

Geology. — *Preliminary Remarks on geological investigations in the Lesser Sunda islands near Australia.* By H. A. BROUWER.

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In 1937 collaborative researches were made by a group of geologists and advanced students of the University of Amsterdam on several of the Lesser Sunda islands near Australia. In the southern row of islands detailed investigations of critical parts were made in the island of Timor. In the northern row investigations were made on the islands Wetar, Alor, Lombok, Adonara, Solor and in the eastern part of Flores. Some remarks on our preliminary results will be given in the following pages¹).

Age of the Flysch in Timor.

The name Flysch was given by WANNER to a facies of rocks which resembles petrographically the Late Mesozoic and Eocene Flysch of the Alps and Carpathian Mountains. This formation is considered to belong to the upper part of the Triassic (Ladinic to Noric). A result of our investigations is that this facies comprises rocks of Upper-Paleozoic age.

On the overthrust sheets in Timor.

The structure of Netherlandic Timor has been discussed by former investigators, mainly by WANNER and MOLENGRAAFF.

For the tectonic relation between a lower unit with Flysch facies — of which the base has not been observed — and the superimposed rocks, sections in the central part of Netherlandic Timor, have proved to be particularly instructive.

The folded lower unit is separated by an intensely crushed and squeezed zone from overlying Permian marls, limestones, tuffs and effusive rocks of which the facies is very different from that of the Permian of the lower unit. It must have moved horizontally over large distances. The outcrop of the contact between the lower unit and the superimposed rocks is strongly influenced by axial dip. Judging from the distribution of the different rocks in the northern part of Netherlandic Timor there may be several windows of the lower unit, which are surrounded by regions with crystalline schists and many varying Paleozoic, Mesozoic and Tertiary formations, in some of which a great wealth of fossils is found.

Our results must be worked out in detail before a division in structural units of the rocks on top of the lower unit can definitively be given.

Comparison between the two rows of islands.

The two rows contrast strongly with regard to their geological com-

¹) As a matter of course many of these preliminary remarks are based upon the detailed work of my collaborators, who will publish the results of their work in due time in special publications.

position and structure. A great part of the northern row is covered by volcanics and many volcanoes are still active. Intrusive granitic to dioritic rocks and various sediments are also found. Although rocks from this row have been mentioned as pre-Tertiary in the literature, we have not discovered rocks older than Young-Tertiary in age and we only saw rather simple structures at all those places where our investigations were made.

The southern row is entirely devoid of active volcanoes and Paleozoic, Mesozoic and Tertiary rocks with a very complicated structure are widely distributed.

Besides the strong contrast in geological composition and structure between the two rows, there are points of resemblance. The volcanic rocks, which occur near the north coast of Timor, resemble the older part of the volcanic rocks of the northern row. We could say that rocks of the northern row rest upon rocks of the southern row near the north coast of Timor, while nowhere in the northern row the base of these younger rocks has been found uncovered by erosion.

Tectonic evolution.

There are Old-Tertiary and Younger-Mesozoic¹⁾ elements in a complex of mostly dark coloured sediments as greywackes, conglomerates, sandstones, clay shales, cherts and limestones, which is found in close relation with the crystalline schists of Timor. Different horizons are found transgressive on the schists. These Younger-Mesozoic and Old-Tertiary formations indicate periods of diastrophism in Mesozoic time.

The present structure is the end result of long periods of movement and the question arises how much of the horizontal movement which is proved by the overthrusting took place before Tertiary times. We will only mention in this connection that the intensity of folding of the transgressive Younger-Mesozoic and Old-Tertiary formations is varying for different sections and at different horizons in the same section. At some places slightly folded or even nearly horizontal rocks are found. We will not enter now farther into the details of this question.

With regard to the youngest tectonic evolution of the rows of islands additional facts have been found, which agree with our opinion expressed in former publications, that in this region there is to be found a fine illustration of a simple relationship between crustal movements and volcanic activity, the volcanic action having been more prolonged in the northern row in proportion as the island rows are further separated.

Proofs of the young tectonic activity in both rows are amply given by the upheaved terraces and coral reefs and the fractures and faults near the surfaces of the present islands.

¹⁾ Upper-Jurassic (Oxfordian) is represented according to Professor R. HEINZ in Leipzig, who made preliminary determinations of our species of *Inoceramus*.