practically sterile, because of a fundamental difficulty which has not yet been resolved: their *axiomatique* was not 'operation.' "

The work of Tinbergen is an attempt to test statistically a mechanism of business cycle policy, which has been developed over a period of years by the author and a group of Dutch mathematical economists. The analysis considers an array of twenty-two variables, and nine "international quantities considered as data." The variables are classified under three heads: (1) prices, such as wage rates, cost of living; (2) physical quantities, such as total employment, total output; (3) value figures, such as total wages' bill, value of exports. These variables are related by twenty-two equations which "are partly of a definitional or technical nature and partly the reflection of 'direct causal relationships.' "

The monograph is devoted to a study of problems which can be formulated in terms of the mathematical system. These problems are of four kinds: (1) to determine the movements defined by the variables for a set of historically given initial values; (2) to extrapolate the natural tendencies of the system, all conditions remaining unchanged; (3) to determine the movements after a variation has been imposed in the system by some "given policy"; (4) to find the optimum variation, that is to say, to determine the "best policy."

Tinbergen's study will be of interest to those who wish to view the full complexity of the economics problem and to see one of the most heroic attempts yet made to reduce the interacting variables to a mathematical system.

H. T. DAVIS

Grundlagen und Methoden der Periodenforschung. By Karl Stumpff. Berlin, Springer, 1937. 332 pp.

As the title indicates, this book deals with the basic ideas of determining the periodic properties of functions and sets of points, and the methods of applying these ideas to empirical functions and observed data. The author, well versed in such analysis from his meteorological work, has taken pains to explain the fundamentals of the subject in a thorough and readily understood manner. Then he goes on to explain in some detail how the fundamentals are best applied to empirical functions obtained from a recording instrument or a series of observations of some physical phenomena.

The problem of expressing a given function as a linear combination of a series of arbitrary functions is attacked by the method of least squares. The equations for the coefficients are derived in general, and the simplified formulas for the case of orthogonal function systems are set down for ready reference. Various function systems are then discussed. These consist of circular functions (which lead to Fourier series expansions), Legendre polynomials, Hermitian polynomials, and Laguerre polynomials.

As a first application, the methods are applied to the smoothing and interpolation of a series of observations.

Next, the technically very important case of the harmonic analysis of observations with one and two independent variables is treated, including several practical schemes for carrying out the detailed calculations.

An analysis is made of the possibility and practicability of expressing an empirical function in the form of a spectrum. The properties and methods of calculating the spectrum of a series of observations is presented.

A chapter on the application of statistical methods to the analysis of the periodic properties of empirical functions serves to introduce distribution functions, correla-