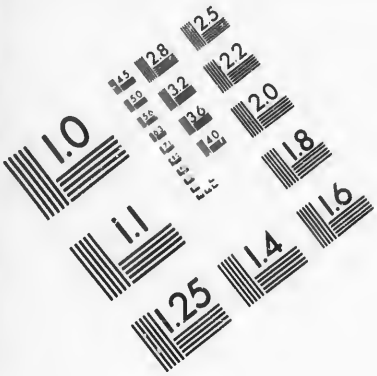

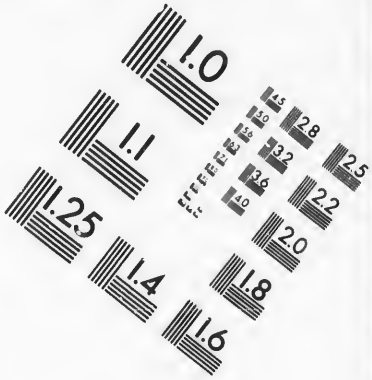

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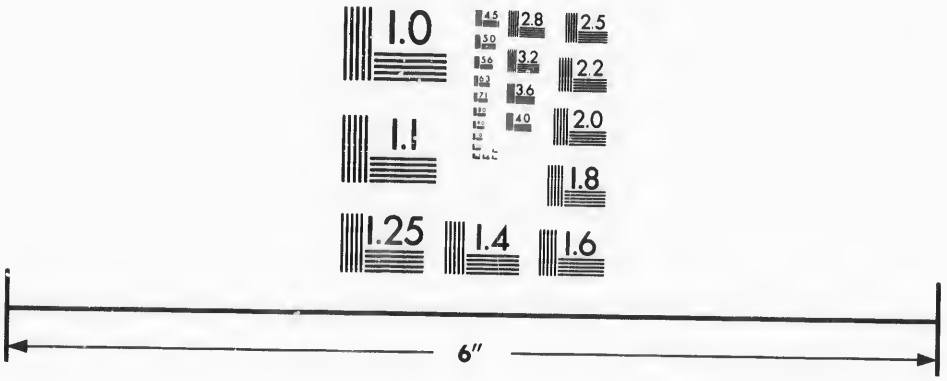

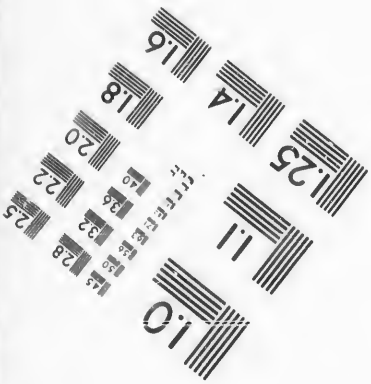

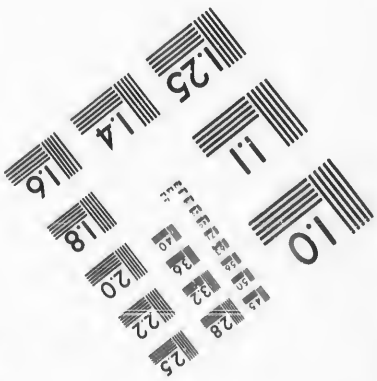

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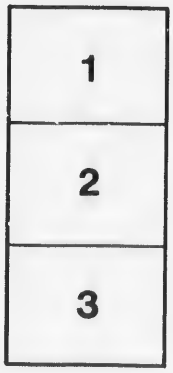

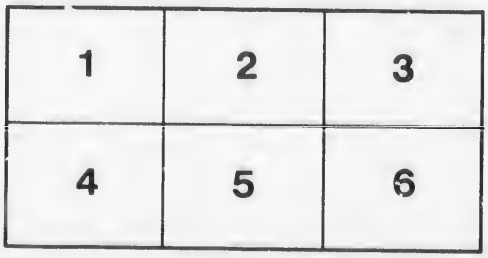

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[From the Proceedings of the American Association for the Advancement of Science, Buffalo Meeting, August, 1876.]

New facts relating to Eozoon Canadense. By J. W. Dawson, of Montreal, Canada.

At the last meeting of this Association, I had the pleasure of exhibiting some specimens of *Eozoon Canadense*, and of giving some oral explanations as to its nature and mode of occurrence. I now ask permission to mention a few additional facts which have been made known since the meeting at Detroit, and which still further contribute to our knowledge of the most ancient known fossil.

(1.) I would first beg leave to direct attention to the very interesting series of specimens now on exhibition in Philadelphia, in the collection of the Canadian Geological Survey; and which give a rare opportunity to study the various aspects of the fossil. In connection with Eozoon, I would also mention the remarkable mass of Graphite from Buckingham on the Ottawa, exhibited by the Dominion Plumbago Company of Canada. This mass is from one of the great beds of that mineral occurring in the Lower Laurentian, on a horizon not remote from that of Eozoon, and which in my judgment are really Laurentian coals, representing the vegetation

of that period, as yet altogether unknown to us in its forms and structures.

(2.) A very interesting specimen, found last autumn by Messrs. Richardson and Weston, at Petite Nation, has enabled me to delineate, in a recent paper, the inverted conical form of a perfect small specimen of Eozoon, and also to show that the acervuline chambers on its upper surface are precisely similar to those small aggregations of spherical chambers resembling *Globigerinæ*, and to which I have given the name *Archæospherinæ;* so that these may not improbably be loose chambers or germs of Eozoon.

(3.) Mr. W. J. Morris of Perth, Ontario, has in the past summer found abundant specimens *in situ* of Eozoon mineralized with Loganite, in the original locality at Burgess. These specimens show that the Burgess variety is on the whole thicker and more continuous in its sarcode chambers, and less developed as to the separating walls than the Grenville and Petite Nation specimens. These new specimens from Burgess have also enabled me for the first time to detect in their dolomitised walls traces of the canal system, into which, however, the Loganite does not penetrate. In some in which the dolomite is mixed with calcite, there is also an extremely minute granular structure, which I believe to indicate an originally porous character of the cell-wall, of which only obscure indications exist in other specimens.

(4.) Mr. G. F. Matthew has sent to me from the Laurentian of Lily Lake, near St. John, New Brunswick, specimens of a dolomitic limestone containing fragments of the skeleton of Eozoon, showing the canal system. This is the first recognition of this fossil in the Laurentian of New Brunswick. A notice of the fact has appeared or will shortly appear in "Silliman's Journal."

(5.) Recent explorations by Mr. Vennor of the Geological Survey have thrown further light on the precise geological horizon of Eozoon in the great Laurentian system. In Sir William Logan's original sections on the East side of the Ottawa, the lowest rock represented is a great thickness of orthoclase gneiss, corresponding probably to the fundamental or Bogian gneiss of the Scandinavian and Bavarian geologists. Above this is a very thick limestone, that of Trembling Lake, which has afforded no fossils. Next is another vast thickness of gneissic beds. Then comes a second limestone, also non-fossiliferous as yet, that of Green Lake. Then another gneissic series and a third limestone, that of Grenville,

which is the special resting place of Eozoon, and is also associated with beds rich in graphite and in calcic phosphate. Still higher is a fourth limestone, and then the Upper Laurentian. Mr. Vennor's observations relate to a region about eighty miles distant, on the west side of the Ottawa and remarkable for its rich deposits of apatite and graphite, though affording Eozoon only in a few places, and in these not precisely in the same state of mineralization as at Petite Nation and Grenville. In this region Mr. Vennor has worked out a series corresponding in its main features with that ascertained by Logan, and it now appears that in both series Eozoon is apparently confined to one horizon, and that in this it is associated with the more important deposits of graphite and apatite. It is true that in the districts explored by Mr. Vennor there are some groups of strata of uncertain age, and which may be upper Laurentian or even Huronian; but the main accordance above stated seems to be certain. It would thus appear that Eozoon and those deposits of graphite and apatite which are probably of organic origin, are characteristic of one great zone of the Lower Laurentian.

(6.) The abundant phosphates occurring in the Lower Laurentian, and as already stated in irregularly stratified beds, and associated with graphite and Eozoon, naturally raise the question whether they are of organic accumulation. The apatite of the Lower Laurentian has indeed as yet afforded no organic structure. Some light may however be thrown on its origin by the analogy of later deposits of similar character; and I have endeavored, in a paper recently read before the Geological Society of London, to show that the calcic phosphate contained in the Cambrian and Silurian rocks of Canada presents in its mode of occurrence points of similarity to that of the Laurentian; while the prevalence of low forms of life, as *Lingulæ*, *Trilobites* and *Hyolithes*, having much calcic phosphate in their skeletons, in the Primordial seas, and the consequent accumulation of beds rich in phosphatic concretions and coprolites, points to the possibility of similar conditions in the earlier Laurentian. I may also here refer, as corroborative of this view, to the recently published researches of Hicks and others on the Silurian Phosphates of Wales.

(7.) The objections to the animal nature of Eozoon recently promulgated by Otto Hahn, and which have been answered in detail by Dr. Carpenter and myself, have directed attention anew

to the geological relations of serpentine; and though I must protest against the idea prevailing in some quarters, that there is any necessary connection between this mineral and Eozoon, yet as serpentine exists in connection with many specimens of this fossil, it is time that geologists were warned against the extravagant ideas of pseudomorphism which have been promulgated in connection with it. I have, therefore, been engaged in the present summer in reëxamining large series of specimens of serpentines associated with organic remains, and have visited some of the Canadian localities of such serpentines, and have studied their geological relations. I hope to show, when these researches are complete, that mieroscopieal and palæontologieal evidence completely vindicates the theory of aqueous deposition of serpentine as maintained by Dr. T. Sterry Hunt, and shows that this mineral, like glauconite and similar silicates, may fill the pores and eavities of fossils, without in any way destroying their forms or structures. I have examples of Silurian corals and other fossils mineralized with true serpentine, precisely like Eozoon in the Laurentian. Further it can be shown that the Lower Silurian serpentines of Canada, alike in their interstratification with fossiliferous limestones, and in their passage into limestone, dolomite and even red slates, conform in a striking manner to the known laws of deposition of hydrous silicates in the modern oceans. Whatever opinions may be held as to the metamorphic origin of certain serpentines, or as to the mode of formation of serpentine veins, the facts I already possess are amply sufficient to show that such theories have no application to the ordinary serpentines found in beds associated with fossiliferous rocks.

(8.) I may add that I hold Gümbel's elaborate exposition of the foraminiferal nature of *Receptaculites*, in the Transactions of the Royal Bavarian Academy, and the announcement by Prof. Karl Moebius of a recent sessile Foraminifer from the Mauritius, not very remote from Eozoon in its general mode of growth, to be important contributions towards the history of this oldest fossil; whose investigation, as will be seen from the above notes, is by no means fully worked out.

[Printed at the SALEM PRESS, May, 1877.