

sense. On the basis of a detailed analysis of the literature, he draws several conclusions. The first is that the assumption that marijuana serves as a 'stepping stone' to the use of other drugs is not valid: "Children may benefit more from spending their time in pursuing a classical education than listening to a police officer tell them to abstain," he declares. Second, he argues that although acute marijuana intoxication impairs the ability to perform some cognitive tasks, chronic heavy use probably does not affect gross intellectual functioning, although it may affect the performance of complicated tasks. Third, he reaches the conclusion that marijuana alters perception and 'slows' time: "The senses generally seem more appealing and interesting, despite laboratory evidence that they be actually impaired." Finally, he finds no evidence that marijuana causes a lack of motivation, reckless driving or aggression. These conclusions mirror the attitudes of most researchers in this field.

The chapter on law and policy is well balanced, and Earleywine considers the moral and pragmatic arguments advanced by both the prohibitionists and the proponents of legalization or decriminalization before concluding that "this is one area where more research will not have as much impact as changes in political climate".

Understanding Marijuana was published before the recent report by the Canadian Senate committee on cannabis, whose superb analysis of the problem and common-sense proposals fit with the overall view of Earleywine. The Canadian committee recommends an approach that "is neither one of total abdicating nor an indication of abandonment but rather a vision of the role of the State and criminal law as developing and promoting but not controlling human action". It is based on their conclusion that "used in moderation, cannabis in itself poses very little danger to users and to society as a whole, but specific types of use represent risks for users... even if cannabis were to have serious harmful effects, one would have to question the relevance of using the criminal law to limit these effects". I believe this is a key point that Earleywine tries to stress with regard to law and policy.

The chapters on pharmacology, health effects and medical marijuana are also a good summary of these fields, although there are mistakes and omissions. Cannabidiol is not psychoactive, as stated, and does not become delta-9-THC as the marijuana plant matures; cannabinoids probably do not suppress vomiting via cannabinoid receptors, as cannabidiol, which does not bind to these receptors, is also an anti-nausea agent; and Earleywine does not mention the potent effects of cannabidiol in models of rheumatoid arthritis and anxiety. Surprisingly, neither the identification of THC as the psychoactive cannabis constituent nor the

cloning of the CB1 cannabinoid receptor is referred to in the otherwise very good and extensive reference list.

Despite minor mistakes and omissions, though, Earleywine has written a well balanced, up-to-date, non-specialist book that should appeal to a wide audience. ■

Raphael Mechoulam is in the Faculty of Medicine, Hebrew University, Jerusalem 91120, Israel.

More on marijuana

Biology of Marijuana: From Gene to Behavior

edited by Emmanuel S. Onaivi
Taylor & Francis, £95, \$150



A protean overview

The Physics of Phase Transitions: Concepts and Applications

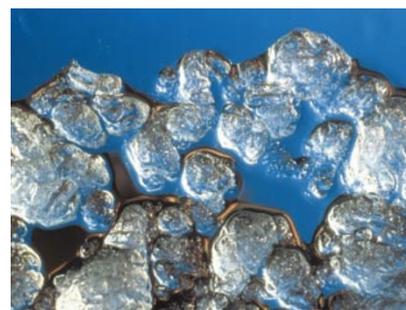
by P. Papon, J. Leblond & P. H. E. Meijer
Translated from the French by S. L. Schnur
Springer: 2002. 397 pp. £49, \$74.95, 69.95 euros

Robert W. Cahn

Phase transformations, flexibly regarded, are central not only to materials science but also to various subfields of physics, and spill over into physical chemistry. Two of the authors of this survey (the third is at a US university) teach at the Ecole Supérieure de Physique et Chimie Industrielles de la Ville de Paris, France, and the twin pulls of its constituent disciplines are clear to see — as is the pervasive influence of Pierre-Gilles de Gennes, the Nobel laureate who headed this *grande école* for many years.

Pierre Papon and his co-authors succeed in covering a much wider range of transitions than I have ever seen in one book before: solidification and melting; critical gas-liquid behaviour; the glass transition; gelation in 'soft matter' and biopolymers; collective (critical) phenomena in solids and liquids — this last incorporating magnetism, ferro-electrics, liquid crystals in much detail, superconductivity and superfluidity; a ragbag of 'nanostructures' (quasicrystals, colloids, emulsions and martensite); monolayers and Langmuir-Blodgett films; with a grand finale focused on geomaterials, plasmas and the ocean-atmosphere system.

Each theme begins with a careful theoretical account, firmly centred on classical thermodynamics and statistical mechanics; readers are expected to be well versed in both of these fields. Broad topics such as fractals and percolation theory are helpfully summarized; others, such as the theory of phonons, are not. Theory is bolstered in each chapter with an array of theoretical problems (answers provided), and appendices cover



Losing its cool: ice undergoing a phase transition.

particularly difficult topics such as renormalization group theory. With the theory out of the way, a range of applications of each theme is summarized in each chapter.

Experimental approaches to the many forms of transformation receive rather less attention, but enough is said (about David Turnbull's droplet method of studying homogeneous nucleation, for instance) to give an impression of how numbers can be put into the theory. Applications of quantum theory are notable for their paucity here; such matters as the use of electron theory to estimate the free energies of rival metallic phases are not treated. There are no literature references for individual pieces of theory or experimental research, but each chapter is provided with a useful select bibliography.

Many links between apparently distinct phenomena are made clear. The remarkable breadth of this book is its principal claim to distinctiveness but it also, inevitably, results in superficial accounts of some of the themes. Transformations in metals and alloys, and in ceramics, receive limited attention. Because of this, but particularly because of the high level of expertise in statistical mechanics expected, the book will find only limited use in the education of materials scientists. Yet physics students and those who labour at the ill-defined interface of physical chemistry and chemical physics will find much of educational benefit here.

The translation from the 1999 French edition is very competently done. There is just one repeated linguistic flaw, which I frequently find in anglicized versions of French prose: 'important' in the sense of 'significant' and in the other French sense of 'large' are confused; and many large things are claimed to be important. Maybe Frenchmen and Texans have more in common than either might like to believe.

Overall, we have here a treatment of strikingly wide perspective, and many readers who may not be motivated to work right through the book will find individual chapters interesting and instructive. I defy anyone who is interested in phase transformations not to learn something from this book. ■

Robert W. Cahn is in the Department of Materials Science and Metallurgy, University of Cambridge, Pembroke Street, Cambridge CB2 3QZ, UK.