de ce fameux critère d'identification, pris à lui seul, bien entendu. A un degré moindre, il en va de même de la densité. Quant aux indices de réfraction, ils ne sont connus que pour un petit quart du total des substances. On se demande vraiment s'il n'eût pas mieux valu inclure ces propriétés, à titre de critères de vérification, dans une table déterminative unique.

Il n'est peut-être pas inutile de signaler que la grande majorité des substances de l'*Index* ne possèdent pas encore leur diagramme de poudre. Pour toutes celles-ci, la goniométrie supplée heureusement à la carence des rayons X.

En ce qui concerne le travail accompli, on doit admirer sans réserve le soin méticuleux, la minutie des calculs, la rigueur des standards qui régissent cette révision critique des constantes cristallines. Les cristallographes saluent avec gratitude la mémoire de R. C. Spiller; leur reconnaissance va aussi à Dr Mary Porter qui continue sans faillir à diriger cette énorme entreprise.

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Synthetic Polypeptides. By C. H. BAMFORD, A. ELLIOTT and W. E. HANBY. Pp. xiii+445 with many figs. and tables. New York: Academic Press; London: Academic Books. 1956. Price $10·00.

This is not the moment for a complete and considered text book on synthetic polypeptides. But it is a moment at which it is very useful to have a book to give some account of the present state of fact and theory in this most interesting and rapidly developing field. If there are points at which stop-press news has had to be inserted in the present text, there is also a record of definite achievement worth serious consideration for the future.

The book is concerned with the preparation of synthetic polypeptides, their physical and chemical properties and particularly the evidence provided by infra-red spectroscopy and X-ray diffraction on their structure and transformations. It develops very largely as an argument concentrated on the discovery that synthetic polypeptides can be obtained, either by solution in different solvents or by other physical means, in α and β chain configurations obviously related to α and β keratins. The detailed correlation of the X-ray diffraction patterns of α-poly-γ-methyl-L-glutamate and α-poly-L-alanine with the Fourier transform of the α helix of Pauling, Branson & Corey is easily the most important single episode in the book and the best example of the advantages offered by synthetic peptides over fibrous proteins in structure determination. Other examples are provided by the very striking near identity of X-ray photographs of β-poly-L-analine and tussah silk and the clues given to the collagen structure by polyglycine II and poly-L-proline. At times the argument of the book becomes rather involved with the explanation of many different lines of study; at other times, one suspects there are hidden complications one would like more fully discussed, for example, the infra-red spectra of crystalline acetanilide. But the main story seems convincing.

Perhaps the most useful feature of the book is the record it provides of interesting observations, many of them hitherto unpublished, made in the course of the authors' researches. Some of these seem to have important bearings on protein structures. The relative stability of the α configuration compared with β, for example, depends markedly on the size of the side chain and on polymer length. Polyglycine has never been found in the α form; α and β are almost equally stable chain types for poly-L-alanine. A 10-mer of the copolymer of *dl*-phenyl alanine and *dl*-leucine was found to be entirely β; only at about 50 residues length was the polymer present as pure α. Dilute solutions of α-poly-γ-benzyl-L-glutamate show many of the effects earlier observed in tobacco mosaic virus gels and some interesting new phenomena. Poly-L-lysine is extremely similar in its reactions with enzymes and in blood-clotting to the protamines,—and so on.

In conclusion I should add two quite separate points. The authors are to be congratulated on the part they have played in developing this fascinating field. The book is beautifully produced.

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Rheology: Theory and Applications. Vol. I. Edited by FREDERICK R. EIRICH. Pp. xiv + 761. New York: Academic Press; London: Academic Books. 1956. Price $20·00; £7.5.0.

This book is the first of three in which it is intended to survey the whole subject of the deformation and flow of materials in a series of articles by leading authorities. The articles in this first volume serve partly to introduce the subject to the newcomer and partly to lay down the basic physical and chemical principles of rheological behaviour. The later volumes will discuss topics such as linear viscoelasticity and relaxation in greater detail, and study the behaviour of particular substances such as plastics, rubbers and pastes.

In the past rheology has largely stood apart from crystal plasticity and dislocation theory, for it has grown up round the ideal Newtonian liquid and has gradually extended its coverage to more complex materials that retain some feature in common with this ideal liquid—usually the ability to flow under constant stress. Crystal plasticity, on the other hand, has grown up round crystal elasticity and the concept of an ideal solid that deforms but does not flow under constant stress. The discoveries of creep in crystals and of elasticity in liquids might have brought rheology and crystal plasticity together, but the molecular processes of flow in liquids and crystals have

proved to have too little in common to force such a union.

In this book a definite attempt is made to bring them together, and six of its chapters deal specifically with solids, metals and dislocations. One gets the impression that where the plasticity of solids can be dealt with from a macroscopic standpoint, as in the articles by Prager, Drucker, and Dow, there is a good chance of linking it to the formal part of rheology, such as is described in the article by Reiner; but that, as soon as the molecular processes of slip in crystals enter the discussion, as in the articles by Dienes, Fleeman, and J. M. & W. G. Burgers, it begins to look like a shotgun wedding. However, one is grateful to the Editor for having persuaded J. M. Burgers to write again after so many years, in a delightful and modest article with his brother, about dislocations in crystals.

Two-thirds of the book deal with the traditional topics of rheology—elasticity of rubber, non-Newtonian flow, viscosity of emulsions—in a series of articles by Rivlin, Alfrey & Gurnee, Fox, Gratch & Loshaek, Frisch & Simha, Peterkin, and Oldroyd. Two trends in this part of the book that particularly interested the reviewer are the movement away from the old formalized rheological models—the spring and dashpot models—towards a molecular theory of rheological behaviour, and the interest now taken in the elastic properties of liquids. The first is brought out particularly strongly in articles by Bondi, and by Riseman & Kirkwood; the second in an article on the accoustical properties of liquids by Lindsay.

Altogether this is a most useful book, particularly for those who wish to know how the physics of the liquid state is developing.

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Les Dislocations. By J. FRIEDEL. Pp. vii+314 with many figs. Paris: Gauthier-Villars. 1956. Price 3,500 fr., $ 10·20; bound 3,800 fr., $ 11·05.

Ten years ago there was no direct evidence for the existence of dislocations, and the development of the theory and its application to yield specific predictions capable of experimental verification was the concern of a small group of research workers interested primarily in metal plasticity. Today we can see the dislocations in metallic and non-metallic crystals, and fundamental experiments are increasingly concerned, not merely with the observations of the effects of dislocations, but with the study of the behaviour of the dislocations themselves, almost as this behaviour may be studied in a bubble raft. At the same time there has been a great development of the theory, which now has widespread applications outside its original concern of the plasticity and strength of metals.

This is the third book giving a general survey of the subject. Crystallographers will expect a high standard in a work associated with the name of Friedel, and they will not be disappointed in this one. Its objective is a *mise en point* for the French reader of the principal properties of dislocations, and the work is, in fact, an excellent survey of the subject.

By design, Dr Friedel concentrates on aspects which are closest to practical applications; for this reason he excludes, for example, the recent mathematical work on continuous distributions of dislocations, and on their connexion with the theory of non-Riemannian spaces (subsequently related, however, to the theory of martensitic transformations). For a countryman of Elie Cartan, this exclusion was made perhaps not without regret, for Dr Friedel gives a vivid explanation of the late development of the study of dislocations: 'et si leur étude dans les cristaux s'est developpée tardivement, c'est sans doute parce que leur géométrie plus difficile choque notre sens cartésien'.

Also omitted because they are still not well understood are some subjects of practical interest, such as fatigue and internal friction. It is, perhaps, unfortunate that Dr Friedel misses the work on the observation of dislocations in thin films, both directly and by Moiré patterns, but this is a measure of the rapidity with which the subject continues to develop rather than a defect in the work.

The plan of the book is to discuss in the first part the fundamental ideas of the theory and the important general properties of dislocation lines; elementary ideas; elastic theory; glide and climb; imperfect dislocations. The author includes, too, in this part a discussion of mechanical twinning, martensitic transformations and crystal growth. The second part gives an account of assemblies of dislocations; dislocation networks and mosaic structures; cold-work and piled-up dislocation groups; recovery; polygonisation; recrystallisation; crystal boundaries; creep; cleavage. Finally, in the third part, the interaction of dislocations with other defects and structural perturbations is considered. A general chapter on interactions with impurities precedes applications to the hardness of alloys and solid solutions, and to yield-point phenomena; and the work concludes with an account of interactions with X-rays, and of optical, electrical and magnetic effects. There are four Appendices: a summary of elasticity theory (rather condensed, perhaps, so that it is more mnemonic than didactic); tables of some useful physical properties; tables of glide and twinning elements; and, most welcome, a short Franco-German-English dictionary of dislocation jargon.

Despite the author's modest claim in the preface, there is much that is fresh and stimulating in the work. He includes, for instance, a thorough discussion of dislocation climb (and applications to recovery and creep) which it is most useful to see presented as a collective whole, and he introduces some novel ideas and extensions of the theory in his discussions of cleavage, of interactions with solute atoms, and of imperfect dislocations.

The price, unfortunately, is rather high.

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