her work, yet that work in itself reveals a personality which must have influenced Romanes' career profoundly, contributing to his development and to that joyous note to which his life seemed attuned until the last years of desperate illness.

Romanes was born at Kingston, Canada, May 20, 1848, and died May 23, 1894. His life, however, belongs wholly to England. His boyhood afforded little opportunity for development, and brought no revelation of his ability, nor was it until he entered Cambridge University that his strength began to show, being called forth largely by the influence of the distinguished physiologist, Michael Foster. While at Cambridge he read for the first time Darwin's works, which became the lastingly dominant influence of his life. Darwin's theory satisfied at once his appreciation of scientific exactitude and his love of broad philosophic problems. The great naturalist formed a close and touching friendship with his young and eager disciple. Their correspondence fills much of the first third of the volume. It continued until Darwin's death. It is most interesting, not only to naturalists, but also from its revelations of character.

Romanes' life was that of a student and with no very striking external events. His biography, therefore, has no element of adventure, but shows us the rôle of one who was active in shaping biological opinion on some of the most momentous questions of the time, pangenesis, the inheritance of acquired characters, the origin of instinct and the evolution of mind. His publications show the man's intellectual magnitude; his biography shows the enthusiasm, the whole-hearted devotion to truth, the generous love of fair play and hatred of personal controversy, which marked him as a character apart.

When Darwin's Life and Letters were published, the fact that he gradually lost his interest in poetry and art made so profound an impression that many began asking whether science made life so barren. It is therefore remarkable that Darwin's foremost disciple in England should have been distinguished by an almost passionate love of both music and poetry, and have also had a deep religious instinct. The story of his religious convictions is most significant. In 1873 he won the Burney prize essay on 'Christian Prayer and General Laws,' and only three years later issued his agnostic book, 'A Candid Examination of Theism.' "It is an able piece of work," says the editor, "and is marked throughout by a lofty spirit, a profound sadness and a belief (which years after he criticised sharply) in the exclusive light of the scientific method in the Court of Reason." His last work, published posthumously, was 'Thoughts on Religion,' the outward expression of the inner change by which he returned to Christian faith.

Romanes had also the poetic faculty, and some of his sonnets are striking. His personal ties were numerous, varied and close, as was natural to a man of so many endowments and of a sympathetic temperament. It is singular to note that he cared comparatively little about painting or the beauties of nature.

The material for the biography is rich in scientific interest and still richer in personal human interest, for Romanes himself was rich in gifts. We are grateful to his wife for so presenting the material that many who did not know him can learn to appreciate him and gain encouragement from his example of industry, sincerity and fortitude.

C. S. MINOT.

On Certain Problems of Vertebrate Development. JOHN BEARD. Jena, Gustav Fischer. 1896. 8vo.

This pamphlet of 77 pages is published to secure attention to the author's theory of animal development. He has claimed, in previous publications, that each individual begins with one generation sexually produced, which produces another genration asexually, the second generation becoming the adult animal. So far as has yet appeared, this theory rests upon the author's observation that the epidermis contributes, in early embryonic stages, to the production of nerve cells. The transformations of these cells *he has not followed*; hence, he concludes, they have disappeared or are transient; hence the whole embryo is a transient structure and, therefore, represents a separate generation. It may be questioned whether a failure to study the fate of certain cells in an embryo is a suf-

ficient basis to construct a revolutionary theory upon.

In the present pamphlet the author discourses at length upon the well-known fact that in all vertebrates there is an embryonic period at the close of which the anlages of all are present, but not yet differentiated. This stage he calls the 'critical stage,' and he has tabulated the condition of the principal structures in various vertebrates at this stage. This table is a welcome addition to our embryological conveniences.

We have been unable to see that the elementary facts, which the author has collated, are anything more than what is commonly taught beginners in embryology, nor to recognize that they afford any arguments to support the author's theory of 'antithetic generation.' The established conception that the embryo is designed to provide undifferentiated tissue for development rests undisturbed, and offers a sufficient interpretation of embryos, without the interpolation of an antithetic hypothesis.

The note of personal exultation predominates in the pamphlet, and the author closes with the following words: "All the things mentioned above, and many more, are in agreement with the view of an antithetic alteration as underlying Metazoon development and—where are the *facts* that are opposed to it?" And echo answers—'where?' C. S. M.

A Handbook of Rocks for use without the Microscope. By JAMES FURMAN KEMP. With a Glossary of the names of rocks and of other lithological terms.

This little book is arranged to meet the special needs of those 'engaged in ordinary field work or in mining or engineering enterprise,' and to present for their use the main facts of petrography in a convenient, compact and intelligible form. As the men who nowadays are engaged in such work or in directing such enterprise usually obtain their preliminary knowledge at one or other of our technical schools or colleges, the book will prove of especial value to students in such institutions to be used for private reading in connection with their lectures and demonstrations. A thorough knowledge of the science of petrography, as of the allied sciences, botany or zoology, can, only be obtained by the continuous use of the microscope; the book, therefore, does not pretend to be a complete petrographical teatise, but for the purpose of the class of students for whom it is intended it contains an admirable presentation of the subject.

The various rock-forming minerals are first described and the principles of petrographical classification explained. Five chapers are then devoted to the Igneous Rocks. The student's attention is especially directed to the chemical composition of the several rocks, a series of analyses of each group being presented and commented upon. The mineralogical composition and relationship of the rocks of this class are excellently summed up in a tabular form on page 18, and are also represented graphically by means of diagrams which, however, would be rendered clearer if drawn to a larger scale.

The aqueous or sedimentary rocks are then taken up and finally the processes of metamorphism are explained and the principal representatives of the group of the metamorphic rocks are described.

It seems, however, unfortunate that the author has seen proper to include among the metamorphic rocks all the products of ordinary atmospheric weathering and decay, so that common clay, if a residual product, is classed as a metamorphic rock. This stretching of Lyell's original definition of metamorphism to include all alteration products of whatever kind is hardly advisable. The products of heat and pressure and those of ordinary superficial weathering are too diverse to be properly included in the same class, even if one were not willing to go so far as Prof. Dana and eliminate from the class of metamorphic rocks all those rocks which are products of alterations which take place at ordinary temperatures.

Appended to the book is an excellent glossary of rock names, which will prove of great value to beginners as well as to more advanced students, for, as Prof. Kemp observes: "One only needs to compile a glossary to appreciate what numbers of unnecessary and ill-advised names for rocks burden this unfortunate branch of science and to convince one that the philological petrographer comes near to being the