years to shape this earth and render it a fit habitation for man, man himself must not be impatient if he is required to spend a few years of arduous toil that he may unlock some of the doors which so carefully guard nature's secrets. Sixty-three years sped on their way from the time when Boussingault first endeavored to ascertain the source of nitrogen in plants, until a satisfactory explanation was reached through our knowledge of the action of root tubercles; and for more than sixty years Lawes and Gilbert sought the solution of plant nutrition without gaining the end in view.

The laws of nature are not kept on draught, as it were, to be drawn in large or small quantity, according to the demand. To present a problem to an investigator and expect an immediate solution, or an immediate practical application, is to be prodigal of a costly equipment, to sacrifice unnecessarily the best and most carefully trained intellectual strength, and to bring discouragement and invite failure. It is, no doubt, true that when a commonwealth has invested a large amount of capital in specially trained men and expensive apparatus, it is reasonable to ask for results, and with this no fault can be found. The danger lies in the fact that sufficient opportunity is not allowed for the careful working out of a problem in all its scientific aspects. Under conditions of haste and undue pressure, the results, if worth anything, are very likely to be incomplete and unsatisfactory, and in too many cases they must be subject to costly revision. I feel disposed at this time to make an appeal to the citizens of this commonwealth to secure to the investigators who will occupy this building, as well as to all others in this college, freedom for the future, from an incubus which, in the history of our experiment stations of the past, has for many years been prolific of disastrous results. I do this because this building should stand as an exponent of the best scientific work and thought, and because I know of no body of men, other than the citizens of Massachusetts, to whom such an appeal may be made with greater assurance of an intelligent hearing, and a fairer prospect that they will apply the remedy, *patience*.

And now to the students of this college, as to those who are to follow you in after years, my best hope is that as you view this building from across the campus, or as you enter its halls for the pursuit of science, you may ever hold it as an inspiration to high ideals, persistent effort and unflinching purpose; and that in whatever walk of life your lot may be cast, you will ever keep before you the example of him whose name it bears, taking up your burden of life in all cheerfulness and hope, and whatever your task may be, with the firm resolve to "Do it."

D. P. Penhallow
McGill University

Scientific Books

Memoir and Scientific Correspondence of Sir George Gabriel Stokes. Selected and arranged by Professor J. Larmor, Sec. R.S. Cambridge. The University Press. 1907. Vol. I., pp. 475; Vol. II., pp. 507.

Biographical literature, if one may judge by the notices which have been written of late years, appears to admit of criticism more easily than almost any other form of history which is not written entirely from the point of view of the student. Whenever, as in the present case, the materials are plentiful and easy of access, the reader is almost entirely at the mercy of the writer, so that the latter may, by his method, give what impression he will of the character which he desires to unfold. In any case, it is a difficult matter to settle what is of permanent value in the life of any man who has left his mark on the men of his generation or who has added to the general store of knowledge. The difficulty is not less

in the case of a man whose life-work and influence are chiefly recorded in his own publications or in those which he has inspired, and whose thoughts and ideas are chiefly of interest in so far as they have affected his work. Stokes is perhaps a typical example of this class. Whatever value we may feel disposed to place on his ideas in religion, politics or education, there can be no doubt that the subjects of chief interest are his methods of work, his ideas on scientific questions, the way in which he made his influence felt in his chosen line of work, and chiefly, the mental make-up and environment which contributed to his success.

Professor Larmor, in selecting from the materials at his disposal, has kept these principles fully in view. In order to do so, he has broken new ground by showing the form which the biography of a scientific man may take, and the innovation is undoubtedly a success. He has not attempted to write the life himself nor even to give his own ideas of what Stokes has achieved. Indeed, he has, in the two volumes, contributed little else than explanatory details, leaving the memoir and summaries to the chosen few who were most closely associated with Stokes in the various lines of thought which the latter followed. The memoir by Mrs. Laurence Humphrey, the daughter of Sir George Stokes, and appreciations by Professor Liveing, Sir Michael Foster, Sir William Huggins and the Right Rev. Bishop G. F. Browne, serve to give a just idea of the life and character and to avoid the inevitable bias of a single point of view. Nevertheless, we may, perhaps, regret the omission of a summary of Stokes's work from one so well qualified to give an opinion as Professor Larmor.

From the historical side, the life of Stokes may almost be said to be the focus of the scientific activities of the last half century. His position as secretary of the Royal Society for over thirty years and as president for five years, naturally kept him in touch with all that was going on. But even more influential on the men of his day was his unselfish willingness to give his time and thoughts to any one who wished to consult him on a scientific question or to obtain his assistance in the solution of some difficulty. His first opinions on any debatable point were rarely wide of the mark and he would nearly always throw out some suggestion or idea which would enable the recipient to get at the root of the matter. Thus his letters, and these were not few or scanty, show the extent to which scientific progress has been advanced by him. This is perhaps nearly as well shown by the letters which he received. Of these the editor has inserted a larger number than might have been expected, perhaps owing to the materials at his disposal, for Stokes never destroyed any papers, and one may fear that all his correspondents had not been so careful.

In pursuance of the two-fold object—the work and career of Stokes and the scientific history of the latter half of the nineteenth century—Professor Larmor has subordinated the chronological order of the letters to the subjects of which they treat whenever this was necessary. A glance at the dates, everywhere supplied, will always give the former. Thus, in the second volume, there is a series of names under each of which will be found a collection of letters to some one correspondent, usually on a particular subject. Even when Stokes's letters to his correspondent were not available, the replies, with notes furnished by the editor, are sufficient to show what part Stokes had played in the development of the subject. Professor Larmor has also taken much care in the selection of headlines, so that one may rapidly find what is needed by simply turning the pages over.

A few extracts from the excellent memoir of Mrs. Laurence Humphrey will best show how she has contributed those circumstances and ideas which are of chief interest. On page 10:

> He considered that many of the men who worked under him in later years had been much overtrained and that this tended to weaken their minds and diminish their power of originality. He had heard of a machine for stuffing live fowls, to which he likened the process, and sometimes said, "They are stuffed, they won't do anything more, the thinking has been done for them." He considered this to be the reason why some of

those who took very high places in the Mathematical Tripos did so little afterwards.

Again on page 34:

He had two really wicked characteristics, that he would never allow any one to help him with his work, not even permitting invitations to be answered for him, and that he kept every single thing he received by post, even advertisements.

On page 36:

Lord Kelvin's visits were occasions of enjoyment to him, and great were the discussions between them, which anything served to begin; for instance, the eggs were always boiled in an egg-boiler on the table, and Lord Kelvin would wish to boil them by mathematical rule and economy of fuel, with preliminary measurements by the millimeter scale, and so on.

On page 44:

One day especially his silence in the House [of Commons] was remarked. Some scientific question had come up and still he said nothing. When we afterwards asked him why, he answered that he had been prepared to rise, but that another person had obviously wished to speak and had said enough, although he had treated the subject from a different standpoint from that which he should have himself adopted. Only one member beat him in regularity of attendance, Sir Richard Temple, who, however, lived in London.

Amongst the series of letters, one striking omission will be noticed, the absence of any correspondence with Lord Kelvin. We are glad to learn from the preface that these suffice to form a collection by themselves and that it has been decided to publish them separately, with a memorial of the lifelong friendship and collaboration of the writers. Of the numerous scientific matters which are treated in the letters given, it is only possible to mention one or two. In a letter to Sir Henry Roscoe dated February 7, 1862, he gives his share in the history of solar chemistry, which, in view of the off-repeated rumors that he had really antedated Kirchhoff, must be regarded as settling the question. He adds, "for I never published anything on the subject and if a man's conversations with his friends are to enter into the history of a subject there is pretty nearly an end of attaching any mention or discovery to an individual." As an instance of the gradual development of the theory of waves and heavy ocean swells we may turn to a long series of letters full of details and carefully thought-out ideas.

In conclusion, one must give high praise not only to the editor for the way in which he has done his work in compiling this biography and to those who have assisted him, but also to the Cambridge University Press for a couple of volumes which are issued in a form suitable either for continuous reading or careful consultation.

E. W. B.

Yale University

American Birds. Studied and photographed from life by William Lovell Finley. Illustrated from photographs by Herman T. Bohlman and the author. New York, Charles Scribner's Sons. 1907. Pp. xvi + 256.

In an attractive volume of moderate size Mr. Wm. Lovell Finley describes in popular style the habits of a considerable number of western birds from the rufous humming-bird to the golden eagle. For the pictures, most of which are excellent, we are equally indebted to Mr. Herman T. Bohlman, who has been the author's companion in the field for many years.

We are told in the preface of this book that "each chapter represents a close and continued study with camera and note book at the home of some bird or group of birds—a true life history of each species." All who watch birds on this side of the Mississippi will be glad to see a faithful transcript of their manners on the Pacific slope, and should not be disappointed to find that their behavior is essentially the same wherever found.

The interests of the author seem to have centered in the acquisition of good photographic illustrations, and in this he has succeeded far better than most students who have gone into the field with such a purpose. Among the more noteworthy pictures may be mentioned some of the rufous humming-birds; the Maryland yellow-throat, a common but extremely shy species whose nest and eggs are rarely seen; the nest, eggs, and young of the red-tailed hawk, one of which shows the re-