

this point, and shows how important it is that prospectors should seek for such contacts. In places the junctions of the rhyolitic and greenstone rocks have also been proved favourable localities for auriferous reefs.

(2) The occurrence of large and payable reefs in granitic rocks show that this class of rocks may carry hitherto unsuspected possibilities, especially near greenstone areas. No rock should therefore be regarded as barren of payable reefs until prospecting has taken place, although, naturally, preference must be given to certain places, e.g., greenstone areas and the junctions of different rocks.

(3) The occurrence of very numerous reefs which have apparently in many cases been payable auriferous near the surface, is demonstrated.

(4) Apart from the Orion Mine at Niagara and the Cosmopolitan at Kookynie (and perhaps one or two others), the reefs have not been worked to any depth. Consequently it cannot be said that the districts as a whole have received any adequate mining test beyond a shallow depth.

(5) The sources of a considerable amount of the alluvial gold found at Tampa do not appear to have been discovered. The possibility therefore remains of the finding of new lodes in this district.

(6) It appears likely that the superficial deposits conceal undiscovered lodes, but, unfortunately, except in rare cases, such lodes (if they exist) are not likely to be found by the prospector.

#### ALBANY.

(J. T. JUTSON AND E. S. SIMPSON.)

The main geological features of the Albany district have been described by Mr. Gibb Maitland, Government Geologist, in Bulletin No. 26 of the Geological Survey. Some additional observations have, however, been made, which bear on both the geology and physiography of the district.

The fundamental rock of the district is a granite, which varies in texture from fine to coarse-grained, and is frequently porphyritic. Its constituent minerals are quartz, feldspars (microcline and oligoclase), hornblende, and biotite. It forms the high hills, the islands, and many of the sea cliffs, besides underlying the sedimentary rocks of the district. Its surface is extremely irregular, rising in places in huge domes, from which the rock is exfoliating on a great scale, and elsewhere being below sea-level. This result is at least largely owing to its long exposure to the eroding agents. It is traversed by numerous dykes and veins of pegmatite, basalt, and dolerite, of varying width from less than an inch to many yards.

In the hollows of the granite a series of marine beds has been laid down. These beds now form a low plateau to the north and north-east of Albany. The fossils found in these deposits (which are still practically horizontal) comprise mollusca, bryozoa, echinoids, and abundant siliceous sponges. Sufficient satisfactory material has not yet been collected to definitely determine the age of these sediments, but there is no doubt that they belong to the Tertiary period, and the presence in them of the cephalopod *Aturia australis*, whose range in Victoria is from Oligocene to Lower Pliocene, fixes their age within comparatively narrow limits. Similar beds occur over many portions of southern Western Australia, and

they will probably be found to be all of the same general age. Those in the vicinity of Albany have been named by the authors the "Plantagenet Beds," and they extend at least as far east as Bremer Bay.

Between the Southern Ocean and Princess Royal Harbour is a high, steep, serrated ridge, the backbone of which is granite, the surface, however, in many places being the coastal limestone. This latter rock represents calcareous sand dunes—now consolidated—which have been blown from the seashore on to the granite ridge.

The recent deposits include the silt and infusorial earth now being laid down in swamps and lakes, the present-forming sand dunes, and the sands of the bars along the coast.

Recent changes in the position of sea and land are strikingly illustrated at Albany. The Plantagenet beds show that during their formation the sea covered wide areas in the southern portion of Western Australia, with numerous islands and islets of granite projecting above the ocean. Uplift later took place, and as a result, the area occupied by land was greater than at present, probably extending over the present sites of Princess Royal and Oyster Harbours and King George's Sound, and even farther southwards. The King and Kalgan Rivers incised or deepened their channels on the new land surface, uniting into one stream below their present mouths, and probably passing between Bald Head and what is now Breaksea Island before entering the ocean.

Long, however, before the drainage basins were reduced to base-level, a positive earth movement occurred, by which the united King-Kalgan River, and the plain over which it meandered were drowned by the sea, and the river bestruck. By such submergence Oyster Harbour was brought into existence, and the present Princess Royal Harbour and King George's Sound (with the various islands of the latter) were formed, but probably at first as portion of a strait, which may have stretched westwards to (the present) Torbay Inlet, through the present Grassmere Valley, leaving the coastal limestone ridge to the south as an island. The then Southern Ocean coast line was also probably pushed to the north.

Since this submergence, the land area has been increased by the natural reclamation from the sea. This has been accomplished by silting, the latter being due to the deposition of stream-borne detritus from the land and wind-borne sand from the coasts, and by the formation, by the action of the wind and of the waves, of sand bars, by which such silting has been much facilitated. The best known example of such a bar is that forming Middleton Beach.

As a result of these agencies, the old Grassmere strait has become restricted to the sea-covered areas of Princess Royal Harbour and King George's Sound, and the entrance to Oyster Harbour has been reduced from a wide mouth to a very narrow one. There is also little doubt that at the time immediately following the latest submergence, there were three entrances from the east to the sea area now occupied by Princess Royal Harbour, but these have now been reduced to one, owing to the building of sand bars, by which the two former islands have now been connected or "tied" to one another and to the mainland to form the peninsula stretching northwards from Frenchman Bay to Possession Point.