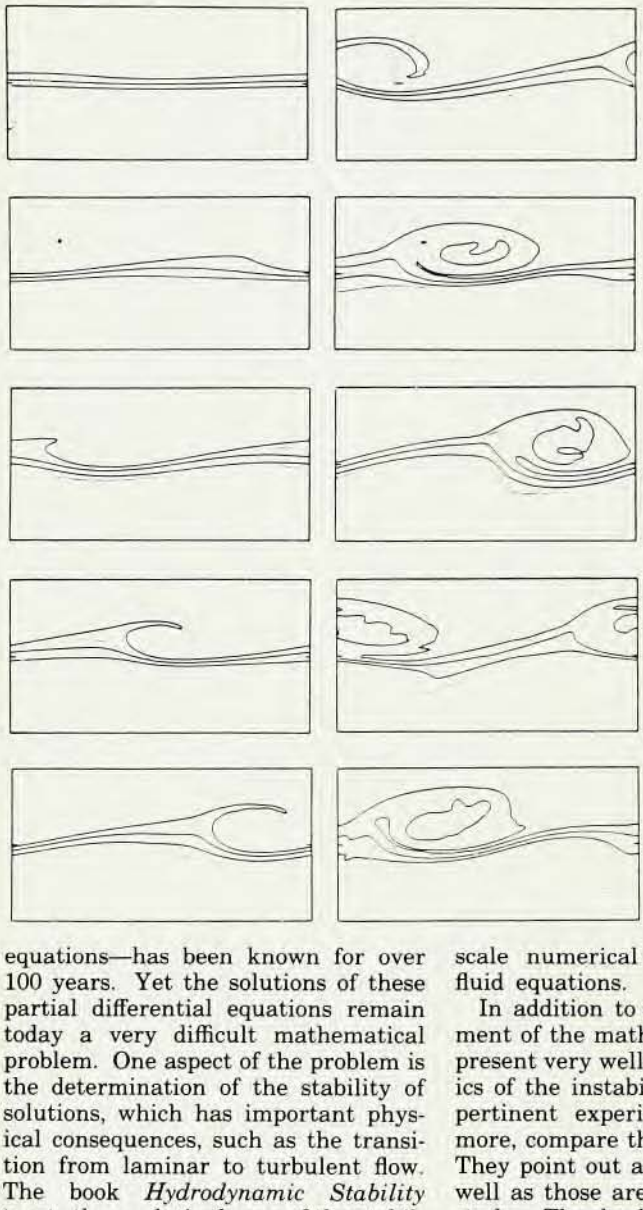

An unstable wave of the kind discussed in the book reviewed here. (Courtesy Norman Zabusky.)

equations—has been known for over 100 years. Yet the solutions of these partial differential equations remain today a very difficult mathematical problem. One aspect of the problem is the determination of the stability of solutions, which has important physical consequences, such as the transition from laminar to turbulent flow. The book *Hydrodynamic Stability* treats the analytic theory of the stability of fluid flow.

The most highly developed method used to find stability is provided by linear theory. The theory calls for considering infinitesimal perturbations about a known solution and linearizing the equations. The stability is determined by the normal modes or solutions with an experimentally determined time behavior. The present book considers three problems in great detail to illustrate the fundamental ideas and concepts of this theory: Bénard convection or thermal instability, Couette flow or rotational instability, and Poiseuille flow or shear instability. In addition, there is a chapter on nonlinear stability. Because this subject is not widely understood, the book is particularly welcome. The authors give a very nice discussion of the concepts now being developed to deal with stablity. The book restricts itself almost entirely to analytical theory and mentions little about direct large-scale numerical calculations of the fluid equations.

In addition to a very careful treatment of the mathematics, the authors present very well the underlying physics of the instabilities. They describe pertinent experiments and, furthermore, compare theory to experiments. They point out areas of agreement as well as those areas that need further study. The book contains extensive references, from current research back to the fundamental contributions of Lord Rayleigh in 1879 and other pioneers.

This is an excellent book for applied mathematicians and physicists interested in hydrodynamics. Problems at the end of each chapter and references to educational films of demonstrations and experiments on fluid flow also make this book well suited for graduate students.

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Biology and Quantum Mechanics

A. Davydov
220 pp. Pergamon, New York, 1981. $45.00

Aleksandr S. Davydov is well known and respected for his work in quantum mechanics, especially exciton theory. This book, however, has very little to do with quantum mechanics except for its brief explanation of chemical bonding and molecular theory in chapter 2 and its exposition of quantum-mechanical energy migration theory in chapter 7. It is mainly a very interesting attempt to summarize biochemistry and biophysics for scientists not already expert in biology, including physicists.

My own background is physical chemistry, and I have had to learn what biology I know as best I could over the past 20 years. While this book did not have much that was new to me in biophysics, it did provide Davydov's often fascinating summaries of the field. It is both comprehensive and quite compact—practically an outline. It should be quite useful to physicists and chemists intending to enter biology, who usually need a period of getting acquainted with it to understand what are the important current problems before they have a good chance to make significant contributions. Davydov's outline supplies much of the material they must become familiar with. While he gives an overview of present status and activity, he is also careful to point out problems still needing solution. There are indeed many challenging problems in biology whose solutions will require all types of skills, probably many not yet developed. Biology also appeals to one's interest for the kinds of structure its processes depend on. They are not just liquid or gas or crystalline structures, like those in chemistry or physics, but individual and purposeful. For example, a protein molecule may be designed with a shape and placement of electrical charges and with hinged joints such that it can recognize and grasp and alter in some predetermined way the type of molecule it acts upon.

In one particularly interesting chapter, on the structure and movement of muscles, Davydov introduces his soliton theory of muscular action. This is not yet an "accepted" theory, but it is interesting and clever. In another chapter he explains solitons in quantum-mechanical detail and explains the difference between them and excitons. He suggests that the α-helices of proteins should be able to transmit vibrational energy over their length or store it for long times as solitons, and that these transmissions could be initiated by chemical reactions, such as hydrolysis of ATP but not by absorption of radiation.

The book has limitations. Anyone concentrating on a particular area of biology will need more detailed information than can be put into a book of this size. A notable omission is the absence of the "cycle of *S*-states" shown by Bessel Kok and Pierre Joliot to be involved in the release of O_2 during photosynthesis. In addition, errors seem to be present in the usual abundance for a typescript. Some are typographical, and some appear to be a matter of translation. Most are readily apparent to an expert but could be confusing to a novice.

The only books remotely similar to this one that come to mind are two that deal more fully with the mechanics of electron transfer processes, but otherwise do not cover the wide range of material in Davydov's book. They are *Charge Transfer Processes in Condensed Media* by Jens Ulstrup (Springer-Verlag, 1979) and my forthcoming book *Quantum Mechanical Tunneling in Biological Systems* (Cambridge University Press), which is a revision of a paper of the same name published in *Quarterly Reviews of Biophysics* **13**, 387 (1980).

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A World on Paper: Studies on the Second Scientific Revolution

E. Bellone
220 pp. MIT Press, Cambridge, Mass., 1980. $14.95

Enrico Bellone's book, first published in Italian in 1976, examines "the transition from classical mechanics to the modern view of the physical world." Predominantly a 19th-century development, this "second scientific revolution" runs, in Bellone's chronology, from 1687 (Issac Newton) to 1913 (Niels Bohr) and, in fact, still continues. The author intends his story to vindicate the autonomy of science (and the history of science) against the supposed claims of unnamed philosophers to reduce it to some predetermined scheme. Bellone repeatedly attacks the view that physics in the 18th and 19th centuries was guided by scientists' attachment to "mechanism" (involving both a materialist ontology and a particular methodology) and that "the roots of contemporary physics . . . lie in a philosophical verdict against mechanism itself and in a deep-seated crisis of physics, which verdict and which crisis occurred in a relatively short period of time around the turn of the century."

The book's tenor is critical, or rather polemical, since Bellone consistently refuses to engage seriously the simplistic views he opposes or even to name their authors. Equally frustrating is his failure to define the essential characteristics of the classical mechanics or modern physics whose evolution he wishes to describe. Nor does he tell us how to distinguish "physicists" from "philosophers"—as his thesis of the irrelevance of philosophical criticism to the development of modern physics requires—in a group that includes Ludwig Boltzmann, Albert Einstein, Ernst Mach, Max Planck and Henri Poincaré. Bellone's overriding desire to explode the consistently unattributed notion that physicists' attachment to a monolithic "mechanism" guided the development of 19th-century physics leads him to deny the label "mechanist" even to Boltzmann and Lord Kelvin, in which case the word simply loses all meaning.

Bellone's concept of a scientist's "dictionary"—the interconnected set of theories, ideas, assumptions, techniques, and the like that the scientist entertains—may not be as original as he and Stillman Drake (who provided a foreword) would have us believe, but it is surely useful. Bellone quite correctly insists that scientists choose different strategies from an evolving "dictionary" as they try to come to terms with specific problems. Unfortunately, his polemical preoccupation has apparently deflected his attention from what he elsewhere recognizes are the crucial