Proceedings of the American Physical Society

MINUTES OF THE MEETING OF THE NEW ENGLAND SECTION HELD AT HARTFORD, CONNECTICUT, OCTOBER 24, 1942

THE twentieth regular meeting of the New England Section of the American Physical Society was held at Trinity College, Hartford, Connecticut, on October 24, 1942. At least forty-five members were in attendance. The invited papers were as follows:

H. G. HOUGHTON (*Department of Meteorology, Massachusetts Institute of Technology*): **The Training of Meteorologists for the Armed Services.**

A. P. R. WADLUND (*Trinity College*): **Physics at Trinity College.**

NORA M. MOHLER (*Smith College*): **Intra- and Extra-Curricular War Courses at Smith College.**

HERMAN FESHBACH (*Massachusetts Institute of Technology*): **Applications of High Voltage Electrons in Nuclear Research.**

Abstracts of six of the eight contributed papers are given below. The others will appear in the *American Journal of Physics*. A vote of thanks was extended to the members of the Physics Department of Trinity College for their generous hospitality.

At the business meeting the following officers were elected for the current year:

Chairman: GLADYS A. ANSLOW (*Smith College*).
Vice Chairman: A. P. R. WADLUND (*Trinity College*).
Secretary-Treasurer: MILDRED ALLEN (*Mount Holyoke College*).
Members of Program Committee:
C. E. BENNETT (*University of Maine*),
W. W. STIFLER (*Amherst College*).

MILDRED ALLEN
Secretary-Treasurer

ABSTRACTS OF CONTRIBUTED PAPERS

1. Anisotropic Solutions of Colloids. LARS ONSAGER, *Yale University*.—The solutions of certain colloids comprised of highly asymmetrical particles—plates or rods—are known to form anisotropic phases at remarkably low concentrations. For tobacco mosaic virus (rods), isotropic solutions containing 2–3 percent virus are in equilibrium with anisotropic phases containing 3–4.5 percent, respectively, according to the amount of electrolyte present. This phenomenon can be explained as a result of repulsive forces by the observation that the mutual co-volume of two swarms of parallel rods (or plates) is roughly proportional to the sine of the angle between their orientation, and larger than the volume of the particles by a factor which is proportional to the asymmetry. The case of rods is particularly simple in that the virial coefficients of order higher than 2 in Mayer's expansion are small, and a quantitative theory is possible. The computed ratio of concentrations at equilibrium is 1.34. The predicted osmotic pressure of the anisotropic phase is nearly proportional to the concentration, in fact, slightly greater than $3cRT/V$.

2. An X-Ray Diffraction Study of Liquid Carbon Tetrachloride. A. EISENSTEIN, *University of Missouri*.—X-ray diffraction patterns of liquid CCl_4 at 27°C have been obtained using both the photographic and Geiger-Mueller counter methods. These patterns have been investigated to a value of 1.1 $\sin\theta/\lambda$ and show seven diffraction peaks in this region. The corrected patterns were subjected to a Fourier analysis to obtain the electron density distribution function for the liquid. This function may be interpreted as indicating that each C atom is surrounded by four Cl neighbors at 1.85A, and that each Cl atom in turn has three Cl neighbors at 2.95A; thus confirming the tetrahedral molecular structure that has been predicted from electron diffraction studies. In addition, each Cl atom has 2–3 Cl neighbors at 3.9A, these neighbors belonging presumably to neighboring molecules. A further electron concentration at 6.2A seems to indicate that at that distance each CCl_4 molecule finds 4 nearest molecular neighbors. By an approximate method of calculation, this distance is found to increase to 7.3A when the liquid is heated to 240°C under a pressure of 35 atmospheres. Using the equation of Hildebrand and Wood, the energy of vaporization has been calculated from the distribution function and found to be in reasonably good agreement with the measured value.

3. Thermal Diffusion Separation of Isotopes. W. W. WATSON, R. SIMON, AND D. L. WOERNLEY, *Yale University*.—Details of several variations of multi-stage thermal diffusion apparatus as well as improvements in the small Nier-type mass spectrometer are presented. Results and calculations for the separation of the isotopes of carbon, argon, and other elements have been obtained. An experiment is described for detecting a negative thermal diffusion constant, using ammonia gas at low temperature.

4. The Disintegration of Co^{60}. MARTIN DEUTSCH AND LLOYD G. ELLIOTT, *Massachusetts Institute of Technology*.—The radiations from the disintegration of the two radio-

active isomers of Co^{60} were studied by beta-ray spectrometer and coincidence techniques previously described.[1] The 5-year isomer was produced with sufficient specific activity by bombarding cobalt metal with deuterons. It decays with the emission of a simple negatron spectrum of maximum energy 0.300 ± 0.006 Mev followed by the successive emission of two gamma-rays of energy 1.10 ± 0.02 Mev and 1.30 ± 0.02 Mev, respectively. The 10.7 minute isomer was obtained by exposing $K_3Co(CN)_6$ to slow neutrons and precipitating the radioactive recoil atoms with KOH and H_2O_2. We find that the direct transitions to Ni^{60}, reported by Nelson, Pool, and Kurbatov[2] constitute only 10 percent or less of the disintegrations. The negatron spectrum has a maximum energy of 1.50 ± 0.15 Mev and is probably followed by the emission of a single gamma-ray. At least 90 percent of the disintegrations proceed by an isomeric transition (probably to the 5-year level) with the emission of a gamma-ray of 0.056 ± 0.003 Mev or a corresponding conversion electron.

[1] Phys. Rev. **60**, 470, 544 (1941); **61**, 686 (1942); **62**, 3 (1942).
[2] Phys. Rev. **62**, 1 (1942).

5. Further Study of Edge Tones. ARTHUR TABER JONES, *Smith College.*—Two types of edge tones are here distinguished: a first type at lower wind velocities, and a second type at higher velocities. The first type is the one that has heretofore received most attention. In it gradual changes in wind velocity or in slit-edge distance are accompanied by changes in pitch that are continuous throughout each of several "stages," the successive stages being separated by discontinuities in pitch. In the second type the changes in pitch are continuous throughout, and may extend over several octaves. The phenomena in the first type are not as simple as is suggested by the descriptions usually given. A number of possible equations connecting frequency N and slit-edge distance h are examined to see which fits best. For a slit width of 0.7–0.8 mm it is concluded that the most satisfactory of these equations is $Nh^s=jU$, where U stands for the velocity of the wind at the slit, $s=1.00$, 1.14, 1.22, 1.43, respectively, and $j=3.9$, 11.8, 24.0, 6.8, respectively, for stage I, stage II, stage III, and the second type of edge tones.

6. Crystal Statistics. LARS ONSAGER, *Yale University.*—The partition function for the Ising model of a two-dimensional "ferromagnetic" has been evaluated in closed form. The results of Kramers and Wannier concerning the "Curie point" T_c have been confirmed, including their conjecture that the maximum of the specific heat varies linearly with the logarithm of the size of the crystal. For an infinite crystal, the specific heat near $T=T_c$ is proportional to $-\log|(T-T_c)|$.