radioactivity of 3 gm. of dysprosium oxide, placed at 33 cm. distance from the heavy water in a paraffin cone of 10° opening. The number of kicks observed at 90° ± 20° to the γ-rays was 700 ± 42, and only 47 ± 40 were observed in the corresponding time at 0° ± 20°. For a pure sine^2 distribution one should expect for the given geometrical conditions at 0°, 5 per cent of the intensity observed at 90°. This result confirms the observation of Chadwick, Feather and Bretscher; the magnetic photo-effect will scarcely yield more than 5 per cent of the photo-electrical intensity observed at 90°, instead of 29 per cent expected. The cross-section of the deuteron for the total photo-effect for 2·64 Mev. γ-rays was obtained by counting the total number of neutrons slowed down in a large tank filled with water, after the method developed by Amaldi and Fermi[7] and Amaldi, Hafstad and Tuve[8]. The total cross-section is found to be $9 \pm 0{\cdot}8 \times 10^{-28}$ cm.^{2}. The cross-section for the electric effect is therefore 9×10^{-28} cm.^{2}, in good agreement with theoretical expectation. An upper limit of 6×10^{-29} cm.^{2} can be indicated for the magnetic effect; this value is much lower than that derived from the capture cross-section of protons for thermal neutrons.

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[1] Wigner, *Phys. Rev.*, **51**, 1067 (1937).

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[4] Dunning, Manley, Hoge, and Brickwedde, *Phys. Rev.*, **52**, 1076 (1937); Halpern, Esterman, Simson and Stern, *Phys. Rev.*, **52**, 142 (1937); Schwinger and Teller, *Phys. Rev.*, **52**, 286 (1937).

[5] See Bethe and Bacher, *Rev. Modern Physics*, **8** (1936). For the number given here the scattering cross-section was assumed to be 18×10^{-24} cm.^{2} for 'free protons' and slow neutrons, and the difference of the magnetic moments of proton and neutron 4·2 nuclear magnetons.

[6] Chadwick, Feather and Bretscher, *Proc. Roy. Soc.*, A, **154**, 366 (1937); see also Richardson, R., and Emo, L., *Phys. Rev.*, **53**, 234 (1938).

[7] Amaldi, Fermi, *Phys. Rev.*, **50**, 899 (1936).

[8] Amaldi, Hafstad and Tuve, *Phys. Rev.*, **51**, 896 (1937).

Wilson Chamber Study of the Neutro-Electric Effect

IN our previous letter describing the results of our Wilson chamber study of the neutro-electric effect[1], we stated that we had found the paired tracks of a proton and an electron in such numbers as would be expected from our counter experiments (assuming the validity of the conservation laws for the energy and momentum).

Since then, we have taken photographs of 10,538 proton tracks; of these 6,448 were taken by using D—D neutrons, and the remaining 4,090 were taken with Li—D neutrons. In each case we found three paired tracks. This is about one sixth of what is expected. Though it is not impossible that they are due to accidental coincidence of the two independent tracks, the fact that we could find no paired track in which the electron starts from the end of the proton track seems to indicate that they are true pairs.

The smaller effect compared with our former result might be explained partly by the fact that the photographs were much clearer in the present case than in the former, and the accuracy of discriminating whether or not the tracks were true pairs was raised considerably, and partly to the statistical fluctuation. No definite conclusion can be drawn from our present result. One may only say that the neutro-electric effect cannot be explained in terms of the direct interaction of the neutron with the atom satisfying the conservation laws, if our previous cross-section determination is not in error by a factor of about 6.

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[1] NATURE, **141**, 328 (1938).

High-Pressure Afterglow in Nitrogen

A MOST remarkable afterglow in nitrogen has been observed at pressures higher than 10 mm. This afterglow has certain properties which would scarcely be looked for in an afterglow at high pressures. The most striking of these is the relatively strong excitation of the Vegard-Kaplan intercombination bands, which originate on the $A^3\Sigma$-metastable state of nitrogen. Their intensity relative to the usually strong second-positive bands is as high as the intensity in the night-sky afterglow which I reported several years ago[1]. The remarkable nature of this phenomenon will be realized when it is pointed out that the weak night-sky glow was produced at pressures of approximately 0·01 mm. by means of a very feeble exciting discharge, while this strong new glow is produced at about 1,000 times that pressure by means of a very strong exciting discharge. In fact, the relative intensity of these bands has been increasing steadily with pressure in the range so far studied. This is an anomalous result in view of the metastability of the $A^3\Sigma$ level. Moreover, the high-pressure afterglow is more intense and has a longer life than similar glows at lower pressures.

There is present on these afterglow plates a strong line at a wave-length of approximately 3470 A., which has not yet been identified. Its behaviour, as the tube cleans up and the nitrogen becomes purer, is now being studied. It is important, too, that a relatively strong unidentified line or band has been reported by both Dufay[2] and Gauzit[3] in the light of the night sky at a wave-length of 3471 A. The presence of this line in the new high-pressure afterglow, in companionship with the Vegard-Kaplan bands, which are strong in the light of the night sky, suggests that it may be the hitherto unobserved atomic nitrogen line $^2P - {^4S}$, the predicted position of which is also 3470 A. If this be true, then the auroral transition $^2P - {^2D}$ should be much stronger in the afterglow, as well as in the light of the night sky, than 3470 A. The approximate position of the components of the $^2P - {^2D}$ transition is at $1{\cdot}0373\,\mu$, and until it is observed in the present experiments or in the light of the night sky, the above proposed identification of the 3470 line as the trans-auroral transition $^2P - {^4S}$ should be considered tentative. It may be pointed out, however, that the infra-red lines at $1{\cdot}0373\,\mu$ would be the nitrogen analogue of the well-known auroral green line.

Added weight is given to the identification of the 3470 line as the unknown atomic nitrogen line, rather than as the second-positive band at 3469, by the fact that the second-positive bands, which are usually stronger than 3469, are either absent or