THURSDAY, MARCH 26, 1874

THE SCIENCE COMMISSION'S MUSEUM REPORT

THE Royal Commission on Scientific Instruction and the Advancement of Science have just issued their fourth Report, which is mainly concerned with the principal public Scientific Museums and Collections of the Metropolis, touching also briefly on the Scientific Museums and Botanic Gardens of Edinburgh and Dublin, and at some length upon provincial Local Museums generally, and upon the means by which these last might be made widely beneficial for scientific instruction. The Report also deals with the subject of Public Lectures in connection with Museums.

The Metropolitan Museums dealt with in the Report are the British Museum, the Museum of the Royal College of Surgeons, the National Botanical Collections and Gardens, the Museum of Practical Geology, and the South Kensington Museum, with its branch at Bethnal Green. The Report of the Commission is founded upon a thorough investigation into the growth and present condition of these institutions, and the opinions of a large number of men competent to speak on the subject as to the best means of systematising the various institutions, and of enabling them to discharge efficiently the objects for which they exist. The following are the principal recommendations of the Commissioners, which we prefer to give in the words of the Report.

With regard to the Natural History Collections of the British Museum, it is recommended :—

"That a Director be appointed by the Crown, and should have the entire administration of the establishment, under the control of a Minister of State, to whom he should be immediately responsible. That the appointments of keepers and other scientific officers should be made by the Minister, after communication with the Director and with the Board of Visitors.

"That a Board of Visitors be constituted, to be nominated in part by the Crown, in part by the Royal and certain other Scientific Societies of the metropolis, and, in the first instance, in part also by the Board of Trustees; the members to be appointed for a limited period, but to be re-eligible; and that the Board of Visitors should make annual reports to the Minister, to be laid before Parliament, on the condition, management, and requirements of the Museum, and should be empowered to give him advice on any points affecting its administration."

With regard to the National Botanical Collections and Gardens, the Commission recommend :—

"That the collections at the British Museum be maintained and arranged with special reference to the geographical distribution of plants and to palæontology; and that the collections at Kew be maintained and arranged with special reference to systematic botany.

"That all collections of recent plants made by Government expeditions be, in the first instance, sent to Kew, to be there worked out and distributed, a set being reserved for the British Museum; and that all collections of fossil plants made by Government expeditions be sent to the British Museum.

"That opportunities for the pursuit of investigations in physiological botany should be afforded in the Royal Gardens at Kew."

With regard to the Museum of the Royal College of Surgeons, it is recommended :—

"That, should the fund at the disposal of the College prove inadequate for the efficient maintenance and continued extension of the Museum, it should receive support from the State, as an institution intimately connected with the progress of biological science in this country."

With regard to the Scientific Collections of the South Kensington Museum, the Commissioners recommend :—

"The formation of a collection of physical and mechanical instruments; and they submit for consideration whether it may not be expedient that this collection, the collection of the Patent Museum, and that of the scientific and educational department of the South Kensington Museum, should be united and placed under the authority of a Minister of State."

With regard to Provincial Museums, the Commissioners recommend :—

"That, in connection with the Science and Art Section of the Education Department, qualified naturalists be appointed to direct the collection of specimens in order to supply whatever deficiencies exist in the more important provincial museums; and also in order to organise typical Museums, to be sent by the Department of Science and Art into the provinces to such Science Schools as may be reported to be likely to make them efficient instruments of scientific instruction.

"That a system of inspection of provincial museums be organised with a view of reporting on their condition, and on the extent to which they are usefully employed, and whether the conditions of the loan or grant from the Department of Science and Art have been fulfilled."

The final recommendations are on the subject of Lectures, and are :—

"That courses of lectures be given in connection with the collection of physical and mechanical instruments, the object of these lectures being to illustrate the progress of scientific and mechanical discovery and invention.

"That the establishment of lectures on Science, accessible to all classes on the payment of a small fee, should be promoted by the Government in the great centres of population.

"That, in the first instance with the view of carrying out the preceding recommendation, the system of instruction of this kind, which has already been established by the Government in the metropolis, should be developed by the institution of courses of lectures on the principal branches of Experimental and Natural Science.

"That the proposed lectures be of two kinds (1) lectures of an elementary character on the general principles and most important facts of Science; (2) lectures specially intended for the working classes on the application of Science to the arts and industries of the country."

Until this Report was issued no general survey had ever been taken of our Museum system, if that can be called a system the growth of which has been almost entirely the result of accident. Both in the metropolis and in the provinces there exists a large number of museums and of collections of various kinds—to a large extent, however, connected with Natural History, and in local museums with Antiquities—but in almost every case, when the history of any of these institutions is traced, it will be found that it had its origin in quite an accidental way, and that no well-defined and intelligent system has been followed in the establishment of those institutions meant for public instruction. Some of the consequences of this capricious birth and untrained growth of the institutions referred to are that, especially in the metropolis, we have a heterogeneous collection of museums that have no relation

whatever to each other, each pursuing the even tenor of its way without any regard to its neighbours; the collections in these museums often overlap each other, thus wasting means that might be expended to better purpose in developing some well-organised common system of aid to scientific research and instruction, and consequently some departments of Science are represented and endowed almost to excess, while others of at least equal importance are not represented at all; and although all of them have ostensibly the same objects in view, viz. to afford facilities for scientific research and for the scientific instruction of the public, some are directly under the control of a Minister of State, others are not.

If the recommendation of the Commission, that the government of the British and Patent Museums be transferred to a department of State with a responsible Minister at its head, is adopted by the Government, no doubt some of these anomalies will be abolished; the institutions will be made to fit into each other, and their government will be reorganised on some common and intelligent system, such as that recommended by the Commission.

One of the most glaring of these anomalies is the almost exclusive representation and endowment in our public museums of the Natural Sciences; Botany, *e.g.*, being twice endowed, in the British Museum and at Kew—while the Physical Sciences, as if they were the illegitimate offspring of man and nature, are left to pick up a living as best they may, so that had it not been for their inherent vitality they would long ago have been starved out of existence.

In our Museums and Gardens, and elsewhere, aid to research in connection with the Biological Sciences is well provided for, while students of Botany, of Zoology, and of Geology in its various departments, have abundant facilities afforded them for the practical study of these sciences. The result is that there is nothing to check the career of these sciences; they have been rapidly extending their domain, and may go on extending it still further without much anxiety as to where the sinews of war are to come from; all this with the very best results to our country. Our readers need no reminding of the immense strides recently made by Physical Science in its various departments, departments increasing in number and complication, and of the vistas of possible discovery of the most stupendous character which have been opened up, but for which private enterprise is utterly inadequate, and which must remain shrouded in mystery unless assistance similar to that which has been so amply accorded to the favourite Natural History Sciences be also given to the hitherto neglected Physical Sciences. Physical Science, though she sees many a glorious world that she longs to conquer, and whose conquest would be fruitful of the best results, can only in sadness let her hands dangle idly by her side, because unaided she cannot reach these fields of battle. No one competent to pronounce an opinion would venture to say that Physical Science has done less for the material prosperity of this country than Natural Science; indeed within the last few years our rapid advance has been almost entirely owing to the practical application of physical discoveries. Yet what encouragement is held out to those who are able and willing to devote themselves to research which brings no profit to the researcher, but which is fraught with ultimate benefit to the race?

The public, as we have shown, is made familiar in our museums with the results which have been reached in the Natural History Sciences, as well as with their *matériel*, but looks in vain for any exhibition of the instruments, the methods, and equally valuable results which belong to Physical Science; hence, no doubt, partly the reason why the latter has been hitherto almost entirely left out in the cold; it is not known, and has but little opportunity of letting the public know its history and achievements, though it has something to show of at least equal value with the umbrella or the boomerang of a conquered savage. In chemistry, heat, light, sound, electricity, astronomy in its various branches—if a student wishes to have something more than a mere book knowledge of the methods of work and of the results obtained (and there are many such students), where can he obtain it in the same way as students of Zoology, Botany, Geology, Comparative Anatomy, and Physiology can carry on the practical study of these sciences? And yet no one, we dare say, would venture to give any better reason for this state of things than that Chance, which has hitherto governed the growth of our museums, has ordered it so.

There can be now, however, no possible excuse for the continuance of this anomalous system, seeing that the Report of the Commission has thoroughly exposed it, and suggested methods whereby to some extent its glaring defects and anomalies may be remedied. If Government wish to find a model for their guidance in reorganising and supplying the deficiencies of our public museums and institutions intended for the researches of students and for popular instruction, let them turn to Appendix III. of the Report of the Commission, containing the Report of the Secretary on the Aid given by the State to Science in France. In a previous article (vol. ix. p. 217) we referred to the disgraceful condition of our Patent Museum, and contrasted it with the magnificent Conservatoire des Arts et Métiers of Paris, extracts from the long and complete catalogue of which, as well as syllabus of its well-organised courses of lectures, will be found in the Appendix referred to.

> "Evil is wrought by want of thought,
> As well as by want of heart."

Government can no longer plead the excuse implied in Hood's lines for neglecting to remedy the evils so forcibly brought under their notice by the Report of the Commission. If means are not forthwith taken to organise our public museums and institutions for scientific research and instruction on some intelligent system, to supplement their lamentable deficiencies, and make them as widely beneficial to the advancement of Science in all its departments and conducive to the highest instruction of the public as they are calculated to be, it can no longer be set down to ignorance, but to an utter disregard to the highest welfare of the country. In this direction the new Government have a chance of distinguishing themselves and winning for themselves an enduring and worthy popularity; let them lose no time in showing their wisdom by appointing a responsible Minister of Education whose duty it will be to keep all our public scientific and educational institutions up to the highest pitch of efficiency, to re-organise them upon some common basis, and to see that the progress of research in all branches of Science is not hampered by the want

of adequate means for its pursuit. By such means will our rulers show themselves to be the real well-wishers and benefactors of their country.

TODHUNTER'S "MATHEMATICAL THEORIES OF ATTRACTION" *

A History of the Mathematical Theories of Attraction and the Figure of the Earth from the time of Newton to that of Laplace. By I. Todhunter, M.A., F.R.S. Two vols. (London: Macmillan, 1874.)

II.

OF the great Scotch mathematician, Maclaurin, we read—"The importance of his investigations may be seen by observing how great has been his influence on succeeding writers. Clairaut, D'Alembert, Lagrange, Legendre, Gauss, Ivory, and Chasles show by reference, explicit or implicit, their obligations to the creator of the theory of the attraction of ellipsoids.

Maclaurin well deserves the memorable association of his name with that of the great master in the inscription which records that he was appointed Professor of Mathematics at Edinburgh, "*ipso Newtono suadente.*" His main contribution to the theory of the figure of the earth was an exact demonstration of Newton's postulate, of which only approximate solutions had previously been given. We may note on § 260 that we have seen the French version of his "Treatise on Fluxions," "traduit de l'Anglois, par le R. P. Pezenas, Paris, 1749; 2 vols." The first volume has li. pp. of Introduction; v.-viii. *Avertissement par le traducteur* ix.-li., Translation of Author's Preface and Introduction with *Table des Matières;* then 344 pp. of text, plates, and 4 pp. of errata. The second volume has viii. pp. of contents, 322 pp. of text, plates, with 6 pp. at end (4 pp. of errata), for errata, *approbation,* and *privilège.*

The next noteworthy name is again that of an English writer, Thomas Simpson. His contributions are of eminent importance. The analysis he employed, Mr. Todhunter observes, "would not have been unworthy of Laplace himself." There is here an interesting biographical note of a kind which the writer so well knows how to introduce, and which adds a charm to the more general details. In writing our notice we have especially dwelt upon the English contributors to our subject; on the whole it can hardly be denied "that Newton's countrymen have left to foreigners the glory of continuing and extending his empire." Singularly enough Mr. Todhunter gives no account of Simpson's work, "A New Treatise of Fluxions . . . with a variety of new and curious problems." London, 1737. 8vo. This is six years earlier than the "Mathematical Dissertations." Problems XXI. to XXIII. (§§ 201-206) deal with attractions of a circular plate on a point on the axis; of a cylinder on a point on its axis; of a sphere on a particle on its surface, or any distance above it, for law varying as inverse of (distance)^2 and for (distance)^n. They correspond to Problems II., IV., V., VI. of 1823 edition of the "Doctrine and Application of Fluxions."

The great work of Clairaut, "Théorie de la figure de la terre," &c., appeared in 1743. In this branch "no other person has accomplished so much as Clairaut; and the subject remains at present substantially as he left it, though the form is different. The splendid analysis which Laplace supplied adorned but did not really alter the theory which started from the creative hands of Clairaut." Laplace, too, places it "au rang des plus belles productions mathématiques."

The expedition to Peru gave rise to much paper warfare, and Mr. Todhunter has collected together, in a useful form, the titles of the original pamphlets. We think he has overlooked the following, "Nouveau projet d'une mesure invariable propre à devenir universelle, extrait d'un memoire lû . . . le 24 avril, 1748, par M. de la Condamine," viii. pp. A copy we have consulted of No. xx. (p. 236) is dated "Plombières, juin 30, 1754." (Consult Lalande, p. 455.)

D'Alembert need not long detain us. Laplace points out that his writings want "clarté." Mr. Todhunter says of him, "The errors of D'Alembert are certainly surprising; they seem to me to indicate that he was little in the habit of enlarging his own views by comparing them with those of others. His criticisms of Clairaut prove that he had not really mastered the greatest work which had been written on the subject he was constantly studying. His readiness to publish unsound demonstrations and absolute errors is abundantly shown in the course of our criticism. On the whole the blunders revealed in the history of the 'Mathematical Theory of Probability,' and in the present history, constitute an extraordinary shade on a fame so bright as that of D'Alembert."

Here we must give an account of a work not mentioned in the History. The "Considerazioni sopra la Figura della Terra" * of Tommaso Narducci appeared about the year 1747. It comprises two Lemmas (in modern geometrical conics they would be for the ellipse (1), GN equal $\frac{CB^2\,CN}{CA^2}$, (2) radius of curvature equal $\frac{PG^3\,CA^2}{CB^4}$), and nine problems. The first problem is "Dati due gradi di meridiano e loro latidudine, trovare la ragione degl' assi, e gl' assi stessi;" the last is "Data la ragione de' due assi, che sia di 1 ad m, trovare nel meridiano un grado, che sia eguale al grado dell' equatore." It is an interesting piece of geometrical work.

In his § 490 Mr. Todhunter considers it curious that the (Cambridge) University library does not possess a complete copy of the famous work of Stay and Boscovich. His surprise will probably be increased when we state that, if we are not mistaken, neither do the libraries of the British Museum or that of the late Mr. Graves; at any rate, we do not remember to have met with Boscovich's commentary on the poem. "These writings furnish elementary accounts of the most important results which had been obtained up to their date, and reveal apparently great knowledge and judgment in Natural Philosophy." A copy of Boscovich's "Dissertatio de telluris figurâ, habita in seminario romano Soc. Jesu nunc primum aucta et illustrata ab ipsomet auctore, P. R. J. Boscovich," forms pp. 161-218 of vol. ii. of Giuliani's memoirs (cited at the foot, date 1744). In p. 184 he speaks of Maclaurin's "Fluxions" as "Newtono ipso dignissima;" there is a noteworthy passage, pp. 217, 218, and also a notice on p. xii.

* Continued from p. 380.

* It occupies pp. 225-266 of vol. iii. of the "Memoria sopra la Fisica e Istoria Naturale di diversi valentuomini," edited by Carl Antonio Giuliani, in 4 vols. (1743-1747).