

"There was no change till about midnight," writes his niece, "and then we saw the shadow of death come softly over his face, and we knew that he had passed into the dark valley, and that the end was near; but there was no pain; only quiet sleep. His breathing again grew more faint and soft; and without a sigh, just as the clock in the great court of Trinity chimed a quarter past one, his spirit returned to God."

Sedgwick's original scientific work will be sketched in another notice. This may conclude with a word on the man himself. A stalwart figure with rugged features and brown complexion, a flashing eye, and a grand pose of the head, which always reminded me of an eagle. He called himself—men called him—ugly. This I never could understand. Few were better tellers of a story: his memory of striking details, his sense alike of humour and of pathos, were so strong. As a lecturer he was discursive, but suggestive—one who stimulated and fertilized rather than who trained. His speeches were marked by a curious play of fancy, unexpected transitions from grave to gay, and occasional bursts of eloquence, which our greatest orators might have been glad to own. As a writer he was often diffuse, sometimes laboured—the results of hurried work or unsystematic arrangement; yet he broke out occasionally into passages of singular force and vigour. For instance, the concluding paragraphs of his preface to the "Catalogue of Cambrian and Silurian Fossils"—his last contribution to literature—are worthy, in my judgment, of a place among the best extracts from English literature. He was sometimes strong and even narrow in his prejudices, as will appear hereafter; he was impetuous in temper, fierce in the fray, positively ripping up an incompetent antagonist; yet he was commonly the most genial and placable of men; he was tender as a woman to those who sorrowed and who suffered, and was the idol of little children.

We may close the present notice with the words with which Mr. Clark concludes his own part of the biography—the words of one of Sedgwick's intimate friends:—

"He was transparent and straightforward—the very soul of uprightness and honour—tender and affectionate—most generous and kind. He had a hatred of all duplicity and meanness. He was entirely unsuspicious of evil, unless it was forced upon his notice; and he expected and believed everyone to be as straightforward and truthful as he was himself. I do not think that any man was so beloved by his friends as he was."

T. G. BONNEY.

(To be continued.)

### GÉRARD'S "ÉLECTRICITÉ."

*Leçons sur l'Électricité, professées à l'Institut Électro-technique Montefiore annexé à l'Université de Liège.*  
Par Eric Gérard, Directeur de cet Institut. (Paris: Gauthier-Villars, 1890.)

THE author of this book says in his preface that when he took charge of the classes in electric technology at Liège he felt the want of a text-book which would give a clear and definite account of electrical phenomena without requiring more extensive mathematical knowledge than his pupils might be expected to possess. We think that in this respect the experience of most teachers of

electricity will coincide with that of M. Gérard. There are very few text-books on electricity in which the happy mean between utter vagueness and methods requiring the use of high mathematical knowledge has been hit; this, however, has been done so successfully in the book before us, that we think the difficulty to which we have just alluded will be almost removed. In this book we have the main outlines of electricity explained in language at once intelligible and precise, and without introducing more mathematics than every student of the subject ought to be competent to follow. In a subject like electricity, where forces have to be compared, the geometrical properties of bodies of various shapes utilized, &c., it is evident that if any numerical results at all are to be attained, some mathematics must be introduced; the question as to how much mathematical knowledge should be expected of students who, as a working hypothesis, may be assumed not to have any special aptitude for that study is one on which opinions will differ. For our part, we think that, even regarding it solely from the point of view of the engineer or physicist, such students ought to be advised to acquire an elementary knowledge of the differential and integral calculus; the possession of this knowledge will make many parts of the subject easy which without it would be difficult, and the time spent in acquiring the mathematics will be much more than saved in the time spent over the physics. In the book before us the mathematics are as plain and straightforward as possible. At the same time, M. Gérard, very wisely we think, does not scruple to use the elements of the differential and integral calculus.

The work contains more than 500 pages, of which about 200 are devoted to the theory of *Dynamos*. The remainder consists of an exceedingly clear and accurate description of electrical phenomena, the subject throughout being treated from Maxwell's point of view. The book is brought well up to date, and contains an account of most of the recent researches in electricity and magnetism; we think, however, it would have been improved by references to the places of publication of the original papers in which these researches are described, so that a student who wishes for a more detailed description than could be given in an elementary text-book might be able to refer to the original authorities for himself.

A most excellent feature of the book is that M. Gérard does not treat the subject as if an investigation was complete when it had led to a relation between a number of symbols. He applies the equations he gets to actual cases, and thus familiarizes the student with the magnitude of the quantities with which he is dealing. He commences the book with Sir William Thomson's maxim, which is so excellent in physics, though its application to other subjects might possibly cause consternation, that "we cannot understand a phenomenon until we can express it in numbers," and he acts up to the spirit of this maxim all through the book.

The book is well and clearly printed, and the author has realized the fact that it is more important that the diagrams in a text-book of physics should be explanatory than that they should be elegant.

There are one or two points which we think might be corrected in a new edition, which we are sure will soon be required. The deformation of dielectrics under elec-

tric forces, which is cited as a proof of Maxwell's theory of stress in the medium, is rather an obstacle than a support to the theory, as some dielectrics are strained in one way, and others in the opposite, while, on Maxwell's theory, the strain should all be of one kind. The statement on p. 97, that the sparking distance increases very much more rapidly than the increase in the difference of potential between the electrodes, should have been limited to the case where the electrodes are pointed; it is not true when the dimensions of the electrodes are large compared with the sparking distance. The proof of the expression for the electromotive force due to induction, on p. 170, does not seem to us to be sound; and the method of measuring the coefficient of self-induction of a coil was really invented by Maxwell, and given by him in his paper on the "Dynamics of the Electric Field," though it is not in the "Electricity and Magnetism."

We must, in conclusion, congratulate the author on having written one of the best treatises on elementary physics which it has ever been our good fortune to read.

J. J. T.

#### THE ART OF PAPER-MAKING.

*The Art of Paper-Making.* By Alexander Watt. (London: Crosby Lockwood and Son, 1890.)

THE author of this work, in the preface, expresses his thanks to certain gentlemen who have been good enough to conduct him through their mills and explain to him the various operations performed therein. From this we gather that the author is not only not a practical paper-maker, but that, up to the time of writing the book, he had but a limited and general knowledge of the subject. These conclusions are amply justified by a perusal of the book. This want of practical knowledge can hardly be wondered at, as the writer is already an authority on such widely different subjects as soap-making, leather manufacture, electro-metallurgy, electro-deposition, &c.

On the other hand, there is evidence that on the whole the author has devoted some considerable time to the reading up of his subject, though in many cases he has not consulted the latest authorities. For example, in speaking of the properties of cellulose, he quotes the opinions expressed by Mr. Arnot in his *Cantor Lectures* for 1877, since which time several additions have been made to our knowledge. We should have preferred to see more space devoted to this branch of the subject, as on the proper understanding of the properties of cellulose the scientific manufacture of paper depends.

Some of the statements with regard to cellulose are inaccurate and misleading, as for example, that "hydrochloric acid converts it into a fine powder without altering its composition," and again, that "nitric acid forms substitution products of various degrees, according to the strength of acid employed." As a matter of fact, ordinary nitric acid does not form nitro-substitution products with cellulose.

Under the head of the "Recognition of Vegetable Fibres by the Microscope," esparto—perhaps the most important raw material used in this country—is not even mentioned. The author's descriptions of the various

mechanical appliances used in paper-making are, with one or two exceptions, accurate and fairly complete. In describing the chemical processes involved, however, the author occasionally gets out of his depth. For instance, he recommends certain qualities of rags to be boiled with 30 per cent. of caustic soda. At first we thought this was a misprint for 3 per cent., but on referring to the source of the information, we found that the author had quoted correctly. Again, we are told that the neutralization of chlorine in pulp by hyposulphite, which the author says is sometimes called thiosulphite, is effected when the liquor ceases to redden litmus paper.

In giving directions for the sizing of paper, the author appears to have left out a number of decimal points. According to him 100 parts of pulp require 10–12 parts of rosin, and 20–30 parts of starch, and from 30–50 parts of kaolin. In the interest of the consumer it is satisfactory to know that such numbers are impossible.

In the chapter containing directions for the testing of alkalies, alum, &c., the following extraordinary statement occurs: "There are two principal methods of analyzing or assaying alkalies by means of the test acid—namely, volumetric, or by volume, and gravimetric, or by weight, in which a specific gravity bottle, capable of holding exactly 1000 grains of distilled water, is used."

Another instance of looseness of style occurs in the statement that "the proportion of caustic soda per cwt. of rags varies to the extent of from 5 to 10 per cent. of the former to each cwt. of the latter."

The general plan of the book also shows want of careful preparation; for example under the head of "Action of Acids on Cellulose," the author discusses the action of the strongly alkaline solution of cuprammonium.

In speaking of the origin of the wood-pulp process, the author champions the right of his father to be regarded as the pioneer. Similarly, with regard to electrolytic bleaching, we are told that the modern Hermite process, which has been successfully applied to the bleaching of paper pulp, is the outcome of an invention patented by his brother in 1851. It is perfectly true that in this patent the electrolysis of chlorides was claimed, but this in no way diminishes the credit due to those who have based on this principle a practical and successful manufacturing process.

#### OUR BOOK SHELF.

*A Contribution to the Natural History of Scarlatina, derived from Observations on the London Epidemic of 1887–88.* By D. Astley Gresswell, M.A., M.D. Oxon. (Oxford: Clarendon Press, 1890.)

THIS volume constitutes Dr. Gresswell's dissertation for the degree of Doctor of Medicine at Oxford, and is published "as a mark of distinction" by the University. It is the result of some six months clinical work at the South-Western Fever Hospital of the Metropolitan Asylums Board, and the author is to be congratulated alike upon the large number of carefully recorded observations which he has made, and upon the evidence his book affords of his careful study of the literature of scarlatina.

Between September 1887 and February 1888 Dr. Gresswell had charge of nearly 600 fever patients, and the statistical tables with which his treatise abounds are thus based on no inconsiderable number of cases. After some