

(2.) *The Undescribed Collections of the Old Survey.*—This constitutes the bulk of the collections, and comprises over 120,000 specimens from 847 localities. Each specimen bears a locality-number, corresponding to an entry in a manuscript register. The fossils are wrapped in paper, and packed away in numbered boxes of uniform size, there being 463 of these boxes stored in limited space in the back rooms and passages of the Museum. It will be readily understood that the handling of the fossils from any given locality is a matter requiring much time and labour. Increased accommodation for these boxes, with slots to take each box separately, is very urgently required.

(3.) *The Collections made under the Reorganized Survey.*—These are also packed away in boxes, not uniform in size or numbered, and with no register, and stored in a small shed in the Museum grounds. Each specimen is wrapped in paper, with a locality-label on paper along with it. The total number of specimens is not large.

#### RELATION OF THE FOSSIL COLLECTIONS TO NEW ZEALAND STRATIGRAPHY.

The history of the New Zealand stratigraphy for the last forty years is the history of controversies between the leading exponents of New Zealand geology. Very many important questions are still unsettled, and must remain so until combined palæontological and stratigraphical researches are carried out in critical areas. In the description of the fossil collections it is therefore desirable to work under some definite plan by which the data for settling these points may be most speedily made available. The chief questions at issue are :—

- (1.) Are Carboniferous fossils present in the Wairoa Gorge, Nelson, as affirmed by Hector, McKay, and Park, and denied by Bell, Marshall, and Clarke ?
- (2.) Is there a sequence of formations and faunas from the Permian to the Jurassic, as affirmed by Hector, McKay, and Park ; or an indivisible Trias-Jura formation, as affirmed by Bell, Marshall, and Clarke ?
- (3.) Is there a conformable sequence from Cretaceous to Tertiary, as affirmed by Hector, McKay, Marshall, Speight, and Cotton ; or are there distinct Cretaceous and Tertiary systems, as affirmed by Hutton and Park ?
- (4.) Do the Cretaceous and succeeding rocks form one rock-series, as affirmed by Marshall, Speight, and Cotton ; or are they divisible into several systems, as affirmed by Hochstetter, Haast, Hector, Hutton, McKay, and Park ?

The last two questions, involving as they do the stratigraphy of the coalfields, are the most important from an economic point of view. After consultation with the Director, I decided to commence detailed work with the fossils of Amuri Bluff and the Waipara-Weka Pass district, where a succession of faunas is clear and undisputed. It is proposed to describe each fauna in the succession in detail, and to discuss the stratigraphical evidence in this district. Later, if necessary, other similar successions, such as those of the South Canterbury rivers, the Oamaru district, and the Kaipara district, can be similarly described, so that any faunal or stratigraphical gaps in the Waipara succession may be detected and filled up.

#### FIELD-WORK IN EAST MARLBOROUGH AND NORTH CANTERBURY.

A flying visit, in which Mr. C. A. Cotton, of Victoria College, accompanied me, was paid to the principal fossil localities of East Marlborough and North Canterbury, in order to decide upon the possibilities of zoning and correlating the Cretaceous and Tertiary rocks, and incidentally to collect further material.

##### *General Account of the Succession.*

The succession of the rocks in question in this area is not in dispute, although the presence or absence of unconformities has always been a matter of controversy. Certain correlations on lithological grounds have been always made without challenge, and appear to be perfectly justified. Over practically the whole area where these younger rocks occur in this part of the Island a white chalky limestone, known as the Amuri limestone, occupies a prominent place in the succession. The underlying rocks are, speaking generally, a middle series of sulphur-mudstones and glauconitic sands, with concretions bearing saurians in some localities, and a basal series of conglomerates and grits which are frequently fossiliferous. The principal variation from this type of deposition is found in the Coverham section of the Clarence Valley, where the lower part of the Amuri limestone is replaced by lenticular flint-beds, while the Saurian greensands are represented by a great thickness of black mudstones with calcareous concretions. In the Waipara district the Amuri limestone of typical facies is overlain by a glauconitic limestone known as the Weka Pass stone, but in its upper parts this rock again approaches the facies of the normal Amuri limestone. In the other localities a marked division of the limestone member cannot so easily be made, although glauconitic partings occur at more than one horizon at Amuri Bluff. The Amuri limestone, or Weka Pass stone, is overlain by the grey mudstones, known as the Grey Marls. North of the Conway River no higher beds are present in direct succession, but in the Waipara district there follow two series of sands with rubbly limestones and shelly conglomerates, known respectively as the Mount Brown beds and the Motunau or Greta beds.

The collections available for working out the succession of faunas in these rocks are very complete as regards the lower members, but contain little material from the beds above the Saurian beds. In part this corresponds to an actual paucity of fossils in the rocks themselves. The Amuri limestone has yielded at Amuri Bluff a few molluscs, elsewhere only *Foraminifera*. The Weka Pass stone is very poor in fossils, and so are the Grey Marls. On the other hand, the Mount Brown and the Motunau beds are locally very rich in shell-beds, but the existing collections do not represent this richness. It is in large measure due to the faunal gap between the Saurian beds and the Mount Brown beds that the difference of opinion as to the relations of the Cretaceous to the Tertiary has arisen, for it leaves a large range of rock-junctions available for the interposition of an unconformity.