

which has been fostered by his training and the habit, born of tradition and the old method of education, of looking a thing up in a book rather than discovering it by observation. One of the consequences of the movement, and one which we hope will prove permanent, has been the establishment of school gardens. Anyone who knows village schools where gardens exist knows the pride that teachers and scholars alike take in them, and their great value from every point of view. A school garden can be made to furnish a vast amount of matter for school lessons, and in addition it instils into the boys that love of gardening so characteristic of the English life of to-day.

The teacher is bound to have text-book help in managing his garden; the proper arrangement of his crops, the times of sowing, the pests or diseases likely to be troublesome, are all matters in which he needs guidance. He cannot afford to make mistakes, his scholars' parents are sometimes expert gardeners, always critical, and ever ready to derive amusement from his little efforts. The book before us will be found very useful in this respect by the teacher, and the instructions for working are quite clear and have been tested with satisfactory results in the school gardens of Oxfordshire. The book is copiously illustrated; indeed, we find a whole page devoted to the photograph of a wheelbarrow and an ordinary watering can. The teacher who intelligently follows the instruction given may quite expect his garden to be successful from a horticultural point of view, and will have little to fear from the carping village critics.

But we do not think this book represents the last word on the subject. Not enough is made of the garden as a means of education, in spite of a highly suggestive chapter by Mr. Meadon on "Discovery Lessons," which shows a full appreciation of the possibilities in this direction. We should like to have seen the book dominated by the spirit of the *experimenter*; instead, we find it dominated by the spirit of the horticultural *instructor*, whose personality comes out on every page, even to the amiable weakness for the long Latin name that we ever associate with the professed horticulturist. It must be admitted, however, that there are difficulties in the way of an experimental school garden. A garden often becomes much too personal an affair to be made the subject of experiment even by the man of science, and how shall the village schoolmaster treat it any more impersonally? The spirit of competition is there; each boy wishes his plot to be the best, and the teacher wishes the garden as a whole to be at least as good as the allotments; experiments, therefore, cannot come in, as he has no room for failures. We are aware, of course, that some schools make trials with artificial manures, but the schemes that we have seen have been entirely empirical, and designed to increase the crop rather than to yield information. We believe that ultimately the school garden will be as successful educationally as it now is horticulturally, and although the present book does little towards helping on this reform it will be found of real value for the school garden as at present conducted. E. J. RUSSELL.

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### ELECTRIC MOTORS.

*The Alternating Current Commutator Motor and the Leakage of Induction Motors.* By Dr. Rudolf Goldschmidt. Pp. viii+210. (London: The Electrician Printing and Publishing Co., Ltd., 1909.) Price 6s. 6d. net.

THOSE who are acquainted with Dr. Goldschmidt's writings will open this book with the expectation of finding a very intricate subject treated in clear and simple style, and this expectation will be fully realised. There is no padding, and consequently the reader must not skip, but if he follows the author conscientiously step by step in his close and methodical reasoning he will find his labour amply repaid.

A good deal has been written about the commutator motor, but we have never come across a treatise written so clearly and in such simple language. The simplicity of treatment is not attained by making inadmissible propositions. It is true the author takes us first through the theory of the so-called perfect motor, having no losses and no leakage, but after establishing the main principles which must count in any theory he goes on to introduce step by step those disturbing influences which are inseparable from the practically possible motor, and at every step he finds an easy way of taking account of these influences. The treatment is in the main graphical, and the author's position in the old controversy between the analytical and graphical school is shown by a passage on p. 30, which runs as follows:—

"The preference for the mathematical or graphical representation is a matter of taste, but I think that many people will agree with me that a very simple diagram, as the present one, will lead more quickly to a clear result, and can more easily be borne in mind, than a more or less complicated formula."

The first part of the book, dealing with the commutator motor, contains six chapters—introductory, the series motor, the repulsion motor, the Latour-Winter-Eichberg motor, some special types, and finally examples of motors, with views and curves of performance, but not many technical data of construction. The only example illustrated by dimensioned working drawings is a 60-h.p. motor made by the Oerlikon Co. The brevity of style is certainly commendable, but in some places it is carried too far. Thus on p. 44, when dealing with the minimum flux required for sparkless commutation, the author gives without proof a formula in which the total flux, that is, the flux per pole multiplied by the number of pairs of poles, is shown to be proportional to the square root of a fraction containing in the nominator the product, horse-power, volts, and length of armature, and in the denominator the product revolutions per minute and diameter of armature. As he says that this formula "will do good service in formulating a general idea of the amount of flux required," we may fairly expect that he should give a proof of it. Another matter in which a somewhat fuller treatment might well be expected is the Deri (not Dery, as the author writes) motor. One page can hardly be considered sufficient to deal with a motor which presents so many interesting features, and is also, from

a practical point of view, of immense importance. These are, however, minor blemishes of the author's work; the important thing is that he has given us an eminently useful and readable book on a subject which has too long been neglected in this country.

The second part of the volume under review deals in great detail with the leakage of induction motors and its predetermination. It is a careful investigation of all the different items which influence leakage, power factor, and overload capacity. The subject is highly technical, and will, therefore, mainly interest the designers of induction motors. Specialists in this branch will, however, find the author's method of dealing with the question of leakage, and especially his diagrams and tables, very useful.

GISBERT KAPP.

### OUR BOOK SHELF.

*Practical Microscopy. An Introduction to Microscopical Methods.* By F. Shillington Scales. Second Edition. Pp. xvi+334. (London: Baillière, Tindall and Cox, 1909.) Price 5s. net.

ALTHOUGH nominally this is a second edition of Mr. Scales's "Elementary Microscopy," published in 1905, yet it is in effect a new book. The first edition was not so pretentious, and did not attempt to give so much information on widely varying branches of microscopy; in fact, if any criticism may be offered, it is that now too much is attempted.

The actual practical instruction in the use and manipulation of the microscope is particularly lucid, and it is difficult to imagine that it could be expressed more clearly. The theoretical side is practically untouched, perhaps wisely so, as to have gone into the theory with sufficient fulness to have made it intelligible to the ordinary reader would have entailed a great increase in the amount of matter.

The subject of photomicrography has been touched on, and this constitutes an entirely new chapter in the book, as in the first edition no attempt was made to deal with it at all. The instructions given are clear, but are in some respects not so full as an earnest student would desire.

The recently re-introduced methods of dark ground illumination are described, and practical instructions are given in the use of typical illuminators. The various methods of illumination of opaque objects are fully dealt with, both by means of an ordinary condensing lens used in conjunction with low powers and by vertical illuminators for use with high powers.

In general, the book may be commended to any student who requires to use the microscope for ordinary laboratory purposes or for research, as one that will afford him all the practical assistance he is likely to require in the course of his work.

*Erosion of the Coast and its Prevention.* By F. W. S. Stanton. Pp. 68. (London: St. Bride's Press, Ltd., n.d.) Price 3s. net.

THIS book is a reprint of a series of articles which recently appeared in *Public Works*.

It consists of five "parts," or chapters, relating respectively to general observations on coast erosion; the agents of destruction and construction, and their effects on the English coast; land reclamation and coast defence; with an appendix on the Thames estuary. There are several maps showing the coast of England and illustrations of defence works. The maps appear to have been reproduced from larger drawings, the writing and names of places being so diminished and indistinct as scarcely to be legible, even with the aid of a magnifying glass.

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The contents of the book form an interesting summary of the condition of coast erosion and protection in England, suitable for a serial publication, but they are of too general and superficial a character to be of any use as a text-book on the subject, and contain no information of consequence that has not been more fully dealt with in books already published. The author does not appear to have made any use of the information contained in the evidence laid before the Coast Erosion Commission, and the fact of this commission being in existence is only once casually mentioned.

The author attributes the destruction of the coast, amongst other agencies, to the action of undercurrents below low water, and of submarine springs and "animal borers," and states that the consideration of such agents of destruction "leads to feelings approaching despair," and "bordering on consternation when the formation of the coast consists of glacial deposit, the London Clay and the like." It would have been more satisfactory if this theory had been supported by instances where this occurs. Although it is also stated that this class of erosion is beyond prevention, in another part of the book a solution of the difficulty is described as being effected by means of submerged chain cable groynes, and it is stated, on the authority of the inventor of this scheme, that these groynes have been laid on flat, sandy shores with excellent results. The locality where this has been done is not given, nor any particulars as to the condition of the shore before and after their use.

*The Evolution of the Sciences.* By L. Houllevigue. Translated from the French. Pp. 318. (London: T. Fisher Unwin, 1909.) Price 6s. 6d. net.

In his preface to the English edition of his book, M. Houllevigue explains that it is not his object to teach men of science anything. "I only wish," he writes, "to interest those who love science as outsiders in the general ideas which form the atmosphere of the laboratory, and, above all, to make them familiar with that superior form of common sense which is called the scientific spirit." Nine subjects are dealt with—the tendencies of chemistry, transmutation and Sir William Ramsay's experiments, the existence of matter, the interior of the earth, the sun, eclipses, the Milky Way, the organisation of matter, and the frontiers of the sciences. Each essay presents the broad aspects of the subject surveyed, and is well calculated to set students thinking about fundamental principles of science. Judging from the absence of reference to work by Joly on radio-activity in relation to the age of the earth, Hale on his solar observations, Kapteyn and Eddington on star-drifts, and other researches of recent years connected with the subjects described, the author has not kept in close touch with all the points in which progress is now being effected.

*History of Astronomy.* By Prof. G. Forbes, F.R.S. Pp. ix+154; illustrated. (London: Watts and Co., 1909.) Price 1s. net.

In this small volume Prof. Forbes describes the evolution of astronomical knowledge under three periods—the geometrical, the dynamical, and the physical. In addition, in book iii. he also describes the evolution of the instruments which have enabled astronomers of all ages to contribute to the store of knowledge on which our present-day astronomy is based.

The geometrical period covers the ages which elapsed between the time when man simply "wondered" and the time when his collected observations and knowledge had prepared the way for Kepler. This is a very interesting section, in which the methods and ideas of early astronomers are so clearly explained as to demand the attention of the general reader.