A cholesteric liquid crystal will show its "fingerprint" or "focal conical" when subjected to a low frequency, medium-strength electric field. The photograph is from the Laboratoires d'Electronique et de Physique appliquée, the French member of Philips Research Labs.

prehensive but uncritical compendium of all that had been said about liquid crystals up to 1962, de Gennes's is a book emphasizing theoretical ideas. It starts with the basic folklore of liquid-crystal phenomena, but rapidly moves on to concepts such as order parameter and symmetry of liquid-crystal phases. The treatment of static and dynamic properties of the director field in nematics is excellent. The author describes the different types of defects, called "disclinations," and illustrates them with remarkably clear photographic examples. The theory of hydrodynamic motions linking the director and mass flow is well presented and thoroughly explained. There are a good number of solved problems to make the treatment useful for students. The last parts of the book contain descriptions of light propagation in cholesterics, and of the smectic phase-superconductor analogue which was one of de Gennes's own major contributions, as well as other significant principles involved in understanding these other liquid-crystal phases.

The book is not an encyclopedia encompassing all we know about liquid crystals. But it has all the important ideas, carefully thought out and well presented for student and researcher alike. It will be profitably read by all those who want to know what liquid crystals are about.

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Linear and Nonlinear Waves

G. B. Whitham
636 pp. Wiley, New York, 1974. $22.50

In the long history of wave phenomena, many books have been written about special waves and special aspects of special waves, but very few authors have tried to present a generalized analysis. The brief 1952 book, *Waves, A Mathematical Account of the Common Types of Wave Motion* by Charles Coulson (Oliver & Boyd, Edinburgh) was a well known early attempt at this, but actually resulted in a grouping of only slightly related essays on several different wave varieties.

Gerald Whitham has now attacked this problem in an elegant and thorough manner. He divides solution approaches into two classes: those for waves that obey a hyperbolic system of differential equations, and those that are described by a function propagating in a field governed by elliptic equations such as the Laplace equation together with boundary conditions. The latter class, one not widely recognized by physicists, he terms "dispersive" waves, because their dispersion relation is central to any solutions. In neither class does he restrict his analysis to linear waves alone, but proceeds successively through linearized treatments of nonlinearities to an examination of methods for dealing exactly with non-linear hyperbolic equations, and with non-linear behavior of dispersive waves of large amplitude. Among the non-linear effects dealt with are such intriguing topics as wave hierarchies and solitary waves. Contributions as recent as 1972 are included, while older methods such as geometrical optics and the eikonal equation are not ignored, but firmly dealt with.

Every scientist or engineer who must deal with waves in situations ranging from the ocean's surface to the generation of optical harmonics will almost certainly find something here to add to his arsenal of methods. The book is replete with exemplary solutions. Traffic flow, flood waves, bores, glaciers, sound waves, ocean wave guides, MHD waves, shock waves, sonic booms, ship waves anistropic media, Stokes waves and solutions of the Burgers, Klein–Gordon, Sine–Gordon, Kortewg–deVries, Boussinesq, and cubic Schrödinger

equations are a few samples of the breadth of example that Whitham includes. The book is a clear guide for self-study, but will be equally desirable as an advanced text.

The author is well qualified for his task having made numerous and various original contributions to the field over the past 25 years. He is currently professor of applied mathematics at the California Institute of Technology.

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Superconducting Machines and Devices: Large Systems Applications

S. Foner, B. B. Schwartz, eds.
692 pp. Plenum, New York, 1974. $39.50

The editors are to be congratulated for their organization of this timely and successful summer institute and the subsequent publication of the proceedings. They chose a prestigous international advisory committee and, with this help, 23 of the more active and prominent people working in this area to deliver the lectures and prepare the written material. In most cases, the authors have pioneered in the exciting developments following the 1961 discovery of the high-field properties of niobium tin and contributed significantly to the many conferences and growing body of literature on this subject. Consequently the book is up to date and authoritative.

The work will be helpful to students in applied superconductivity and engineering, to serious workers in the field and to those scientists and engineers wishing to familiarize themselves with current progress in this technology. Another way to view this book is to consider it as a preview of some of the technologies that will develop and mature in the post-industrial societies of twenty to thirty years from now. It should also help to revitalize university courses in power engineering which have tended to become stale in past decades.

The energy crisis and the vast expenditures contemplated to meet future energy needs make power engineering, transportation and industrial growth, among the most challenging fields to which a growing number of advanced technologies will be applied. These include thermonuclear fusion, magnetohydrodynamics, rotating machine development, electrical-power transmission, instrumentation, computation and magnetically levitated ground transportation. The superconducting aspects of these technologies are treated in the present volume in addition to a neces-