neers, he has written many papers and books and for thirty-five years he was a college professor. His product, however, can hardly be called a really good book.

The author is chief examiner on engineering for the London Board of Education. At the request of this board a few years ago he gave to a group of teachers a series of lectures upon the "Mechanics of Building Construction, with the object of perfecting their knowledge of the subject and at the same time illustrating the manner in which it should be taught." These lectures have been expanded and form the basis of the present text.

In giving the original lectures and in this work of revision it may be conjectured that the author's duties as examiner were ever present in his mind and unconsciously influenced his style of writing. The attempt is made to explain methods of estimating the strength of all structural parts met in English building practise. The method chosen is generally that of working out particular problems rather than developing the principles involved. In those parts where some attempt has been made to develop principles, the writing seems very careless. In some cases the simplest things are explained and some of the important ones are omitted. While a considerable portion of the book naturally has to do with flexure, the simple principles of the theory of flexure are not given. It is apparent that the writer has not had the same class of readers in mind while he was writing different parts of the text.

The book will doubtless be of assistance to the men who are preparing for the examinations referred to. It can hardly be recommended to the general student. It seems, however, especially well fitted for the use of an architect or builder who has taken up his work without a proper education; his familiarity with the subjects treated will enable him to read the parts in which he is interested with some understanding; but it is a question whether such a man should be encouraged to make his own calculations unless he is willing to begin at the beginning in his study of the subject; otherwise it is almost certain that he will make mistakes due to the fragmentary character of his information.

The book is arbitrarily divided into thirty lectures for the supposed convenience of teachers who, while giving lectures upon the subject, may wish to follow the author in a servile manner. Graphical solutions are used throughout in preference to algebraic solutions; the figures illustrating the text are very numerous. The subjects treated cover fairly well the simpler problems likely to be met in building work in England; they do not include steel building construction as practised in America.

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The Evolution of the Vertebrates and their Kin. By William Patten, Ph.D. Philadelphia, P. Blakiston's Son and Co. 1912. Pp. xxi + 481.

Twenty-two years ago there appeared in the same number of the *Quarterly Journal of Microscopical Science* two papers, one by Professor Gaskell and the other by Professor Patten, both maintaining the inadequacy of all the theories that up to that time had been proposed to account for the origin of the vertebrates and advocating a new one, namely, the derivation of the vertebrate phylum from crustacean-like ancestors. For more than two decades both authors have devoted themselves to working out the details of their theories and we now have the results of their labors collected into single volumes, that by Professor Gaskell having appeared about a year ago, while that of Professor Patten now lies before us.

It must be confessed that a certain amount of scepticism will obtrude itself into the consideration of both works, not from any predilection for older theories, but on account of the fact that on a common foundation the two authors have built up systems of homologies utterly incompatible the one with the other, the result being that the reader, despairing in his search for the truth in either system, is inclined to cry with Mercutio, "A plague o' both your houses." Professor Patten's views,

however, will on the whole prove the more acceptable to morphologists, since they do not show the utter disregard of certain fundamental principles of embryology so characteristic of Professor Gaskell's theory.

Professor Patten, as is well known, traces the vertebrate phylum back to an arachnid ancestry, represented by such forms as the Eurypterids, and thence traces it upwards through the Ostracoderms to the primitive arthrodire, dipnoan and amphibian forms. It will not be possible here to discuss the various homologies of arachnidan and vertebrate structures proposed in the book, such as the identification of the arachnidan limbs with the vertebrate external gills, of the arachnidan liver lobes with the vertebrate pharyngeal pouches and thyreoid, of the lemmatochord with the notochord. Nor can more than mention be made of the comparison of the lateral and parietal eyes of the arachnids with the corresponding structures in vertebrates, or of the suggestive similarity of the endocranium and branchial cartilages of *Limulus* to those of the vertebrates. But attention may be especially directed to two points that seem to be crucial for the theory, namely, the homologies of the surfaces of the body and the mode of evolution of the vertebrate brain.

The hæmal and neural surfaces of the vertebrate descendant are homologized with the same surfaces of the invertebrate ancestor whose appendages have migrated hæmally until their basal portions form the branchial arches and whose mouth has been supplanted by a new one, so that the stomodæum no longer perforates the central nervous system. A portion of the original stomodæum has become the ependymal lining of the third ventricle, another portion of it is represented by the infundibulum and hypophysis, and the new mouth is formed from what Professor Patten terms the cephalic navel, the region where in *Limulus* the blastoderm completes its investment of the yolk and which is identified with the dorsal organ of other arthropods. The cause of the closure of the original mouth Professor Patten finds in the constriction of the stomodæum by the consolidation and enlargement of the cephalic neuromeres and the evident difficulty in the way of imagining such a "cataclysmic metamorphosis," as Professor Patten rightly calls the closure of one mouth and the opening of another, he endeavors to avoid by the suggestion that it took place "during the embryonic, or larval period, the increasing volume of the yolk sphere making . . . (it) possible." In other words, he suggests that the closing of one mouth, the development of another, the transfer of the oral arches to the hæmal side and the appearance of true gill clefts all took place in the course of the life history of a single generation! Or should it be of a single individual?

With regard to the second point referred to above, Professor Patten holds that the entire arachnidan nervous system is equivalent to the vertebrate brain, the spinal cord being a later development which does not and probably never did show a division into neuromeres. But, it may be remarked in passing, in the vertebrate brain thus formed are included the hypoglossal segments, the hypoglossal nerve being the result of the segregation of special fibers from the vagus complex supplying the gills. The hypoglossal segments are, accordingly, primary constituents of the vertebrate brain, a view entirely at variance with the results of vertebrate morphology. The arachnidan fore brain consists of that portion of the brain situated in front of the stomodæum and is composed of three neuromeres. The first of these is associated with the olfactory organ and represents the olfactory lobes; the second is associated with the lateral eyes and its mushroom bodies become the cerebral hemispheres, while behind the third neuromere lies the stomodæal commissure, which is the representative of the vertebrate cerebellum! The medulla oblongata corresponds, however, to the abdominal or branchial portion of the nervous system of *Limulus* and, therefore, there is no correspondence whatever between the neural and hæmal surfaces of the vertebrate brain as far back as the region of the cerebellum, the neural surface of all this portion of the brain, including the hemispheres, the roof of the tweenbrain,

the optic lobes and the cerebellum, being derived from the procephalic neuromeres and having been carried caudally by the enlargement of the cerebral hemispheres and the optic lobes. Surely one might expect to find some indications of such a remarkable translocation in the ontogeny of the vertebrate brain, and yet one will look for it in vain. If it has occurred we must leave it to the neurologists to frame an explanation of the connections of the cerebellum.

This translocation is an essential part of Professor Patten's theory and with its accuracy and that of the supposed new-formation of the mouth the theory must stand or fall. While one may admire the ingenuity displayed in discovering unexpected homologies, one must acknowledge a feeling that in many cases they but create difficulties greater even than those they were intended to obviate. Nor does one find in the theory any explanation of the most essential feature of the vertebrate nervous system, namely, its arrangement in longitudinal zones corresponding to the nerve components. Indeed, the theory makes such an arrangement impossible, and yet an explanation of this arrangement and associated structural peculiarities must be an essential part of any acceptable theory of vertebrate phylogenesis.

But while the theory must be adjudged to be at least "not proven," it must be pointed out that Professor Patten in the study of the problem has added extensively to our knowledge of the morphology of the primitive arachnids and of the Arthrostraca, an account of the latter, based very largely on the study of material contained in Professor Patten's private collection, forming one of the most interesting chapters of the book. The concluding chapters are a discussion of the author's views as to the phylogeny of the various vertebrate and invertebrate groups, summed up in a concluding phylogenetic tree. Even though one may not agree with the author's conclusions, this portion, as well as the rest of the book, will be found well worth careful study by all morphologists.

It is to be regretted that the author has not taken more pains to render the reading of the book less tedious. Not but that the presentation is satisfactory, barring many annoying orthographical errors, and the numerous illustrations are excellent both in execution and reproduction. But rarely is a figure to be found on the page where it is referred to and the reader becomes wearied turning backwards and forwards to find the figure to which his attention is directed, only to discover, when he has located it, that he must turn again to the end of the book to find an explanation of the lettering employed. And even then he will not always find what he is looking for. The index, too, is decidedly inadequate.

J. P. McM.

SCIENTIFIC JOURNALS AND ARTICLES

The contents of the June issue of *Terrestrial Magnetism and Atmospheric Electricity* include:

"The Penetrating Radiation," W. W. Strong.

"Results of some Long Series of Magnetic Observatory Observations: Colaba (1846–1905), Pola (1847–1909) and Potsdam (1892–1900)," reviewed by D. L. Hazard.

"The Physical Theory of the Earth's Magnetic and Electric Phenomena, No. V.: On the Formation of the Earth's Magnetic Field," L. A. Bauer.

"Magnetic Declinations and Chart Corrections in the Atlantic Ocean according to the Observations on Board the *Carnegie*, June, 1910, to March, 1911," L. A. Bauer and W. J. Peters.

BOTANICAL NOTES

Laboratory botanists who are looking for a constant temperature apparatus will do well to read W. J. S. Land's paper on this subject in *The Botanical Gazette* for November, 1911, where the descriptions are illustrated by working drawings quite sufficient to enable a good workman to reproduce the apparatus at much less cost than otherwise.

Botanists will read "The Wilting Coefficient for Different Plants and its Indirect Determination," by L. J. Briggs and H. L. Shantz (Bull. 230, Bureau of Plant Industry, U. S. Dept. Agriculture), for two purposes: (1) The very considerable amount of valuable