KONINKLIJKE AKADEMIE VAN WETENSCHAPPEN TE AMSTERDAM.

PROCEEDINGS OF THE MEETING

of Saturday January 28th 1899.

(Translated from: Verslag van de gewone vergadering der Wis- en Natuurkundige Afdeeling van Zaterdag 28 Januari 1899 Dl VII)

The following papers were read:

Geology. — *„On Brackish-water deposits of the Mclawi in the interior of Borneo"*. By Prof. K. MARTIN.

It is more than forty years since the mining engineer R. EVERWIJN's geognostical expeditions in the „Wester-Afdeeling" of Borneo. Since that time several explorers have been occupied with the geology of that country and nevertheless all our present knowledge of the geological formation of West-Borneo is still based on incoherent data only of which we do not even possess a rough geognostical sketch map.

During the last years the mining engineer N. WING EASTON has been intrusted to make a closer investigation o this country and

from the examination of the fossils forwarded by him to Leyden it was possible to point out inter alia the existence in Borneo of a jurassic system [1]).

His last consignments from the basin of the Kapoeas contained sedimentary rocks with hundreds of fossils upon which I wish to give some preliminary information. Of the objects to which I wish particularly to draw attention only a few have been collected at the main river somewhat below the mouth of the Melawi whereas the greater portion were found in the region of the last named important left branch of the Kapoeas. The localities are situated either on the said Melawi or on its tributaries the S. [2]) Kajan and the S. Tebidah which flow into the S. Kajan. Taken altogether the fossils have been collected in ten different places and an examination of important material containing numerous organic remains from most of these localities was possible. This examination however proved to be rather difficult, the objects being as a rule exceedingly brittle thus requiring to be prepared with the greatest care which could only be done with the aid of a needle.

The fossils are embedded in clay some of which contains calcium carbonate and turns into marl; in some cases they also form the organic centres of marl concretions. In other cases the clay becomes sandy and often it serves only as the cementing material which keeps the thick mass of fossils together. Shell-breccia are numerously represented.

Among many hundred specimens of shells and periwinkles obtained from this material, only seven species can be named viz. *Arca melaviensis spec. nov.*, *Cyrena subtrigonalis* P. G. KRAUSE, *Cyrena subrotundata* P. G. KRAUSE, *Corbula dajacensis* P. G. KRAUSE, *Melania melaviensis spec. nov.*, *Paludomus gracilis* P. G. KRAUSE *spec.*, and *Paludomus crassa* P. G. KRAUSE *spec.*, but the greater part of these species vary so much as to render the determination very difficult. The material collected by G. A. F. MOLENGRAAFF at the upper Kapoeas especially at the S. Pinoh and the S. Lekawai (also branches of the Mĕlawi) on being examined by P. G. KRAUSE was found to contain also the above mentioned species; but the material at his disposal for his researches being defective in several respects, he has not been successful in giving a complete determination of some species (*Arca* and *Melania*) while to others he has given different generic names (*Paludomus*).

Having compared the petrifactions of the different localities in the

[1]) See: Samml. d. Geol. R. Museums in Leiden. Bd. V. (KRAUSE, MARTIN, VOGEL)

[2]) S = Soengai, Malayan name for river.

collections of MOLENGRAAFF and WING EASTON it becomes evident that in the basin of the Mclawi a deposit occurs which taken as a whole is of the same age. This deposit evidently corresponds with the formation stated by EVERWIJN to be tertiary, his statement however was not sufficiently proved. The fauna of these beds exhibits different facies which is due in all probability to the quantity of salt having varied during the process of formation and also having been present in greater or lesser quantities in different localities. A number of species (*Melania* and *Paludomus*) living in fresh water have been found amalgamated with the species of *Cyrena* and *Corbula* which are prevalent amongst these fossils and were inhabitants of brackish water as also the species of *Arca* which may have lived in close proximity to the sea. This amalgamation would chiefly take place during the rainy season.

It is exceedingly difficult to settle the age of the strata in regard to the character of the fauna as sketched above. A direct determination based solely on the occurrence of the species is impossible as none of the above mentioned species corresponds with any described species either from India or the Malay Archipelago. Neither is it of any use to compare these fossil species with the terrestrial shells of Nias described by WOODWARD and which up to the present time have been considered by others to be tertiary. During a recent visit to London I have had an opportunity of studying these Nias forms and feel assured that they decidedly are not tertiary but are, as WOODWARD supposed, of a more recent date.

A comparison with the „intertrappean beds" of India, which constitute a connecting link between cretaceous and tertiary, seems to be of the greatest importance. Their fauna still allows relations to be traced to the Laramie-group of North America and similar relations also exist between the Laramie-group and the upper cretaceous of Ajka in Hungary; consequently this fauna was not from a geographical point of view so well differentiated in those days as at the present time. The fauna of the Mèlawi beds does not show any features to correspond with that of the „intertrappean beds" the Laramie-group etc., on the contrary containing only still living Indian genera amongst which is the genus *Paludomus* it resembles very closely in character that of the present day.

Separating from *Paludomus* the genera *Pyrgulifera* Meek and *Cosinia* Stache which certainly do not belong to it, there remains only a single group which must be considered one of the most characteristic of the Indian fauna. The occurrence of the genus *Paludomus* is restricted to this area, being found in India, Further

India, Sumatra and especially in Ceylon and Borneo. Amongst the still living Bornean forms there are found some species closely allied to the fossil ones; *P. gracilis* in particular closely resembles *P. Everetti* Smith from Sarawak.

Setting on one side its dissimilarity to the fauna of the „inter-trappean beds" and on the other its resemblance in one highly characteristic point to the fauna of the present day we may conclude that the Mèlawi deposit must be of more recent date than the said Indian strata, which constitute a transitional formation between cretaceous and tertiary. For the above reasons the Melawi deposit cannot be older than tertiary but may be of eocene age as, not one of the seven aforesaid species is known to belong to the present fauna and may be considered as extinct, the habitus of two of these species (*Melania melaviensis* and *Cyrena subtrigonalis*) is moreover somewhat aberrant when compared with still living forms. Meanwhile a more exact determination of its age than „tertiary" cannot be given with any certainty and it is for this reason and to avoid all misunderstandings that I propose to call this deposit by the generalizing name of „Melawi group" in reference to the region where it has originally been found.

From the material which has been examined, the Melawi-group can be traced from the S. Tempoenak below Sintang eastwards along the Mèlawi as far as the S. Lekawai and also on the S. Kajan to a certain point somewhat above Maboek [1]). This tertiary (eocene?) brackish-water sediment can only have been formed with the assistance of rivers and brooks which perhaps belonged to the same river system that is now represented by the Mèlawi and its tributaries and accordingly the beds of these streams may have been cut out of the sediments which they themselves have contributed to form.

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1) At present it is impossible to trace a further extention of the Mèlawi-group. I can only state that I have also received through the agency of WING EASTON a consignment of petrefactions from the river Silat (flowing into the Kapoeas near Silat above Sintang) which contains a fauna differing from that of the Mèlawi-group.

Particularly numerous amongst which are the remains of *Vivipara* which is represented by at least two different species and there also occurs a species of *Corbula* (s. str.).

The latter seems to be quite distinct from *C. dajacensis* while amongst the species of *Vivipara*, a highly characteristic form is found which I propose to name *V. Eastoni*. The figures of two specimens of this new species are inserted here. A very remarkable characteristic of this species is the presence of sharp and prominent keels, one of which situated at the angle of the whorls projects very strongly.

It is possible that this deposit of the river Silat is older than the Mèlawi-group, but certainly it is not older than cretaceous.