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NOTICES OF MEMOIRS.

I.—THE INTERNAL FLUIDITY OF THE EARTH.[1]

The following is a translation of a letter addressed by Professor H. Hennessy, F.R.S., to the Secretary of the Academy of Sciences of Paris, which has appeared in the *Comptes Rendus* for March the 6th:

"On the 13th of July, 1868, M. Delaunay made a communication to the Academy, in which he treats of the rotation of the earth considered as a hollow shell inclosing a nucleus of fluid matter. By a simple train of reasoning he was led to conclude that the very slow motions of rotation which produce the phenomena of precession and nutation of the earth's axis would take place as if the whole earth were absolutely solid, and therefore that the phenomena of precession and nutation could not afford any foundation for an estimate of the thickness of the solid crust of the globe. When I read M. Delaunay's paper in the *Comptes Rendus*, I was much pleased to find

[1] Communicated by Prof. E. Hull, F.R.S., etc.

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so remarkable a confirmation of conclusions, to which I had been long since led, and which I have developed in my publications, thus emanating from such an eminent mathematician. At the time I thought it unnecessary to put forward any claim as to priority, but since 1868 I have noticed that several geologists have quoted M. Delaunay's results as if they were unexpected, and I may therefore be excused for calling the attention of the Academy to what I had previously made public. In my "Researches in Terrestrial Physics," published in the *Philosophical Transactions* for 1851, I endeavoured to investigate the structure of the earth by the aid of known physical and mechanical laws. I was thus led to reject the hypothesis always openly or tacitly made by mathematicians in treating of the earth's figure, namely, that the particles of the fluid mass from which it had partly solidified underwent no change of position during the process of solidification. From a consideration of the mechanical and physical properties of the materials of the earth's crust which are known to us, I was led to conclude, that in the process of solidification of the crust, its interior surface would assume an ellipticity at least as great as that of its exterior surface.

A conclusion nearly equivalent was announced soon afterwards by a distinguished geometer, Baron Plana, of Turin, in a paper inserted in Schumacher's *Astronomische Nachrichten*, No. 860. This result must follow, no matter what may be the law of density of the strata of the interior fluid nucleus, because the removal of each successive outer stratum by solidification and adhesion to the inner surface of the crust modifies the pressure on the remaining fluid and allows it to assume a shape possessing almost the same ellipticity as the primitive spheroid.

In the investigation made by Mr. Hopkins on the phenomena of precession and nutation, he assumed the absence of friction between the solid shell and its contained fluid, and in this way he was led to establish the expression—

$$P^1 - P_1 = \left(1 - \frac{\epsilon}{\epsilon_1}\right) \left\{ 1 - \frac{\eta}{1 + \frac{h}{q^5 - 1}} \right\} P_1$$

where P^1 denotes the observed precession, P_1 that of a solid homogeneous spheriod having the ellipticity ϵ_1 equal to that of the shell's outer surface, ϵ is the ellipticity of the inner surface of the shell, the other letters represent functions depending on the density of the shell and nucleus, but such that the quantity $\frac{\eta}{1 + \frac{h}{q^5 - 1}}$ is a small fraction, always much less than unity. The application of the above formula to the question of the thickness of the earth's crust manifestly depends upon the value of the fraction $\frac{\epsilon}{\epsilon_1}$. In

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order to determine this value, Mr. Hopkins tacitly assumed the hypothesis which I rejected, and found the value of ϵ on the supposition that it contained the same at every stage of the earth's solidification. If, in accordance with my results, we make ϵ equal to or at least not less than ϵ_1, we would have $P^1 = P$ or $P^1 \angle P_1$, values so entirely different from the observed value of precession that I was led to conclude that the motion of rotation of the crust and its contained fluid takes place nearly as if the mass were entirely solid. Six years afterwards I reiterated the same result in the *Atlantis*, and also showed from independent reasons why great friction and pressure should be expected to exist between the fluid nucleus and the inner surface of the crust. At the meeting of the British Association, at Manchester, in 1861, I took an opportunity, in the presence of Mr. Hopkins, of pointing out the inconclusiveness of his results regarding the internal structure of the earth, and I again distinctly repeated my former conclusions. Mr. Hopkins promised a reply to my remarks, but this promise has never been fulfilled."

It appears from the number of *Nature* for March 23 that at the meeting of the French Academy of Sciences, on the 13th of March, M. Delaunay read a declaration, stating "that he acknowledged that Mr. Hennessy had used the same arguments as himself against Mr. Hopkins's theory relative to the fluidity of the interior parts of the earth."

II.—Review and Synopsis of the Contributions to Fossil Botany Published in Britain in 1870.[1]

By William Carruthers, F.L.S., F.G.S., of the British Museum.

Carruthers, W.—On Fossil Cycadean Stems from the Secondary Rocks of Britain. Trans. Linn. Soc., vol. xxvi. pp. 675–708, pl. liv–lxiii.

After investigating the nature of the Palæozoic remains referred to *Cycadeæ*, the author describes twenty-five species belonging to eight genera. Four of the genera are placed in one or other of the tribes of the existing Cycads, while two new tribes are established for the remaining genera.

——— On the Petrified Forest near Cairo. Geol. Mag. Vol. VII. pp. 306–310, Pl. XIV.

The so-called forest is described, and the different specimens of silicified woods found in it are referred to two species of the genus *Nicolia.*

——— On the Structure of a Fern-stem from the Lower Eocene of Herne Bay, and on its Allies, Recent and Fossil. Quart. Journ. Geol. Soc. vol. xxvi. pp. 349–353.

The stem (*Osmundites Dowkeri*) is minutely described, and compared with that of *Osmunda regalis*, L. A new arrangement of some described Fern-stems from Palæozoic and Mesozoic rocks is proposed by the author.

Dawson, J. W.—On the Pre-carboniferous Floras of North-eastern America, with especial reference to that of the Erian (Devonian) Period. Abstract. "Proceedings of Royal Society," May 5, 1870.

The Erian Flora is revised, and twenty-three new species added. Large trunks of *Prototaxites* were described, and also two species of *Psilophyton*, with details of their form, structure, and fructification. The occurrence of *Lepidophloios* and *Calamodendron*, noticed for the first time in the Middle Devonian; specimens of *Cyclostigma* and *Cardiocarpum*, and a new genus, *Ormoxylon*, were described.

[1] Reprinted from *The Journal of Botany* for April, 1871.

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——— On the Graphite of the Laurentian Rocks of Canada. Quart. Journ. Geol. Soc. vol. xxvi. pp. 112–117.

The author estimates that the quantity of carbon in the Laurentian is equal to that in similar areas of the Carboniferous systems. This carbon has been obtained from the deoxidation of carbonic acid by plants, and consequently indicates the existence of plants side by side with the *Eozoon*.

M'Nab, W. R.—On the Structure of a Lignite from the Old Red Sandstone. Trans. Bot. Soc. Edin. vol. x. p. 312.

The author proposes to name the wood which he describes *Palæopitys Millerii.* It was found by Hugh Miller at Cromarty.

Von Mueller, F., and R. Brough Smyth. Observations on some Vegetable Fossils from Victoria. Geol. Mag., Vol. VII. p. 390.

The specimens were fruits from surface deposits, and were obtained from one of the deep leads at Haddon. One is a coniferous fruit allied to *Solenostrobus*, of Bowerbank, to which the name of *Spondylostrobus Smythii* is given. The others are not named, but suggestions are given as to their affinities, and these indicate, according to Von Mueller, a flora analogous to that of the existing forest-belt of Eastern Australia.

Williamson, W. C.—Contributions towards the History of *Zamia gigas*, Lindl. and Hutt. Trans. Linn. Soc., vol. xxvi. pp. 663–674, pl. 52, 53.

The author gives an account of the different structures which he believes to belong to this plant, describing in detail the stem, leaves, and male and female flowers.

Synopsis of the Genera and Species described in the preceding Papers.

Filices.

Chelepteris, Quart. Journ. Geol. Soc. vol. xxvi. p. 352.

Osmundites Dowkeri, Carr. Quart. Journ. Geol. Soc. vol. xxvi. p. 349. *Lower Eocene.* Herne Bay.

Cycadeæ.

Bennettites Gibsonianus, Carr. Trans. Linn. Soc. vol. xxvi. p. 681, pl. lviii–lx. *Lower Greensand.* Luccombe Chine, Isle of Wight.

B. maximus, Carr. l. c. *Wealden.* Isle of Wight.

B. Peachianus, Carr. l. c. ; pl. lxii. *Middle Oolite.* Helmsdale, Sutherlandshire.

B. Portlandicus, Carr. l. c. ; pl. lxi. *Lower Purbeck.* Isle of Portland, Dorsetshire.

B. Saxbyanus, Carr. l. c. ; pl. lvii. *Wealden.* Isle of Wight.

Bucklandia anomala, Presl, Trans. Linn. Soc. vol. xxvi. p. 679 ; pl. liv. fig. 1–3. *Wealden.* Cuckfield, Sussex.

B. Mantellii, Carr. l. c. ; pl. liv. fig. 4. *Wealden.* Cuckfield, Sussex.

B. Milleriana, Carr. l.c. ; pl. lv. fig. 1. *Coral Rag.* Brora, Sutherlandshire.

B. squamosa, Brongn. l. c. *Stonesfield Slate.* Stonesfield.

Crossozamia Buvignieri, Pomel, l. c. p. 680. *Jurassic.* St. Michel, France.

C. Moreaui, Pomel, l. c. *Jurassic.* St. Michel, France.

Mantellia inclusa, Carr. l. c. p. 681 ; pl. lxiii. fig. 2 and 3. *Lower Greensand.* Potton, Cambridgeshire.

M. intermedia, Carr. l. c. ; pl. lxiii. fig. 4 and 5. *Lower Purbeck.* Isle of Portland, Dorsetshire.

M. microphylla, Brongn. l. c. ; pl. lxiii. fig. 6. *Lower Purbeck.* Isle of Portland, Dorsetshire.

M. nidiformis, Brongn. l. c. ; pl. lxiii. fig. 1. *Lower Purbeck.* Isle of Portland, Dorsetshire,

Raumeria Reichenbachiana, Göpp. l. c. p. 682. *Formation unknown.* Wieliczka, Gallicia.

R. Schulziana, Göpp. l. c. *Formation unknown.* Gleiwitz, Silesia.

Williamsonia gigas, Carr. l. c. p. 680 ; pl. lii. and liii. *Inferior Oolite.* Scarborough, Yorkshire.

W. hastula, Carr. l. c. *Inferior Oolite.* Saltwick, Yorkshire.

W. pecten, Carr. l. c. *Inferior Oolite.* Gristhorpe, Yorkshire.

Yatesia crassa, Carr. l. c. p. 680 ; pl. lv. fig. 7. *Coral Rag.* Brora, Sutherlandshire.

Y. gracilis, Carr. l. c.; pl. lv. fig. 2. *Lias*. Lyme Regis, Dorsetshire.

Y. Joassiana, Carr. l. c.; pl. lv. fig. 8 and 9. *Coral Rag*. Brora, Sutherlandshire.

Y. Morrisii, Carr. l. c.; pl. lv. fig. 3–6. *Lower Greensand*. Potton, Cambridgeshire.

Zamia gigas, Lindl. and Hutt. Trans. Linn. Soc. vol. xxvi. p. 663; pl. lii. and liii. *Inferior Oolite*. Yorkshire.

CONIFERÆ.

Ormoxylon, Dawson, Proc. Roy. Soc., May, 1870.

Palæopitys Millerii, M'Nab, Trans. Bot. Soc. Edin. vol. x. p. 312.

Spondylostrobus Smythii, Von Muell. GEOL. MAG. Vol. VII. p. 390. *Post-Tertiary*. Haddon, near Smythesdale, Victoria.

ANGIOSPERMOUS DICOTYLEDONS.

Nicolia Ægyptiaca, Endl. GEOL. MAG. Vol. VII. p. 309, Pl. xiv. Fig. 1 and 2. *Tertiary*. Desert of Suez, east from Cairo.

N. Owenii, Carr. GEOL. MAG. Vol. VII. p. 310, Pl. XIV. Fig. 3 and 4. *Tertiary*. Desert of Suez, east from Cairo.

REVIEWS.

I. — METALLOGRAPHY AS A SEPARATE SCIENCE, OR THE STUDENT'S HANDBOOK OF METALS, CONSISTING OF NOTES OF FIFTY-FIVE METALS. By THOMAS ALLEN BLYTH, M.A., Ph. D., etc. London: 8vo. pp. 128. (Longmans, Green, Reader, & Dyer, 1871.)

THIS small treatise appears to consist of contributions which had previously appeared in various Magazines, to some extent revised by the author, and is now reprinted in a separate form.

The design of the work is a useful one, and is intended to convey in an elementary manner the general character, properties, and uses of the various metals. It consists of 58 chapters, each of which, except the first three, are devoted to one of the Metals, arranged in alphabetical order. The first three chapters are devoted to the general physical characters and properties of the various metals, which, we think, might have been somewhat more extended to the benefit of the reader, inasmuch as when treating of mettallic lustre, specific gravity, fusibility, or crystallization, the author does not mention the different kinds of lustre, or the mode of taking their specific gravity, the various degrees of hardness, their relative degrees of fusibility, or the crystalline forms which many of the metals are known to assume.[1] Nor does he distinctly enumerate all those metals which are found in a native state from others which occur merely in combination. And further, the author does not give a complete list either of the native metals or of all the other elements with which they are found associated in nature. Even amongst those that are mentioned as the most general combinations are oxygen and sulphur, as well as carbon and phosphorus: the two former, either as oxides or sulphides, are very abundant in the

[1] In chapter 3, a brief account is given of the *alloys* of metals and their general characters as to their density and fusibility.

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