It will be seen that all the lines of Nova Aurigæ have previously been recorded in other Novæ, or in the bright-line stars.

The complete spectrum, including the photographic region, was shown in the diagram exhibited on the screen. This, and the light curve of the spectrum from F to C, was drawn by Mr. Fowler and Mr. W. J. Lockyer, on February 22, and confirmed by Mr. Fowler on February 23. The 3-foot reflector and McClean spectroscope were employed in each case.

The changes which are taking place in the Nova are exactly what would be expected according to my hypothesis, that new stars are produced by the collision of meteor-swarms. The rapid fading of the star demonstrates that small masses and not large ones are engaged, and this is further confirmed by the observed diminution in the brightness of the continuous spectrum relatively to the bright lines. If two condensed bodies were in collision, it is evident that the lines would fade first.

III. "On the Organisation of the Fossil Plants of the Coal-Measures. Part XIX." By W. C. WILLIAMSON, LL.D., F.R.S., Professor of Botany in the Owens College, Manchester. Received January 18, 1892.

(Abstract.)

The author recalls attention to the discovery by the late Rev. W. Vernon Harcourt of a fragment of a Lepidodendroid branch, in which the internal structures were well preserved. The specimen was described and figured, first by Witham, who gave to it the well-known name of *Lepidodendron Harcourtii*. It was next described by Lindley and Hutton, in their 'Fossil Flora,' and still later, and more scientifically, by Brongniart, in his 'Végétaux Fossiles.' In its interior Brongniart found a single vascular cylinder encasing a medulla. At a later period he obtained fragments of two other plants, in each of which he found the above cylinder, but invested by a second one which was obviously an exogenous product of a cambium zone. From these three specimens he unfortunately concluded that the first belonged to a Cryptogamic Lycopod, whilst the second and third were Gymnospermous Phanerogams. These latter examples he further identified with his genus *Sigillaria*.

This classification was universally accepted by the palæobotanical world until 1871, when, in his Memoir, Part II, the author announced his conviction that Lepidodendra and Sigillariæ were alike Cryptogams, and that the exogenous zone supposed to be characteristic of the Phanerogams was not confined, in ancient times, to that great division of the vegetable kingdom.

Apart from this general question, now conclusively settled, further knowledge of *L. Harcourtii* has long been sought for in vain. Harcourt's original fragment was unfortunately an imperfect one. Its outer cortex and foliage were wholly wanting, as well as specimens illustrating its various stages of growth. Recently, however, a very fine series of such specimens has come into the hands of the author, and a large amount of new information has been obtained from them. Some of the new examples are very young branches, perfectly invested by their bark and leaves. The detailed structures of all the organs of these specimens are now described in minute detail. A more exact technical nomenclature than has hitherto been employed is applied to their various structures. Besides these young forms, other specimens resembling that studied by Brongniart, both as regards condition and apparent age, have been obtained, and also one magnificent older and arborescent example, from Airdrie, in Scotland, which, including all its leaves, has been between four and five inches in diameter.

But even this latter specimen presents no appearance of the secondary or exogenous vascular zone so common amongst other much younger Lepidodendra. Hence the author concludes that *L. Harcourtii* has in this respect been like *L. Wunschianum*, the well-known Arran species, in which a magnificent exogenous zone exists, but which was only developed when the plants attained to an advanced arborescent condition.

Some of these youngest specimens show evidence that they had been fructigerous twigs. But, before describing these, the author examines anew the entire subject of the branches to which the names of *Halonia* and *Ulodendron* have been applied. Both of these have now been proved to have been fruit-bearing branches, but their true relations to each other and to their parent plants are still in a state of serious confusion. The existing definitions of these two types are shown to be altogether unsatisfactory; some specimens which according to one generally accepted definition are Haloniæ according to another are Ulodendra. In fact the two sets of definitions overlap in such a manner as renders them no longer applicable.

Two classes of facts have to be considered here; first, the positions and arrangements of the reproductive fructifications on the supporting branches, and, secondly, the nature of the scars left on the exterior of the bark after these deciduous fructifications fell to the ground. The positions of these scars in *Ulodendron* are usually defined as biserial, being arranged in two longitudinal rows,* one on each side of the sustaining branch, whilst in *Halonia* these

* In his last publication, M. Renault recognises that there are sometimes four such rows.

rows are defined as being more numerous, and the scars quincuncially arranged. In *Ulodendron* each such scar is further surrounded by a large circular, or oval, and very characteristic disk. The author shows that the essential and homologous structure in all these fruit-bearing branches is a small circular area, forming the summit of a larger or smaller conical arrested branch which was covered with leaves. This small apical area represents the part at which the deciduous fructification was organically united with its sustaining branch. Each such branch was supplied with a distinctive form of vascular bundle, which differed alike from those larger ones seen in ordinary vegetative branches, and from the smaller ones passing outwards to the leaves; this bundle is always abruptly broken off at the extreme apex of the fructigerous tubercle in a way demonstrating that it was formerly prolonged into some deciduous appendage which is rarely preserved *in situ*. But *Ulodendron* has, in addition, surrounding each of these fruit-bearing points, a flattened surface, the size of which was mainly dependent upon the age to which the tree had attained when it perished. This orbicular surface was primarily covered with ordinary leaves, normally arranged, but the full development of which was arrested by the pressure of some external agent. The author concludes that the central fructigerous point was homologous in all these cases, and that the variations seen in them arose largely from the degree of prominence attained by the arrested lateral branch. When that prominence was sufficient, the cone-like fruit was pedunculate, and no disturbance of the surrounding leaves was produced; but when that elevation was small, or almost non-existent, the cone was practically sessile, and, as it grew, its expanding base crushed down the leaves which it covered and thus produced the large flattened disk characteristic of *Ulodendron*. These two names, *Halonia* and *Ulodendron*, have no longer any generic value, but the terms Halonial and Ulodendroid may be conveniently retained as adjectives applicable to appropriate specific forms.

The author applies these conclusions to his younger specimens of *L. Harcourtii*, and shows that many of them were fructigerous in the Halonial form.

The organisation of the leaves of some of these Lepidodendroid plants has been re-examined. As is well known, on the leaf-scars alike of *Lepidodendron* and of *Sigillaria*, each scar left on the bark after the fall of the deciduous leaf had three minute points impressed upon its surface. Brongniart regarded each of the three as representing the entrance of a leaf-trace into the leaf, and very recently some other observers have arrived at the same conclusion. The author, long ago, showed that the central spot alone represented the vascular leaf-trace, the two lateral ones being merely cellular structures, but the details of which were very imperfectly known. These new speci-

mens demonstrate the exact features of these structures. Professor Bertrand, of Lille, and M. Hovelacque, of Paris, have simultaneously investigated the two lateral points on the leaf-scar, to which the former author has given the name of *parichnos*, which name Professor Williamson adopts. But these two palæontologists have further called attention to a fourth structure in these leaves, hitherto, in some degree, overlooked; and which they designated the *ligule*. The author finds this organ well developed both in *L. Harcourtii* and in *Lepidophloios*, but rejects the name ligule, on the ground that he cannot identify the fossil structure with the organ bearing the same name in living Isoetes and Selaginellæ. He, therefore, adopts for the former the term Adenoid organ, believing it to have had glandular functions. Details are also given of the organisation of several forms of Lepidostrobi, some of which are identified with their parent plants.

The general conclusion arrived at by the author in reference to the *L. Harcourtii*, which has been so often made the subject of debate during the last twenty years, is that it occupies no exceptional position amongst the other Lepidodendra, but that whilst palæontologists in various parts of the world quote the species as one with the organisation of which they were familiar, they were all alike mistaken in their determinations. Until now no specimen of the same plant has been in the possession of any observer less imperfect than that described by Brongniart; hence, when in the past authors have, as was my own case, referred various examples of cortex, leaves, and fruits to *Lepidodendron Harcourtii*, we have no evidence whatever that such references are true ones.

If such references are still declared to be authoritative, I must ask where the specimens are to be seen that carry our knowledge beyond what we derived from Harcourt's imperfect branch.

IV. "On Biologic Regions and Tabulation Areas." By C. B. Clarke, F.R.S. Received February 8, 1892.

(Abstract.)

Biologic regions have been used for two purposes, viz.: (1) to exhibit the most natural primary divisions of the globe, so far as the distribution of existing Mammalia (or of plants or living things) is concerned; (2) as areas of reference on which the complete distribution of a large genus or order of plants or animals may be tabulated.

It is clearly of the highest importance that one set of areas of reference should be employed by all naturalists, as foreseen by Mr. Wallace when he devised his primary zoologic regions and sub-regions. If one naturalist tabulates one order of Butterflies on one geographic