

case, writers of manuals no doubt felt it incumbent on them to gild the pill by introducing such matter as tended to show that there was such a thing as a practical application of chemistry to the Arts.

However, that time has passed. Perhaps no science has of late become so widely popular, and certainly none has advanced so rapidly towards accuracy as chemistry. It is, therefore, time for it to throw aside the crutches upon which it was bound to support itself whilst struggling for recognition and public favour, and to march boldly forward, depending on itself alone. As a means to this end, it is with great pleasure that we welcome Mr. Crookes's translation of Dr. Wagner's work. He has given us, in the form of a handbook, what could only before have been obtained either by searching in special treatises, or by reading much more cumbersome dictionaries; and the existence of this book cannot but have its influence in setting free much of the space hitherto occupied in educational works on chemistry, by perfunctory descriptions of technological processes.

We most heartily join with Mr. Crookes in the hope he expresses at the end of his preface—"We cannot let this work pass out of our hands without expressing the hope that, at no distant date, chairs of Technology will be founded in all our universities, and that the subject will be included in the curriculum of every large school." Such an event could not fail to have the happiest effects on all; for, while it would set free the scientific student from a subject he does not require, it would enable those wishing to become managers of works or manufacturers, to study their special subjects in the best possible way."

The work consists of 745 closely-printed pages, with 336 illustrations, and a copious index. The subjects are treated at considerable length, and with extreme lucidity; this is especially the case with the portions devoted to metallurgical processes, where every step is carefully traced, and all the latest forms of furnaces, &c., are represented by woodcuts. We notice, however, that the section on electro-metallurgy is shorter than could have been wished, and that no mention is made of the process of depositing nickel upon iron, &c.

In the section on explosive compounds, we have full details for the preparation of picrates, nitro-glycerin, gun-cotton, &c.; though the author, perhaps led away by his chemical enthusiasm for these bodies, has treated gun-powder somewhat shortly, and the very interesting results obtained by the use of pebble, pellet, and prismatic powders, we do not see noticed at all; in fact, this article is decidedly behind the times. The preparation of salt, sulphur, soda, ash, bleaching-powder, &c., are well and fully treated, though we do not see Deacon's process for the preparation of chlorine mentioned.

The articles on glass and earthenware are remarkably good and full, as are those on cements and lime, paper, sugar, and spirit. Since March 1868, two editions of the work have been issued, making eight in all. Of the eighth, and last, translations have been made into French and Dutch, and everyone will thank Mr. Crookes for the quantity of new matter he has added. In conclusion, it need only be said that the formulæ are throughout molecular, and that the metric system of weights and measures is used, except where English quantities were indispensable. We feel sure that this book will permanently take its place among

our manuals, and that the editor and translator will, in future editions, correct any little faults and errors which are, in so large a work, unavoidable; while he will keep it fully abreast of the times.

R. F.

OUR BOOK SHELF

Ueber die Bedeutung der Entwicklung in der Naturgeschichte. Von Dr. A. Braun, Berlin.

Ueber die Auflösung der Arten nach natürliche r Zuchtwahl. Von einem Ungenannten, Hanover. (London: Williams and Norgate.)

THESE are two of the most recent of the numerous contributions which Germany has made to the literature of Darwinism. The first is an address delivered on the anniversary of the medical and surgical Frederick-William Institute in Berlin, and is a tribute to the enormous impetus given to physiological research by the promulgation of Mr. Darwin's theories. The writer, however, while fully adopting the principle of Evolution, leans to the views which have during the last few years greatly spread among naturalists, that any theory like that of natural selection, which does not recognise an inherent law of progress, is insufficient to account for the phenomena of the transmutation of species.

The second of these pamphlets is a more noteworthy production. The anonymous author also admits the principle of Descent by Evolution, but contends that the carrying out of this principle, so far from leading, as is generally supposed, to a multiplication of species and to a gradual rise to more and more perfect organic forms, must necessarily result in a gradual diminution in the number of species, a fusing together of form after form, and a descent to more lowly, instead of an ascent to more highly organised structures. With the origin of life he does not concern himself, but only with its future; and the succession of organised beings he compares not to a tree branching out into infinite ramifications, but to a river uniting in itself an infinitude of smaller streams. Whether the proposition is a serious one, or whether it is put forward as a *reductio ad absurdum* by a furtive opponent of Evolution, it is difficult to say; but the argument is carried out with considerable ability, and a strong point is made of the acknowledged degeneracy of many races of men from the condition of their ancestors, and of the gradual dying out of tribes and the consolidation of the human family into an ever decreasing number of types.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

The National Herbarium

YOU will, perhaps, give admission to a few remarks on Dr. Hooker's instructive "Reply" to my "Statement" of 16th May, 1872, bearing in mind that this "Statement" was called for in explanation of the grounds of my requirements and assignment of space in the Museum of Natural History, to be built at South Kensington, for the reception, uses, and applications of the National Herbarium, on the conviction that such would be continued and maintained in the metropolis.

Dr. Hooker had put in the van of his evidence,† and recommendations bearing on the reduction,‡ limited applications,§ and subordination to Kew||, of the Herbarium at the British Museum

* See NATURE, vol. vi. p. 516.

† Minutes of Evidence of Royal Commission on Scientific Instruction.

‡ Ans. to Q. 6,683.

§ Ans. to Q. 6,684 and 6,685.

|| *Ibid.*

as regards supply,* nomenclature, and government, a summary of the amount of botanical work represented by the 140 volumes having the Herbarium at Kew as their cause or conditions.

Seeing that—were this summary to be held as decisive, administratively, for carrying out his urgent desires—a Government impressed with its responsibilities for the application of public money, would place on retiring allowances the proportion of the staff no longer needed in the Metropolitan Herbarium—there was a motive in addition to my duty in response to the inquiry of the First Commissioner of Works, to sift the grounds of Dr. Hooker's attack on the Department of Botany in the British Museum. The anxieties of its officers were too well founded.

The argument from the amount of herbarium work at Kew since the practice of transferring there the dried plants collected in Government expeditions would be valid if such work could not be done elsewhere, or if such work had not been done in the Metropolitan Herbarium prior to the diversion therefrom of its legitimate supplies.

But the "Prodromus Floræ Novæ Hollandiæ," the "Observations Systematical and Geographical on the Herbarium collected in the Vicinity of the Congo," not to cite other works of Robert Brown, well known to botanists—and I may add the "Plantæ Javanicæ Rariores" of his successor, John Joseph Bennett, F.R.S.—are examples of "scientific work" at the London Herbarium, in relation to its legitimate supplies, which will bear comparison with the "scientific work which is turned out from the Herbarium at Kew."

The circumstance which, in the emergency threatening a Department of Natural History in the British Museum I was bound to submit to the consideration of Government, was that the works added to Botanical Science, for which before its supplies were intercepted by a "competing establishment" the National Herbarium in London furnished the materials for publication, were works of assigned duty. The officers of such Herbarium had no trusts or responsibilities in relation to the Royal Gardens, but gave their aid in naming the living Plants at Kew; leaving the officers in charge of those gardens free for the works and applications for which a Nation provides and supports its collections of living plants. Had Robert Brown been the director of such establishment, those who had the inestimable pleasure and benefit of his intimacy know that his devotion to the experimental and physiological duties of his office would have been the prime and paramount subject of his time and labours at Kew.

Permit me to exemplify my argument. In the "Report of the Royal Garden at Calcutta for 1870" (No. 585, 14th May, 1872) it is stated:—"At the beginning of the year the total stock of *Ipecacuanha* amounted to five plants in Sikkim and seven in this garden. These represented the only surviving offspring of a single plant received from Dr. Hooker of the Royal Gardens, Kew, in 1866.—At the request of the Right Hon. the Secretary of State for India, attention has for some years past been given in Edinburgh to the propagation of *Ipecacuanha* plants for this country, and during the past year the supplies raised there began to arrive. Five 'Wardian Cases' containing about 100 plants were received from Dr. Balfour of the Royal Botanical Gardens at Edinburgh." The Curator of these gardens, Mr. McNab, referring to the earlier introduction of living plants of *Cephaelis Ipecacuanha* into the Kew Gardens, and alluding to the slow and difficult method of its propagation by the adopted methods of cuttings, proceeds to describe the better method to which his experiments on living specimens led.† "The roots or rather rhizomes of the *Cephaelis*

are peculiarly annulated (Pl. iv. fig. 2). A few of them were taken from one of the plants in the Botanic Garden during the month of August, 1869, and, after being cut into transverse sections of different lengths, were inserted in a horizontal position over the surface of a pot prepared with drainage and white sand. This pot was placed under a hand-glass in a warm propagating bed, and kept moist. A few weeks afterwards the root-cuttings began to swell, and showed signs of budding, chiefly on the upper cut surface, as in Pl. iv. fig. 3. In most cases only one bud was developed, but in some instances two or more were produced. When several growing plants are observed the root can be cut through so as to form independent plants." If this has not before found a place in the columns of NATURE it may be deemed worthy of one, for, as the physiological botanist in charge of the Edinburgh Gardens observes—"Understanding that the Government intend to introduce the cultivation of this plant in India," and "in order to meet the demand which in all likelihood will be made on nurserymen for plants of *Cephaelis*, it is well to know how it can be propagated independently of cuttings" (*ib.* p. 318).

To give another instance. In an obituary notice of Dr. Fred. Welwitsch, the editor of a horticultural journal refers to the species of a plant which bears his name as follows:—"The *Welwitschia mirabilis* is about as remarkable a plant as the *Rafflesia Arnoldi* itself, and equally uncultivable."* The simple fact is, the ill success at Kew. One cannot be sure till Edinburgh has had its chance.

As a popular premier once defined dirt, so a weed is a plant multiplying in a wrong place. We may hope for a reversion of the sentence on *Welwitschia* when "cones with ripe seeds" and "fine young plants" have found their way to a botanic garden whose officers are not diverted from experimental work, not trammelled and obstructed by that wasteful weed—an overgrown herbarium. The native conditions of existence of the *Tumboa* may then and there be imitated so truly, with ample provision for the descent of the tap-root, as to enable visitors to see the plant alive, and Mr. McNab may even succeed in giving other horticulturists the opportunity of multiplying specimens.

From such instances—and they might be multiplied—of legitimate successes, where a botanic garden is content to use the herbarium in the contiguous metropolis, and has not the low ambition of setting up a competing one in the garden itself, I infer an administrative advantage in maintaining the division of labour, which worked well in the days when the Government collections of live plants went to Kew, and those of dead plants to London.

I do not merely suggest, but affirm, that the nation loses part, perhaps much, of the benefit of the liberal grants and aids it affords to its garden of living plants through the uncalled-for and unnecessary accumulations there of collections of dead plants and the resulting herbarian work. Dr. Hooker evades the concluding argument of my statement, takes a personal stand-point, assumes the tone of an injured individual, and deems it unfitting to notice what he is pleased to call an "insinuation."

He who is most sensitive as to himself is often least mindful of the feelings of others. If Dr. Hooker will read his answer to Q. 6661 (*op. cit.*, p. 434), he may, at least ought to, have some sense of the pain he inflicted on fellow-servants of the State and collaborators in science, on men at least his equals, and one of whom, in a recondite botanical problem, has shown himself his superior. Statements of a certain character may be made by one careless as to cost in few words and at small loss of time. It required the evidence occupying pp. 530, 531, of the published "Minutes" of the Scientific Commission to show the groundlessness of the insinuation conveyed in the answer to Q. 6661.

I will not now trespass further on your valuable space. But

* *The Garden*, Oct. 25, 1872.

* Ans. to Q. 6,785, "That the British Museum Herbarium and that at Kew should be under one control, and the former be continuously added to from Kew." In his Ans. to Q. 6,732, Dr. H. says—"The trouble of supplying the South Kensington Museum would be very trifling,"—which I think probable.

† McNab "On the Propagation of the *Ipecacuanha* plant," *Transactions of the Botanical Society of Edinburgh*, vol. x. p. 318.

the "Kew Question" has assumed proportions, and may have consequences, meriting for it a thorough ventilation; and I permit myself to believe that you may not be unwilling to receive further remarks on those points in my "Statement" to which Dr. Hooker has condescended to reply.

Sheen Lodge, Oct. 30

RICHARD OWEN

Physics for Medical Students

I AM and have been a "medical student" for many years, and hope to live in that capacity for some years more. I admit that I ought to know "the relation between the surface temperature of the body, the quantity of heat passing away from it, and the amount of heat generated in the body by the food given to a patient," but I do not know all this, and I have never discovered anyone who can tell me where I can learn it or how I can find it out by any efforts of my own.

Moreover, I have been unable to get a clear and satisfactory answer to the following simple questions, and have failed to find anyone who will explain to me accurately how I am to set to work to get the information so much desired:—"What is the quantity of heat generated in the body by the food, and how is it to be determined? How is the quantity of heat that passes away from the body in a given time to be estimated with anything approaching to accuracy?" If my friend and colleague Prof. Adams will be so kind as to give answers to these questions in NATURE, I can assure him he will confer a great favour upon many workers and thinkers in my profession, besides proving the value of such questions as that objected to by Mr. Heath for medical students. At this time we doctors are much in need of physical help. I have no doubt that physicists will be much astonished at our ignorance, but never mind that; we are quite ready to learn, and don't mind being laughed at or even spoken of with slight contempt by our physical friends if they will only help us. Nay, we will suffer anything from those who will instruct us so that we may be able to set to work upon living people who are "generating" and giving off heat, and determine with accuracy the different rate at which heat is "generated" and given off under different circumstances.

Prof. Adams asks whether "the production of heat in the human body by the consumption of food" is "carried on on principles entirely different from those of the production of steam in a boiler," and seems to regard it as one of the "mildest of questions," in heat that can be proposed for a medical student to answer. Will he answer his own question by asserting that the principles are the same in the two cases? Heat in the body, steam in the boiler—heat, steam; body, boiler!—or shall the question be revised before it is proposed to the student?

I have not the slightest doubt about the usefulness of a knowledge of physics to those who are working at medicine, and quite agree that the rising generation of medical students should be taught physics. But this is a very different thing from teaching people to fancy that living things are mechanisms, machines, galvanic batteries, or molecular apparatuses. I venture to think that some of the most distinguished physicists are too fond of deserting their own department for the purpose of trying to make people believe that there is an analogy between steam-boilers and human bodies, when no one has yet succeeded in proving that there is any true analogy whatever.

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LIONEL S. BEALE

In the last number of NATURE Mr. Adams, of King's College, criticised the remarks made by Mr. Heath in his introductory address upon the character of the London University medical examinations, and of the first, the preliminary scientific, more especially. It scarcely needed a column and a quarter of close type for Mr. Adams to tell us that a medical man should be acquainted with physical laws and phenomena, and that in his opinion the mathematical question quoted by Mr. Heath was not too difficult to be fittingly placed in the examination paper. The former point is beyond question, and the latter is not to be settled by declaring the statement of the editor of the *Lancet* to be "shallow." As to the view that a medical man should be able to estimate precisely "the amount of heat lost through a blanket or a seal-skin coat," I will only say that it seems to me that a slight consideration of the physical and physiological conditions involved, and their variations in different instances, will suggest the hope that he will not waste his time in attempting such feats, simple as they may be deemed in physical laboratories. I will not take up space in commenting upon Mr. Adams' argu-

ments and illustrations in support of his position, since they do but go to show that a medical man should have some knowledge of natural philosophy and its applications to the conditions with which he has to deal, and not that he should be driven to expend his time, already overcharged with much more that is of no possible use to him, upon mathematical processes which concern astronomers, chemists, and engineers. There is no doubt that to give a scientific character to medicine, exact quantitative methods must be applied to physiology and pathology, but it should be the work of men specially trained and devoted to the purpose. It has for some time past been commonly agreed that the medical student's education is such that he is urged to acquire a quantity of information with little regard to its use and digestibility. He has a great deal to learn in a short time. The chief part of his education consists, or should consist, in observing and comparing morbid conditions, and in learning or devising means for their relief and cure. Whatever time he spends upon what is not requisite, or has little direct bearing upon his art, implies time mis-spent and injury to the sufferers he will later attend. Prof. Huxley did not go too far in saying that the conduct of those who impose useless knowledge upon medical students is imply criminal.

F. LYNDON ATTWOOD

Junior Athenæum Club

NORTH POLAR EXPLORATION

IN the last number of the *Mittheilungen* Dr. Petermann publishes his 6th paper on the Geography and Discoveries of the Polar Regions, in which he gives an abstract of what has been done during the last three or four months.

The two projected Norwegian expeditions into the Siberian Seas, under the guidance of Captains Jensen and Mack, have at present been unfortunately frustrated; the former from a damage to the screw of the steamer, the latter from inability to penetrate the masses of ice. However, a projected scientific expedition for next year is exciting much interest at Tromsø. The French Expedition, under Ambert and Mack, has not yet put to sea, having been detained by the delay in settling the estate of Lambert, who left a large sum to be devoted to this purpose. This is much to be regretted, as Captain Mack has already distinguished himself by penetrating farther than any other discoverer into the Siberian Sea.

However, the much-talked-of and bold expedition under M. Octave Pavy, has, it is understood, at last left San Francisco, with what results remains to be seen. He expects to reach Wrangell Land by September 1, making his way farther northward in sledges, and hoping to come to open sea about May 1873. He will then proceed towards the Pole by means of a raft of somewhat novel construction, consisting of four hollow cylinders provided with a deck, and capable of holding all necessary provisions for Pavy and his small party for two years, by which time he expects to have reached the Pole, and returned to San Francisco. His companions are Dr. Chesmore, who has travelled much in Alaska; Captain Mike, who a few years ago attempted to cross the Atlantic in a vessel of somewhat similar construction to Pavy's; Watkins, a renowned Rocky Mountain hunter; and two sailors of whaling experience: in all, the expedition will consist of six men.

The latest news from the North American Expedition is contained in a letter from Dr. Bessels to Dr. Petermann, dated August 23, 1871, at which time the expedition had reached Tessinsak, the most northerly Danish settlement in Greenland, in lat. 73° 24' N., and long. 56° 12' W. Further details as to this expedition will be found in NATURE for September 19.

One of the most important and best fitted out expeditions is the Austrian one under Payer and Weyprecht, which left Tromsø in July, for the purpose of exploring the unknown region north of Siberia, to which they are prepared to devote three years. By the latest advices, about the end of July, the expedition was fairly on the road to its field of labour, and Count Wiltschek