mately the same stage of development; it may be, as he suggests, that the plant did not fruit until reaching maturity. The seeds of Bennettites are in size like "small grains of rye"; they seem to be exalbuminous, and have little in common with the enormous seeds of recent cycads. With the exception of a single Italian species, in which Solms-Laubach found a few pollen grains associated with a female flower, we were in complete ignorance as to the nature of the male flowers until the publication of Wieland's results. It was usually assumed that in Bennettites, as in true cycads, the flowers were unisexual. Whatever interpretations we put on the morphological value of the interseminal scales and seed-bearing pedicels, it is clear that the female flowers of the fossil genus are characterised by a morphological plan far removed from

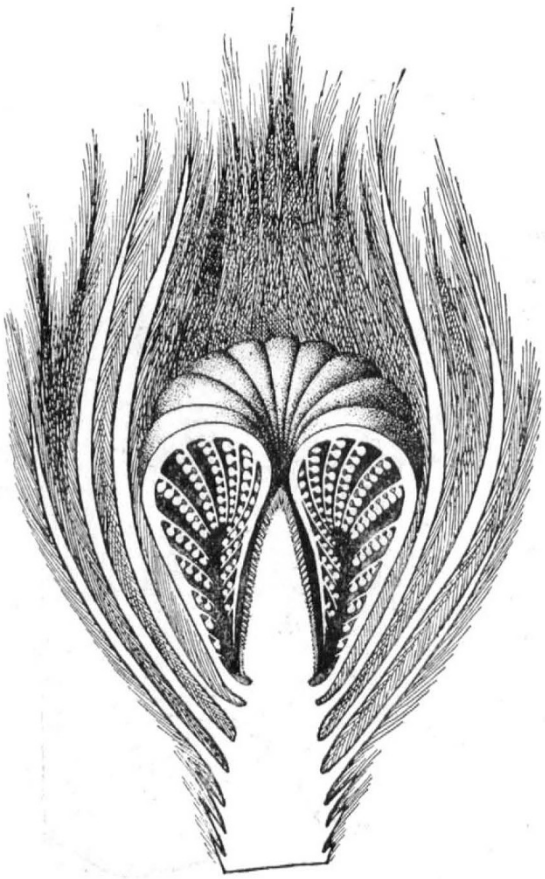

FIG. 2.—Restoration of unexpanded bisporangiate strobilus showing enveloping bracts, folded microsporophylls and conical receptacle bearing short ovuliferous pedicels, &c.

that of the leaf-like carpels of Cycas and from the crowded carpellary scales of other recent genera.

Mr. Wieland has conclusively proved that previous views as to the unisexual character of the Bennettites flowers are incorrect; in most cases, at any rate, the flowers were bisexual. He figures several examples of reproductive shoots terminating in ovulate flowers like those of *Bennettites Gibsonianus*, bearing a basal rim (Fig. 1, s) to which was formerly attached a hypogynous whorl of pinnate microsporophylls with pinnules reduced to an axis producing numerous synangia and microspores. This assumption as to the former association of microsporophylls with a central group of ovuliferous pedicels is justified by the discovery of numerous examples of bisexual flowers, consisting of an axis terminating in a conical receptacle bearing the two sets of organs characteristic of what have previously been styled female flowers, but differing in the smaller size of the seed-stalks and interseminal scales, and presenting the appearance of partially aborted or immature female organs. Surrounding this central receptacle there is a whorl of several pinnate leaves with their upper portions folded inwards between the petioles of the central gynœcium (Fig. 2), and bearing rows of synangia of a type but little removed from those of modern marattiaceous ferns. No specimen has so far been described of a bisexual flower in which both androœcium and gynœcium are mature. There appear to be two possible explanations: are these bisexual flowers comparable with the male flowers of Welwitschia (Tumboa), in which the female portion is functionless; or have we a case of dichogamy, in which the male organs matured first, and were subsequently shed? This discovery, first announced in a short paper by Mr. Wieland in 1899, is of the greatest importance as demonstrating the retention in a comparatively little altered form of filicinean synangia and spores of the marattiaceous type side by side with female organs which foreshadow the angiospermous gynœcium. It is impossible in the space at our disposal to attempt to deal with the numerous questions of phylogeny—the probable line of evolution of the Bennettitales and their relationship to modern cycads—but we naturally ask, Is it fitting to speak of plants possessing this type of flower as cycads? The term cycads used by the author is perhaps justifiable if adopted in the widest sense, but the reviewer cannot help feeling in sympathy with a view expressed in a letter recently received by him from Prof. Nathorst, of Stockholm, that the extension of the designation cycads to plants so far removed in the organisation of their essential organs from the cycads as we know them necessarily tends to minimise the importance of fundamental differences.

The generic name Cycadeoidea, proposed by Buckland in 1827, is used by the author in preference to Carruthers's genus Bennettites; it would, we think, be better to retain the latter name for all cycad-like stems possessing the lateral fertile shoots of the type originally described by Mr. Carruthers. There is another very different form of stem which Nathorst discovered in the Rhætic plant beds of Scania bearing fronds long known as a species of Anomozamites, and flowers which probably agreed closely with those of Bennettites. This stem, which Nathorst names *Williamsonia angustifolia*, is important as demonstrating the wide range of vegetative variation within the great group Cycadophyta. The discoveries of Mr. Wieland, Prof. Nathorst and others demonstrate the impossibility of forming any adequate conception of the nature of the Cycadophyta—to use Nathorst's convenient term—if we confine our attention to the meagre remnant of that phylum which has survived the revolutions in the plant kingdom since the beginning of the Cretaceous era.

In the concluding chapters Mr. Wieland deals with questions of phylogeny; while recognising much that is suggestive in the treatment of this difficult subject, we feel that there is a certain vagueness in his conclusions which, though partly due to lack of data, is perhaps to some extent the result of a want of clearness and conciseness of treatment. The initial difficulties have, however, been surmounted, and Mr. Wieland has completed with conspicuous success a very important section of the work; we close the volume with a desire for more, and heartily wish the author further success in a field where the opportunities are unrivalled. A. C. S.

THE RECENT HIGH BAROMETER.

A REGION of exceptionally high barometer readings over western Europe was a feature of especial interest during a great part of January, the mercury in many places attaining to a greater height than any previous record, while elsewhere the readings have scarcely been exceeded. To trace the history of this anticyclonic region and to attempt any explanation requires a series of synchronous and synoptic charts embracing a large part of the northern hemisphere; possibly this may be undertaken by one of our European weather offices when all the facts have been collated. It would seem that vessels traversing the Atlantic have in many cases experienced

barometer readings much in excess of the average during the whole voyage, and for the greater part of the month.

As early as January 4, a region of high barometer, with readings 30·3 inches, spread in over the Bay of Biscay from the Atlantic; this gradually extended eastwards over south-western Europe, and on January 12 the region intensified, readings of 30·7 inches occurring over the Bay of Biscay and western France. The anticyclone maintained its ground, and on January 17 and 18 was distinctly spreading northwards, the isobar of 30·5 inches embracing France, England, Denmark, and the greater part of Norway and Sweden. On January 20 the anticyclonic area was greatly augmented, apparently by an independent region of high barometer spreading down from the extreme north of Europe. The highest readings—30·9 inches—were situated over Lapland and Finland, and on January 21 the highest pressure was in the vicinity of the White Sea, the barometer at Archangel reading 31·39 inches. On January 22 the anticyclone was central over northern Russia, the barometer at Kuopio standing at 31·46 inches. The maximum height of the barometer was attained on January 23, when at Riga the reading was 31·58 inches, and the region of 31 inches and above embraced parts of England, Scotland, and Ireland, the barometer at some of the stations in the British Islands being higher than any previous record. The high barometer area continued to travel southwards, and on January 26 the centre was in the neighbourhood of Constantinople, but the highest reading had then decreased to about 31·1 inches.

The absolutely highest reading of the barometer on record is 31·72 inches, which occurred at Irkutsk on December 20, 1896, and at Semipalatinsk on December 16, 1877. The highest in the British Islands is 31·11 inches, at Aberdeen on January 31, 1902, and 31·10 inches at Fort William on January 9, 1896. The lowest reading on record at the surface of the earth, and reduced to sea-level, is 27·12 inches, at False Point, on the coast of Orissa, on September 22, 1885, and the lowest in the British Islands 27·33 inches, at Ochtertyre on January 26, 1884.

From about January 20 to January 26 the weather was intensely cold over western Europe, and an easterly wind was blowing for the most part. The Weekly Weather Report issued by the British Meteorological Office shows that, for the week ending January 26, the mean temperature was 9° F. below the average in the midland, southern, and south-western districts of England, and the deficiency amounted to 7° F. in several other districts. The minimum temperatures were as low as 5° F. and 10° F. in many parts.

STAR CATALOGUES.[1]

SOME astronomical work is so attractive that it readily finds support and imitation. The preparation of star catalogues scarcely belongs to that category. Such work is dreary and monotonous, and those who devote themselves to it are entitled to the acknowledgment that is invariably granted to those who are willing to sacrifice brilliancy to utility. There is little scope for the exercise of originality. Once the scheme is defined, the stars selected, and the needed accuracy attained, there is nothing to break the wearisome repetition of a purely mechanical process. The work can hardly be said to possess the attractiveness of permanence. The observations give the position of the stars at a certain epoch, and almost before the catalogue is available as a whole, the work of supplementing it has begun. The wayward and lawless proper motions of the stars tend to render the coordinates obsolete, and this cause alone will necessitate the repetition of the work upon which so much labour has been bestowed. Yet no work requires more care and forethought, and this will be painfully evident to those who read the introductions to the several works, the titles of which are quoted below. It will be equally evident to those who recall the names of those who have devoted themselves to this work, and who will thus be reminded that many astronomers, from Flamsteed to Airy, have been content to stake their reputation upon their contributions to the cataloguing of star places. It is the opportunity for the introduction of greater accuracy that affords the necessary compensation. Sir David Gill, than whom few can look back upon the accomplishment of a greater mass of work, probably views the completion of these catalogues with very considerable satisfaction, and regards them as rounding a well-filled career.

The usefulness of a catalogue will be more readily appreciated if the star places are required to make accessible other material to which it is at present impossible to give a final and convenient form. This is the case with the first of the catalogues on our list. The 8560 stars are not isolated points irregularly distributed over the sky, but are generally the brighter stars to be found in the zone allotted for observation to the Cape of Good Hope Observatory by the Astrographic International Congress. These stars form the fiducial points to which the unknown stars of the photographic plates will be referred. The coordinates, determined on one plan, will give great uniformity to the resulting photographic catalogue. All the observations have been made between 1896–9, and, since the plates have been taken approximately within the same years, possible errors arising from proper motion are effectually eliminated. Moreover, the advantages arising from employing stars taken at one epoch and observed on one uniform plan are patent. Apparently, in the use of facilities for reducing photographs, observers in the southern hemisphere were at a disadvantage compared with those in the northern, since the latter could immediately bring into use the admirably arranged catalogues of the Astronomische Gesellschaft; but the pains bestowed by Sir David Gill upon this piece of work have entirely reversed the conditions, and placed the Cape Observatory in the most favoured position, for, to a certain extent, he is able to select those stars for the reduction of his measures which are most suitably arranged upon the plate. The northern observers have to accept such stars as have been observed; but in forming a new catalogue, one would naturally observe those stars which will furnish the best data for subsequent reduction. An ideal scheme would be to select for each plate eight stars distributed uniformly round the circumference of a circle of about 55′ in diameter, the centre of which coincided with the centre of the plate, and, in addition, two stars near the centre of such plate; but owing to overlapping, whereby the four corners of one plate become the centres of four other plates, such a scheme does not work out practically, and on the average twelve or thirteen stars, somewhat irregularly situated, will be available for the reduction of each plate, and this number may rise to seventeen or eighteen stars.

The individual results on which the catalogue places rest have been published in the annual volumes. The details here presented enable one to follow the small corrections that have been introduced to eliminate systematic errors and to secure uniformity throughout. To the ledgers of right ascension three terms have been applied, one to reduce the right ascension to what it would have been if Newcomb's system had been adopted; a second correction, depending on magnitude, is required to reduce the R.A. of a particular star to what the observer would have recorded if the star had been of the fourth magnitude. The necessity of the third correction is not very clear. It has been required because of the small number of clock stars employed in each zone, "and perhaps also because of small outstanding errors in the adopted values of Level, Collimation, and Azimuth."

In order to obtain the greatest possible accuracy in the declinations, a system of small corrections has been applied

[1] "A Catalogue of 8560 Astrographic Standard Stars between Declinations −40° and −52° for the Equinox 1900 from Observations made at the Royal Observatory, Cape of Good Hope, during the Years 1896–99 under the Direction of Sir David Gill, K.C.B., F.R.S." Pp. lix+403 (London: Printed for H.M. Stationery Office by Eyre and Spottiswoode, 1906.)

"Catalogues of Stars for the Equinox 1900·0 from Observations made at the Royal Observatory, Cape of Good Hope, during the Years 1900–1904 under the Direction of Sir David Gill, K.C.B., F.R.S." Pp. xiii+123. (Edinburgh: Printed for H.M. Stationery Office by Neill and Co., Ltd., 1906.) Price 4s. 6d.

"Astrographic Catalogue 1900·0, Oxford Section, Dec. +24° to +32°. From Photographs taken and measured at the University Observatory, Oxford, under the Direction of Prof. H. H. Turner, F.R.S. Vol. i. Pp. lxvi+223. (Edinburgh: Printed for H.M. Stationery Office by Neill and Co., Ltd., 1906.)