preciable scattering of mass values because of the influence of chamber turbulence on the curvature and an uncertainty of at least a quarter of an inch in the range. Thirty-seven determinations form a set of observations whose fluctuations in value are consistent with the estimated probable errors of each measurement. This set of observations gives a mean value of $215 \pm 4$ times the mass of an electron for the mass of the mesotron. Six of the observations are difficult to explain by arguments of statistical fluctuation. These give values of 114 and 120 for masses below the normal mass, and values of 474, 538, 588, and 717 for values above the normal mass. Since the probable error of each observation is about ten percent of its value, a considerably larger number of observations will be required before the existence of particles with masses different from the normal mesotron can be established. R.B.B.

The Mass of Cosmic Ray Mesotrons. By J. G. Retallack and R. B. Brode. *Phys. Rev. 75: 1717, June 1, 1949.*

## Neutrinos

The baffling thing about the neutrino is our inability to detect it in the free state. All of our empirical knowledge comes from the observation, by a number of experimenters, that neither energy nor momentum is conserved in beta decay, in which a radioactive nucleus emits an electron. The present experiments draw the net of reality a little tighter about the neutrino by showing that the missing energy and the missing momentum are proportional in the beta decay of radioactive phosphorus, just as one expects from a single relativistic particle or quantum. Although these experiments measure the momentum vector attributable to the neutrino, they do not prove that the neutrino energy actually goes along with the momentum. Only subsequent detection could prove this point.

In these experiments, the directions of the electron and the recoil atom are selected by slits. The electron momentum is measured with a beta spectrometer. The recoil momentum is determined by measuring the recoil time of flight over a measured distance, its mass being known. With this technique one is able to estimate the errors caused by the surface which supports the radioactive phosphorus source. C.W.S.

Neutrinos from P32. By Chalmers W. Sherwin. *Phys. Rev. 75: 1799, June 15, 1949.*

## Crystal Elasticity

The elastic properties of such anisotropic bodies as single crystals of metals are expressed in terms of either one or the other of two sets of constants: moduli of compliance or moduli of elasticity. Since about 1920, when techniques were developed for growing reasonably large single crystals of metal, these elastic constants have been measured for many metal elements and alloys. Measurements on zinc have been rather extensive and the overall agreement between different workers is none too good. The writers of the present paper, in connection with other work, made determinations of Young's modulus of about twenty-five zinc crystals, by both static and dynamic methods.

From the values of Young's modulus, two compliances and a combination of two others were determined. By combining these with previously published measurements by Bridgman a set of constants was obtained which the writers regard as more reliable than any previous determination. Also, since many crystals were measured and the orientation range was well covered, the data afford a good experimental check on the crystal elastic theory. Some measurements were taken up to three hundred and seventy-five degrees centigrade and from the data so obtained Young's modulus may be computed for any direction in the lattice for all temperatures between twenty-five degrees and three hundred and seventy-five degrees centigrade. E.P.T.T.

Elasticity of Zinc Crystals. By C. A. Wert and E. P. T. Tyndall. *J. App. Phys. 20: 587, 1949.*

## Oscillating Polymers

During the past several years there has been considerable interest in the elastic and dissipative properties of high polymers, in particular those properties which lend themselves to acoustic or other dynamic methods of measurement in which frequency is a variable. Such tests as these, made over a wide frequency range and at various temperatures, are potentially valuable in the study of the fundamental nature of long chain compounds; but in addition there is an immediate practical interest since the properties mentioned are related to the mechanical power loss and resultant temperature rise occurring in a high polymer when it is cyclically oscillated, as it is in some end uses such as in a tire cord. Three methods have been used to measure the elasticity and internal viscosity of polymeric yarns and films over a frequency range from about three to thirty thousand cycles per second. It was possible to calculate power loss in the form of heat given off under specified conditions of dynamic stress or strain. At present the interpretation of the results of such measurements as these in terms of molecular processes is not in a satisfactory state and it is expected that this aspect will receive increasing attention in the future. J.W.B.

Dynamic Measurements of Polymer Physical Properties. By J. W. Ballou and J. C. Smith. *J. App. Phys. 20: 493, June, 1949.*