SCIENTIFIC BOOKS

On Growth and Form. By D'ARCY WENTWORTH THOMPSON. Cambridge University Press. 1917. 8vo. 779 pages with 408 text-figures.

In the author's own words the purpose of his book is to show "that throughout the whole range of organic morphology there are innumerable phenomena of form which are not peculiar to living things, but which are more or less simple manifestations of ordinary physical laws." This thesis Professor Thompson elaborates in a most interesting manner, developing with the aid of our fuller knowledge of physical forces and of the conditions under which they act, the mode of study initiated by Borelli many years ago, and applied, more recently, with striking and suggestive results, to several forms of organic activity by Rhumbler, Leduc, Przibram, Macallum and others. These results and many others less familiar receive clear exposition, but the book is far from being a mere compilation, a refreshing originality, being characteristic both in subject matter and in the manner of its presentation.

The contest between the vitalistic and mechanistic views of the phenomena of life has been carried on by generation after generation of men and always with the strategic results of the struggle in favor of the mechanists, as one vitalistic stronghold after another has fallen. The attack is drawing ever nearer to the central citadel and Professor Thompson's book is a massing of the attacking forces before this citadel. But the author with all his enthusiasm, recognizes limitations in his resources. "Nor do I ask of physics," he says," how goodness shines in one man's face and evil betrays itself in another. But of the construction and growth and working of the body, as of all that is of the earth earthly, physical science is, in my humble opinion, our only teacher and guide." Psychic phenomena are outside the limits of his attack. Even with this limitation, however, the book is one of the strongest documents in support of the mechanistic view of life that has yet been put forth.

It would be difficult to give an adequate résumé of the contents of a book, so crowded with facts and ideas of the greatest interest to morphologists; it must suffice merely to mention some of the problems treated. One finds an interesting discussion of the physical factors determining the size of organisms, especially interesting being the consideration of the conditions which may determine the minimum size of a living organism. This is followed by a chapter on the factors determining growth and then follow chapters on the structure and form of the cell, in which the phenomena of karyokinesis are regarded as "analogous to, if not identical with those of a bipolar electric field," and the forms assumed by organisms as expressions of the law that a liquid film in equilibrium assumes a form which gives it a minimal area under the given conditions. In this connection Professor Thompson expresses the opinion that in the simpler organism, whose form is due to the direct action of a particular physical force, similarity of form is not necessarily an indication of phylogenetic relationship.

The form of the cell in cell-aggregates is then taken up, the arrangement of the division planes being considered as illustrations of the principle of minimal areas, and the author then passes on to the consideration of concretions and spicules. This involves as an essential problem the question of crystallization in the presence of colloids, a question concerning which there is much yet to be learned. The further discussion of the forms assumed by spicules leads to their division into two groups, those of intracellular origin and those that are intercellular, linear growth of the former under restraint leading to forms which have for their mathematical basis geodetic curves, while in the case of the latter the phenomena of adsorption and the deposit of the crystalline material on interfaces are held to be sufficient for the explanation of even the marvellously complicated radiolarian skeletons.

The mathematical properties of the logarithmic spiral as applied to the forms shown

by molluscan and foraminiferal shells are then discussed and from this to a consideration of the form of horns and tusks the passage is easy. A brief discussion of phyllotaxis follows and is succeeded by a chapter on the shapes of eggs and other hollow structures, after which one finds an interesting description of the mechanical principles illustrated by the structure of individual bones and by the skeleton as a whole. The concluding chapter is an exposition of Professor Thompson's method of comparing the form of different organisms, or of their parts, by inscribing, for example, the outline of the skull of *Hyracotherium* in a system of Cartesian co-ordinates and then determining the deformation of the system necessary for a similar inscription of the outline of the skull of a horse. A graphic representation is thus obtained of the manner of growth characteristic of this particular line of evolution, and the method may thus serve in certain cases as a test of phylogenetic affinity.

This brief outline may give some idea of the scope of the book, but it altogether fails to indicate the interesting and suggestive manner in which the various topics are treated. Professor Thompson's style is marked by a clearness of expression which makes every page of interest and his book is one that may well be recommended as revealing food for thought and fields for investigation which have been too much neglected by students of morphology. J. P. McM.

Tsimshian Mythology. By Franz Boas. Based on Texts recorded by Henry W. Tate. Paper accompanying the Thirty-first Annual Report of the Bureau of American Ethnology, 1909–1910. Washington, Government Printing Office, 1916. Pp. 1037; 3 plates; 24 text figures.

The core of this paper consists of English versions of sixty-four Tsimshian myths and three war tales, written down for the author by Mr. Henry W. Tate, a Tsimshian Indian of Port Simpson, B. C., in his own language, between 1902 and the year of his death, 1914. The translations were made by Professor Boas on the basis of "a free interlinear rendering by Mr. Tate."

However, unlike most ethnologists who have published Indian stories, Professor Boas has not rested satisfied with the mere printing of "material," important as such publication undoubtedly is, nor even with the addition of comparative footnotes. He has made this work the occasion and the basis for studies of several different aspects of Tsimshian ethnology, and for what is by all odds the best investigation of the distribution of American myths and mythic elements which has so far appeared, one which goes a long way toward satisfying the often-voiced demand for a concordance of American myths. Besides the usual tables of contents, bibliography and alphabet explanatory of the characters representing native sounds used in the work, it contains an introductory description of the Tsimshian, and, best of all, a summary of the comparisons and a detailed index to the references used in the comparison, the latter prepared with the assistance of Dr. H. K. Haeberlin. In appendices III. and IV. students of American Indian languages will find useful material regarding the speech of the people among whom these myths were current. The work is also used as a medium for the publication of seven Bellabella and ten Nootka tales, by Dr. Livingston Farrand and Mr. George Hunt respectively.

The longer studies to which reference has been made are "A Description of the Tsimshian, Based on Their Mythology" (pp. 393–477), a treatise on "Tsimshian Society" (pp. 478–564), and finally the "Comparative Study of Tsimshian Mythology" (pp. 565–871), already mentioned as the crowning feature of this work.

While the value of myths as sources of information regarding the general ethnology of the tribe from which they were collected has frequently been commented upon, so far as I am aware we have here the first attempt to write an ethnological description based entirely upon them. For this reason, if for no other, the result is of interest. It shows that Tsimshian stories contain an incomplete, but upon