

the same time the cyst which they contain. The insects and their cysts thus arrive in its intestine; the insects are digested by it, the membranes of the cysts are dissolved, and the embryos included in them are set free. The latter settle immediately in their new living abode; by their cephalic prickles they penetrate into the membrane of the intestines and encyst themselves again.

But that new cyst is not like the one that protects the embryo in the body of the insect; it is spherical or ovoid, not lengthened, and provided with a membrane not thick and opaque, but slender and perfectly transparent.

In that second state it undergoes another and important transformation and becomes a larva. The tail, hardly as long as the body, extends more and more, rolling up on itself; the body extends likewise, and the groove situated between them vanishes and the volume of the cyst increases at the same time. The worm, thus merely transformed, resembles a hematoid in its general appearance, though its unmodified head makes what is more like acanthocephalus.

When in autumn one of the above-named fishes is dissected and the intestine is laid over a glass slide, microscopical examination shows that it is strewed with numerous cysts containing embryos and larvæ of gordins at different stages of growth. The author has always found some. Sometimes they almost touch each other, so numerous are they.

The gordins offer, then, in the course of their growth, complete metamorphosis and very complicated migrations; they take successively three distinct forms, encyst themselves twice, and change three times their abode. In the embryo state they at first live in water, then in the body of several aquatic larvæ of Diptera, and in the state of larvæ they inhabit the intestines of fishes; at last, in the perfect condition, they cease to be parasites and become river worms.

There exists, however, an important hiatus in the history of the growth of these worms. How can we harmonise what has just been said with the assertion (that seems to be trustworthy) of the naturalists who have seen real gordins in the abdomen of terrestrial insects (grasshoppers, crickets, &c.)? Has there been an error of observation committed? Or would these be single individuals gone astray from the water where they had to lay their eggs? M. Villot adopts the latter opinion.

Should any one ask of what service are such curious, difficult, and apparently useless researches, it could be replied that many illnesses, some of them mortal, arise from parasites that attack certain parts of our body (the intestines, the liver, &c.); and every advance in our knowledge of the habits of those beings is a service rendered, not only to science, but also to humanity.

M. CORNU

A PRIVATE CIRCUMNAVIGATING EXPEDITION

IN *Les Mondes*, for some time past, details have been given of a proposed expedition; partly scientific and partly for pleasure, on a somewhat gigantic scale. The proposed scheme seems to be the idea of a single gentleman, M. le Capitaine Bazerque, who has been twice round the world; though it has the hearty commendation of the Abbé Moigno, editor of *Les Mondes*, and of Le Comte Pennazzi, as well as others. The scheme is called "La Caravane Universelle," and has for its main object a grand voyage for scientific exploration over the five parts of the globe. The excursion-party may be joined by men of science, and also, we understand, by artists and others belonging to all nationalities, who wish to see the world for themselves under intelligent guidance. A subscription has been opened in the various European countries and in America, to provide Captain Bazerque with a steam-

vessel suitable for the expedition. The *modus operandi*, we understand, will be that the vessel shall visit in succession all the most interesting parts of the world, staying long enough at each place to enable all its features to be investigated by the *savants* and artists composing the expedition. "The material organisation of the expedition," says Count Pennazzi in commending it, "will allow those who form part of it to investigate thoroughly the rich treasures of Nature. The eastern slope of the Cordilleras, the sources and upper course of the Amazon, the Rocky Mountains, the country of the Mormons, the eastern coast of Africa, Australia, Japan, China, Indies, are among the regions whose flora, fauna, geology, and ethnography will furnish to the caravan much that is unknown to discover, and many interesting problems to solve." Verily the Count is right in calling the scheme "sympathétique et seduisant."

The organiser of the scheme intends, of course, that the vessel shall be fully furnished with all necessary scientific instruments. As concerns the material and moral well-being of his "sage companions," Captain Bazerque proposes to make the following provisions:—(1) Bi-monthly telegraphic communication between each of the members of the caravan and his family. (2) A Roman Catholic and Protestant chaplain to accompany the expedition. (3) Special and easy camping material, allowing the expedition to sojourn in the midst of countries hitherto unexplored. (4) To ensure the possibility of transit everywhere, a company of sappers will be provided, to go before and clear the way of wood; to construct rafts, bridges, to help as instrument-holders, constructors of beacons and of marks. It is supposed that 35 sailors will fulfil these and many other useful functions.

The Captain proposes to divide the scientific work of the expedition as follows:—(1) Meteorology, astronomy, and terrestrial magnetism; (2) Geography and cosmography; (3) Mineralogy, geology, palæontology, botany, zoology; (4) Anthropology, ethnology, ethnography; (5) Hygiene, medicine and surgery; (6) Photography applied to the works of man; (7) Study and collection of agricultural processes and implements; (8) Study, collection, and photographing of pottery; (9) Metallurgy and metallurgic history; (10) Dye-stuffs; (11) Histology, archaeology, biography; (12) "Compte rendu anecdotique de l'expédition." In order to keep the eager world informed of the conquests of this scientific army, the bold originator contemplates the establishment of a periodical, *La Caravane Universelle*, exclusively devoted to the chronicling of its deeds. This journal will be under the care of a central editorial committee, located in Paris, we suppose, to whom will be sent, every month, collections of plants and other objects, photographs, drawings, and statistics of all kinds, together with a scientific and descriptive narrative of what is seen and done. The journal will be printed in handsome type, embellished with engravings, maps, and drawings "by the best European artists;" and each number will appear in English, French, German, Spanish, and Italian.

When we say that *Les Mondes* publishes an elaborate table, showing the states and countries to be visited, the families, tribes, and races of the Aborigines, and the conquering families, our readers will perceive that from beginning to end the scheme is thoroughly French in the ideal perfection and completeness of its conception and plan.

Much, no doubt, can be accomplished by a judicious division of labour; and if the 100 or 150 gentlemen who are expected to compose the expedition should always be of one mind, be all animated by such a love for science as to be willing to endure any hardships, be prepared to submit implicitly to the guidance of a man of perfect organising faculty, wide knowledge and sympathy, combined with promptness and decision; if each confines himself strictly to the department for which his experience and attainments fit him, and if various other important condi-

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 *Isoteles*. 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,