there can be no possible comparison with the Brockenhurst Corals. The Molluscan fauna of the Lower Oligocene is exactly identical with the Tongrien inférieur of Belgium, and is very rich (I described 756 species), that of our Rupel Clay being rather poor, so that it is quite impossible that a larger number of fossils could pass from the former to the latter (which contains about 200 species, 70 of which are common to the Lower Oligocene, as I stated in my monograph, p. 1443), and the Upper Oligocene has a well-characterized fauna discovered last year as far west as Boncelles, north of Liège. I must therefore object to separating the Oligocene only into two divisions and to the putting the Brockenhurst Beds in the Upper Eocene.

It is a mistake or misprint that I once cited the Venus Bed from the Lower Headon Series, instead of the Middle; the Lower may belong to the Eocene, which is otherwise represented in the most northern parts of Germany by clay with Crabs and a few Mollusca of the London Clay and basaltic tufa, as in Denmark (Møller). The important beds of brown coal between Halle, Magdeburg, and Brunswick are still doubtful, though I rather believe them to be of Eocene age.

As to the Aquitanien, I am not sure that it is everywhere clearly defined, so that it may belong partly to the Upper Oligocene and partly to the Lower Miocene, containing mostly brackish and fresh-water beds, which so often form "des terrains de passage", or intermediate beds.

VII.—OBSIDIANITES IN THE MALAY PENINSULA.

By J. B. SCRIVENOR, M.A., F.G.S., Geologist to the Federated Malay States Government and formerly of H.M. Geological Survey of the United Kingdom.

THE appearance of Professor E. Weinschenk's paper¹ at the close of last year on two specimens of Moldavite from Kuttenburg, in Bohemia, affords a convenient opportunity of recording occurrences of the related 'obsidianites' (referred to by Professor Weinschenk as Billitonite and Australite) in the Malay Peninsula.

The literature dealing with the occurrences of obsidianites in the Malay Archipelago and Australia is unfortunately scattered. The subject has been fully treated, however, and in view of the origin suggested for Moldavite by Professor Suess and supported by Professor Weinschenk, namely, that these peculiar pieces of glass fell on the earth as meteors, it is interesting to note the lunar-volcanic origin suggested for obsidianites by Dr. Verbeek in 1897,² and the admission of the probability of a meteoric origin by Dr. Krause in 1898.³ On the other hand, Mr. E. S. Simpson,⁴ while describing West Australian

¹ "Die kosmische Natur der Moldavite und verwandter Gläser": Centralblatt f. Min. Geol. u. Palaeontologie, December 15, 1908, No. xxiv, pp. 737-42.

² R. D. M. Verbeek, "Glaskogels van Billiton-Jaarboek v. h. Mijnwezen in Nederlandsch Oost-Indië": Wetenschappelijk Gedeelte, 1897, pp. 235-72, pl. i.

³ P. G. Krause, "Obsidianbomben aus Niederländisch Indien-Jaarboek v. h. Mijnwezen in Nederlandsch Oost-Indië": Wetenschappelijk Gedeelte, 1898, pp. 17-31, pl. i.

⁴ E. S. Simpson, Geol. Survey of Western Australia, Bull. No. 6, Notes from the Departmental Laboratory, 1902, pp. 79-85, pls. i, vi-viii.

obsidianites in 1902, inclines, apparently, towards the view of their having been derived from terrestrial volcanoes. References to earlier literature will be found in the works of the above-mentioned authors.

A detailed description of the obsidianites in the Malay Peninsula is unnecessary, since they agree with those described and excellently figured by Dr. Verbeek, Dr. Krause, and Mr. Simpson. Dr. Verbeek figures also two specimens of Moldavite (Bouteillesteenen) from Bohemia for comparison with the obsidianites.

With one exception all the specimens that have come under the writer's notice were found in tin-ore bearing alluvium in the Blat and Gambang Valleys in the district of Kuantan, Pahang. The exception is a small obsidianite from the Sudu Seremban Tin-mine, Negri Sembilan, collected by Mr. Leonard Wray in 1904 and now in the Perak Museum, Taiping.

Mr. H. C. Robinson has informed the writer that obsidianites have been found elsewhere in Negri Sembilan, namely, at Gemas and on the Triang River.

Generally the Pahang obsidianites show the "brilliant black lustre, making them appear, as Krause says, as if varnished or lacquered",¹ and they also show the sculpturing that is the chief feature of these remarkable bodies. Sometimes, however, they are distinctly water-worn, which robs them of their lustre and impairs the minute detail of the sculpturing.

A partial analysis of a specimen by Mr. B. J. Eaton, Government Chemist, Kuala Lumpur, shows—

Si O ₂	72.60	per cent.
Al ₂ O ₃ and Fe ₂ O ₃	26.00	"
Ca O	4.00	"

The mean specific gravity of three large specimens was found to be 2.46.

The alluvium in which the obsidianites are found is sandy and contains few pebbles. These are mostly quartz, but others of quartz-porphyry and dolerite occur, both rocks being found in situ in the district.

None of the specimens examined by the writer show any trace of the shell of glass which Professor Weinschenk describes² as covering about one-third of the surface of the two specimens of Moldavite from Kuttensburg; but seeing how thin and fragile this skin is, its absence in a bed of alluvium containing rolled pebbles is not to be wondered at.

As the writer has no facts to record regarding the Pahang obsidianites helping to terminate the doubt that exists as to their origin, he does not propose to discuss the theories that have been put forward at any length. Professor Weinschenk considers² no stronger proof could be given of the cosmic nature of Moldavite than the glass skin, which is interpreted as the result of fusion of the surface of the stones as they fell through the atmosphere, unless they should be observed actually falling. Without assuming the pre-existence of volcanoes now disappeared, the theory of a meteoric origin is the only one that explains the wide distribution of these bodies. The objection that no undoubted meteorites of the same composition are known

¹ Simpson, op. cit., p. 81.

² Op. cit., p. 739.

is obvious, and if, as the writer understands Mr. Simpson to be inclined to think, obsidianites are bombs hurled enormous distances from terrestrial volcanoes, a thin skin of fused glass might be formed during their descent. To the writer, however, a meteoric origin seems the more probable.

Obsidianites are now known to have been found in the following localities in Malaysia:—Billiton (Verbeek, *op. cit.*); Mt. Moeriah, Djapara, Java (pp. 245, 246); Pleiari, Tanah Laut, S.E. Borneo (pp. 246, 247); Sungri Riam, Tanah Laut, S.E. Borneo (pp. 246, 247); Bungaran (Natuna Archipelago) (Krause, *op. cit.*); Blat and Gambang Valleys, Pahang; Gemas and Sungri Triang, Negri Sembilan (H. C. Robinson); Sudu Seremban, Negri Sembilan (L. Wray).¹

NOTICES OF MEMOIRS.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. ABSTRACT OF ADDRESS TO THE GEOLOGICAL SECTION BY ARTHUR SMITH WOODWARD, LL.D., F.R.S., V.P.Z.S., Sec.G.S., Keeper of Geology in the British Museum, President of the Section. Winnipeg, Canada, August 26, 1909.

THE circumstances of the present meeting very clearly determine the subject of a general address to be expected from a student of extinct animals. The remarkable discoveries of fossil backboned animals made on the North American continent during the last fifty years suggest an estimate of the results achieved by the modern systematic methods of research; while the centenary celebration of the birth of Darwin makes it appropriate to consider the extent to which we may begin deducing the laws of organic evolution from the life of past ages as we now know it.

* * * * *

There has been an unfortunate tendency during recent years for the majority of geologists to relinquish the study of fossils in absolute despair. More ample material for examination and more exact methods of research have altered many erroneous names which were originally used; while the admission to scientific publications of too many mere literary exercises on the so-called 'law of priority' has now made it necessary to learn, not one, but several names for some of the genera and species which are commonly met with. Even worse, the tentative arrangement of fossils in 'genetic series' has led to the invention of a multitude of terms which often serve to give a semblance of scientific exactitude to the purest guesswork, and

¹ The Pahang obsidianites, like obsidianites elsewhere, have been stated to be pieces of slag resulting from smelting operations. A comparison of the physical and chemical properties of obsidianites and slag from a furnace in operation shows how wide of the mark this view is. A more interesting theory emanated from a Malay Rajah, who told the writer that he had collected a number of these stones and believed each to contain a gem in the centre. A valuation was asked for, and the writer felt sorry that it should fall to his lot to destroy the Rajah's belief by cracking one open for his inspection.