tions, and a broader point of view than the preceding analytical method of least squares.

Other analytical methods for period analysis are considered. The Laplace transformation, differential and difference relations, and the method of exhaustions are included.

Finally, a discussion of physical aids to period analysis—including physical concepts such as momentum, resonance, and interference; and mechanical and optical devices—serves to complete the discussion of methods of application to practical problems.

There is collected in this book a sound treatment of the basis of the period analysis of empirical functions together with detailed discussions of methods of applying these in practice.

Anyone engaged in such period analysis or interested in a sound discussion of fundamentals will find this book very useful.

HOWARD EMMONS

The Axiomatic Method in Biology. By J. H. Woodger. Cambridge, University Press, 1937. 10+174 pp.

We have here the first attempt to build a system of biology on the basis of abstract logic. The book will probably be harder reading than the author (reader in biology at the University of London) realizes—save for those few who are versed both in Russell's symbolism and in fundamental biology. Nonetheless, its writing was a task well worth doing, and one which has been done excellently. It discusses biology with precision of statement and reliability of reasoning, and clearly shows the conceptual unity underlying a number of basic branches. It emphasizes the wisdom of R. A. Fisher's remark: "I can imagine no more beneficial change in scientific education than that which would allow each (mathematician and biologist) to appreciate something of the imaginative grandeur of the realms of thought explored by the other."*

In justification of the undertaking, Woodger quotes A. N. Whitehead: "There are an indefinite number of purely abstract sciences, with their laws, their regularities, and their complexities or theorems—all as yet undeveloped." And in the preface, which calls the book an experiment, he says: "In every growing science there is always a comparatively stable, tidy, clear part, and a growing, untidy, confused part. I conceive the business of theoretical science to be to extend the realm of the tidy and systematic by the application of the methods of the exact or formal sciences, i.e. pure mathematics and logistic."

Almost the whole substance of the book is given in the symbolic statement of axioms, definitions, and theorems. As a concession to the laity, most statements are also explained, more at length, in words. Some 250 symbols are used, mainly taken from the *Principia Mathematica* or introduced for their biological usefulness; the list of these symbols constitutes, in fact, the only index.

The ten undefined signs can be interpreted as "part of," "before in time," "organized unities," "related by a succession of divisions and fusions," "cell," "male," "female," "whole organisms," "environment," "genetic properties." The most important derived concept is that of a "hierarchy," a relation (xRy) which is one-many and asymmetrical, has just one beginner and, as possible terms y, those to which this

* R. A. Fisher, *The Genetical Theory of Natural Selection*, p. ix.