restricted conformations resulting from solution growth.

On drawing (to draw ratio 10) the change in the broad component is small but the narrow increases at the expense of the medium, indicating an increase in freely mobile chains. Only one molecular weight (8×10^4) was studied in the fibre drawing experiments; it would be interesting to know how the results depended on molecular weight. It would also be instructive to study higher draw ratios. The authors propose that their n.m.r. studies of solution-grown samples cast doubt on the adjacent re-entry theories of lamellar crystals and support the Flory (1962) model of loops with random lengths connecting the crystal sequences.

R. G. C. Arridge

Flow-Induced Crystallization in Polymer Systems

Edited by Robert L. Miller
Gordon and Breach Science Publishers, New York, London and Paris, 1979. pp. x+370, £23.60. (Midland Macromolecular Monographs Volume 6)

It is not often that a reviewer thumbs through a book, notices a full-page reproduction of one of his own published diagrams and discovers that it has been ascribed to someone else (page 70)! This only serves to illustrate the problems facing an editor when preparing for publication a collection of conference papers. This said, however, it is pleasing to report that this volume suffers less than many such collections from the patchiness and uneven coverage that we have learned to associate with multi-author books of this kind. The reason, perhaps, is that the first five chapters, at least, are good reviews which lead on naturally to the more specific research papers that follow. The review chapters cover general crystallization phenomena, the analysis of crystallization kinetics, crystallization from solutions and crystallization from the melt. The research contributions, which occupy a further eleven chapters, are concerned with these and other subjects such as solidification of polymer fractions, flow induced crystallization, solid state extrusion of crystalline polymers, fibre spinning, ultra-drawing, biaxial stretching, crystal orientation, stiff-chain aromatic polymers and optical studies of stress-induced crystallization. Several of these contributions, though concentrating on their authors' own studies, are written in review style, which further aids the coherence of the book. Overall, then, the subject of polymer crystallization under conditions of flow and deformation is comprehensively covered in a highly readable manner. The book therefore constitutes a valuable statement on the state of knowledge in this field and its relevance to industrial processes.

Each chapter is followed by reported discussion which sometimes, but not always, justifies the space devoted to it. There are some unfortunate choices of running page titles. Thus a chapter on solid-state extrusion has the running title 'solid state crystallization', and one on crystallization under extreme temperature and pressure *gradients* is page-titled 'crystallization under extreme temperature', which is a totally different matter. These however are minor defects and the book can be recommended as a coherent up-to-date source on the subject of polymer crystallization under conditions of flow and deformation, with contributions from many recognised authorities in the field.

E. H. Andrews

Physical Testing of Rubbers

R. P. Brown
Applied Science, London, 1979. pp. xi+327, £18.00

The aim of this book is to present an up-to-date account of rubber testing procedures. It purports to be comprehensive, in that it covers all the tests which are in common use and some which are not. It is essentially a successor to Scott's book of the same title which was published several years ago.

This book largely achieves its aims and objectives. It should therefore prove to be a most useful addition to the library of the practising rubber technologist and also of engineers and designers who are concerned with the use of rubbers as stress-bearing materials. As far as the present reviewer can see, all the major types of test are covered, including tests on unvulcanized rubbers, electrical tests, thermal properties, and tests for resistance to environmental influences. Important matters such as the preparation of test-pieces and their conditioning before test are also considered.

Although the book in its present form will undoubtedly be most useful, and fulfils its aims in a general way, it must be pointed out that it does have some serious deficiencies. It is to be hoped that the author will see fit to rectify these in a second edition. Perhaps the most serious criticism is that the first 50 pages (i.e., approximately one sixth of the book) are virtually wasted. In a book of this size on a subject as large as the physical testing of rubbers, a chapter of 23 pages on standards and standards organizations (which includes, for instance, *inter alia*, the address of the Ghana Standards Board) is a luxury which cannot be afforded. The other main chapter occupying the first 50 pages is entitled "Limitations of Test Results — Statistics". This chapter is so misleading and full of errors as to be best omitted altogether in a subsequent edition. At the beginning of this chapter, the author draws attention to the unpopularity of statistics and attributes it in part to the subject having been severely neglected in schools and universities. A more likely cause is the confusion and error which often accompanies the presentation of the subject in chapter such as the one which this author offers! Two examples of the serious shortcomings of this chapter are as follows: (1) the ordinates of Figures 3.2 and 3.3 should not be labelled "frequency of readings"; the ordinates are frequency densities and not frequencies. The difference between these terms is far from trivial; it is fundamental to the matter of the presentation of frequency distributions for data which refer to a continuous variate, and so to a whole area of the theory and practice of statistics; (2) the basis of the process of Analysis of Variance is the partitioning of sums of squares, and not (as is implied on pp. 42–43) of variances. In preparing a second edition, the author should consider omitting much of the material contained in the first 50 pages of this edition, and using the space thereby made available to deal in more detail with certain aspects of the main theme of the book which are at present largely ignored. Two related aspects which immediately come to mind are (a) the way in which the various test procedures have evolved to their present forms, and (b) the effects of important test variables upon the result obtained.

The second criticism of this book is that the more fundamental aspects of the subject are on the whole not well presented. Students, for instance, will not be encouraged to think sensibly about the fundamentals of the subject. Examples of this deficiency are as follows. (i) The relationship between the two equations given on page 165 is obscure. (ii) It is most misleading to state on page 171 that the expressions for S' and S'' are the solutions of the given differential equation (which is an equation in a variable x). (iii) It is not in the least clear why it is convenient to consider stress as a vector having two components (page 160–161). There are also some unfortunate errors. Thus, for instance, a spring and dashpot in parallel are said to constitute a Maxwell model (page 159).

The third criticism, is that, although the book is generally well written, the language does need tightening up in places. A particularly blatant example is on page 31, where the author states that "All test are not equal"! Assuming that the concept of equality means anything at all applied to a physical test, did anyone ever suppose that all tests are equal? Having recovered from the shock of this statement, the next words are "some are more meaningful than others..."!

The final comment concerns units. Inevitably and regrettably the book deals almost entirely in SI units. However, the present reviewer wishes that the author had not been quite so fulsome in his commendation of these units (page 16). The SI system is seriously defective in at least three important respects. One of these should become immediately apparent if an attempt is made to perform calculations in SI units using the corrected version of the equation given on page 269. (The equation as it stands is incorrect in at least three respects, one of which is probably the result of a printer's setting error.)

To sum up then, this is a very useful book for the practising rubber technologist, and for the engineer and designer who work with rubber, but there is much scope for improvement in a second edition.

D. C. Blackley