Further, Joliot and Kowarski[3] found some very energetic tracks in a Wilson cloud chamber from silver bombarded with neutrons, while more recently Mouzon, Park and Richard[4] have reported a few straight β-ray tracks in a cloud chamber ($H = 1{,}500$ gauss) from uranium bombarded with neutrons.

These facts, taken together, suggested that the observed penetrating radiation from radium might consist of mesotrons emitted occasionally during the breakdown of radium atoms under neutron bombardment[5].

To test this hypothesis, measurements were made on the radiation from a source of 900 milligrams of (radium + beryllium), by means of a Geiger-Müller counter, made of brass 1 mm. thick, having a diameter of 5 cm. and length of 15 cm., filled with air at a pressure of 7 cm. mercury. Source and counter were each surrounded on all sides by 30 cm. of lead, and space of 50 cm. left between them for insertion of absorbing screens.

A large count, about 250 impulses per minute above the background, was obtained with the 900 mgm. (radium + beryllium). When the latter source was replaced by a 600 millicurie (radon + beryllium) source (having almost the same neutron output), the same large effect was still obtained, showing clearly that the phenomenon was independent of the presence of radium atoms.

A small count was, of course, to be expected from the neutrons from the sources, but not one of this order of magnitude.

The Geiger-Müller counter was then replaced by an air ionization chamber of the same dimensions, connected to a linear amplifier, but no particles were detected having an ionization greater than about one sixth of a polonium α-particle, namely, approximately 20,000 ions.

Absorption measurements in lead gave a coefficient $\mu = 0{\cdot}03$ cm.$^{-1}$, in agreement with the earlier findings. This value is the same, however, as that found by Goldstein and Rogozinski[6] for the absorption of neutrons in lead. We therefore decided to eliminate drastically all possibility of neutrons reaching the counter by putting the source, with its lead protection, inside the 'water room' surrounding the cyclotron in the Collège de France. The water tanks are 1 m. wide and 4 m. high, and the ceiling is also covered with 50 cm. of water. Under these conditions, a count of 15 impulses per minute per curie above the background was obtained, which was surprisingly large in view of the small solid angle subtended by the counter. By emptying progressively the water tank between source and counter, the counting rate steadily increased. The maximum rate was calculated to correspond to about 1 impulse per 500 neutrons reaching the counter. Finally, the tank was refilled, and the lead protection of the counter covered with a layer of boric acid 1 cm. thick to absorb slow neutrons. When all neutrons were thus prevented from reaching the counter and its lead screens, the count from 1 curie of (radon + beryllium) diminished practically to zero.

The supposed penetrating radiation from radium and (radium + beryllium) was therefore due entirely to gamma-rays excited by neutrons in the lead protection round the counter, in the brass wall of the counter, and in the air inside it.

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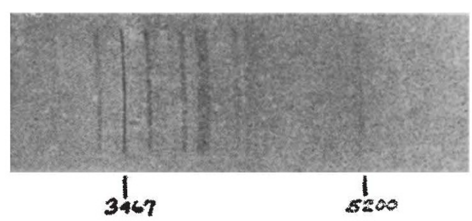
Forbidden Transitions in Nitrogen

IT has been possible to observe the forbidden transition $^2D \rightarrow {}^4S$ in atomic nitrogen by a method similar to the one which led to an unusually large relative intensity of the green auroral line[1]. The essential part of the method is the weakness of the discharge which generates the afterglow.

The first such observations on the high-pressure nitrogen afterglow led to the remarkable enhancement of the $^2P \rightarrow {}^4S$ line at λ 3466·4. When the experiments were repeated, using panchromatic plates, the weaker nebular line at approximately 5200 A. appeared. No exact wave-length measurements have been made; but approximate measurements indicate clearly that the new line in the green is the expected nebular line[2]. The afterglow in which this line appeared was produced in a small quartz bulb of about 150 c.c. capacity and the pressure was about 30 mm.



A number of experiments during the past year indicate that high pressures and small volumes are favourable for the production of forbidden transitions. The absence of first-positive bands, especially those which are expected on the basis of collisions between metastable atoms and molecules of nitrogen[3], is surprising and may mean that either the number of metastable entities is extremely small or that collisions of the second kind between metastable entities are highly improbable.

Further experiments are in progress in order to clarify these points.

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