Moreover, the author seems to have taken care to pick examples with a live physical interest.

In the space of some 500 pages it would hardly have been possible to deal completely with all these subjects, but one is surprised at how well they have in fact been treated. The book is certain to prove popular in colleges of technology, and if a second edition is contemplated, perhaps it might also contain a section on elasticity.

It is a matter of common experience that the level of mathematical education actually attained by many "engineers and scientists" is often below what is desirable, and even below what is formally demanded by the educational institutions involved. One can only express the hope that the existence of Prof. Lambe's book will contribute something to the solution of this problem.

The Way Things Are. By P. W. Bridgman. 333 pp. Harvard U. Press, Cambridge, Mass., 1959. $5.75. *Reviewed by R. Bruce Lindsay, Brown University.*

FOR the past thirty years the interest of P. W. Bridgman in problems connected with the foundations of physics has been reflected in a stream of books and articles which have received careful attention by scientists and philosophers. The first two of his books *The Logic of Modern Physics* (1927) and *The Nature of Physical Theory* (1936) presented not only a distinguished experimental physicist's searching critique of concept-making in science but also developed a characteristic viewpoint with regard to physical theorizing to which the name "operational" has come to be attached. As the years have passed Professor Bridgman has widened the scope of this viewpoint to include other aspects of human intellectual activity, particularly with reference to the relation between the individual and society. This in turn has led him to consider more deeply the whole process of understanding human behavior in general. In the present volume he has assembled the results of his latest thinking. It is not quite correct to say that herein lies his whole philosophy, since he has made no attempt to construct a formal system. Rather he considers here in turn a whole series of puzzling topics, ranging from language and logic through physical methodology to psychology and sociology.

Needless to say the volume is as provocative of thought as all Bridgman's writings have been, and it will be examined with great interest. The very title arouses a query: is it as dogmatic as it seems to be? The author would deny any such imputation, since he evidently means the title to imply that the book is on "the descriptive level". Yet throughout the interpretations are those of Bridgman. It could hardly be expected to be otherwise since the author quite honestly takes the extreme individualistic standpoint about human knowledge, and continually stresses as his cardinal principle that "we never get away from ourselves". Those critics who in the past have called him a solipsist, will find much in the present volume to reinforce their conclusion.

The physicist will inevitably be most interested in the discussion of topics in logic, probability, and the physical sciences, including references to the nature of "truth" in science, experiment, measurement, and the concepts of quantum theory. The treatment throughout is strongly colored by the operational attitude. Bridgman appears to be as unhappy as ever with the arbitrary construction of concepts and hypotheses which characterizes modern physical theorizing (and in a certain sense has also characterized most successful physical theories of the past considered in the light of their time), and still gropes for more meaning for theories on the macroscopic level of actual experience. This is an interesting and valuable point of view. There seems however to be no guarantee of its ultimate effectiveness as a tool in scientific discovery. The psychology of scientific invention is still a mystery. We know only that there have existed clever people with ingenious ideas which they have been able to sell to other competent people for exploitation. At first these ideas look very arbitrary. Familiarity later seems to remove much of the arbitrariness, particularly if the theories actually "work".

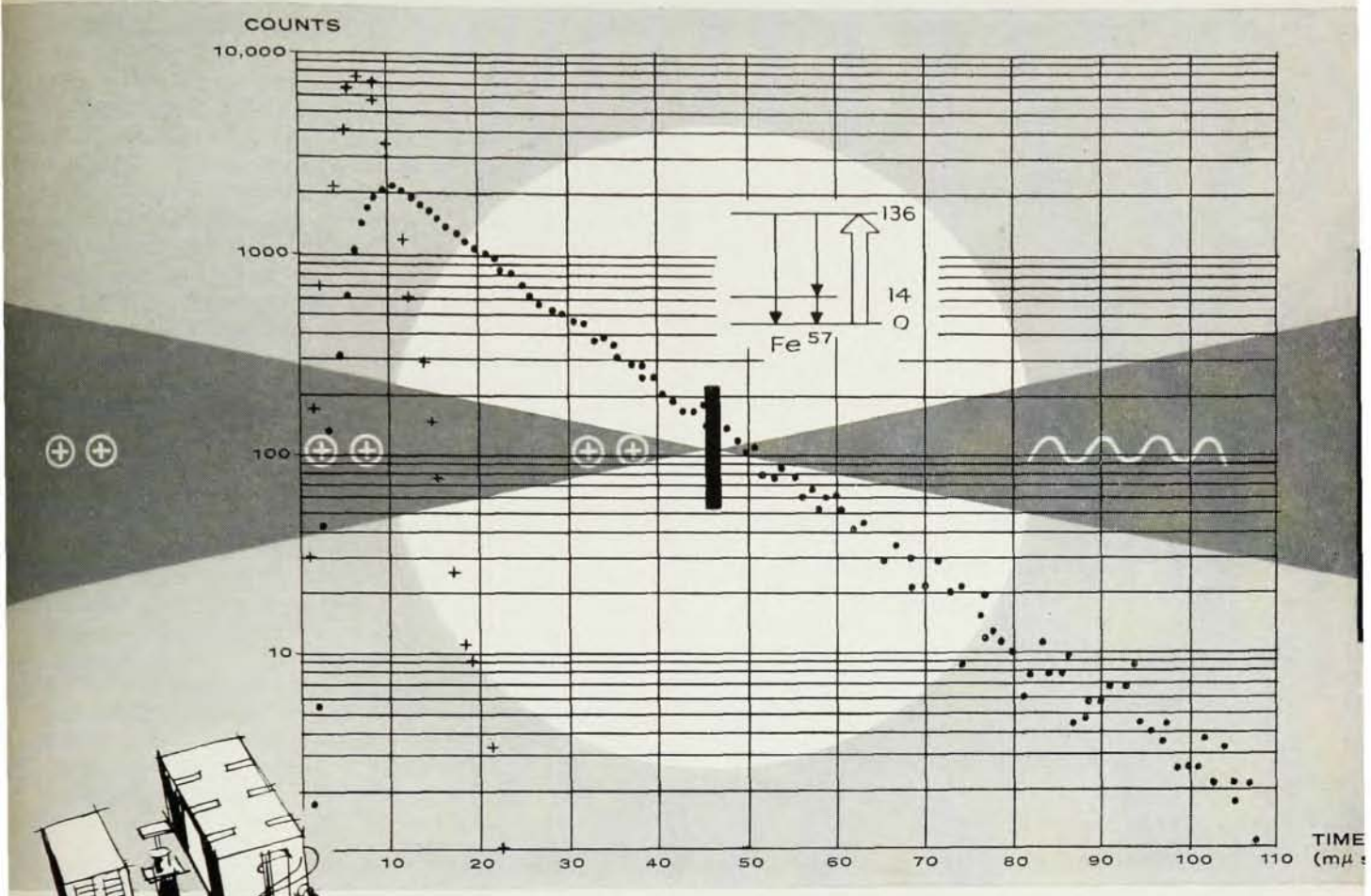
The present reviewer is not competent to judge the impact of the psychological and sociological implications of the author's point of view, as set forth at the end of his book, on the professionals in these fields. Speaking for himself he does not find the conclusions about the place of the individual in society very convincing, particularly for example with reference to the author's adversely critical attitude toward the graduated income tax and related matters. This might seem peculiar since the reviewer has always thought himself as much of an individualist as Professor Bridgman. But these are much more difficult matters than theoretical physics and demand a more elaborate analysis than the author has been able to give in the restricted space at his disposal.

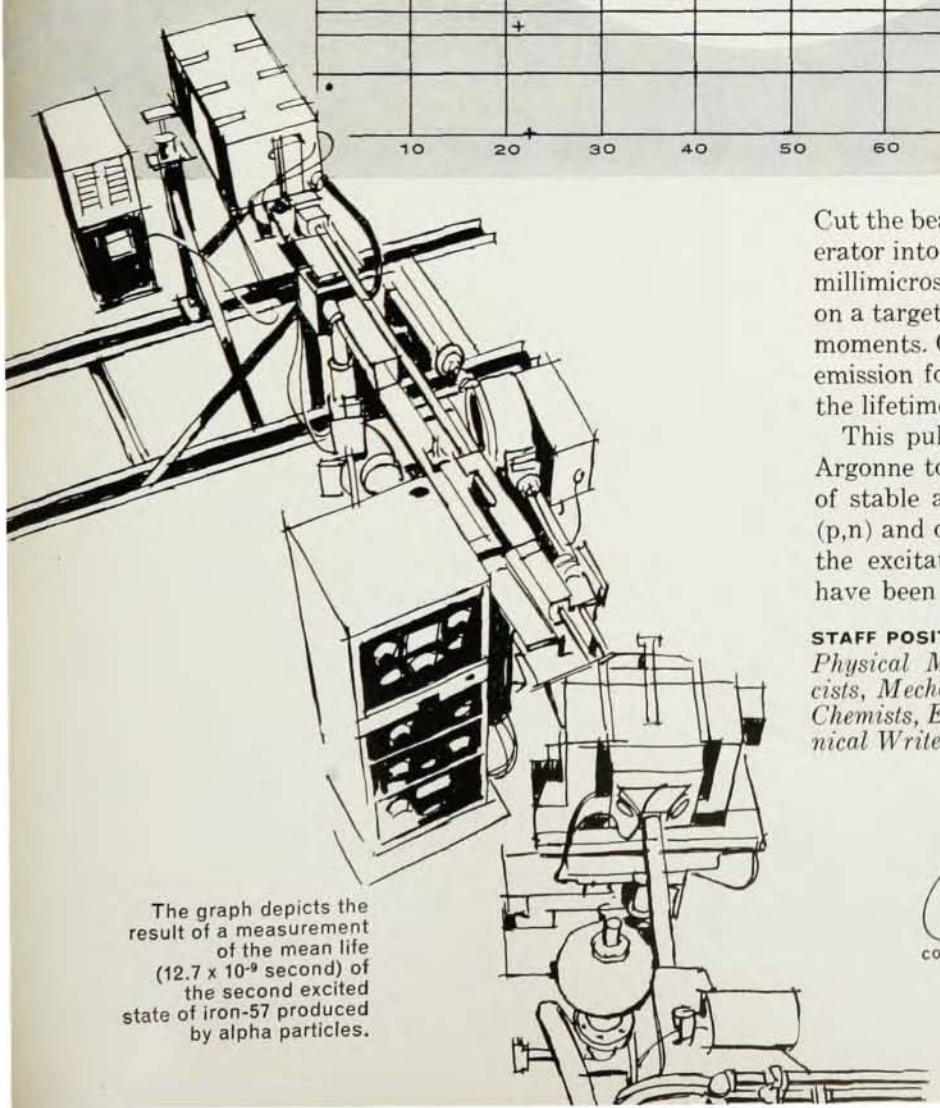
It is to be hoped that Professor Bridgman's book will be widely read by both scientists and nonscientists since it contains many ideas which must be reckoned with, expressed in vigorous and challenging fashion.

Theorie der Stabilität einer Bewegung. By Joel G. Malkin. Translated from Russian into German by W. Hahn and R. Reissig. 402 pp. R. Oldenbourg, Munich, Germany, 1959. DM 47.00. *Reviewed by T. Teichmann, Lockheed Missiles and Space Division.*

THE stability theory of differential equations is of interest not only because of its intrinsic importance in the complete theory of differential equations but also because of its growing significance in practical applications. In the latter field, it is basic for the effective application of numerical and approximate methods to the solution of equations and to the determination of stable regimes of physical systems. There are three main approaches to dealing with prob-

MEASURING LIFETIMES OF EXCITED STATES OF NUCLEI





The graph depicts the result of a measurement of the mean life (12.7×10^{-9} second) of the second excited state of iron-57 produced by alpha particles.

Cut the beam of particles from an electrostatic accelerator into pulses one millimicrosecond long and 140 millimicroseconds apart. Allow this beam to impinge on a target and produce nuclear excitation at precise moments. Observe the rate of decrease of gamma-ray emission following each pulse and from this obtain the lifetime of the excited state.

This pulsed-beam technique has been applied at Argonne to the study of a number of excited states of stable and unstable nuclei. Coulomb excitation, (p,n) and other reactions have been used to produce the excitation. Lifetimes as short as 10^{-10} second have been measured.

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lems of stability: comparison of solutions, indirect methods using auxiliary functions, and more abstract topological methods. The first two of these were thoroughly investigated by Liapunov and in many cases enable explicit answers to be given to important questions. The third is mainly the work of Poincaré and is more general in scope though it is not easily applicable to other than second-order problems.

Malkin's work is devoted in the main to the Liapunov second method and centers around the construction of the appropriate Liapunov functions which are essentially semidefinite convex functions (with respect to the time variable) of the variables entering the equation. While there is no general method for constructing these functions, enough examples are given of the appropriate functions for fairly comprehensive classes of differential equations to enable the method described to be used in a variety of practical problems.

This is a mathematics book but designed to enable the reader to solve practical problems. A selected number of examples are worked out in an extended fashion and the general treatment goes to some pains to bring out the underlying concepts of the method. The exposition transcends questions of stability alone—in particular, full treatments are given of singular and degenerate cases which show how general methods must be modified to take care of the special circumstances. Among the features particularly worthy of note is the analysis of second-order systems using the methods of Poincaré and Liapunov and an extended discussion of equations with periodic coefficients indicating how their regions of stability are to be established.

Because the methods used are so powerful, the author has been able to produce a valuable book from the point of view of mathematical and practical interest with hardly any reference to non-Russian mathematicians. The serious reader will probably find it worthwhile at least to glance at Cesari's review, "Asymptotic Behavior and Stability Problems in Ordinary Differential Equations", in the *Ergebnisse der Mathematik* series in order to assure himself of the contribution of Western mathematicians to some of these problems and to recognize the existence of other topics of interest in this subject.

Fonctions analytiques—Equations intégrales. Vol. 1 of Le Calcul différentiel dans les Espaces de Banach. By Aristotle D. Michal. 150 pp. Gauthier-Villars, Paris, France, 1958. Paperbound $7.30. *Reviewed by C. M. Ablow, Stanford Research Institute.*

THE tendency toward abstraction and generalization characteristic of much of modern science is nowhere stronger than in mathematics. Established theorems are examined for excess hypotheses, and attempts are made to exhibit theorems as special cases of more general facts. For example, it is a classical theorem that the only continuous functions $f(x)$ satisfying $f(x+y) = f(x) + f(y)$ are constant multiples