

tions are fulfilled, *La Caravane Universelle* may have something worth listening to, to tell the world monthly. At all events, we heartily wish the project success, and hope that Captain Bazerque may soon have a list of subscriptions large enough to encourage him to commence the practical organisation of his scientific pleasure-party. We see from *Les Mondes* of January 23, that at Captain Bazerque's request, M. de Quatrefages, president of the Academy, has nominated a committee to indicate the principal parts of the earth that ought to be specially explored, and to find out a number of young energetic European men of science, willing to accompany the expedition.

Hitherto such expeditions have been thought practicable only with Government assistance. If Captain Bazerque's scheme is successful in all respects, he will have the merit of showing that Science need not look to Government for help, even in her weightiest undertakings, though we fear the world is not yet ripe for this new application of "the voluntary principle."

FOSSIL CRYPTOGRAMS

THE exogenous (circumferential) growth of fossil vascular cryptogams is a subject of so much interest and importance, that I may perhaps be permitted to say a few words regarding it. In a paper which was read at the December meeting of the Edinburgh Botanical Society, I combated the idea of the circumferential growth of calamites. The moist nature of the soil in which calamites must have grown would lead one to expect a poor development of the fibro-vascular bundles, and in comparing what I believe to be the fibro-vascular bundles of calamites with those of our recent equisetums, this idea is fully confirmed. Then in *Equisetum* there is a large development of the sclerenchyma of Mettenius, which forms the strong hypoderma. In a Brazilian fern which has come under my notice, this sclerenchyma runs to the fibro-vascular bundles, and presents an appearance exactly like Williamson's woody wedges, the large and small cells giving an appearance wonderfully like medullary rays. There is another point which, to my mind, is of much importance; namely, that in most of our recent vascular cryptograms, the embryonic parts do not enlarge; but as each successive leaf and portion of stem is produced, every such leaf and portion of stem is larger than the part preceding it, and this continues until a certain maximum is reached, when the stem becomes cylindrical. It is impossible to overlook that this mode of growth is evident in calamites, and until convincing proof can be brought forward of the circumferential growth of calamites, I must decline to accept it.

Turning from the calamites to *Lepidodendron*, it is evident that in it circumferential growth was much more likely to have occurred. In the calamites there is no evidence that they required year by year increasing quantities of water for purposes of transpiration, while in *Lepidodendron* the numerous small leaves which must have gone on increasing in number during the whole life of the plant (which however need not have been very long) demands that some addition to the conducting tissue should be made. As in botany we constantly find the same physiological purpose provided for in many morphologically distinct ways, I do not think it is at all necessary to believe in a form of growth identical with that in dicotyledons, because that would involve a complete change in type. Looking at such a stem as *Lycopodium chamaecyparissus*, in which the cortical tissues become so curiously modified, there is no difficulty in imagining that an increase by means of a cortical meristem might take place, a condition which I believe still exists in *Isoetes*. Hegelmaier in his paper, "Zur Morphologie der Gattung *Lycopodium*" in the *Botanische Zeitung*, 1872, p. 796, points out the presence in lycopods of a

peculiar layer which he calls the *phloem sheath*, outside the phloem of the bundle, but inside the cortical portion, and therefore a series of cells belonging to the pterom and not to the periblem tissues. It seems to me probable that this phloem sheath may have represented a meristem layer from which new tissue was formed, as it would be the representative of the pterom meristem of the higher plants, while its position outside the vessels would further seem in some way related to the absence of vessels in the secondary wood of conifers.

Passing from the fossil lycopods, of which *Lepidodendron* is the type, with its central axis of fibro-vascular bundles, we come to *Dictyoxylon*, which I believe we must take as the type of Strasburger's new group the *Lycoperidæ* (*Die Coniferen und die Gnetaceen*, p. 259). Strasburger, in pointing out the relation of the archisperms to the vascular cryptogams, shows that the transition from the lycopods to the conifers is abrupt, and states that a new group intermediate between the two must have existed. To this group he gives the name *Lycoperidæ*, and I have no hesitation in referring *Dictyoxylon stigmaria* and *sigillaria* to it, and considering the former to be the type. The main root of *stigmaria* has more affinity with conifers than lycopods, while the branching of the root is distinctly lycopodiaceous and not coniferous the root of conifers not branching in a dichotomous manner. It is not difficult to understand how the phloem sheath would in *Dictyoxylon* be still further differentiated, as pterom meristem, and even true cambium formed, thus affording the passage from the lycopodiaceous to the archispermous stem. It is also not improbable that trigonocarpon may be referable to the *lycoperidæ*. While therefore I cannot see my way to accept the theory of the exogenous growth of calamites, I do not see any reason to doubt that in lycopods the circumferential growth may have taken place by means either of a periblem meristem, or pterom meristem, or by both: while in *Dictyoxylon* the relation of the growth of the stem to that of a conifer must be very close indeed.

W. R. MCNAB

NOTES

ONE of the principal events of the past week has been the funeral of Professor Sedgwick, whose death, though at a ripe old age and after a life devoted to work of the highest importance, yielding valuable results to Science, has called forth expressions of sympathy and regret from all quarters, from Royalty downwards. In this week's *NATURE* will be found a sketch of the life and work of the veteran geologist, from the pen of one who knew him long and well.

COALS in London are up to 48s. a ton, and there seems every probability that the rising process will continue. If they went at once up to 100s. a ton it might be the best thing that could happen to the nation, as thereby it might be "tunded" into adopting one or more of the obvious and easily applied means whereby the scandalous waste of our precious fuel might be avoided. It is a low average when we say that at least three-fourths of our coal is absolutely thrown away, and that simply because people "canna be fash'd" to prevent it. Men of science have dinned the alarming state of "the coal-question" into the ears of the nation for years, but we fear most men's heads, like their hearts, must be reached through their pockets. Sir W. Armstrong's address at Newcastle, which we reprint this week, is one of the most practical, forcible, and intelligent on the subject we have hitherto seen. It is deserving of attention from all who have to pay for coals.

THE Council of the Anthropological Institute has appointed a Committee of Psychological Research, viz., Francis Galton, F.R.S., chairman; Dr. John Beddoe; Hyde Clarke; David Forbes, F.R.S.; Sir John Lubbock, Bt., F.R.S.; E. B. Tylor,