terpretation in terms of nuclear models are given for all the heavy nuclides.

This is the most comprehensive collection of the nuclear properties of the heavy elements that has appeared in print. Volume II is essentially an encyclopedia of heavy-element data and is extremely useful to scientists working in this field. Unlike Volume I, which is designed to acquaint the reader with the systematic nuclear properties of the heavy elements, Volume II is more suitable as a reference book for the expert in the field who is interested in the detailed nuclear properties and how they were measured.

The third and final volume is devoted to the subject of fission. This volume contains 500 pages, comprising thirteen chapters, with the subject matter divided into two sections; Part I includes low-energy fission, and Part II is devoted to moderate- and high-energy fission. Low-energy fission encompasses spontaneous and thermal-neutron-induced fission while moderate- and high-energy fission refers to fission induced by particles with energies of 1 MeV or more.

Embodied in Part I is a discussion of the theory of fission largely devoted to the liquid-drop model, including the recent work of Swiatecki, Fong's statistical theory, and a brief mention of the application of the unified model to fission. This section also summarizes the available information on the charge, mass, and energy distribution in fission and many of the properties of particles and photons emitted during the fission process.

Included in Part II is a discussion of heavy-ion, meson-, and gamma-ray-induced fission. This section of the book also discusses the statistical approach to fission cross sections at moderate energies, the angular distribution of fission fragments, and the competition between fission and neutron emission from the compound nucleus. At very high energies, the Serber model and Monte Carlo calculations are considered as a possible explanation of the experimental data.

Characteristically, this volume has valuable and interesting tables and graphs. Many of the recent experiments are discussed and their contribution to the field pointed out.

Organizing the materials and writing these three volumes was an immense task, and the authors are to be congratulated for undertaking the project and doing such a good job. The authors were very adroit at describing complex experiments and results in a language that can be readily understood. These books will enable almost any scientist to bring himself up to date on the nuclear properties of the heavy elements. For those who can afford the price and have an interest in the nuclear properties of the heavy elements, these three volumes will be a valuable acquisition.

Paul Fields is a Senior Chemist in the Chemistry Division, Argonne National Lab, Argonne, Ill. Joining the old "Metallurgical Laboratory" of Manhattan Project days in 1943, he has been in the nuclear field since then, except for one year at Standard Oil (Indiana) in 1946. His main interests for the past 20 years have been the nuclear and chemical properties of the heavy elements, an area in which he has published about 70 papers and been codiscoverer of two of these new elements. A member of Phi Beta Kappa, he received a BS degree (1941) from the University of Chicago, where he subsequently completed a year of graduate work.

RUSSIAN APPROACH TO FATIGUE

Title Problems of Metal Fatigue

Author V. I. Belyaev

Publisher Daniel Davey & Co., 1964

Pages iii plus 78

Price $3.95

Reviewer W. A. Wood

The author in this short but well-translated book has strung together results of his personal research on a set of roughly related problems in metal fatigue. The book is addressed to mechanical engineers, but the problems it deals with are old ones in which there is already extensive literature in the West. Accordingly for Western engineers its interest will be in seeing how a Russian worker, apparently without much reference to Western research, handles some familiar problems.

The author confines himself mainly to the study of carbon steels and structural alloy steels. He begins with metallographic observations designed to prove that fatigue cracks often begin in those parts of a grain where slip movements have concentrated. Here the Western reader might be pardoned for reflecting that he has seen better demonstrations in the classic paper by Ewing and Humfrey published in **The Proceedings of the Royal Society**, dated 1903, and many times since.

The author then goes on to study how the surface hardness of his trip specimens changes as they are fatigued in a machine that bends them to and fro at 1500 min. He finds that those areas where stresses are highest at first harden slightly, then soften, and that when they soften they begin to show signs of cracking. He concludes that this softening causes the cracking, although the critical reader might wonder whether, conversely, cracking might not cause the softening.

Next the author, utilizing this conclusion, extends the life of his fatigue specimens by removing their surface layers, polishing or grinding them away at intervals during a test. From these experiments he draws the familiar inference that fatigue damage commonly begins at the surface of a metal. However, in his bending type of test it would be rather surprising if damage began elsewhere.

The author then turns to the problems of prestressing and overstressing. In prestressing, he follows the approach of early Western workers, subjecting specimens for so many cycles to amplitudes just less than the fatigue limit, then to higher and higher amplitudes, and reaches the well-known conclusion that the apparent

fatigue limit of steels may thereby be raised. In overstressing, he carries out tests, which again are virtually repetitions of experiments that have been familiar to Western workers for many years. He relates his observations to the way his steels harden during cyclic deformation, paying no attention to local changes in their chemical composition which, as Sinclair at the University of Illinois showed some time ago, could affect his results in a more fundamental way. On the basis of these observations he recommends that some service parts such as tool steels and roller bearings might benefit from appropriate prestressing programs and gives some supporting examples. His recommendations might seem naive to workers in this country who, also concerned for example with fatigue behavior of bearings, have found it desirable to develop sophisticated treatments such as the General Motors process of "marstressing".

After some extension of his experiments on overstressing to others on short-time overloading, the author concludes with the problem of whether fatigue behavior can be predicted from single static tensile tests on a metal. This part is of more interest than the preceding routine tests, possibly because the author, judging from other publications, may be more familiar with static deformation than cyclic deformation. He concludes that fatigue behavior can hardly be predicted from static tests during which a specimen deforms slowly as in creep, or from normal tensile tests during which a speciment still deforms more slowly than in fatigue test, but that it might be predicted from so-called dynamic tests in which deformation to facture takes only a few hundredths of a second. Accordingly he describes an apparatus for determining dynamic strengths and proposes relevant formulae.

Thus, although the book is intended for engineers and designers, Western workers would find it limited in scope and certainly in originality. There is no reason why any worker should not repeat work already written up, if he feels he can add something new, but there is also no reason why he should publish the results, if he can't. The fact that a Soviet worker does so suggests that he has an audience of engineers whose knowledge of fatigue problems is elementary.

W. A. Wood studied under Sir W. L. Bragg at Manchester University, UK, receiving his BSc with top honors in 1928, his MSc in 1929, and his doctorate in 1935 in physics. Post-doctoral work with Bragg centered at the National Physical Laboratory, UK where there later developed a Metal Physics Division of which Wood became head. The winner of two awards for his studies on the strength of metals and another for work on creep of metals, he was with Melbourne University, Australia, from 1948 to 1964. Currently he is a professor in the Department of Civil Engineering and Mechanics, Columbia University.

DISLOCATIONS AND THEIR MOVEMENT

Title The Strengthening of Metals

Editor Donald Peckner

Publisher Reinhold Publishing Corp., 1964

Pages vi plus 250

Price $12.50

Reviewer Robert M. Goldhoff

This book has as its purpose a review of the mechanisms by which metal are strengthened. The editor chooses as his base the atomistic scale of observation and has his competent contributing authorities develop the subject in a most logical and comprehensive way. Thus, the opening chapter discusses the basic concepts of dislocations and their role in determining metallic strength. This is then followed by equally lucid descriptions of the basic mechanisms of strain hardening, solid-solution hardening, precipitation hardening, dispersion hardening, martensitic transformation hardening and finally strengthening by superlattice formation.

Since the book is devoted to dislocations and the manner in which resistance to their motion is affected by the basic strengthening mechanisms, it is likely to be most appreciated by those wishing to become acquainted with the important general developments in this area. It will provide an excellent review for the metallurgist who wants to be abreast of these important developments and at the same time it will be a reasonably simple yet complete introduction to dislocation concepts for the non-metallurgist seeking knowledge of metallic behavior. To insure this purpose the first chapter incorporates the novel approach of amplifying each point made by suggesting illustrative problems for the reader to solve before proceeding further. The point is made that interested readers can develop their reasoning ability independently by working out such problems without the aid of established viewpoints and therefore no literature references are appended. It seems likely that the average reader with a minimum of time to devote to this pursuit will occasionally find himself unable to answer a query and finding no ready reference to which he can turn will proceed with a vague discomfort and annoyance at this obstacle. I believe a good bibliography at this point would have been helpful. This is a minor point and for the reader who does diligently complete the book the knowledge gained will be a maximum for a minimum of effort.

This entire subject is a difficult one to treat without involving a great deal of scientific complexity, yet this book succeeds in retaining reader interest without sacrificing the necessarily involved concepts. It is written clearly, concisely, and competently. I recommend it, in general, but in particular to those who fit the categories discussed above.