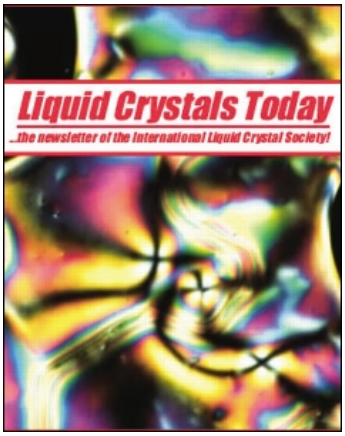

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BOOK REVIEW

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BOOK REVIEW NEW BOOKS

from David Lacey, Hull University, UK

"Liquid Crystals: Nature's Delicate Phase of Matter" by Peter J Collings.

Published by Princeton University Press/Adam Hilger

Most textbooks for newcomers to the subject of liquid crystals either treat the subject as though it was a mathematical problem or are written in such a way only understood by persons with a knowledge of liquid crystals. At last here is a book which has been written for both newcomers to the subject and those who want a general overview of the concepts, properties and applications of liquid crystals.

Although Peter Collings is Professor of Physics at Swarthmore College, he realises that not **all** scientists like mathematical puzzles, and very few equations are used in the text. Nevertheless, the explanations given by the author, especially in Chapters 3 and 4 which cover the electric, magnetic and optical properties of liquid crystals, are very good. The diagrams he uses to explain concepts, theories and properties of liquid crystals are simple and easy to understand with not an equation in sight — well, just a few. The clarity of his explanations is refreshing and I am sure newcomers to the subject of liquid crystals will find this book invaluable.

In Chapters 6 and 7 the author discusses the applications of thermotropic liquid crystals, the major application being in electro-optic display devices. Although these chapters contain good descriptions of most display devices using liquid crystals, the book fails to explain why liquid crystals are useful for this type of application. It also underplayed the importance of a whole range of display devices which come under the umbrella of supertwisted nematics (STN) which, along with the active matrix display devices, will form the basis of future electro-optic display devices using liquid crystal materials. However the two chapters on applications are concise and well written, and make for very good background reading.

Chapters 8 and 9 on lyotropic and polymer liquid crystals respectively were in my view too short, especially the latter, and do not reflect the amount of research work now being undertaken in this area. The final two chapters cover the theory and biological importance of liquid crystals. Ths most remarkable aspect of the theory chapter is that it contains **no** equations, yet the main ideas come through because of the author's clear and simple explanations.

Overall I thought the book was well-written, easy to read and well-illustrated, and it must be a prime target for all new students entering liquid crystal research or even for those who wish to know a little more about the subject. The only major criticism I have about the book is that in the Preface the author states 'I have tried to be as comprehensive as possible, covering all the important areas of biology, chemistry and physics'. Both the biology and the physics are covered in this book but the chemistry, that is the relationship between the structure of the liquid crystal material and its thermal and physical properties, is very poor. A chapter on this subject would have made this an excellent reference book for liquid crystal researchers.

Structural Transformations in Liquid Crystals

S A PIKIN, translated by M E Alferieff, 440 pp.
Gordon & Breach Science Publishers (1991)
ISBN 2-88124-296-0; Hardcover.

Contents: **PART A: Thermodynamic description of structural changes in liquid crystals.** *Includes:* Thermodynamic states of LCs; Interaction of order parameters and conditions for thermodynamic equilibrium in LCs; Effects of striction, impurities and defects in LCs; Phase transformations induced by an external field; Polarized states in LCs.

PART B: Modulated structures in a dissipative anisotropic medium. *Includes:* Dynamics of a nematic liquid; Diffusion-electrical phenomena in nematic liquids; Low & high frequency electrohydrodynamic effects in LCs; Electrohydrodynamic instability with special boundary conditions; Nonlinear phenomena in threshold instability effects.

Thermophysical Properties of Liquid Crystals

ALFRED L TSYKALO, translated by M E Alferieff,440 pp.
Gordon & Breach Science Publishers (1991)
ISBN 2-88124-322-3; Hardcover.

Contents: **Nematic Liquid Crystals** — General information on structure & classification; orientational order and molecular dynamics; computational-theoretical study; thermophysical study; comparison of experimental data and computational results.

Smectic & Cholesteric Liquid Crystals — Structure; classification; orientational and translational order; Theoretical investigations; Thermophysical properties.

Chiral Nematics & Liquid Crystals in Supercooled States.

Liquid Crystals Consisting of Disc-like Molecules — Molecular structure and theory; Results of theoretical and experimental studies.

Mixtures of Liquid Crystals — Structure of solutions of LCs; Thermophysical properties of solutions of LCs.

Liquid Crystals: Nature's Delicate Phase of Matter

(see book review)

PETER J COLLINGS, 222 pp.
Princeton University Press/Adam Hilger (1991)
ISBNs 0-691-08509-9 (Hdbk)/0-691-02429-4 (Pbk); PUP
ISBNs 0-7503-0054-X (Hdbk)/0-7503-0055-8 (Pbk); A Hilger.

Contents: What are LCs? The story of LCs; Electric and magnetic field effects; Light and LCs; LC displays; Other applications; Soaps, surfactants and microemulsions; LC polymers; Defects in LCs and fluid lattices; Biological importance of LCs.

Critical Phenomena in Liquids & Liquid Crystals

MIKHAIL A ANISIMOV, approx 416 pp.
Gordon and Breach Science Publishers (Summer 1991)
ISBN 2-88124-806-3.

Partial Contents: Thermodynamics of critical phenomena; Modern ideas on nature of critical phenomena; Isomorphism of critical phenomena; Features of experimental procedure for the study of critical phenomena; Critical exponents and critical amplitudes: results of experimental studies; Equation of state near a liquid-gas critical point; Structural transformations in liquid solutions; Phase transitions with coupled order parameters; Critical phenomena in thermotropic LCs.