

It must be remembered, however, in this connection that probably the walls of the tower itself were not without influence. The clock tower was a sand-stone structure with a square cross section of about 50 square metres area and while the building proper of the City Hall was about 40 metres high, the tower extended up as a column to over 24 metres above the roof of the building. The clock room in which the measurements were made was provided with four glass windows serving as dials for the clock, each with a diameter of about 5 metres. The room itself had an attic space above it and this again was covered with a tile roof. It is presumable that the walls of the clock room emitted penetrating rays and also absorbed to a certain extent those coming from the outside. However, the ionization observed in the basement of the City Hall was only 1 ion per c.c. per second greater than that obtained on the University lawn. Consequently the amount contributed by the tower and walls of the clock room was probably not greater than 1 ion per c.c. per second. The absorption by the glass windows, too, would not be very considerable and so one may perhaps without sensible error set off the one effect against the other and conclude that the readings obtained represent fairly well the relative intensities of the penetrating radiation at the surface of the earth at Toronto, and at a point 64 metres above it.

## II.—SECONDARY RAYS PRODUCED BY THE EARTH'S PENETRATING RADIATION.

In the discussion which has preceded, it has been assumed that 5.8 ions per c.c. per second represents the ionization produced in air confined in a zinc receiver by the penetrating radiation present at the surface of the earth at Toronto and by other radiations which it may give rise to or be accompanied by.

This value is somewhat higher than that obtained by Wright\* in 1908 at Toronto whose numbers shew a difference of only 3.8 ions per c.c. per second between the readings taken on the ice of Toronto Bay, and those taken on the University lawn. It must be remembered, however, that in his experiments the lawn was covered with a layer of ice and snow to a depth of 20 centimetres while in the present measurements the ground was bare. This difference in the condition of the ground might easily account for the difference in the results. Further support for this explanation is found in the fact that in the present investigation the readings obtained in the physical laboratory were practically the same as those obtained on the bare lawn while in Wright's

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\* Proc. Roy. Soc. No. A. 577, p. 175, 1911.