

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

WASHINGTON D. C.

Madison, Wisconsin, December 19th, 1887.

Sir William Dawson,
McGill College,
Montreal, Canada.

My dear Sir:-

Your favor of the 15th of December, acknowledging my paper on the Huronian, is just received.

You think my asking the question, "Is there a Huronian Group" speaks badly for United States geologists, who should have known for thirty years past, that the only possible answer is an affirmative one. There is no question with me that this matter was substantially a settled one in the time of Logan and Murray, but it is not astonishing that there should have been so much doubt when an opposite ground has been taken, not only by prominent geologists in the United States, but by prominent officials of the Canadian Survey, who have not only taught that the Huronian is inseparable (as to any unconformity) from the mass of the Archaean, but in one case at least have gone so far as to assert that Logan never believed in any such unconformity; a most singular assertion in face of Logan's statements in the Geology of Canada of 1863.

Even now I understand that the chief officials of the Canadian Survey are going to reply to my paper, whose views they oppose very vigorously. To obscure the matter yet further, numerous geologists, both in the United States and in Canada, and even in Europe, have been using the term Huronian right and left for rocks which are not only totally different in character from the Huronian, but whose relations to known members of the geological scale have never been so well established as to warrant any such use of the term. I should add that Dr. T. S. Hunt has, perhaps more than any other person, tended to confuse this question by his characterization of the Huronian, which, in the typical region has no resemblance whatever to his descriptions; and yet further by his attempts to adapt to all portions of the world his -- to me -- fanciful succession of pre-Cambrian groups. I feel entirely safe so far as the Lake Superior region is concerned, in saying that no such succession exists there at least. Taking only his own identification of groups in that region, I find that his Norian overlies the Animiké in the most distinct and unmistakable manner, as every geologist agrees who has been on the ground, the Animiké being, according to Hunt's latest views, his Taconian; that his Mt. Alban has there no existence, being made up mainly of granitic and gneissic rocks which plainly underlie the Huronian of the south shore of Lake Superior. Again, his Arvonian is made up of a series of quartz-

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porphyry flows, picked out of the Keweenaw series; and so on.

The result of all this has been to make our geologists feel very sceptical about nearly all that has been advanced with regard to ~~the~~ pre-Cambrian geology. At all events, I found some time since that all of the principal geologists of the United States Survey had been so impressed by the confusion that prevails among the writings of many of those who have dealt with the pre-Cambrian formations, and by the fancifulness of Hunt's views, that they were all, except President Chamberlin, disposed to discredit anything and everything looking towards a separation of the pre-Cambrian into distinct terranes. My present paper, and one which was written nearly two years since for the Seventh Annual Report of the U. S. Survey, but is still in press, grew out of discussions which we had at Washington on this question. I think I may say now that I have in the main established my point there, and that sooner or later, the Survey will adopt some general designation to cover all pre-Cambrian and post-Laurentian groups, leaving any further sub-divisions to be recognized in ^{its} ~~their~~ classifications as ^{its affairs} ~~they~~ become convinced of their validity. Whatever doubts I may myself have had as to the existence of a genuine Huronian, were completely dispelled when in 1883 I made my first examination of the region north of Lake Huron. Not long afterwards appeared Whitney and

Wadsworth's "Azoic Rocks", which has ^{had} ~~added~~ also not a little influence, in leading geologists not directly acquainted with the older formations, to discredit almost anything that has been published about them. Whitney and Wadsworth's book, although it is of course exceedingly one-sided, accepting everything in the most credulous manner that seems to substantiate the views of its authors, and criticising all opposing evidence out of existence, nevertheless contains a good deal of criticism warranted by the careless way in which many geologists have written upon the pre-Cambrian rocks.

Each one of the four points which you raise in your letter, has been carefully considered by us for some years past.

I. As to the name to be used to cover the gap occupied by the Keweenawan, Huronian and other series of fragmental strata above the crystalline Archaean. Our chief objection to the use of the term Huronian in any such general sense as that in which you seem to use it, lies in the consequent relegation of such enormous series of rocks as the original Huronian and the Keweenawan to altogether too subordinate positions. In the geological column Huronian naturally falls in the list with Silurian, Cambrian etc., having the same rank with them. Now, if we use the term Huronian to cover both the original Huronian and the Keweenawan, we put in a

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subordinate position formations each one of which is more than comparable as to volume with any one of the ^(generally recognized) great groups of the geological column. This is true, even if we throw out of sight all of the eruptives of these two series, and consider only their genuinely sedimentary portions. Moreover, as I am sure you would admit on going over the ground, there is in northern Wisconsin, northern Michigan and northeastern Minnesota, a most notable discordance between the Keweenawan series and what we take to be the equivalents of the Huronian beneath it. Still further, these two series are so entirely distinct as to their lithological characteristics, that it did not seem to us desirable to include them within one rock group. More than this, it seemed to us very desirable to have some term of a general nature, which should cover not so much the Huronian and the Keweenawan only, as the whole gap between the Cambrian and the crystalline Archaean, so that we could characterize any rock series found in this gap by this general name, without, at the same time asserting, or seeming to assert, its equivalency with either Huronian or Keweenawan.

2. As to the position of the Animiké series, I am aware that there have been several quite different opinions, but these differences have come mainly from an insufficient examination of the ground. So far as I am aware, the only ones that have seen

the ground sufficiently to form an opinion have been N. H. Winchell of the Minnesota Survey, myself and assistants, and Mr. A. C. Lawson of the Canadian Survey; and all of us, while differing as to many other matters, agree without any question as to the subordinate position of the Animiké to the Keweenaw series; as to its unconformity with a series of crystalline schists beneath it, and as to its striking lithological similarity -- as also its similarity as to stratigraphical position -- to the original Huronian of the north shore of Lake Huron. In fact, the matter is so completely plain to any one who approaches the country from the westward through northeastern Minnesota to Thunder Bay, as to leave, it seems to me, no sort of possibility of question with regard to the relations of the Animiké to the overlying and underlying rocks. On the south shore of Lake Superior, in the Penokee region, is a series of rocks having not merely the same relation to the underlying crystallines and overlying Keweenaw series as does the Animiké, but having a subordinate stratigraphy entirely correspondent with that of the Animiké itself. Indeed, the Penokee iron-bearing series and the Animiké form the opposite edges of a great synclinal beneath the basin of Lake Superior. Now, the Penokee series is traceable directly into the iron-bearing series of the Marquette region, which finally is so entirely similar in general

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character and in position to the Lake Huron Huronian as to leave no sort of question in my mind with regard to their equivalence. Thus by a second process of reasoning, we reach the conclusion that the Animiké is the equivalent to the original Huronian..

Again, although the Animiké does undoubtedly rest unconformably upon older crystalline schists, these older schists have nothing in common with the Huronian of Lake Huron. On the contrary, they are far more nearly comparable with schists that unconformably underlie the iron-bearing rocks of the Penokee and Marquette regions, and with others that are directly associated with the granite and gneiss underlying the Huronian of Lake Huron.

3. Your third point, namely, that while the original Huronian is but little altered, there may be other places where it has suffered much alteration, has been borne in mind all along, but so far as we have ever been able to trace any alterations of the true Huronian, they have been but minor matters, the principal one being the producing of a schistose structure by squeezing, accompanying which have been developments of mica etc. When the original rock was an eruptive of some sort, some difficulty has arisen in distinguishing the resulting schists from older ones, but the fragmental rocks seem always to have retained their fragmental texture; and our experience is all against the idea of any such

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alteration of the Huronian in the Lake Superior region as would produce large areas of genuine crystalline schists. I should say in this connection that this conclusion is based, as are also all conclusions I have announced during the last few years, not only on field study, but on extended studies of thin sections, of which we have now examined many thousands, representing in great detail all portions of the Lake Superior region. Moreover, our conclusions have never been reached in a hurry but have come to us only gradually, and have always been withheld a long time before publication, during which time they have received all possible discussion and consideration. I do not in the least mean to say that I have not announced conclusions which will ultimately be proved erroneous, but I do mean to say that every precaution I could devise has been taken against error.

4. As to the various divisions which have been proposed for the genuine crystalline Archaean, and to which you refer, I must confess too insufficient an acquaintance with the matter in the field, outside of the Lake Superior region, upon which to base an opinion. I am confident that the succession that Hunt advocates of late years does not obtain in the Lake Superior country, but beyond this I am not prepared to go. I take it from what I remember of your publications, and from what you write me in your letter,

that you are among those who accept the sedimentary origin of the bulk of the crystalline Archaean. It seems to me from what knowledge I have of these ancient rocks, that such a view is quite possibly a true one, but what experience I have had, which has been quite extended so far as the northwestern country goes, including the examination of great areas of gneiss etc., in the field, and the examination of great numbers of thin sections, has only resulted in forcing upon me a nearly agnostic position. If then I am unable to be certain about the sedimentary origin of the greater part of these ancient crystallines, I naturally feel somewhat doubtful with regard to the sub-divisions which have been suggested for them, based upon unconformities. But I know that my experience in this respect is still inadequate. Indeed, it seems to me that the greatest obstacle to the progress of accurate geological conclusions lies in the limitations of the areas over which a single man can spread his examinations. The differences between competent geologists seem to me to arise very often from the fact that no two of them have been over precisely the same ground. So far as the Lake Superior country goes, I feel that we are doing and have done all that man can do in trying to reach the truth, but when I come to compare that region with others, or when I hear other geologists whose experiences in the Lake Superior

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Dec 21*

country is less than ours, trying to compare other regions with it, I am often disposed to despair, for neither I nor the others can get the experience necessary to enable us to obtain precisely the same outlook. Going to a region for a month or two, and seeing exposures here and there, building up in the imagination the structure of the unseen intervening areas, results more often in inaccurate conceptions than in accurate ones.

Begging your pardon for this lengthy reply -- to which, of course, there is no necessity that you should trouble yourself to answer further, I remain

Most sincerely yours,

Richard D. King

Erving
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Lawrence
Hunter

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