

No attempt has as yet been made to work out the graptolite zones in these rocks, but it seems probable, considering the enormous thickness of the rocks, that such zones will be found. The most plentiful graptolite of the central area is *Tetragraptus fruticosus*. Besides this form there are two other species of *Dedymograptus*, *Tetragraptus quadribachiatus*, *T. bryonoides*, *Dichograptus octobachiatus*, *Loganograptus Loganii*, *Goniograptus Thureauii*, *Phyllograptus typus*, *Thamnograptus typus*, and some forms apparently referable to *Dendrograptus*. All these species, it will be remembered, occur in the Quebec group of rocks. A crustacean of common occurrence is *Lingulocaris M'Coyi* (R. Etheridge jun.). This is the same as the oft-quoted *Hymenocaris Salteri*, a manuscript name of Professor M'Coy's. Two species of *Protospongia* occur, but are rare.

The extension of the Bendigo rocks to the southward along the line of strike is cut off by a newer granite, which is about ten miles across. To the south of this again comes the Castlemaine goldfield. The river gravels of this area, both recent and tertiary, were very rich in gold, but although a few rich "reefs" were found they did not prove of a permanent character, and mining is now at a very low ebb in the district. The structure of the country is similar to that of Bendigo. The anticlines succeed one another very rapidly, being only about three hundred yards apart, as a rule, and the strike is very constant. The main axis of elevation passes through the township of Chewton, about two miles east of Castlemaine, and the lowest beds contain a graptolitic fauna, apparently identical with that of Bendigo. Two or three other zones may be recognized overlying this one. *Tetragraptus fruticosus* does not range above the lowest zone. *Didymograptus bifidus* is the commonest fossil in the next zone, and the problematical *Didymograptus caduceus* of Salter marks the next. The other recognized species agree very closely with those of the Quebec group, species of *Tetragraptus*, *Dubograptus*, *Logarograptus*, *Goneograptus*, *Temnograptus*, *Thyllograptus*, *Dendrograptus* and *Thamnograptus* occur.

THE MARINE TERTIARIES OF AUSTRALIA.

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TERTIARY beds of marine origin are extensively developed in the southern portion of Australia, forming a more or less broken fringe along the coastline from the head of the Great Australian Bight to the Snowy River in the east of Victoria. With the exception of a prolongation up the basin of the Murray River they do not extend far from the coastline and attain no great height above the sea. They are absent from the eastern coast of Australia, being apparently faulted below sea-level. Till of late years very little has been done towards the elucidation of the fauna, only a few species having been described. Recently, however, Professor Ralph Tate, of Adelaide, has done a great amount of work among the Mollusca and Echinoderms of the series and has enabled several workers to enter the field. The fauna is remarkably rich, especially in the older rocks, and not far short of 2,000 species have been recorded. The limit is far from reached, as fresh forms are coming to light at every new locality visited. Several papers descriptive of the beds as seen in different localities, with more or less imperfect lists of fossils, have appeared in the publications of the Royal Societies of South Australia and of Victoria. The most exhaustive one is by Mr. J. Dennant, on the beds of Muddy Creek, Victoria.*

More recently Professor Tate and Mr. Dennant have, in

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the same publication, begun the work of correlating the whole series of beds as shown in the two colonies.

By Professor Sir F. M'Coy the lowest and most widely occurring beds are referred to Oligocene age, and he refers others, which differ lithologically, to the Miocene. Messrs. Tate and Dennant class both as Eocene, and it has been shown that in one locality at any rate the so-called Miocene really underlies the so-called Oligocene. The lists from Muddy Creek, above alluded to, show 511 recorded species, of which only one and a half per cent are living at the present day.

The fauna of the older tertiaries presents a more tropical aspect than that found on our coasts at the present day. *Murex*, *Vobeta* and *Cypræa* are extensively developed and often of gigantic size; the *Cypræa gigas* of M'Coy, for instance, is a very globose form and reaches the length of eight inches.

The strata consist of sands, clays and limestones, the latter being usually composed in the main of polyzoal remains. In some places an *Orbitoides* limestone occurs, the chief species being *O. Mantelli*. The clays yield the greatest numbers of forms, which in some places are beautifully preserved in a stiff blue clay that cuts like new cheese.

The Miocene beds of Tate and Dennant are not so extensively developed as the Eocene, while Pliocene beds with marine fossils are still rarer. In many places marine gravels occur, which have been ascribed to this age, but apparently on very slight grounds. Where they will be placed now is quite uncertain.

Below the lowest marine beds, and frequently separated from them by a denuded basalt-flow, is, in some places, a series of terrestrial and fresh-water deposits with plant remains with beds of lignite. These have, for many years past, been spoken of as Miocene. It is now proposed to remove them to the Cretaceous. It will be a strange thing if we have to wage war in a case so closely comparable with the Laramie one.

THE SCIENTIFIC MAN ON THE FARM.

BY CHARLES B. COOK, OWASSO, MICH.

For many years the average farmer has been a man of few resources. His city brother has outwitted him in every department of his business. He has availed himself of no opportunity to secure a scientific education, and still worse, his county paper is the only periodical that ever enters his dwelling. As a result he is ignorant of the most vital laws that underlie farm husbandry in all of its branches and "farms it" in a general "go-as-you-please" style. These facts alone are sufficient to account for the farmer's general reputation as a man totally unfit for any other business. To make a bad matter worse, the illiterate farmer is continually belittling his profession to an extent that is limited only by his vocabulary.

In direct contrast to the above style of farmer the scientific agriculturalist is growing more and more to take hold of the farm, not only as a field for experiment and study, but as a vocation that will generously respond, financially, in direct proportion to the amount of mental force applied; for it is a fact just beginning to dawn on the minds of the public that the farmer's bank account compares most favorably with that of his professional brother, and where genuine ability prevails, coupled with a love for the vocation wherein one is called, the farmer's account is likely to run ahead.

The educated farmer of to-day is placed almost beyond competition, while the lawyer, the mechanic and the doctor find talented competition on every corner. The scientific man's education enables him to make the most