

Is the Fauna Called "Primordeal" the Most Ancient Fauna?

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Under the above title Dr. J. Bergeron discusses the claim of the Primordeal Fauna of Barrande to be considered the oldest assemblage of animals that has existed on the earth. This is the fauna which characterises the Cambrian rocks (as now understood), and which for a long time was claimed to be the oldest that has existed on the earth.

Dr. Bergeron thinks differently and cites abundant internal evidence from the fauna itself in favour of his view that there has been an older fauna.

After speaking of the influence which the opinions of Darwin and other evolutionists have had on the interpretation of late discoveries in the Cambrian rocks (especially in the application of the discoveries in the embryology of recent animals to the interpretation of the primitive forms of the Cambrian seas), he takes the trilobites as the most interesting forms, viewed from the stand point of evolution, as being organisms of the highest type (for that age), because in them the results of evolution are most manifest.

After speaking of the trilobites as Arthropods with a chitinous test, living in the water, breathing by gills, furnished with numerous pairs of thoracic limbs of which some are connected with the jaws and some with the abdomen, he proceeds to give in outline a description of the parts of their bodies and their use in the economy of the creature.

The metamorphosis of the Cambrian trilobites has been shown by Barrande for the genus *Sao* and by Matthew for the genera *Liostracus* *Ptychoparia* and *Solenopleura*. The

three latter exhibit similar series of metamorphosis and so are naturally grouped in the same family. On the other hand the changes in the young of *Paradoxides* follow an independent line of development, showing that this genus belongs to a different family. "We see then that in the trilobites of the fauna called Primordeal there were already differences in the mode of development; and these differences in the forms of the same group living at the same epoch, correspond certainly to a grade of evolution which is not the same; this compels us to admit that before the time when this trilobite fauna lived, there must have been another from which it proceeded."

Another argument used by Dr. Bergeron is that the size of the front lobe of the glabella in embryonic forms of the early trilobites foreshadowed the genera *Paradoxides* and *Olenellus*, which are similarly characterized in the adult stage. However, he thinks that more weight is to be given to the small size of the pygidium in these and other primordeal genera as indicating the primitive aspect of the Cambrian trilobites, for in the embryonic trilobite the pygidium is small compared with the cephalic shield.

The development of the genus *Agnostus* also is taken as showing the line of change through which the genera of trilobites were inclined to pass. Tullberg had shown this for the *Agnosti* of Scandinavia.

The author shows that the earlier forms of *Paradoxides* were small and the gigantic form *P. Regina* was one of the later. These large species perished suddenly without leaving any successors. The same rule holds for *Asaphus* and *Illanus* and large species of other genera.

"The preceding study of the characters peculiar to the trilobites of the Cambrian has led us to the conclusion that these present sure indications of an evolution anterior to the epoch in which they lived. This leads us to think that there must have lived prior to the fauna called primordeal, one which may have contained the ancestral types of the most ancient one that we actually know."

Dr. Bergeron supports this view of the source of the most

ancient forms of animals known by an outline of the opinions now held in regard to the metamorphism of the older sediments, by which the proofs that may have existed in the pre-Cambrian rocks of the life of that earlier epoch have been destroyed.

This article by Dr. Bergeron, published in the "Revue Générale des Sciences, Paris, 1892," is an excellent review of the evidence on this subject as based on the latest discoveries in geology.

RADIOLARIAN REMAINS IN THE AZOIC ROCKS OF BRITTANY.

Dr. Chas. Barrois helps to solve the above question of his countryman (Is the fauna called Primordial the most ancient fauna?) by proclaiming the discovery of Radiolarian remains in the Azoic rocks of Brittany. These he discovered in a graphitic quartzite which constitutes an integral part of the granulitic gneiss of that part of France. The beds have been traced through Vannes and several neighboring towns, where they are less affected by granulitic intrusions, and become a carbonaceous quartzite and shale, and underlie the system called the schists of St. Leo. These schists are considered to be pre-Cambrian, and would correspond to the Huronian system of Canada.

Sections of the carbonaceous shales placed under the microscope show circular or rounded objects of a peculiar aspect; they recall at first view sections of *Radiolarians*. Dr. Barrois submitted sections of this shale (phtanite) for examination by M. Cayeux, who stated that the presence of Radiolarians in these phtanites was undeniable, and one could even refer them to *Monospheridæ*, the most primitive of the Radiolarians.

"These Radiolarians are the most ancient organic remains found in France, and probably in the world; and the phtanites are at present classed in the Primitive Azoic formation about the limit of the Laurentian and pre-Cambrian systems."

By degrees cotemporaries are turning up in the Pre-Cambrian rocks for the once solitary Eozoon. To Walcott's

minute molluscs of the Grand Cañon of the Colorado are to be added the Stromatopora-like fossil and the Hexactinellid sponge of the Pre-Cambrian rocks of St. John (Eastern Canada), and now the Radiolarians of Western France.

ON SOME NEW DISCOVERIES IN THE CAMBRIAN BEDS OF SWEDEN.

Dr. J. C. Moberg, of Lund, has within the year that is past enlarged the number of species known from the Olenellus Zone of Sweden. In two pamphlets he has described a number of species collected by Dr. N. O. Holst and others, which are of peculiar interest. These are from sandstone boulders and beds in the south of Sweden.

Among the fossils are two new species of Olenellus, one allied to *O. (Holmia) Kjerulfi*, but differing in the more strongly arched headshield, by having a much heavier cheek-spine, by a deficient (or perhaps rudimentary) interocular spine, by a more lengthened hypostome devoid of spines at the back, etc. This species he calls *O. Lundgreni*.

The second species is allied to *O. (M. sonacis) Michwitzi*, from which it is distinguished by the arrangement of the glabellar furrows by the form of the outer part of the pleuræ, by the presence of a small point on each side at the back of the pygidium, etc. This species he calls *O. Torrelli*.

With these two species of Olenellus, Dr. Moberg found a small *Lingula*?, two *Hyalithes* and a small *Obolella*?, and he supposes their geological age to be intermediate between that of *O. (H.) Kjerulfi* and *O. (M.) Michwitzi*.

He has found in loose blocks of Cambrian sandstone a brachiopod of which the arched valve is said to resemble the shell of *Ancylus*. It is marked within by a set of radiating ridges like the supposed operculum of *Hyalithellus micans* and Dr. Moberg revives Dr. Hall's genus *Discinella*, referring his species to it. As it has 14 radiating furrows

in place of the 9 or 10 that are found on the form from Troy, N.Y., described by Hall, he considers it specifically distinct, calling it *D. Holsti*.

He very significantly remarks that in the material in which his *Discenella* was found, one "very seldom finds any fossil which is plainly the living chamber of a pteropod of the type which Billings described under the name of *Hyalithellus*; and on the other hand one does not find the *Discina*-like fossil in the material where the reed-shaped or *Hyalithus*-like fossil is plentiful."

Dr. Moberg describes two species of *Kutorgina*; one doubtfully as such, having a very peculiar interior. This probably is of some other genus. Other genera described are *Acrothele*, *Obolella*?, *Scenella*??, *Dentalium*?, *Hyalithes*, *Volborthella*?

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