

dealing with the fundamental principles of physical science, and the second with physical geography as it is generally understood. The complete syllabus thus provides the outlines of an elementary course of general science. Mr. Thornton's book has been written upon the lines of the first part of the syllabus, and therefore it is limited to brief treatment of the elementary facts and principles of physics and chemistry. A large number of experiments are included, some of them good. The illustrations are also numerous, and some of them are original.

The Wealth and Progress of New South Wales, 1895-96.
By T. A. Coghlan. Vol. i. Ninth issue. Pp. 491.
(Sydney: Government Printer, 1897.)

THE difficulty in preparing a volume of this kind is to limit the information concerning the details of local affairs, and yet make them useful both locally and to the outside world interested in the features and progress of our colonial possessions. Mr. Coghlan, the Government Statistician of New South Wales, seems to have successfully adjusted the balance of the two interests, with the result that his volume appeals to all who wish to have accurate information concerning the active life of the Colony. Moreover, there are chapters on the history of the Colony, the climate, geological structure, physical configuration, fauna, flora, forestry and fisheries, and mines and minerals. The volume will be very serviceable for reference.

LETTERS TO THE EDITOR

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The Glacial Period and the Irish Fauna.

It has been shown by the work of many observers, in Scotland, Ireland, north-western England and the Isle of Man that during the Glacial Period the basin of the Irish Sea must have been filled with an ice-sheet. It is not probable, therefore, that the interesting speculations of Dr. Scharf on the origin of the Irish fauna (NATURE, October 28, 1897), in so far as they are based upon assumptions as to the glacial conditions of the Irish Sea, will meet with much acceptance among geologists.

There is one possible mode of migration for land-animals in formerly glaciated regions which I think has been too frequently ignored by students of the subject. I refer to the probability that the ice-sheet itself may have furnished a practicable route across narrow seas. In Prof. I. C. Russell's luminous description of the Malaspina Glacier of Alaska, we read that "a broad game-trail which had evidently long been used by bears, wolves, foxes and mountain-goats," skirting the Chaix Hills, "continued across the glacier 6 or 8 miles north-eastward to the Samovar Hills." Again, Dr. Scharf himself incidentally mentions that in Northern Europe "it is a well-known fact that reindeer are in the habit of travelling considerable distances on ice."

During my recent survey of the Isle of Man I have found abundant evidence to show that during the maximum glaciation an extraneous ice-sheet swept across the highest summit (2034 feet), and also that during the closing stages of the Glacial Period this ice-sheet melted away more rapidly in the vicinity of the island than in the surrounding obliterated sea-basin. Under such conditions the island formed a nunatak accessible for any animal which could cross the ice. And I think that the general circumstances attending the close of the Glacial Period indicate that most of the land surrounding the enclosed sea-basins in our latitudes might be in a condition to support animal life before the decaying ice-lobes had disappeared from these hollows. During the earlier stages of the Glacial Period it is clear that the climate was such as to favour the accumulation of glaciers even at sea-level, and this condition persisted until ice-sheets of great thickness had covered the lowlands. This growth at length ceased; perhaps, as I have elsewhere suggested, in the east sooner than in the west, because

of the greater amount of snowfall along the western periphery of the sheet.

In the northern part of the Irish Sea basin there existed a high plateau of ice, its surface probably not far, if at all, short of 3000 feet above present sea-level. An amelioration of climate set in, and progressed until, say, no permanent snow was possible at any altitude under 1000 feet. But the ice-sheet was already in possession, and by reason of its elevation would remain, throughout the greater part of its area, uninfluenced by this extent of change, or it might even still continue to grow where there was sufficient precipitation. In an ice-choked basin hemmed in by hills as is the Irish Sea, the discharge by flow alone was scarcely likely to keep pace with the surface accumulation.

Not until the climate became such that melting was in progress over the whole plateau would there be much general lowering of its surface. Under such conditions, as the elevation of the ice-sheet was equal to, or greater than, the uplands upon which it abutted, the snowfall could no longer remain permanently, even on the hilly ground. Hence, as the land emerged from its icy covering, it would remain bare, and ready to support vegetation. As on the Malaspina Glacier, even the ice itself, where covered with morainic debris, might become verdure-clad.

The melting influence of rain falling upon the ice-sheet would be distributed equally over the recipient surface, for its superfluous heat would be at once absorbed. But whatever rain fell upon the emerging land could gather and flow in comparatively warm streams, capable of exerting a considerable differential effect where they impinged upon the margin of the ice. There would thus be a general tendency for the melting mass to shrink down more quickly in the vicinity of land; and this effect would be accelerated as the lower levels were uncovered.

These are the conditions disclosed by the field evidence in the Isle of Man, and that life existed under such conditions is proved by the presence, in one of the gravel-terraces of this period, of the arctic fresh-water crustacean *Lepidurus (Apus) glacialis*, which lives now in icy pools near glaciers in Norway and Spitsbergen, along with an arctic willow, *Salix herbacea*, and a few other plants of wider range.

The Irish Elk reached the Isle of Man about this time, and I think it probable that it crossed from the mainland on the waning ice-sheet. The evidence is altogether unsatisfactory for a Post-Glacial land-connection, as Mr. P. F. Kendall has shown.

The distance between the nearest points of Ireland and Scotland is about the same as between the nearest points of the Isle of Man and Scotland, and I see no reason why certain elements of the Post-Glacial fauna of Ireland should not have been similarly introduced by the ice-bridge. At any rate, in view of the above-quoted data furnished by the Alaskan Glaciers, this appears to me to be a legitimate supposition, and one which is in keeping with the general trend of the geological evidence.

G. W. LAMPLUGH.

The Variability of Mira Ceti.

THE notes in NATURE, December 2 and 9, are very welcome, as they show more interest in δ Ceti than in late years, and especially as from present information there have been but few observations from this side on the recent appearance. It seems that I have seen, so far, more of the star than any one else.

The maximum of Mira, following previous ephemerides, was due October 1. But *The Companion* and Chandler have added a correction of about forty days, and given the date as November 9. This phase appears to have occurred this season November 30, which is sixty days late. But it is not at all improbable that another maximum may be observed, although the star seems now to have broken away definitely. It was a step or so brighter than a star (3⁹⁹ H.P.) last night, and is unchanged to-night except in colour. Its reddish cast to-night, judging from some past experiences, indicates a change in light, and another rise may occur.

The magnitude November 30 was 3², Gamma Ceti being 3⁵⁹ Harvard measurement.

It is remarkable that while there is agreement as to the light-curve of Mira for three years, the dates of maximum are as much as five weeks apart. But there still remains some doubt as to the fluctuations in 1894-95; and did not Mr. H. M. Parkhurst confirm the present writer's observations of that apparition, they would have been thrown out of court. And some doubt would attach to Mr. Parkhurst's did not an observer at Moscow, mentioned in NATURE, confirm both of us. DAVID FLANERY.

Memphis, Tenn., U.S.A., December 24, 1897.