

LETTERS TO THE EDITOR.

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On the Secondary Radiation due to the γ Rays of Radium.

IN a recent communication to the *Annalen der Physik* (4 and 5, 1904), Paschen described experiments showing that a thick lead block containing radium emits negatively electrified particles which can be deviated in a magnetic field. He concluded that he had deflected the γ rays, thus differing from previous experimenters.

I have found that particles having a negative charge are projected, and are readily deflected magnetically. However, these are not γ rays, but differ from them inasmuch as they are completely absorbed by about a millimetre of lead.

In order to prove this, an electroscope with a thin aluminium face was mounted on a lead platform (1.2 cm. thick) above a block of lead 10 cm. high, at the centre of which was placed 30 mg. of radium. On applying a magnetic field to bend the rays towards the electroscope, the electroscope readings were doubled, but this increase was reduced to half value by a screen of lead (0.1 mm. thick) placed in front of the aluminium face. Since negatively charged particles are thus projected from the lead surface, it is clear that, as Paschen observed, a block of lead, placed in a vacuum and well insulated, would acquire a positive charge, and would continue to do so as long as the radium emitted γ rays, even if these penetrated two or three inches of lead.

The effect which Paschen observed was due not to the primary γ rays, but to the diffuse secondary radiation caused by the γ rays in the lead. This may be shown to be mainly a surface effect, for the secondary radiation from a greater depth than one or two millimetres is absorbed by the lead itself. The curvature of the rays, necessarily implied by Paschen's second experiment, is so large that other experimenters could not have failed to detect it by direct methods had the effect been due to γ primary rays.

This deflection of γ secondary radiation by a magnetic field is similar to Becquerel's result, obtained photographically, when he deflected the β secondary rays. Curie and Sagnac have also shown that Röntgen rays striking a metal cause it to emit negative electricity and to acquire a positive charge; Dorn has proved that such rays can be deflected by a magnet.

Any experiment designed to prove that the primary γ rays can be affected by a magnetic field must involve evidence that the effect produced is not due to the easily deviated γ secondary radiation.

A. S. EVE.

McGill University, Montreal, August 22.

A Source of the Ionisation of the Atmosphere.

It is perhaps not very generally known that human breath has a considerable power of discharging an electrified conductor. This fact can be strikingly shown by an experiment easily carried out. If the discharging knobs of a Wimshurst electrical machine are drawn apart so far that a spark just refuses to pass, then on breathing across the gap the spark is instantly precipitated.

The discharging power of the breath is more conclusively demonstrated, however, by breathing through a metal tube into which an insulated metal rod projects axially, the insulation of the rod being out of reach of the breath. If the rod is connected to the cap of a graduated gold-leaf electroscope, comparative observations show that the rate of discharge of the electrified rod and gold leaves is 60 per cent. to 70 per cent. greater when air from the lungs is passing through the tube than when ordinary air fills it. Again, the rate of leak of a charged electroscope in a small, badly ventilated class-room, was found to be 50 per cent. more rapid when the room was full of students than when it was empty. Incidentally, this explains in part why experiments on electrostatics are often troublesome to carry out in a room crowded with a large audience.

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The point of interest, however, in these experiments is the fact that the slow low-temperature combustion going on in the lungs ionises the air in the same way as the rapid high-temperature combustion of flames. And if this slow ionisation of the air can take place in the lungs of living animals, it may also go on less markedly in the chemical interaction between the air and living plants, and in some cases between the air and inorganic matter, at ordinary temperatures, so that there is here a continual source of atmospheric ionisation apart from any possible radio-active processes.

J. R. ASHWORTH.

Rochdale, August 27.

Celtic Place-names.

THE review of Mr. Johnston's "Place-names of Scotland" in your number of July 28 explains a problem that has been for a long time a puzzle to me in reference to the existence in County Leitrim alone, of the thirty-two counties in Ireland, of the word "allt" in common parlance.

To North Leitrim there came over from Stirlingshire about the year 1608, as followers and soldiers of Sir Frederick Hamilton, grandson of the second Earl of Arran, a strong Scotch colony. From them we took in a great measure our English or Scotch-English. Here is a trace of it. A half-dozen others of our distinctive Leitrimisms I have already traced back to Scotland; others to elsewhere.

In odd words and odd uses of them, and in odd pronunciations, are found "helpful and interesting sidelights for the historian" (to use the reviewer's expression) all through Ireland. Indeed, the "Irish plantations," and the parts of England and of Scotland the planters came from, might be plotted out by a careful observation of such peculiarities. They are disappearing. Before it is too late, or it becomes too difficult, it would be well worth while for someone who knows the rural districts of both countries intimately to attempt the task. It should well repay the historian or the philologist. I have been trying something like it, but I have had slight opportunity for making the acquaintance of any English dialects except the Yorkshire and the Lancashire, and I cannot accordingly push it very far.

I have to thank the reviewer; but permit me to say that the Leitrim use of "allt" (or "alt") corresponds rather with that given by Mr. Johnston than with that claimed by him. With us an "alt" is not "a streamlet passing through a ravine," but a narrow, deep glen or hollow through which, as a rule, of course, a stream or streamlet flows; but that a stream should do this is not essential for the chasm to be so termed. Joyce, too, would support this. The word *alt*, he states ("Irish Names of Places," p. 353, 1869 edition), is found in townland names in Ireland, and in its topographical application it is generally understood to mean a cliff or the side of a glen.

I should be much interested in knowing if Mr. Johnston would subscribe to our precise application of the word. It is evidently a primitive word of Aryan origin. The meaning of all allied words in any language I am familiar with favours our interpretation, and it is hard to see how it could come by the meaning of "streamlet," however flowing.

JOSEPH MEEHAN.

Creevelea, Drumkeeran, Co. Leitrim, August 5.

I HAVE read with much interest your correspondent's letter, and can well understand his difficulty with regard to the Scottish usage of the word *allt*. Here it is applied, as I have stated, to a stream passing through a ravine or hollow; never, so far as I am aware, to a glen or dry chasm.

The Irish *alt*, which is slightly different in spelling, is also apparently different in application. Your correspondent may be interested in the various Celtic usages of the word as given by Dr. Macbain in his "Etymological Dictionary of the Gaelic Language":

"Allt, a stream; Ir. alt, height, (topographically) glen-side or cliff; O. Ir. alt, shore, cliff; O. W. allt, cliff; Cor. als; Br. aot, shore, all allied to Lat. altus. The Gaelic form and meaning are possibly of Pictish origin."

Looking down or up the precipitous sides of many a