translated into English by Prof. Everett, there has been an almost continuous stream of works upon Physics from our neighbours across the Channel. French publishers of technical works appear to be of opinion that the production of a "Traité de Physique" is an indispensable part of their duty, and that their good name will suffer unless they bring one out. France is fortunately rich in physicists, so that there are always good men to be found to do the work. The result is that each Paris season introduces one or more new books upon Physics, which are in most cases well written, and generally abound with excellent illustrations.

The "Cours de Physique" of Prof. Fernet is at once both ably written and singularly incomplete. It is intended as a text-book for the *Classe de Mathématiques Spéciales*, and as such cannot altogether be classed with the books of which we have been speaking. It is written for a special purpose, and its value to the general student is much impaired thereby.

The chapters treating of the molecular construction and of the various forms of matter is a concise digest of the modern theories of this most speculative subject, and the definitions of the solid liquid and gaseous states of matter are particularly clear. On the other hand, no reference whatever is made to the all-important subject of gravitation, so that the laws of falling bodies and projectiles, centre of gravity, and even the pendulum itself, are necessarily cut out.

Again, hydrostatics is both fully and ably treated, the law of Archimedes and the determination of specific gravities being very clearly explained.

The whole subject of heat is confined to the expansion under its influence of solid, liquid, and gaseous bodies, which occupies one-fourth of the whole book. The reader looks in vain for some reference to the laws of freezing and evaporation or of conduction and specific heat. More extraordinary still is that the entire subject of radiant heat is conspicuous by its absence, no reference being made to diathermancy or to the reflection and refraction of heat, and the dynamical theory is ignored altogether.

In Optics the laws of reflection and refraction are more fully treated than any other subject in the book, the properties of mirrors and lenses of various forms being thoroughly and mathematically considered. No reference is, however, made to dispersion, and the question of colour is left out altogether, necessitating of course the omission of the important subject of spectra and of the Fraunhofer lines. Again, double refraction and all the phenomena connected with polarisation are not even alluded to, nor are the interesting subject of the velocity of light and the beautiful experiments of Foucault, of Fizeau, and of Cornu for its determination.

Acoustics is entirely left out, and statical electricity occupies but a short chapter, in which induction is fairly treated, and the various forms of electrical machines are well described.

What is perhaps the most remarkable omission of all is that of the entire subject of Electro-dynamics. No mention is made of the voltaic battery, of the great subject of electro-magnetism and the electric telegraph, of electrolysis or of induced currents as exemplified in the Ruhmkorff coil, neither are magneto-electricity or thermo-electricity referred to.

The only explanation offered for the omission of so important a branch of physical science in a "Cours de Physique" is the following foot-note to the chapter upon Statical Electricity:—

"By the rules for admission into the *École polytechnique*—which are identical with those for the *Classe de Mathématiques Spéciales*—candidates are required to possess an elementary knowledge of statical electricity and of magnetism only. The importance, therefore, of these two subjects in the present course does not admit of their being treated as fully as those in the preceding chapters. The further study of them must be reserved for the course in the *École*, where students are required to work up the subjects of both dynamic electricity and electro-magnetism."

We may assume from this note that the other omissions to which we have referred are due to the same regulations. It is difficult to understand how such rules can exist, or what considerations could have guided those who framed them when they required candidates for admission to read up statical electricity, leaving the more important subject of electro-dynamics alone, as well as the science of electro-magnetism, notwithstanding its important applications.

From what has been said it will be seen that Prof. Fernet's "Cours de Physique" is evidently a "cramming" book for students seeking admission to a particular class which has very exceptional requirements. For that purpose it is no doubt of value, but it is practically unavailable to the general student of Physics by reason of the number and the importance of its omissions.

THE CHEMISTRY OF LIGHT AND PHOTOGRAPHY

The Chemistry of Light and Photography in their Application to Art, Science, and Industry. By Dr. Hermann Vogel, Professor in the Royal Industrial Academy, Berlin. New and thoroughly revised edition, with 100 Illustrations. (London: H. S. King and Co., 1876.)

IAST year, in reviewing in the columns of NATURE this volume of the International Scientific Series, it became our duty to point out the very serious errors in chemistry with which the translation abounded.

We are happy to find that in this "new and thoroughly revised edition," the whole of the objectionable passages have been corrected, and that the same measure of correction has been extended to the English throughout, so that the work is now a very creditable translation. With regard to the author's share of the work, we can, on a perusal, recommend it as a thoroughly good *résumé* of the principal photographic processes, and we note that the very numerous variations of the photo-printing and lithographic processes have been very fully noted and their chief points described, for, although this description of what are, as a rule, trivial variations of one or two processes may seem useless, it cannot fail to call the reader's attention to some of the vagaries permitted by patent laws in various countries. We also notice that some considerable space has been given to astronomical photography (in connection with which we would note that the name of the eminent American astronomer who produced the negative of the moon from which the frontispiece of the book is taken is Rutherford, and not Rutherford, as

printed). Slight notices have also been given of spectrum-photography, which we hope to find fuller in a new edition, and of the effect of colouring matters in modifying the action of light on various reagents, the study of which latter point appears to be undergoing considerable development both at home and abroad.

Taken as a whole, the book is an admirable guide to one who has some considerable knowledge of the subject, or for giving the general points of the art to an ordinary reader, but we do not think that it is equal to Van Monckhoven's book as a practical treatise on the art. It abounds, however, in valuable hints and suggestions, and we would recommend Chapter XII., "On the Correctness of Photographs," to the attention of everyone who wishes to become a competent photographer, whether for the purposes of Science or of Art. With regard to the latter we cannot do better than conclude with the following quotation from the chapter in question, page 129:—

"It may, perhaps, excite surprise that the writer ascribes greater truth to painting than to photography, which is generally regarded as the truest of all methods of producing pictures. It must be self-evident that this remark can be made only of the works of masters . . . the picture of the photographer is not self-created. He must test, weigh, consider, and remove the difficulties which oppose the production of a true picture. If his picture is to be true he must take care that the characteristic is made prominent and the accessories subordinate. . . . To do this he must, of course, be able to detect what is characteristic and what accessory in his original. The sensitive plate of iodide of silver cannot do this; it receives the impression of all that it has before it, according to unchangeable laws. . . . The photographer will not, indeed, be able to control his matter like the painter, for the disinclination of models and optical and chemical difficulties often frustrate his best endeavours; hence there must always be a difference between photography and a work of art. This difference may be briefly summed up by saying that photography gives a more faithful picture of the form, and art a more faithful picture of the character."

R. J. FRISWELL

OUR BOOK SHELF

Les Insectes; Traité Élémentaire d'Entomologie, comprenant l'Histoire des Espèces utiles et de leurs Produits, des Espèces nuisibles et des Moyens de les détruire, l'Étude des Métamorphoses et des Mœurs, les Procédés de Chasse et de Conservation. Par Maurice Girard. (Paris: Baillière et Fils, 1873-76.)

As a compilation this work evidences a considerable amount of industry; judging, however, by the various memoirs quoted in the first 240 pages, it would appear that the author's researches have not extended to a much later date than the year 1868, a fact which will unquestionably detract very greatly from the value of his generalisations.

The author's object being to unite in one book the classification, geographical zoology, and economy of insects, he divides his introduction into the following heads:—1. Anatomy and Physiology; 2. Instinct and Intelligence; 3. Collecting and Preservation; 4. Palæontology; 5. Geographical distribution; 6. Species and Classification; the consideration of which subjects occupies 229 pages.

Owing to the bulk of the work (which, although up to the present time it has only dealt with three orders of insects, nevertheless extends to 840 pages), we cannot strongly recommend it as a pocket companion; still the

student of entomology, particularly if he has a taste for preserved viands *warmed up*, should certainly find a place for it upon his library shelves.

The plates are clearly defined and abound in instructive details, the only drawback being that they are for the most part reproductions of the illustrations to Guérin's "Iconographie du Règne animal;" it is, however, satisfactory to note additional representations of an anatomical character, as also of certain highly interesting cave-inhabiting species.

A. G. B.

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.]

Protective Mimicry

In the last number of NATURE Mr. Murphy brings forward the following argument against natural selection, with reference to protective mimicry. He advances two classes of cases in which he urges the improbability of the occurrence of a first variation in the requisite direction. "One of these is the change of colour with the season of such animals as the ermine, which is brown in summer and white in winter. Had the ermine been either permanently brown or permanently white, there would have been nothing wonderful in it, but it seems impossible that the character of becoming white in the winter and brown in the summer could ever have originated in ordinary spontaneous variation, without a guiding intelligence."

Now Pallas as quoted by my father ("Descent of Man," second edition, p. 229 and 542) states that wolves, horses, and cattle, as well as *nine* other kinds of mammals become lighter coloured during the winter; and several well marked cases of a similar change of tint in the winter coat of horses in England have either been brought under my father's notice, or have been observed by himself. It is impossible to suppose that these instances of a similar change occurring in widely distinct animals can be put down as partial reversions to an ancestral habit of turning *completely* white during the winter months. We may therefore presume that they are due to the "direct action of the conditions of life;" we might perhaps compare them to the greyness accompanying the impaired nutrition of old age; or to that caused by injuries, e.g. in the hair about old sores on the withers of horses; or again to the extraordinary recorded case of temporary greyness of the eyebrow accompanying frontal neuralgia.

But to whatever cause these slight changes of colour in certain quadrupeds taking place at the beginning of winter are due, there can be no question that they supply the identical "first variations," whose occurrence Mr. Murphy thinks so "infinitely improbable." It is impossible to doubt that with such material to work on, a process of rigorous natural selection might develop almost any degree of seasonal change of fur. "The roe, for instance, has a red summer and a greyish white winter coat; and the latter may perhaps serve as a protection to the animal whilst wandering through the leafless thickets, sprinkled with snow and hoar-frost." If the roe "were gradually to extend its range into regions perpetually covered with snow, its pale winter coat would probably be rendered through natural selection, whiter and whiter, until it became as white as snow." ("Descent of Man," p. 542). Mr. Murphy also adduces the manner in which the chameleon, and certain fish, protect themselves by rapid changes of colour. He remarks that it seems "utterly impossible for such a character to originate in spontaneous variation." It would be taking up too much space to enter into this subject; it may, however, be worth noting that according to Pouchet, under certain conditions the changes of colour are only developed in the turbot in several days. Again J. Bedriaga asserts that various parts of the body in certain lizards are *permanently* altered in tint by exposure to the sun; and he states that the mechanism by which this change is effected is precisely the same in principle, as that to which the variations in pigmentation are due in the chameleon. Brücke and others have shown that in the chameleon the changes of tint may be produced by agencies having no connection with protection; for example, by the excitements of anger and sexual passion, by illness, and by local irritants and nerve-stimulation.