size of a common high polymer (the raw material from which plastics and rubber are made) affects most of its properties but the molecules are too large to be measured by x-ray scattering in the ordinary way. Research on synthetic rubber during the war showed that visible light can be used, its wavelength being about the same size as the molecules themselves. Experimental difficulties have retarded the general use of the technique but this paper now describes its successful application to polystyrene, to get molecule sizes that cannot be determined any other way.

The basis of the technique is that when a high polymer solution is illuminated by a beam of parallel and polarized light the intensity of the scattered light varies smoothly with the angle of scattering. The apparatus used in these experiments was built primarily to measure the intensity distribution of the light and ultimately to calculate molecule size. Data for polystyrene in various solvents showed that the tendency of polymer chains to curl up and become smaller is affected by temperature and the kind of solvent used. As more data, especially on temperature dependence, becomes available it may be possible to theorize with some confidence about the intramolecular energies that determine the size and shape of such complicated structures as the polystyrene molecule. B.H.Z.

Apparatus and Methods for Measurement and Interpretation of the Angular Variation of Light Scattering; Preliminary Results on Polystyrene Solutions. By Bruno H. Zimm. *J. Chem. Phys. 16: 1099, December, 1948.*

Sound Skip-Zones

Today's beliefs about temperatures twenty to forty miles above the earth stem in the main from a discovery made during Queen Victoria's funeral, when minute gun booms overpassed large regions of England. Just why sounds from explosions return to earth after skipping a hundred miles is controversial, but most evidence indicates hot air layers in the upper atmosphere.

If, instead, the bending of rays in the stratosphere were a shock wave phenomenon, their striking distance would change with the size of the blast. Noises from eight-inch guns and an atomic bomb fail to show such an effect. Furthermore, microbarometric pressures recorded 115 miles away from 3-to-250-ton TNT explosions are less than three per cent of those predicted by shock wave theory.

By touring through the upper atmosphere, the bang from a blast reaches distant points later than would normally be expected. Exact arrival times from infrasonic pressure records permit calculation of the sound rays' incident angles. Ray paths in the troposphere and stratosphere can be constructed from concurrent meteorological data. Then equations borrowed from seismology give the altitudes of the rays' summits. Records of the Helgoland Big Bang supply temperature values up to 105 miles' height. They agree excellently with V–2 rocket data, but fall considerably below NACA tentative standards.

Upper Atmosphere Temperatures from Remote Sound Measurements. By Everett F. Cox. *Am. J. Phys. 16: 465, December, 1948.*