Einstein's theory of gravitation. The latter article includes the interesting parable of the flat fish that travelled on curved paths in the vicinity of a hummock in the sea, and attributed the effect to a force field. Discussions of matter extend from Lavoisier's account of different kinds of air, to Powell's survey of different kinds of elementary particles. Schrödinger provides an interesting analogy to illustrate the statistical nature of particle physics, and the different statistics applicable to different situations.

When a scientist is asked to recommend a book on science to a lay friend he is anxious to choose one that suits his conceptions of science and of his friend. He will find that this volume presents science as an intellectual activity of a high order, a rigorous discipline conducted not simply by technicians but by men of imagination. These impressions are fortified by several selections on the nature of scientific activity and its consequences in society and technology.

Ordinary Differential Equations. By Wilfred Kaplan. 534 pp. Addison-Wesley Publishing Co., Inc., Reading, Mass., 1958. $8.50. *Reviewed by Peter L. Balise, University of Washington.*

With the increasing emphasis on mathematical analysis in science and engineering, this reviewer (a mechanical engineer) welcomes Dr. Kaplan's book. It was written for the student of science or engineering, with special reference to instrumentation and control. In particular, Dr. Kaplan follows the input-output concept, thus treating the differential equation as a representation of the response of a system to various inputs. This is directly applicable to the use of transfer functions and block diagram algebra for systems analysis. At the same time, the book is mathematically rigorous and appears suitable for a general introductory course in differential equations.

Illustrative of the author's approach is his presentation first of a "transient" and a "steady state" solution; not until later does he introduce the term "complementary function". It is this reviewer's experience that "complementary function" connotes little to the beginning engineering student. However, care must be taken to show that the transient part is literally only part of the solution, unlike the steady state; otherwise some students will obtain nonhomogeneous linear equation boundary constants as if the equation were homogeneous. Similar comments apply elsewhere; Dr. Kaplan's approach is excellent, but often should be supplemented by the instructor's clarification.

In addition to topics normally covered in an introductory text, the book includes other material appropriate to its special aim. Finding the roots or their signs for algebraic equations, and the question of stability, are discussed in some detail. There are very clear explanations of responses to the various standard types of inputs, and of high-order systems produced by low-order systems in series. The Laplace trans-

formation is presented, but rather briefly to be of much use; of course a real appreciation of its mathematical significance would be beyond the scope of this book, but for an introduction to servomechanisms one would wish for considerably more than is included. Matrices are covered concisely and well. There is a chapter on numerical methods, as an introduction to digital computer programming. Regarding the increasingly important nonlinear systems, the describing-function method is not covered, but an excellent chapter on phase-plane analysis shows clearly that much can be understood of a differential equation by methods yielding other than its actual solution.

There is brief mention of analog computers, and in his preface Dr. Kaplan suggests a course outline, noting that he devotes two periods to analog computer demonstrations. This reviewer strongly supports such use, having found that an analog computer can serve as a living blackboard, showing in minutes what would otherwise require many words or pictures. With mathematical rigor leavened by illustrations, as in Dr. Kaplan's book, and use of an analog computer if available, the instructor who is sympathetic to the non-mathematical major can present to him a meaningful course in differential equations.

Reason and Chance in Scientific Discovery. By R. Taton. Translated by A. J. Pomerans. 171 pp. Philosophical Library, Inc., New York, 1957. $10.00. *Reviewed by Charles Süsskind, University of California.*

A highly original study of the relative roles of active purpose, change, and error in discovery and invention, Taton's work has been put into splendid English by A. J. Pomerans.

In a recent issue of *Discovery*, Lord Halsbury remarked (apropos of a review of *The Sources of Invention* by J. Jewkes, D. Sawers, and R. Stillerman, recently published in London by Macmillan) that "it is surprising how little objective study we give to the mentality and career of inventors"; and indeed the literature of investigations into the nature of scientific discovery is quite sparse. The most one finds are generalities such as Pasteur's oft-quoted remark (originally made at the opening of the Lille Faculté des Sciences in 1854) that *"dans les champs de l'observation, le hasard ne favorise que les esprits préparés"*.

A possible exception can be found in the realm of mathematical invention, which has occupied psychologists for half a century, ever since they heard Poincaré's now-famous lecture on the subject. This lecture appears in Poincaré's *Science and Method* (recently reissued as a paperback by Dover), and the present author, himself a mathematician, draws heavily on his famed predecessor's analysis. But Taton is necessarily on his own in discussing the other sciences, both theoretical and experimental, and he makes a valiant —and on the whole, highly successful—attempt to initiate a series of investigations into the workings of the inventive mind. Writing without prejudice toward