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others who have written on the subject of peer review—including Rustum Roy. Selecting from among some of the harsher judgments on peer review, we read about the theft of ideas; the unwillingness of scientists to take risks; discrimination against those who have no scientific–political connections (the Old Boy network); priority score inflation; promotion of mediocrity; stifling of innovative research; faddishness; the sheer inefficiency and wastefulness of peer review; the lack of accountability to the public; and so on. It is a merit of the book that although the authors share and articulate some of these dark views, they present their opinions analytically and do not hesitate to take the critics to task when they think it necessary. This combination of criticism of peer review and criticism of the critics makes for some vigorous writing.

What is insufficiently pursued in the book are flesh-and-blood examples of great scientific or policy failures that might plausibly be attributed to our practices of peer review. The careful, detailed analysis of a handful of real historic episodes—consequential ones—might well teach us more than reams of survey questionnaires and citation counts.

It comes as something of a surprise toward the end of the book, after all that slashing away at peer review, when the authors come out with their own reform proposals, which are in fact quite modest. The general framework of peer review should be preserved, they state, but with greater provision for rejoinders, the removal of referee anonymity and greater rewards and professional recognition for dedicated refereeing.

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Instabilities and Fronts in Extended Systems

Pierre Collet and Jean-Pierre Eckmann
Princeton U. P., Princeton, N. J., 1990. 196 pp. $29.50 hc
ISBN 0-691-08568

The formation of patterns and instabilities in dissipative systems that live on an infinitely extended space domain poses a number of important and challenging problems. In particular, for the theoretically inclined physicist who seeks to understand on a mathematical basis, most of the central questions are far from solved. In general these systems exhibit bifurcations, where a continuum of modes becomes unstable, and thus the process of new length scale generation is no longer discrete. Multiple scaling methods lead in a formal way to the Ginzburg–Landau equations, which have had a remarkable impact on our understanding of the transition to chaos. However, their justification on a rigorous basis can only be expected on a finite but large interval of time, as recent investigations have shown.

The declared purpose of this book, by Pierre Collett and Jean-Pierre Eckmann, is to tackle some significant problems and to treat bifurcation and dynamics of dissipative systems in extended domains over all times. In contrast to the many *ad hoc* solutions of special problems, the authors try to stress a more general and systematic point of view. In fact throughout the book this intention is distinctly felt. The examples are well chosen and reflect the general structure without succumbing to the temptation of a too general or too technical presentation. The book gives a fine overview of the present state of the subject, not in the sense of a comprehensive monograph, but rather as a quick, professional picture of the main advances and the actual questions to be answered. It contains a short introduction to the now classical aspects of bifurcation and the local dynamics in the neighborhood of critical states. At the same time it is a guide to the new boundaries, eager to inform about the most recent relevant literature.

A few remarks on the content may be in order. The general theme is played by the Swift–Hohenberg equation, which is of fourth order in the space variable, has a translational and reflectional symmetry in space and models some real dissipative systems, such as the Taylor–Couette system in hydrodynamics. The reflectional symmetry can be broken in a moving coordinate system, which again can cause convective instabilities and new types of bifurcation. While these bifurcations can be studied in the context of perturbed reversible systems, the analysis of the nearby dynamics requires new methods. In the case of bifurcated space-periodic solutions, a nonlinear version of Bloch or Floquet theory is developed to describe their time behavior—in particular, their stability.

The book is most interesting when analyzing the dynamics of fronts. These fronts are solutions that connect a stable equilibrium to an unstable one and propagate into the latter region. The analysis given for the Swift–Hohenberg equation is independent of any type of maximum principle and is therefore applicable to a wide range of systems.

The book is essentially self-contained for a reader with some basic knowledge of bifurcation theory and higher analysis. The less prepared user will find a well-chosen sequence of elementary but significant examples and a good guide to the literature.

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Polarized Light in Optics and Spectroscopy

David S. Kliger, James W. Lewis and Cora E. Randall
Academic, San Diego, Calif., 1990. 304 pp. $64.50 hc ISBN 0-12-414975-8

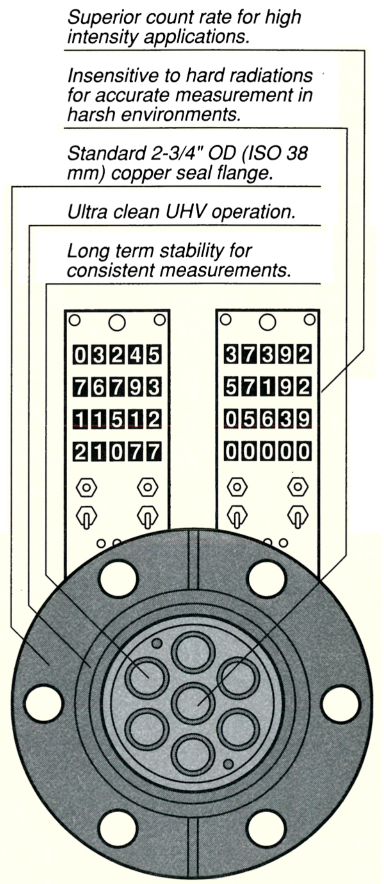
The polarization of light is of considerable interest and has broad applications in virtually every branch of science and technology. Therefore the appearance of a new book in this field is welcome. The authors of this book are chemists of good standing, although they are relatively unknown to the optics community. A principal reason for writing this book, according to the preface, is that *Polarized Light* by William Shurcliff (Harvard U. P., Cambridge, Mass., 1962) is out of print and hence is not easily accessible. This argument is weak at best. Shurcliff's book, which remains the most lucid general exposition on polarized light, is readily available in many university libraries (for example, I was able to find copies at both Tulane and the University of New Orleans) and a student edition of the same book, which Shurcliff coauthored with Stanley Ballard, was published by Van Nostrand in 1964.

Several other books on polarized light have also appeared in recent years, including *Polarized Light and Optical Measurement*, by D. Clarke and J. P. Grainger (Pergamon, New York, 1971), *Ellipsometry and Polarized Light*, by R. M. A. Azzam and N. M. Bashara (North-Holland, New York, 1977) and *Matrix Theory of Photoelasticity*, by P. S. Theocaris and E. E. Gdoutos (Springer-Verlag, New York, 1979). This book does not mention any of these prior works or the numerous edited volumes and conference proceedings that have been published on polarized light, ellipsometry and polarimetry; nor does it refer to the valuable book-length (217-page) review "Crystal Optics" by G. N. Ramachandran and S. Ramaseshan in volume XXV of *Handbuch der Physik* (Springer-Verlag, Berlin, 1961). The absence of a credible bibliography diminishes this book's value as a reference.

As its title indicates, this book consists of two parts. The first part, "Polarized Light in Optics," chapters 1–5, contains less than one would expect under such a general heading. It is concerned mainly with three mathematical tools for the description of polarized light, namely the Jones calculus, the Mueller calculus and the Poincaré sphere. This section also includes some elementary pictorial representations of polarized light and brief descriptions of some of the basic devices that control polarization. There is little that can be considered new here, and similar material is readily available elsewhere. It does not discuss such current topics as polarization aberrations in optical systems, polarization optics of liquid crystals and fiberguides, magneto-optical recording and readout, optical isolators, and Q switches. Methods for measuring the state of polarization of light are also not to be found in this book.

The second part, "Polarized Light in Spectroscopy," chapters 6–8, is likewise too brief and narrow to serve as a general reference in this area. It mainly covers spectroscopy of aligned or partially aligned molecules in suitable hosts, a topic covered much more comprehensively in the book *Spectroscopy with Polarized Light* by J. Michl and E. W. Thulstrup (VCH, New York, 1986). The second part has better references than the first, but they are still few—fewer, for example, than in the authoritative review "Optical Spectroscopy of Oriented Molecules" by John Schellman and Hans Jensen (Chemical Reviews **87**, 1359, 1987).

An evident shortcoming of this book is that its two parts are disconnected. In particular, the tools developed in the first part are not at all demonstrated in the second. The reader will not see a Jones matrix, a Mueller matrix or the Poincaré sphere at work in chapters 6–8. Even the term "degree of polarization" has different definitions in the two parts of the book. Many topics in spectroscopy that would have fit nicely in the second part are omitted. I mention two examples: determination of vector magnetic fields in the solar atmosphere from the measured wavelength variation of the four Stokes parameters across a spectral line and the use of spectroscopic ellipsometry for the characterization of surfaces and thin films. (The importance of spectroscopic ellipsometry was underscored when David Aspnes received the 1987 Wood Prize of the Optical Society of America.)



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