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THE ORGANISATION OF NATURAL HISTORY MUSEUMS

THE two questions connected with museum reform more especially demanding attention relate to their resources and their organisation.

Provincial museums are very generally either the property of societies the funds of which are expended mainly in publishing memoirs, or are carried on in connection with free libraries. With regard to the first, it is impossible that adequate means should be forthcoming for their efficient maintenance, and with regard to the second the library, as a rule, swallows up an inordinate share of the funds provided by a rate. Some are connected with teaching bodies. In nearly all cases they are poverty-stricken and largely dependent on casual benevolence for their support and increase. It is surely only just and fair that the funds necessary for making them efficient should be provided out of the public purse since they are for the public weal, as is the case in all other countries except our own. I do not advocate that the whole burden of this should fall on the public; it should certainly be borne in part by private individuals, who, if experience in other things be worth anything, are ready to subscribe liberally when a clear case has been made out that their liberality will be of practical use. The relation which the museum of natural history at Lyons bears to the Société des Amis des Sciences Naturelles illustrates my meaning, for while supported by the Municipality, it is largely indebted to the Society for the purchase of new and rare specimens. Why should not similar associations for similar ends be formed in connection with every important museum in this country? A well-arranged museum of any size is of necessity costly, and to be well officered must offer inducements other than those which tempt the badly-educated, the mere enthusiast, or the worsted in the struggle for life.

The abnormal connection between museums and libraries should be severed, as it is to be severed in the case of the national collections, because they have no real connection with one another. The officer who has the care of both, if they be of any size, cannot in the nature of things perform satisfactorily what he undertakes. If he give up his mind to the library he will probably neglect the natural history, or *vice versa*. To this cause the chaotic state of many of our museums is to be assigned. A curator has not merely to catalogue and arrange, but he has to master thoroughly the collections under his charge, and in this respect he differs essentially from a librarian. A museum is one thing, and a library is quite another thing.

The Public Libraries Act of 1855 has certainly failed so far as relates to the establishment of museums, if the rapid development of other means of advancing knowledge during the last twenty-two years be taken into account.

On the very difficult question of museum buildings, it seems to me that the maximum amount of space and of light

obtainable at the lowest cost consistent with good work should be the chief end, rather than a building with a fine outside. As a rule we content ourselves with mere externals. Well-supported collections in a big barn or an old cotton-mill are more likely to be useful than a grand building on which the greater part of the funds are likely to be spent to the starving of the museum within. This fact is fully recognised in the United States. In our wealthy centres of population there is no reason why we should not have large collections adequately housed, as is the case very generally on the Continent.

The best internal organisation of a museum which occurs to me is that which preserves as far as possible the continuity that exists both in nature and art, and in which the departments are arranged in the following order:—

1. Mineralogy and crystallography and petrology, including mineral products used in the arts. This should be approached from the point of view offered by chemistry.

2. Palæontology, illustrating the ancient history of life on the earth from the Eozoon to the beginning of the historical period, and consisting of fossils arranged stratigraphically, and divided as far as possible into three divisions within the limits of each group—the fauna and flora of the sea, of the fresh water, and of the land. Under this head prehistoric archæology is included.

3. Botany.

4. Zoology.—In this department it is wholly unnecessary to have every species mounted. The birds may very conveniently be represented by one stuffed specimen of a class, family, or genus, while the species are preserved for reference, and the skins occupy a small space in drawers, as in Dr. Sclater's collection at the Zoological Society.

4A.—Comparative osteology and anatomy are the natural offshoots of zoology, ranking under that head. I cannot, however, agree with those who hold that they should form part of the zoological series, since their chief value consists in their comparison with the like parts of other creatures. Were the collections of the Royal College of Surgeons arranged in the same cases with the zoology of the British Museum—dissections and bones of lions say with stuffed lions—they would at once lose their teaching value.

5. Ethnology, worked out as it is now being done by Mr. Franks in the British Museum, and Dr. Bastian in the Imperial Museum at Berlin.

6. Art.

This scheme is applicable to museums large and small.

In founding provincial museums the fauna, flora, and geognosy of the surrounding districts should receive the first attention, and to these may be added, if possible, a general collection. In all cases they should be connected with teaching. The principle of co-operation should be freely brought into play, and casts of the more important objects in each should be made for exchange and distribution. Each museum should be available for the general public, the local societies, and the teaching bodies of the place, schools, colleges, and the like. Were we to expend as much common sense and energy in this direction as in most others we should soon see our museums important instruments in spreading culture, and in a very different position to that which they now hold in relation to those

of other countries, in many ways worse off than our own. The subject is well worth the attention of all who have at heart the higher education of the people.

W. BOYD DAWKINS

THE CARBONIFEROUS FLORA OF CENTRAL FRANCE

*Flore Carbonifère du Département de la Loire et du Centre de la France.* Par Cyrille Grand' Eury, Ingénieur à St. Étienne. (Imprimerie Nationale, Paris.)

THIS work consists of three quarto volumes, the first of which is devoted to the plants, the second to the geology of the districts under consideration, and the third forms an atlas with thirty-four plates of fossil plants and four large "tableaux," in which the author has "restored" the plants he has described according to his own ideas of their morphology.

It is very obvious that the carboniferous plants of one district cannot be received as altogether typical of those occurring at other and distant localities. Hence such publications as those of Dr. Dawson and Prof. Newbury in America, and the volumes of M. Grand' Eury, are extremely valuable to the English palæo-botanists. They tend to preserve him from the one-sided habit of viewing the subject which he is apt to contract when only studying the types occurring in his own coal-fields. But apart from this M. Grand' Eury's work has an independent value, especially in some departments in which he has made important additions to our stock of knowledge. This is especially the case with his investigations amongst the hitherto obscure plants known as Flabellarix and Cordaites, as well as amongst some remarkable sporange-bearing ferns.

Our knowledge of Cordaites has hitherto been most vague; but M. Grand' Eury has fortunately obtained some beautiful specimens in which not only the leaves are attached to the stems of several species, but in some he also finds what he believes, I think justly, to be male and female organs of reproduction, thus establishing the point that these plants were monœcious Phanerogams. These organs are slender spikes, some of which support small scaly buds lodged in the axils of bracts, and which the author believes to have been antheriferous. Others bear single seeds in each axil. Some of the spikes are affirmed to be those of Antholithes, and the seeds to be identical with *Cardiocarpus*. The stems which bear these reproductive structures have a Sternbergian pith, surrounded by an exogenous woody zone inclosed within a distinct bark, which latter appears to have consisted of more than one layer. M. Grand' Eury concludes that these plants were Conifers, of which the well-known *Dadoxylons* were the ligneous axes, and that the type which survived for a time in some of the *Ulmannix* of the Lechstein, and in the *Albertia* of the Triassic rocks. I see nothing, however, in his figures and descriptions leading me to conclude that they are identical with our British *Dadoxylous*.

The new ferns described by the author are equally remarkable. They include numerous forms of *Pecopteris*, with very peculiar sori approaching those of the *Marattiaceæ*. Some of these fronds he associates unhesitatingly with *Psaronius* and other stems of tree-ferns. The author's

researches on the above subjects have been conducted under most favourable conditions, of which he has availed himself in a praiseworthy manner.

When we come to the debateable subjects of *Calamites*, *Lepidodendron*, *Sigillaria*, and *Asterophyllites* I am obliged to use different language. On these points the author adopts substantially the ideas of Brongniart. Thus he distinguishes between *Calamites* and *Calamodendron*, making the former an equisetaceous plant and the latter a gymnospermous one. I cannot understand how any one can do this in the face of our present knowledge of the facts.

In external form the supposed *Calamites* and *Calamodendron* exhibit precisely the same appearances. All these appearances are explained in the most exact manner by the internal structure of the many illustrative specimens which we now possess, and which demonstrate that we only have one type of organisation. Further, what are called *Calamites* by the school to which our author belongs are amongst the most abundant of the plants furnished by our coal-shales, and there is nothing to prevent their being equally common in the Oldham and other beds, in which all the plants retain their internal structure, if they existed as an independent type. But the moment we find a *Calamitean* plant with organisation it proves to be a *Calamodendron*. Even M. Grand' Eury is compelled to admit "il est au moins surprenant que l'on n'ait pas mis la main sur un *Calamite* avec la structure conservée." Very surprising, indeed, considering that we have obtained such numbers of these plants with structure from Oldham, Halifax, and Autun, as well as, though less abundantly, from Burntisland. The conclusion to be drawn is too obvious to need reiteration.

Imbued with these ideas respecting *Calamites* and *Calamodendron*, it was inevitable that M. Grand' Eury should fall into error respecting *Asterophyllites*. These plants are regarded by his school as the branches and leaves of *Calamites*. Hence he could not recognise as *Asterophyllites* any plant which had not a *Calamitean* axis. But I have shown that *Asterophyllites* has *not* such a structure, but one identical with the very different one of *Sphenophyllum*. M. Grand' Eury escapes the difficulty by contending that my plants are *not* *Asterophyllites*, but *Sphenophylla*. This is certainly not the case. Brongniart has clearly defined the latter genus as possessing 6-8 or 10 truncate cuneiform leaves; and after referring to the fructification of *Sphenophyllites*, he correctly says:—"Ce mode de fructification, malgré l'obscurité qui environne encore sa vraie structure, est trop analogue à celui des *Asterophyllites* pour qu'on puisse douter de l'affinité de ces deux genres." This conclusion is precisely identical with mine. Instead of 6-8 or 10 leaves in each verticil, my plants have 18 or 20. These leaves are linear, not cuneiform; and as my next memoir will demonstrate even more clearly than I have yet done, each leaf had a single central vascular bundle instead of the two or more invariably seen in *Sphenophyllum*.

In his views respecting the relations of *Sigillaria* and *Lepidodendron*, M. Grand' Eury also clings to the old Brongniartian ideas promulgated in bygone years. M. Brongniart and M. Renault have described the organisation of two *Sigillarian* fragments, *S. elegans* and *S.*