

There were some changes in staff during the year. Mr. O. L. Bruhn, who was clerk to the survey for ten years, was promoted to a better position with the Public Works Department. Mr. D. H. K. Ross, who filled the vacancy, has a good knowledge of photographic work, and in order to allow him to use his skill on survey work Miss J. Bailie was appointed to assist him. Dr. C. O. Hutton took up the position of Petrologist in October, 1938, and Dr. Arnold Lillie, appointed as geologist, arrived from England late in April, 1939. Messrs. M. Ongley and E. O. Macpherson were granted leave for further terms.

AMURI SUBDIVISION.

By J. HEALY.

Owing to Mr. Fyfe's removal to the West Coast on coal-survey examinations after four field seasons in the Kaikoura subdivision, to the writer, who had assisted Mr. Fyfe during his last season, has been assigned the duty of completing the work. Field-work began on 9th January, 1939, and by the end of March the writer, assisted for six weeks by Mr. J. H. Sticht, B.Sc., had mapped 180 square miles in the Culverden-Waiau district. Some time was spent in examining the unfamiliar geological succession in critical areas. Notwithstanding that Dr. Finlay determined the foraminiferal faunas of several members of the Tertiary sequence, there is little to add to Mr. Fyfe's account of the geology of the district.

STRUCTURE.

Most of the area examined is contained in the Culverden-Waiau basin, a depression determined by north-east-trending structure lines. The Lowry Peaks Range in the south-east part of the area continued north as Mount Parnassus Block, forms uplands of the older rocks, against which the Tertiary and Cretaceous beds in the basin are down-faulted. Near the entrance to the Hurunui gorge in the south end and near the Stanton River in the north this faulting is complex, and strips of younger rocks are involved in the older greywackes, though this may in part be due to several periods of movement having affected the area.

The younger sediments of the depression have been thrown into a series of north-easterly-trending folds broken by minor faults and were apparently later further faulted. Through the centre of the district, from Isolated Hill, Mount Highfield, and The Humps to Mount Stewart and Mount Percy, a core of greywacke is exposed along a central anticline bordered on each side by a syncline. Along the Highfield ridge the anticline is decidedly a-symmetric and steeply flexed on the north-west; southward it is lower and the greywacke does not outcrop. It reappears at Isolated Hill in a further up-arching, but again disappears as the anticline plunges south-west below the plains. A short distance north-west of Isolated Hill is a large slightly-transverse fault which probably accounts for the decreased height of the greywacke.

PHYSIOGRAPHY.

The Culverden-Waiau Plains extend from the Hurunui River north-east to the Waiau, and thence for some distance up the valley of the Mason River. Between Rotherham and Culverden the flats are from 600 ft. to 650 ft. above sea-level, the highest point being at the road turn-off to Hanmer. Thence the plains slope gently downwards towards Lowry Peaks. North-east, up the Mason valley, the level rises. The plains are broken by the Isolated Hill block, which is completely surrounded by gravels and rises to a height of 1,280 ft. at Isolated Hill itself.

The fault mentioned in the previous section divides this block into two physiographic units. The north-western part has a regular surface 800 ft. to 850 ft. above sea-level, etched into parallel ridges with broad, rounded surfaces, by streams incised in narrow V-shaped valleys, which are parallel to the strike of steeply-dipping, alternately hard and soft sandstones. South-east of the fault is the dome-shaped mass of Isolated Hill, which is traversed from north to south by a prominent limestone escarpment. The western portion of this dome shows the sharply hummocked topography typical of greywacke. South-east of Isolated Hill the surface drops to a lower level, broken by the ridge formed by the more resistant Sugar Loaf sandstone.

Highfield ridge somewhat resembles Isolated Hill in that it has a prominent limestone escarpment north-west of which the greywacke is characteristically eroded. The greywacke continues north-east as a ridge towards Mount Stewart; several prominent peaks on this ridge at the head of the Bourne Stream are quite aptly named The Humps.

Throughout the strip of Tertiary country that extends from Waiau north-east for some fifteen miles the remnants of a former high-level, gravel-covered plain, cut in the younger rocks and near the Leader River extending right across the greywacke, are easily traced. The gradual flattening of the slopes at the south end of the Highfield ridge and the coarse-gravel deposits of this locality are probably due to erosion at this base level. At lower levels are well-dissected remnants of terraces intermediate in height. The highest is approximately 450 ft. above the present level of the Waiau River.

The high-level surface is best shown farther to the north-east in the Bourne and Stanton basins, and on part of the headwaters of the Leader where fairly steep-walled valleys are incised to a depth of 300 ft. to 400 ft. There are intermediate terraces along the main streams. Usually the interfluvies are broad, gravel-capped ridges, and viewed from any one of them the former extent of the planed surface is evident. From a height of 800 ft. above sea-level, between the Bourne and the Stanton, the level of this surface rises gradually north-east to 1,600 ft. beyond the Leader. It overlaps on the lower end of the Mount Stewart Block and apparently extends right across the greywacke block north of Solomon's Throne. The streams have largely reached grade and are now commencing to widen their valleys by lateral corrosion, especially in the area composed of Tertiary rocks. These soft mudstones and sandstones are eminently prone to weathering, and in the deep gullies where bush is largely removed there are many slips and soil erosion is increasingly prevalent.