

of the morainic amphitheatre to the plain of the enclosed depression. A complex of glacial and fluvio-glacial deposits of contemporaneous origin corresponds to each phase of the cessation of glaciation. Thus in a single glacial series there may be a succession of complexes, one partially superimposed on another, and each corresponding to a definite stage of retreat or advance of the ice. The fluvio-glacial deposits in a single glaciation are spoken of as inter-stadial.

Under the deposits of relatively recent glacial accumulation which are characterized by trifling superficial alteration due to weathering, two other glacial series are found, distinguished from each other and from the most recent series by highly weathered layers or by evidence of great erosion, showing the existence of a long sub-aërial period between each epoch of glaciation. These periods are termed interglacial in distinction to the brief interstadial periods which occur in the course of a single glaciation. Amongst the interglacial deposits of the neighbourhood of the Alps, at least on the north of the chain, *loess* must be included. *Lehm* is a product of alteration of loess, mainly distinguished by the absence of carbonate of lime.

The more ancient moraines are often weathered externally into a brick-red crust, termed *ferretto* by the Italian geologists. The moraines so coated always occupy the outer side of morainic amphitheatres, and are therefore called *external moraines* in distinction to the more recent *internal moraines*, which form the inner slopes and in part rest upon the more ancient. This is not a mere case of superposition, but of actual enclosure, the external moraine extending around as well as partially under the internal. The alluvia of the most ancient glaciation are termed *plateau alluvia* (Deckenschotter), those of the intermediate glaciation *high-terrace alluvia* (Hochterrassenschotter), and those of the most recent stage *low-terrace alluvia* (Niederterrassenschotter).

I cannot conclude without an expression of gratitude to Professor Penck, for his great kindness and tireless patience in not only showing, but making sure that every member of the excursion saw and understood the various features which he explained.

SURVEY OF THE MACCLESFIELD BANK, SOUTH CHINA SEAS.

THE 'Report on the Results of Dredgings on the Macclesfield Bank,' by P. W. Bassett-Smith, surgeon R.N., which has recently been issued by the Hydrographic Department of the Admiralty, contains valuable material for discussion in connection with coral reefs. The Macclesfield Bank lies in the centre of the South China Sea, halfway between the northern part of the island of Luzon and the coast of Annam, and due south of Hong Kong. Earlier surveys showed that it rises rapidly out of deep water, has a length of about 80 miles, and a breadth of 30 miles, and

that the general depth over the greater part of the area is about 40 fathoms, with indications of a shallow rim round the edge, characteristic of a submerged atoll. Frequent reports of shoal water made by ships crossing the bank showed the need for an accurate survey, and the results of a day's dredging by Mr. Bassett-Smith on board H.M.S. *Rambler* indicated the importance of a scientific investigation of the coral. On April 23, 1888, the *Rambler* anchored on the south-west side of the reef, in lat. $15^{\circ} 28' N.$, $113^{\circ} 51' E.$, depth 13 fathoms. Seven hauls of the dredge were made in depths varying from 20 to 44 fathoms, and upon these Mr. Bassett-Smith reports: "The result of the day's work impressed upon me that life on the Macclesfield Bank was very active, it being very far from the condition of a *drowned atoll*. . . The surface of the Macclesfield Bank appears to shelve slowly down to 50 fathoms; here the rapid drop occurs. . . . Living coral was brought up by the dredge every time, but these deep-water corals were quite different from those obtained on the Tizard Bank, except one madrepora in 26 fathoms. There were two chief kinds—one, a compound coral in the shape of thin cups; the other, a branching, *very porous* coral, with large black polyps in deep cups, both entirely unable to stand any great surf action. . . . The most active growth of living coral was found on the slope down to 27 fathoms upon the 'Dead Coral Rock,' and from this depth the proportion of dead coral rock progressively increased down to 44 fathoms."

H.M. surveying-vessel *Penguin* was accordingly despatched to examine the bank in April, 1892, and the western half of the reef was surveyed, immense numbers of zoological specimens being collected. Reef-building corals were absent in only seven hauls of the dredge (excluding those over 50 fathoms), and six of these were on the inner side of the shallow rim, where the bottom was sandy, only one being on rock and sand outside the rim. Thirty-eight genera of corals were obtained, and probably many ordinary varieties are present which could not be brought up with the means at hand. The temperature of the surface water ranged from 79° to 85° Fahr., and that at the bottom of the lagoon was 76.9° Fahr. The tow-net showed that minute organisms were abundant. The currents over the bank were strong, and the water exceptionally clear—all favourable conditions for active growth. Mr. Bassett-Smith's observations at depths greater than 20 fathoms are of special interest. We extract the following: "From the patches of 10 to 20 fathoms, where the most abundant and most massive branching forms of corals were obtained, one passed down slopes more or less gentle to an average depth of 40 fathoms; this was either covered with sand, where no corals grew, or only psammocera, anacropora, and leptoseris, all small; or a rough bottom composed of, *to a very large extent, a rotten calcareous rock, formed by algae in situ* . . . ; below this the surface was covered with 'coral sands,' turning into muds the deeper one

went. . . . The amount of solid rock formed by vegetable organisms on this reef is, I am sure, very large; and as it was most abundant between 20 and 50 fathoms, its building-up power in such reefs as this must be a very important factor."

The other half of the work of survey was completed by H.M. surveying-ship *Egeria* in April and May, 1893, and Mr. Bassett-Smith was transferred from the *Penguin* for the time. The results of the previous year's observations were fully confirmed, and many interesting details added. Characteristic sections of the slopes on different parts of the bank were made, two of which are reproduced in the report. On the north side the slope is gradual for at least 10 miles; on the eastern slope 300 fathoms is reached only 1 mile from the shore, and on the southern side at a similar distance, both these sides being practically precipitous. A very significant feature was the number of heads of actively growing coral rising up out of the deep water of the lagoon—often nearer to the surface than the rim—the lagoon itself being a sandy flat with an average depth of 45 fathoms, on which only a few simple corals were found.

The net result seems to be, as Mr. Bassett-Smith states, that there is no reason to doubt that the actual increase of solid calcareous rock from these marine organisms requires a much less narrow limit of depth than is usually assigned to them. Growing coral is found in depths of 30 to 40 fathoms, and along with it large quantities of rock formed by calcareous algæ *in situ*. The living algæ may also assist in protecting the rock underneath them from the solvent action of sea-water. It is noteworthy that very few algæ are found on the lagoon flat.

Taken along with the conclusion, based chiefly on the hydrographic observations, that there is no evidence of a vertical movement of the bank as a whole, Mr. Bassett-Smith's reports afford valuable help in accounting for the depths of such lagoons, and strong support to Murray's theory of the formation of atolls. We are glad to learn that the extensive zoological collections, by no means confined to corals, have been sent to the British Museum for exhaustive examination.

THE MONTHLY RECORD.

THE SOCIETY.

Reception by the President.—On the afternoon of December 12, the President and Mrs. Markham held a reception in the Society's rooms, Savile Row, the object being to give the Fellows an opportunity of inspecting the extensive alterations which have been made in the Society's premises. About 650 Fellows and their friends attended the reception, which was in all respects successful.

Antarctic Exploration.—At the meeting of the Society on December 10, 1894, the President, Mr. Clements Markham, made the following remarks: When, just a year ago, Dr. John Murray of the *Challenger*