

are not more than 50 feet deep, and none has yet been proved to continue below 300 to 500 feet. The future of manganese mining is limited by some of the same factors as iron mining, owing to the limited range of the ordinary oxide ores. The mines are still open quarries, from which the ore can be very cheaply produced. Mr. Fermor's monograph concludes with a comparatively elementary statement regarding the methods of mining and the economics of the industry. More precise information as to labour costs and efficiency would have been of interest. The rates of pay are from 2½ to 7 annas a day for men, 1½ to 4 annas for women, and from 1 to 3 annas for children; the efficiency must be very low if it may be judged by dividing the annual output of the different mines by the number of people recorded as engaged in them. The native miners appear to insist on more holidays than Welsh colliers, without having the same excuse.

Owing to the present great activity in Indian manganese mining, the known deposits there cannot last very long. Mr. Fermor in 1907 estimated that the supplies would be worked out in from thirty to fifty years. Now, in spite of some additional discoveries of ore, he is disposed to reduce even that short limit; and he earnestly warns India that it is adopting a wasteful policy in the reckless export of manganese, which will have to be purchased from other countries for the manufacture of ferro-manganese when India works its enormous supplies of iron ores. Owing to the possibility, however, of the discovery of fresh deposits and of the invention of new processes that may supplant manganese, it is not proposed to impose legal restrictions on the export of the ore.

J. W. G.

#### THE STRUCTURE OF CRETACEOUS PLANTS.

HITHERTO our knowledge of the structure, as distinguished from the mere external appearance, of Mesozoic plants has been for the most part limited to the older floras, in which only the earlier types, such as ferns, cycadophytes and conifers, are represented. From the Upper Cretaceous, the epoch when the now dominant angiosperms first overspread the world, little structural material has been available until lately, if we except the petrified wood of palms, which has long been known and is of the utmost interest.

At the present time new facts of great value are coming in from two principal sources—from the researches of Drs. Hollick and Jeffrey on the lignites of the eastern United States, and from the work of the authors below cited on the petrifications from northern Japan.

The specimens described in the present paper, which must be regarded as only a first instalment of the work, were among those collected by Miss Stopes on her recent expedition, undertaken with the assistance of a grant from the Royal Society, and helped in every possible way by the Government and universities of Japan. Eighteen types are described—not a large number, but quite enough to make a good beginning. The number of species with structure preserved is not very large, even in the best known fossil floras. We think, however, that the authors in their comparison somewhat underestimate the richness of the English Carboniferous flora in admitting only about seventy structural species; 100 would be nearer the mark.

The flora investigated is a mixed one, the eighteen species including one fungus, three ferns, eight gymnosperms, and six angiosperms; such proportions are quite unusual, the angiosperms commonly being dominant if they appear at all.

Only a few of the most important forms can be referred to here. Among the ferns, *Schizaeopteris mesozoica* bears the characteristic sporangia of Schizæaceæ, *Aneimia* being the nearest genus. Of the gymnosperms, *Niponophyllum cordatiforme* may be either a leaf or a leaflet; if the former, it may be a belated member of the ancient Cordaitæ; if the latter, it may be akin to the Bennettitæ.

*Yezonia vulgaris*, with a cypress-like habit, has a very peculiar structure, the small adpressed leaves containing numerous vascular bundles. If, as there is reason to

suspect, the cone *Yezostrobus Oliveri* was its fruit, the plant appears to represent a type intermediate in certain respects between Cycadophyta and Conifera.

*Cunninghamiostrobus yubariensis* shows a clear affinity with the recent *Cunninghamia*, while *Cryptomeriopsis antiqua*, so far as vegetative characters can decide, comes near the familiar *Cryptomeria* of modern Japan.

Among the fossils referred to angiosperms, *Saururoopsis nipponensis* shows an anatomical structure similar in some ways to that of *Saururus*, an ally of the peppers. Some readers may perhaps ask if it is quite certain that this plant is an angiosperm, and may even think of a possible comparison with Ophioglossaceæ. In the meantime, the authors' suggestion is at any rate tenable. It is interesting that the commonest angiosperm in these rocks, *Sabio-caulis Sakurain*, appears to show the nearest affinity with the native climbing plant *Sabia japonica*.

The most sensational discovery, however, is that of a three-celled ovary of the type of Liliaceæ, for this is the first case in which any angiospermous fructification has been found fossil with its structure preserved. A perianth or bract is adherent to the lower portion of the ovary, making it partly inferior. It is curious, if somewhat disappointing, to find that this ancient flower appears to have been already so advanced as to give no clue to its ancestry.

In many cases diagrammatic text-figures are used very advantageously to supplement the photographs (sometimes a little obscure) which form the bulk of the illustrations.

The authors' concluding remarks suitably sum up the results so far attained:—"These new fossil plants, then, seem to be an interesting community, consisting of a mixture of old and new types, of higher and lower plants mixed in nicely balanced proportions: a community, which in some respects, at any rate, one could have hardly imagined from the fossil remains hitherto available from the Epoch."

#### ARCHÆOLOGICAL AND ANTHROPOLOGICAL INVESTIGATIONS IN ARKANSAS AND LOUISIANA.<sup>1</sup>

MR. CLARENCE B. MOORE in 1908-9 investigated the mounds and cemeteries of the valley of the Ouachita, a river that rises in central western Arkansas and flows south-easterly into the State of Louisiana; its lower course is the Black River, which joins the Red River, a tributary of the Mississippi. The more striking remains are earthenware vessels of very varied forms and different colours. The most common form of decoration consists of the original surface of the vessel being left in scroll bands and round or oval discs, the interspaces being generally filled up with parallel lines or cross-hatching. The accompanying figure illustrates a superb bottle, 8½ inches in height, which has a coating of red pigment of superior quality, through which is incised a beautiful combination of discs and running scrolls in a field of parallel lines which emphasise the design; possibly the incised lines were accentuated with white pigment, but no trace of this remains. The technique of some of the vessels from Glendora is superior to anything of the kind hitherto met with outside the Lower Mississippi region.

The excavations were confined almost entirely to land that was, or had been, under cultivation. When the aborigines selected dwelling sites along rivers subject to overflow, they naturally chose high ground; and later, when Europeans selected land to clear for cultivation, they were similarly influenced, especially as much of this land had been enriched by aboriginal deposits. It is needless to say that the report is illustrated in that sumptuous manner which characterises Mr. Moore's publications.

The value of the memoir is enhanced by a very careful study, by Dr. Aleš Hrdlička, of the skeletal remains discovered by Mr. Moore. This constitutes a welcome contribution to the craniology and osteology of the American Indian, and we hope it will be followed by similar studies by the same anatomist. Dr. Hrdlička, in an attempt to determine the amount of prognathism, made use of the

<sup>1</sup> "Studies on the Structure and Affinities of Cretaceous Plants." By Dr. Marie C. Stopes and Prof. K. Fujii. Phil. Trans. Royal Society, Series B. vol. cci. Pp. 90; plates 9. (Royal Society, 1910.)

<sup>1</sup> "Antiquities of the Ouachita Valley." By Clarence B. Moore (Journal of the Academy of Natural Sciences of Philadelphia, 2nd series, vol. xiv. part i., 1909.)