

## APPENDIX.

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SIR.—In your issue of Christmas morning appeared a letter from Mr. Tyrrell of the Geological Survey criticizing my lecture on the "Oldest Geology of the Red River and Assiniboine Valleys." I have not until the present time had an opportunity of noticing it. With your permission I shall quote the various criticisms one by one, that none may be omitted.

1. Mr. Tyrrell says: "The original Archæan in continental nucleus, spoken of as the 'Laurentian Island,' extends southward into Minnesota, Wisconsin, Michigan and New York, and therefore Canada should not be said to own the whole of this Laurentian Island, but rather the greater part of it. The use of the term Laurentian, instead of Archæan, to include both the Laurentian and Huronian, is not correct, any more than it would be correct to group both men and horses as horses. Laurentian and Huronian were names applied by Sir William Logan to separate geological groups or systems, and as they have not been shown to be the same the one named cannot be used to include them both without causing the utmost confusion."

The use of Laurentian instead of Archæan was simply to prevent confusion in a popular discussion of the subject. I said distinctly as follows: "We have preferred to use the well known term Laurentian rather than Archæan which some are now employing to include both Laurentian and Huronian." The terms, "Laurentian island" and "Laurentian lakes" have now become well known, including as every one knows the Huronian. The distinction between Laurentian and Huronian is not easily drawn. Prof. Chapman (page 298) says: "The stratigraphical relations of two series, Laurentian and Huronian have not yet been clearly made out. The mineral characteristics and especially the presence of conglomerates holding quartz and other fragments lead undoubtedly to the conclusion that the Huronian beds are of later formation than the Laurentian, but as pointed out by Dr. Selwyn, the Huronian appear in many places to pass under the latter." It is well known that members of the geological staff form the opinion that the Laurentian series are not metamorphic sedimentary rocks, and their relation to the Huronian is very uncertain. How absurd it is then to be dogmatic, the more that it has been found necessary to invent the colorless word "Archæan" to include the Laurentian and Huronian. As to the extent of the "Laurentian island" the portion of the Laurentian uncovered by Palæozoic which is outside of Canada is utterly trifling compared with the vast area within our borders.

2. Mr. Tyrrell says: "The iron ore on Lake Winnipeg does not occur in 'Cambrian' rocks, but, as has been pointed out by the writer several times, in the highly altered schists of the Huronian system. There is no known natural outcrop of 'Cambrian' rocks in Manitoba, and the only record of this system in the province is in Dr. Dawson's paper on the boring at Rosenfeld where he cor-

lates the lowest horizon of his section with the Lower Magnesian, ~~Laurentian~~ or Calciferous, adding a (?) to indicate a certain amount of doubt in the correctness of the determination."

Here Cambrian is used to mean the lowest of what were formerly called Silurian, and must now be admitted to be at least Campro-Silurian. Dr. Dawson is correct in identifying the rocks immediately above the Laurentian at Rosenfeld as Calciferous, which is Cambrian. As in the case of the Quebec rocks of Eastern Canada, it is difficult to separate chalky and Calciferous, and especially in Manitoba it is difficult to get a horizon corresponding exactly with that of Ontario. As to the iron bearing rates my statement was that they "lie near the base of the Cambrian," lie on the Laurentian island of which I had been speaking, very near the point of union of the Palæozoic and underlying rocks.

3. Mr. Tyrrell says: "Possibly the most unfortunate sentence in the whole paper is the following: 'Lake Winnipeg is now definitely known to be a broad trough hollowed out by glacial action, on the east shore consisting of the hard granite and conglomerate of the Laurentian, and on the west of its lower rocks of the Calciferous, and probably Potsdam series, now classed as Canadian rocks lying upon the Laurentian.'"

Lake Winnipeg is not definitely known to have been hollowed out by glacial action. It is much more probable that it is an old pre-glacial river valley, of the general character of that of the Mississippi of the present day, with its northern end blocked by drift and alluvial deposits, or a depression has been formed in the bottom of this old valley by movements of the earth's crust; evidence of these crusted warpings being seen in the high beaches along the foot of the Manitoba escarpment. On the east shore of Lake Winnipeg there is no "conglomerate" known in the Laurentian, and in fact it is more or less doubtful whether there is conglomerate anywhere in the Laurentian. On the west shore no "Calciferous" or "Potsdam" is known, and there is no reason to suppose that there are any palæozoic rocks in that vicinity below the St. Peter's sandstone (chazy) which is there found resting directly on the archæan."

The last first. After the explanation in regard to Laurentian it seems mere trifling to deny the presence of conglomerates. Prof. Chapman (page 297) says: "The Huronian representatives although distinct enough in their entirety, closely resemble in many cases the Laurentian rocks of the district, and cannot always be readily separated from them. As a rule, however, the texture is less crystalline or less granitoid, and slaty or semi-crystalline conglomerates appear among them." Mr. Tyrrell seems to especially object to Lake Winnipeg being so decidedly put down as hollowed out by glacial action. In my lecture of last year I had occasion to point out the distinguished service in geologizing Manitoba, performed by Prof. Upham, of Boston. So completely did Prof. Upham's