Geology. — *Note on "Negroheads" (coral boulders) in the East Indian Archipelago.* By J. H. F. UMBGROVE. (Communicated by Prof. G. A. F. MOLENGRAAFF.)

(Communicated at the meeting of March 28, 1931.)

In his excellent paper on "Island reefs of the Queensland Coast", M. SPENDER [1]) made a comment on the use of the word "negrohead" or "niggerhead".

As the word has been applied by some authors to large coral boulders which have often been found isolated on the surface of reefs, and as it has been used again by other scientists to indicate lumps of living coral in the deep water of the reef, he suggests to abandon the word, and to use the word "coral-head" for the living pinnacles in the water and "coral boulders" for the dead specimens on the reef flat.

These boulders are a common phenomenon on reefs in the area of the Great Barrier Reefs and also on other reefs which are situated in regions where tropical disturbances — cyclones — occur.

I noted their absence on reefs in the Malay Archipelago where monsoons blow with great force, as e.g. on the Thousand Islands in the Java Sea, and the Spermonde Archipelago. This applies also to the Bay of Batavia, Emmahaven (W. Sumatra) [2]) and to the Togian Islands in the Gulf of Tomini (N. Celebes) [3]).

From this one might conclude that, in regions where no cyclones occur, no coral boulders can be expected either.

A latitude of 5° is the lowest in which cyclones do occur; between 6° and 8° latitude they are still very rare.

The Malay Archipelago is situated only 6° north and a little more than 9° south of the equator. Consequently the conditions for the origin of cyclones are unfavourable.

C. BRAAK [4]) l.c.p. 41 informs us that, so far as they occur, cyclones are

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[1]) M. SPENDER, Island Reefs of the Queensland Coast. Journal R. Geogr. Society London 1930.

[2]) J. H. F. UMBGROVE, Coral Reefs of the Bay of Batavia. Wetenschappelijke Mededeelingen, N°. 7, 1928 (and excursion Guide Fourth Pacific Science Congress 1929).

Coral Reefs of the Thousand islands Java Sea. Ibid. N°. 12, 1929.

Coral Reefs of the Spermonde Archipelago. Leidsche Geologische Mededeelingen, Vol. 3, 1930. Coral Reefs of Emmahaven, Ibid., Vol. 4, 1931.

[3]) J. H. F. UMBGROVE, The Influence of the Monsoons on the Geomorphology of Coral Islands. Proceed. Fourth Pacif. Sci. Congr. Java 1929 (ed. 1930).

[4]) C. BRAAK, The climate of the Netherlands Indies. Vol. 1, Part 2 in Verh. Koninkl. Meteorol. Observatorium te Batavia, N°. 8.

occasionally met with in the extreme south east of the Archipelago. The disturbances of which the cyclone-like character could be determined with certainty, are known from the islands of Timor, Banda, Roti, Kisser, Leti, Damar and the Kei islands (l.c.p. 43): "The cyclones that occasionally pass to the South of the Small Soenda islands and Java are too far distant to cause an appreciable influence, and the same is the case with the cyclones of the China sea". "The islands north of Celebes are sometimes visited by the typhoons which pass to the south of Mindanao, as was the case with the Talaud islands in October 1904".

So one could meet with coral boulders on Timor and the neighbouring islands. As far as I know we do not yet possess data of those places either denying or confirming this supposition.

Neither have I been able to find data concerning this in the Pilot Book for the East Indian Archipelago.

As to the islands between Celebes and the Philippines some data can be found in the Pilot Book [1]). From Salababoe, one of the Talaud-islands, the following is mentioned (l.c. pag. 63): In the Southern entrance of the sea arm between Salababoe and Karakelong are the islets Saha besar and Saha ketjil. These small islands are covered with a dense vegetation and are surrounded by a white sandy beach, on which locally lie big rocky lumps of weathered coral ("groote rotsachtige klompen van verweerd koraal").

Not so absolutely convincing are the records on Maria-reef (l.c. pag. 61) and the island Kawaloesoe (l.c. pag. 62) belonging both to the Kawio-islands. From these islands the occurrence of black stones along the reef edge ("zwarte steenen op den rifrand") is mentioned.

To these data we can add the following statement published very recently by KUENEN [2]): "On the reef at the northwestern corner of the island Morotai as well as on the reef of the Nanoesa-islands and on the eastern coast of Karakelong (Talaud-island-group) so called negro-heads occur". Moreover, Dr. KUENEN kindly told me that these are the only localities where he saw negro heads during his cruise with the Snellius Expedition in the East Indian Archipelago.

Outside this region, however, two examples of coral boulders along the coasts of the East Indian Archipelago are known to me. Here the cause has not been a cyclone, but tidal waves caused by the volcanic eruptions of the Krakatoa in 1883 and the Paloeweh volcano in 1928.

At the time of the great kataclysm of Krakatoa in 1883 "negroheads"

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[1]) Zeemansgids voor den Oost-Indischen Archipel, Deel V, 1919.

[2]) „Hier (langs de N. W. kust van Morotai) komen op het rif, evenals op dat van de Nanoesa eilanden en op de Oostkust van Karakelong in de Talaud groep z.g. „negro-heads" voor."

PH. H. KUENEN. Tijdschrift Koninkl. Nederl. Aardrijksk. Genootsch. Deel XLVII, pag. 194—195. 1931.

were cast on the shores in great numbers by the tidal wave attendant on the eruption. Close to the lighthouse of Anjer some tremendous blocks of coral were thrown on the beach; the largest block lies at about a 100 m. distance from the shore and has a volume of 300 M^3.

In his standard work on Krakatoa [1]) the situation of this block has been drawn by VERBEEK on a map. In 1927 I visited the same boulder, now thickly overgrown and covered with a luxuriant vegetation. Some smaller "negroheads" are scattered along the coast in the neighbourhood of the lighthouse of Anjer. In 1926 I found big coral boulders, among which there were enormous colonies of Diploastraea heliopora on the coast of Java's S.W. Point where, in 1883, the lighthouse was entirely destroyed by the devastating tidal wave.

In his recent memoir on the Volcano of Paloeweh [2]) NEUMANN VAN PADANG says that "the eruption of 4/5 August 1928 was accompanied by 3 sea-waves reaching a height of 5—10 metres on the coast of the island itself and on the opposite part of the island of Flores".

On p. 66 l.c. he reports that on the N. coast of Flores a coral boulder of an irregular round shape and about 10 M. cubic contents was thrown on the beach near Maoroleh.

These two examples are the only ones known to me from historic times.

They point out, however, that coral boulders may be met with on more reefs and coasts of the Archipelago, where they need not have been caused by cyclones, but as is evident from the above, may have been thrown up by a tidal wave caused by the eruption of a neighbouring volcano.

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[1]) R. D. M. VERBEEK, Krakatau, Atlas 1888.

[2]) M. NEUMANN VAN PADANG, Paloeweh. Vulkanologische en Seismologische Mededeelingen, N°. 11, 1930.