

of chemistry, beginning the study of the carbon compounds with the aid of this manual, to gain any but most hazy ideas regarding the general scope of this branch of the science.

But notwithstanding such defects as those we have mentioned there can be little doubt that M. Wurtz's book is possessed of many admirable qualities. In place of masses of unconnected facts he presents the student with carefully-selected leading data; he may, we think, strain some of his favourite theories too much, yet he inculcates the paramount necessity of theoretical explanations; he gives prominence to generalisations, such as equivalents, combining weights, and laws of multiple proportions, nomenclature and notation, bases, acids, and salts, &c., &c., and these he develops historically with great clearness and rare felicity of illustration; and he gives just sufficient detail concerning chemical manufactures as suffices to render these intelligible to the ordinary student of chemistry.

The translation appears to be admirably executed. The book is well printed, and the illustrations are distinct. But why should one be led to believe that spirit-lamps and charcoal-furnaces are still the ordinary appliances for raising the temperature of substances in chemical laboratories?

In reading the historical notes which are given concerning most of the important compounds and generalisations of chemistry, one is almost persuaded to believe that, after all, "chemistry" is a French science."

M. M. P. M.

#### OUR BOOK SHELF

*The Geological Antiquity of Insects.* Twelve Papers on Fossil Entomology. By Herbert Goss, F.L.S. 8vo, pp. 1-50. (London: John Van Voorst, 1880.)

THIS bulky pamphlet must prove decidedly useful both to geologists and entomologists. The subject of fossil entomology has of late assumed gigantic proportions, and asserted an importance little dreamt of when palæontology first substantiated its claims as the real guide to geologists in determining the nature of many strata. Indeed, as is truly stated by Mr. Goss, the wonder is that remains of any animals so fragile as insects could have been preserved sufficiently for scientific purposes; yet we find contemporaneous with the remains of those marvellous Devonian fishes those of the earliest types of insects, chiefly only wings, it is true, but wings in such a complete state of preservation that the intricacies of neurulation can be traced; and this neurulation is in some cases so difficult to homologise with that of existing forms that a separate, supposed extinct order (*Palaodictyoptera*) has been formed (probably unnecessarily) for the reception of these remains. Mr. Goss has given detailed accounts (with copious references) of almost every described species of fossil insect from the older formations, and has contrived to very lucidly place before his readers the sequence of appearance of the now-existing orders according to the testimony of the rocks. As we ascend in the geological scale the indications become less complete, and only genera, or eventually only families, are alluded to, but always with the same copious references to authorities. It could not be otherwise. As we ascend the materials increase enormously, until at last, in the post-tertiary system, we find ourselves in the presence of remains that have been identified with species now living in the same district; and in somewhat less recent strata in North

America the multitude of fossil remains of insects is such as to place it out of the question that any detailed account could be given of them. Not the least useful feature in the work consists in the notes on the correlation of special insect-forms with the most remarkable animal and vegetable relics from the same formations.

This pamphlet has no claims as embodying the results of original research; it is a useful concentrated compilation from the literature on the subject by one who evidently has an intelligent knowledge of it both in its geological and zoological aspects, and as such cannot fail to be of service as a text-book, giving the student a clear outline sketch, and the references where to seek more detailed information. Such a work is often more useful than original essays, which, from the magnitude of the subject, can only be limited in their aim. The treatment may be a little unequal, and we think it would be possible to point out cases in which certain fossil-insects have been referred to a wrong position; but this is the fault of the original describers.

We are rather sorry to see that all notice of Amber-Insects is intentionally omitted for the present, more especially as, from the medium in which they are preserved, these are the most perfect of all fossil insect-remains. They consist for the most part of well-marked existing genera, but we think no one has yet dared to identify any amber-insect with an existing species. In connection with this subject one word of caution to palæontologists with regard to many fossil insects. We find many insects (excluding those in amber) referred to modern genera, and even among those from ancient strata. This is a convenience only; it indicates that certain fossils present the general appearance of the existing genera to which they are referred; but in the majority of instances it does not prove that they would be so referred if the remains were in the same condition as the recent materials. In most cases we think it would be otherwise.

The substance of this pamphlet originally appeared as a series of introductory papers in vols. xv. and xvi. of the *Entomologists' Monthly Magazine*, but the reprint contains additional matter.

#### LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]

[The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

#### The Opportunities of Science Masters at Schools

IN consequence of my publishing in your columns some facts on visual and other memory, I have been favoured with letters from many persons and from many countries; few however have been more acceptable than those from the masters and mistresses of schools. Confining my remarks for the present to the masters of the larger establishments, I may mention that the science masters of Cheltenham and of Winchester have promised assistance, but I write especially to acknowledge the aid already rendered to me by Mr. W. H. Poole, the science master of Charterhouse, and to make some comments thereon, in order to show how wide and yet how neglected a field for original research lies open to every schoolmaster. Mr. Poole has sent me returns from all the boys who attended his classes—172 in number. He selected certain of my questions concerning visual and other memory, he explained them clearly to the boys and interested them in the subject, and then he set them the questions to answer in writing, just as he would have set questions in the ordinary course of school-work. Lastly, he forwarded to me the replies in separate bundles corresponding to the different classes, and each paper was numbered, so that if I wanted to learn more about any of them and sent him the numbers, he

could ascertain the names of the writers. In this simple manner, by almost a single stroke, Mr. Poole has called a mass of statistical data into existence, more thorough and complete than could perhaps have been procured in any other way. I have spent many hours in analysing the answers, and find that they bear generally the marks of painstaking and veracity; they have already led me to results which appear important, but of which this is not the time to speak.

The observation I desire to make is that as every hospital fulfils two purposes, the primary one of relieving the sick, and the secondary one of advancing pathology, so every school might be made not only to fulfil the primary purpose of educating boys, but also that of advancing many branches of anthropology. The object of schools should be not only to educate, but also to promote directly and indirectly the science of education.

It is astonishing how little has been done by the schoolmasters of our great public schools in this direction, notwithstanding their enviable opportunities. I know absolutely of no work written by one of them in which his experiences are classified in the same scientific spirit as hospital cases are by a physician, or as other facts are by the scientific man in whose special line of inquiry they lie. Yet the routine of school work is a daily course of examination. There, if anywhere, the art of putting questions and the practice of answering them is developed to its highest known perfection. In no other place are persons so incessantly and for so long a time under close inspection. Nowhere else are the conditions of antecedents, age, and present occupation so alike as in the boys of the same form. Schools are almost ideally perfect places for statistical inquiries. If a census on other subjects such as this that has been made by Mr. Poole, was carried out, say once a term, or even once a year, at each great public school, what a rich statistical output we should annually witness. Or again, if a schoolmaster were now and then found capable and willing to codify in a scientific manner his large experiences of boys, to compare their various moral and intellectual qualities, to classify their natural temperaments, and generally to describe them as a naturalist would describe the fauna of some new land, what excellent psychological work might be accomplished! But all these great opportunities lie neglected. The masters come and go, their experiences are lost, or almost so, and the incidents on which they were founded are forgotten, instead of being stored and rendered accessible to their successors; thus our great schools are like mediæval hospitals, where case-taking was unknown, where pathological collections were never dreamt of, and where in consequence the art of healing made slow and uncertain advance.

Some schoolmaster may put the inquiry, What are the subjects fitted for investigation in schools? I can only reply, Take any book that bears on psychology, select any subject concerning the intellect, emotions, or senses in which you may feel an interest; think how a knowledge of it might best be advanced either by statistical questioning or by any other kind of observation, consult with others, plan carefully a mode of procedure that shall be as simple as the case admits, then take the inquiry in hand and carry it through.

FRANCIS GALTON

#### Museum Conference

PRESUMING that the object of a museum is twofold, viz., to instruct the general public through the eye and to serve as a repository of material by means of which specialists can carry on their scientific and historical researches, it must be obvious to every thoughtful observer how inadequate the machinery generally is to the end in view. A visitor, let us suppose, to the zoological department of a museum, observes a number of birds bearing a general family likeness, and a name under each specimen. Having no pictorial clue to the habits, native country, or specific distinctions of the numerous specimens, no verbal description before him, and no intelligent curator on the spot to give the information required, he goes away with a hazy impression of what he has seen, and too often with a headache. Surely there is room for improvement in the direction of the amount of information that could be conveyed by proper adjuncts to the specimens, and by grouping them according to the countries to which they belong, &c.? Many a missionary going abroad would gladly learn something of the economical and medicinal products of the country to which he is going; but in a museum in which vegetable products are grouped according to their natural orders his difficulties are increased tenfold. I can imagine no better means of improving the character of museums and of increasing their usefulness than

a conference of curators to exchange ideas and the results of their experience. With regard to the use of museums by those seeking special information, the circumstances are very different in large cities and in small towns. In cities, as a rule, the curator naturally becomes in time the depository of a large amount of special information, for which there is such a demand that time is rarely left him for the manual labour and supervision which the keeping of a museum in good order involves. In this case it is assistance that is required rather than increase of salary, although a curator should in my opinion be so well paid that he need not be obliged to resort to literary work to eke out a living.

In provincial towns the case is somewhat different. The curator has less demand made upon his time by specialists, but he needs to be well acquainted with almost every branch of art and natural history, and is often expected to be able to lecture upon any subject that can at all be included within the range of objects in the museum. Such extensive knowledge is rarely to be found concentrated in one person, and consequently one branch of natural history is often pursued to the exclusion of others, as of arts and antiquities, or *vice versa*; and it is little consolation to the naturalist who has done good local work to think that if his collection be left to the local museum it may become devoured by insects or neglected by a subsequent curator who takes little or no interest in that particular branch.

A monthly or quarterly publication would form an excellent means of communication for the exchange of duplicates, the distribution to suitable quarters of the productions of foreign countries for purposes of investigation, for the record of improvements in manipulation or exhibition, and for the results of experience in various directions. Such a publication, if circulated abroad, might be made the means of incalculable benefit to trade by suggesting uses for little known native productions and by bringing residents abroad in communication with those at home who could direct them how best to utilise the resources of newly-explored districts.

I see no reason also why museums, especially those of a technical character, should not be made in some degree self-supporting, by charging a small admission fee to visitors and a fixed fee for the identification of objects used or to be used in trade. I trust the subject of a museum conference will be well ventilated in your columns, and that the liberal offer of the Council of the Society of Arts will soon be turned to account by a preliminary meeting in the rooms of that Society. I would suggest that those who are able and willing to form an executive committee should forward their names at once to Mr. Paton, who will then be in a position to carry out a scheme which cannot fail to produce a beneficial effect upon the education of the nation at large.

E. M. HOLMES

#### Ural Crayfish

REFERRING to the notice in NATURE, vol. xxi. p. 454, of M. Malakhoff's memoir on Ural Crayfish, you will perhaps allow me, a resident among the foot-hills of the South-Western Urals, space for a few words. *Astacus leptodactylus* is found in most of the streams here, in some abundantly. The variety is that in which the cephalo-thorax and chelæ are studded with tubercles, and is accurately represented in Prof. E. Ray Lankester's Fig. 2, in NATURE, vol. xxi. p. 354. I have one before me at the present moment from a tributary of the River Bielaia, measuring five inches in length, and this is the average size. I have never seen the mountain variety mentioned in M. Malakhoff's paper. His remark that "in the Ural the natives call the freshwater Unio Rak (*Ecr. rüsse*) and the true crayfish *Rak-ryba* (*Ecr. rüsse poisson*)" does not apply to this district, for here the latter is called simply "rak" and the unio "rakovitza" and "rakovina" indifferently, general terms for a mollusc and its shell. Various opinions exist in reference to the quality of the flesh. For my own part I find it extremely insipid, and I believe any Englishman eating it for the first time would be of the same opinion; but the inhabitants of the country, who have, of course, no opportunity of tasting fresh marine crustacea, rather esteem the flesh. Englishmen staying here a long time often grow to like it in default of anything better, till I verily believe in some cases they leave the country praising it as a delicacy. This may be one of the ways in which the diverging opinions respecting its quality have originated.

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