PLANTS OF THE PAST. By F. H. KNOWLTON. pp. 273 + xix, 90 figs. 1927: Princeton University Press (Humphrey Milford, London). 16*s*. net.

THE late Dr. Knowlton made a long series of contributions to our knowledge of the fossil plants of North America, and his last work was an attempt to give an account of the salient facts about the plants which clothed the earth in former times. It is not intended to be a text-book but rather a narrative for the general reader, and it is well illustrated by photographs of specimens as well as by restorations. The plan of the book is good, it includes chapters on the preservation of plants, coal, the problem of organic evolution, the influence of plant life on animal evolution, and on the value of the study of fossil plants. Parts of the work are very well done and make interesting reading, while the chapters dealing with the Cretaceous and Tertiary times are valuable summaries of the state of knowledge with special reference to North America.

In a book of this type, which covers a large field, it is perhaps inevitable that some points should be open to criticism, and from the botanical side a considerable number of criticisms may be fairly made. From a geological standpoint the work loses value owing to the obscuration or neglect of an important principle in dealing with fossil floras throughout the ages. This is the recognition that the accepted units of geological time are generally based on marine sediments and marine organisms, while most plants are terrestrial organisms, consequently the floristic periods in the earth's history cut across the sedimentation periods. Thus the Upper Devonian floras cannot be separated from the Lower Carboniferous floras, but there is an important break between the Upper and Lower Carboniferous vegetation. The neglect of this principle is especially noticeable in the chapter on the Devonian floras, where an entirely erroneous impression is given.

Finally we must mention with regret that some of the recent palaeobotanical "mare's nests" have been perpetuated, such as the description of a *Medullosa* petiole from the Carboniferous of Illinois as an Angiosperm stem.

H. H. T.

CORRESPONDENCE.

CLIMATIC CORRELATION OF RAISED BEACHES.

SIR,—The paper by Mr. D. Baden-Powell in your October issue dealing with the present climatic equivalents of the raised beach faunas contains some interesting data and employs a method of research which has been most effectively used in the past and is no doubt capable of further extension. One cannot but hope that Mr. Baden-Powell will go on with it, and apply his knowledge of the mollusca to further climatic determinations of a similar nature.

At the same time it is essential to realize that the use of this climatic factor in the correlation of one beach with another is liable to very serious error, and has indeed in the author's hands already led to conclusions which are unquestionably erroneous. His work has, I fear, the common defect of much palaeontological research of having an insufficient background of field work. I have even grave doubts as to whether he has covered the literature of his subject. If he had he could hardly have been led into the error of correlating the pre-glacial raised beach of Gower in South Wales with the post-glacial raised beach of Scotland. The former is earlier than any boulder-clay observable in contact with it in South Wales or Ireland, the latter is later than any boulder-clay or moraine occurring in the whole area of its distribution in Scotland. How is it possible that the boulder-clays laid down at the maximum extension of the ice in Wales and Ireland could be later than the local moraines of Scotland? It is clearly not possible, and therefore the author's correlation must be wrong. The post-glacial, so-called 25 foot beach is moreover not always at a height of 25 ft. above O.D., but ranges in height from 35 ft. above high water mark at the centre of its area of distribution down to sea-level at the periphery. It becomes coincident with or descends below sea-level far north of Gower and is not found as a raised beach in South Wales. Its fauna as exhaustively studied by Dr. Praeger in Northern Ireland is noticeably warmer than that of the present shore, so that it will indeed be a remarkable and interesting fact if it should be colder in Scotland. This is not at all so impossible as might appear at first sight, for, as I have pointed out elsewhere, there is archaeological evidence indicating that the post-glacial beach may have quite different dates of origin at its periphery and its centre. I feel therefore that the author's line of work may be of enormous importance in this respect, since the building of the beach may possibly be prior to the climatic optimum in the central area and later than it in the peripheral area. All that we know at present is that it is contemporaneous with it in the intermediate area of Northern Ireland.

Now if I understand the author aright he does claim to have proved the fauna of the 25 ft. beach of Scotland to be colder than that of the present day. If so he has put a nail in the coffin of his method of correlation by temperature, but he may nevertheless be arriving at a result of the utmost importance. I can only beg him to persevere, but to look upon his faunal methods as a means of proving that beaches are not contemporaneous, rather than that they are.

I might perhaps make one or two further points to avoid misunderstanding. The author states that no obvious warping appears to have occurred since 100 ft. times, the level of the 100 ft. beach remaining constant throughout Scotland according to the measurements of the Survey. The fact is that these measurements are

neither accurate enough, nor distributed widely enough, to establish any such conclusion. This beach has been excluded or destroyed by a glaciation throughout the whole central area. It is known over a relatively narrow belt round about this blank area and its height is not altogether constant even here. Further out it is unknown and nobody has yet been able to offer a reasonable suggestion as to what becomes of it. The belt along which it is known may correspond roughly with the 100 ft. isobase of deformation. Moreover it is patently absurd to say it has suffered no warping, since the later 25 ft. beach is so obviously warped throughout the area occupied by the 100 ft.

The author makes an amazing use of Mr. Hinxman's valuable observations at the head of Loch Torridon. He cites them on p. 406 as proving a readvance of the ice between 50 ft. and 25 ft. times and later, on p. 437, as suggesting an advance subsequent to 25 ft. times. Now Mr. Hinxman only mentions one readvance, and it cannot well do double service as being both pre- and post- 25 ft. An explanation of what is meant would be very welcome in this instance.

Finally, I should like to ask the author if he has guarded against a source of error liable to be introduced by working over old collections of raised beach shells. There is always the possibility that a certain proportion of kitchen-midden material may be included in these, as the early collectors were not always careful to discriminate, and regarded any shells found above sea-level as an indication of change of level.

W. B. Wright.

Manchester.
10th October, 1927.

ERRATUM.

In Fig. 2, p. 68 (February, 1927), the base-line of the section should be horizontal, the stratification-plane dipping to the right.