distribution of the triplet recoil electron, and ratio of pairs to triplets. Preliminary results, based on one-thousand events, indicate that the pair opening angle distribution follows Borsellino's[1] calculation closely. The momentum distribution of the triplet recoil electrons is in fair agreement with an evaluation by Rohrlich[2] and the ratio of pairs to triplets over a wide range of energies above 100 Mev is roughly unity.

* Supported in part by the joint program of the Office of Naval Research the U. S. Atomic Energy Commission.
[1] A. Borsellino, Phys. Rev. 89, 1023 (1953).
[2] J. Joseph and F. Rohrlich, Revs. Modern Phys. (to be published).

Y8. Negative Helium Ion Fraction in an Equilibrium Beam in Hydrogen Gas.* THEODORE JORGENSEN, JR., CHRIS KUYATT, AND C. A. SAUTTER, *University of Nebraska.*—A beam of helium ions is sent through a region containing hydrogen gas at about 30 μ pressure. The emerging equilibrium beam is analyzed in a magnetic field in a vacuum. The ratio of the He^- ions[1-3] to the He^+ ions will be shown for energies from 40 to 200 kev. The broad maximum in the He^-/He^+ ratio is 6.5×10^{-4} and occurs at 100 kev. Using other data[4] the ratio of He^- to the total beam is shown to have the maximum of 2.1×10^{-4} at 130 kev.

* Work supported by the U. S. Atomic Energy Commission.
[1] E. Holøien and J. Midtdal, Proc. Phys. Soc. (London) A68, 815 (1955).
[2] P. M. Windham *et al.*, Bull. Am. Phys. Soc. Ser. II, 2, 11 (1957).
[3] V. M. Dukelskii *et al.*, J. Exptl. Theoret. Phys. (U.S.S.R.) 3, 764 (1956).
[4] Stein, Barnett, and Evans, Phys. Rev. 96, 96, 973 (1954).

Y9. Collection of Ions Produced by Alpha Particles in Air. Z. BAY AND H. H. SELIGER, *National Bureau of Standards.*—One of the important assumptions in the measurement of the average energy expended in producing an ion pair in air (W_{air}) by alpha particles is that recombination effects can be accounted for by extrapolation to infinite field strength on the basis of the Jaffé theory. This extrapolation method was recently challenged by Wingate, Gross, and Failla[1] who concluded, from an observed pressure-dependence for saturation ionization currents, that values of W_{air} for alpha particles obtained at atmospheric pressure are in serious doubt. As a part of our program to determine W_{air} for alpha particles, we have therefore investigated the range of validity of the extrapolation methods under usual conditions of measurements. Our measurements in air with Po^{210}-alpha particles over a pressure range from 0.25 to 2.5 atmos gave extrapolated saturation currents independent of pressure within $\pm0.3\%$, the experimental uncertainty of our data. We therefore conclude that the usual extrapolation methods can be applied with confidence in absolute W measurements. The experimental techniques used and the differences between our results and the conclusions of Wingate, Gross, and Failla[1] will be discussed.

[1] Wingate, Gross, and Failla, Phys. Rev. 105, 929 (1957).

Y10. Charge Transfer Cross Sections for Protons in H_2.* T. M. DONAHUE, W. H. KASNER,† AND J. NOLAN, *University of Pittsburgh.*—Measurements of the cross sections for electron capture and loss by protons and hydrogen atoms in H_2 in the energy range from 2.4 to 70 kev have been made by a combination of new methods. These involve the employment of a sequence of nine identical condensers to collect slow ions in the measurement of σ_{10} or to remove charged particles in the measurement of σ_{01} and $(\sigma_{10}+\sigma_{01})$. The method eliminates uncertainty concerning end corrections and secondary emission. The results for σ_{10} lie considerably below those previously reported, the maximum of 3.6×10^{-16} cm^2 occurring at 0.49 kev. Below this peak σ_{10} is accurately proportional to the one-third power of the energy.

* Supported by the Office of Naval Research.
† Present address: The University of Maryland.

Y11. Investigation of the Energy Loss per Ion Pair for Protons in Various Gases.* H. V. LARSON, *General Electric Company.*—Values of w for protons in A, N_2, CO_2, air, and tissue equivalent gas were determined. A 2-Mev positive ion accelerator was used as the source of protons. The energy of the protons was determined by a precision gaussmeter that was calibrated by the Li(p,n) and T(p,n) reactions. These protons were scattered from a gold foil into a parallel plate ionization chamber. The fast electron pulses were collected on one electrode, amplified, and counted. The positive ion charge was collected on the other electrode and measured by means of a standard capacitor that was connected between the input and feedback terminals of a vibrating-reed electrometer. The value of w for 2-Mev protons in argon gas is 26.53 ±0.24 ev/ip; the other w values will be reported at the meeting.

* This paper describes in part, work done under contract between the General Electric Company and the U. S. Atomic Energy Commission.

SATURDAY AFTERNOON AT 1:30

NBS, East Building

(E. BURSTEIN presiding)

Solid-State Physics, Mostly Nonmetals

Z1. Shock-Induced Phase Transitions in Nonmetallic Elements. R. GROVER, R. H. CHRISTIAN,* AND B. J. ALDER, *University of California, Livermore.*—The amazing rapidity with which phase transitions can be induced by shocks has been confirmed by further experiments[1] on phosphorus and carbon. In addition the phosphorus data show that the transition pressures differ significantly from static compression data. The amorphous phases of carbon and phosphorus (red) irreversibly transform to the crystalline phase as confirmed by conductivity, recovery, and equation-of-state experiments. Both of these transformations are of a similar crystalline nature and require the establishment of long-range order. The one for phosphorus occurs at about 25 000 atmospheres and 200°C while in static experiments at 20°C, at least 45 000 atmospheres is required. The transition from yellow phosphorus to black, on the other hand, which involves the breaking of bonds, occurs dynamically at about 80 000 atmospheres and a somewhat higher temperature, as opposed to 12 000 atmospheres and 200°C statically.

* Now at General Electric Co., Philadelphia.
[1] R. H. Christian and B. J. Alder, Tenth Anniversary Meeting of the Division of Fluid Dynamics.

Z2. Electrical Conduction in Type *A* Zeolite. W. PERIA, *Honeywell Research Center* (introduced by O. S. Lutes).—Zeolites are a class of aluminosilicates having a three-dimensional framework structure, featuring the occurrence of large cavities in the crystallographic unit cell. A structure