MATHEMATICS

Chairman: L. H. Whittcraft, Ball State Teachers College

Paul Overman, Purdue University, was elected chairman for 1949.

ABSTRACTS

PHYSICS

Chairman: J. C. Hendrics, Franklin College

Ancil R. Thomas, Valparaiso University, was elected chairman for

ABSTRACTS

Metastable Atomic States in Gas Discharges. K. W. Meissner, Purdue University.—The behaviour of a discharge through gases can be considerably influenced by the presence of atoms in metastable states. A simple experiment with a glow discharge in very pure neon strikingly shows such an influence in the following manner.

A glow discharge is maintained in a simple discharge tube of 25 millimeter diameter and 150 millimeter length which has been filled with very pure neon of about 5 mm Hg. The operating voltage is chosen in such a way that the discharge remains just stable. As soon as the glowing neon tube is irradiated with light of an intensive neon discharge tube the glow discharge becomes unstable and goes out. The explanation of this behaviour can be found in the fact that the number of metastable atoms is greatly reduced by absorption of certain wavelengths of the irradiating source.

Investigations With a Reflection Echelon Grating. Delmar O. Davis, K. W. Meisner, Purdue University.—The performance of a reflection echelon grating made by Adam Hilger, Ltd., London, was investigated.

The possibility of changing from a "double-order" pattern to a "single-order" pattern by changing the geometrical conditions instead of the commonly used change of air pressure is discussed and the idea was tested experimentally. It was found that a slight change of the angle of incidence allows one to produce a change of a whole order. This fact is of great importance for investigations in the vacuum ultraviolet.

The accuracy of wave length measurements is not affected by the choice of the angle of incidence as was shown by wave length measurements of krypton and neon lines.

Last, the effective resolving power of the reflection echelon was determined by using the Zeeman effect of the 5570 A krypton line. The smallest Zeeman splitting which could be resolved by the echelon was taken as the limit of resolution. It was found that the reflection echelon achieves, in practice, the theoretical resolving power.

Neutron Diffraction by Ice Crystals. HUBERT M. JAMES, Purdue University.—X-ray studies have established the positions of the oxygen atoms in ice crystals, but determination of the positions of the hydrogen atoms has not been possible. Neutron diffraction offers a powerful method for locating the hydrogen atoms, but interpretation of the diffraction patterns obtained by Wollan and Shull at Oak Ridge has offered difficulties which are apparently connected with other peculiarities in the behavior of ice—the presence of unexplained diffuse bands in the X-ray spectrum, and the unexpectedly large value of the entropy. It is known that each oxygen atom has four oxygen neighbors, tetrahedrally arranged, and on each oxygen-oxygen line one must expect to find one hydrogen atom. Pauling has accounted for the observed entropy of ice by assuming that each hydrogen atom can occupy two alternative and unsymmetrical positions with equal probabilities, subject to the condition that of the four hydrogen neighbors of each oxygen, two must be in the position nearer to this oxygen, and two in the more remote positions. A calculation has been made of the neutron diffraction patterns to be expected for a single ice crystal, on Pauling's model. This consists of three parts:

(a) Laue spots, with intensities predictable by assigning half the scattering amplitude of each hydrogen nucleus to the two alternative positions for that nucleus.

(b) A continuous background arising from the randomness in the arrangement of the hydrogen muclei.

(c) A background showing some structure due to the correlations established between the positions of hydrogen atoms by the condition that each oxygen atom shall have exactly two close hydrogen neighbors.

Dr. Wollan informs the author that the observed intensities of the Laue spots agree well with this prediction.

The Determination of the Deflective Curve of a Vibrating Beam by Means of Bonded Strain Gages. B. E. QUINN and JAMES E. BROCK, Purdue University.—An experimental method is described for securing strain vs. time records at significant points along a vibrating beam by means of bonded strain gages. A simple transformation gives

$$\frac{d^2y}{dx^2} = \frac{\epsilon}{c}$$

where ϵ is strain and c is the distance from the neutral axis to the extreme fiber. If we plot ϵ/c vs. length for any instant, then it is possible by means of two successive graphical integrations to plot the deflection curve. The determination of other properties of the vibrating beam from the ϵ/c vs. length curve is also explained.