BOOK REVIEWS

Superplastic Flow: Phenomenology and Mechanics. K. A. Padmanabhan, R. A. Vasin and F. U. Enikeev. Springer Verlag, GmbH and Co. KG, Tiergartenstraße 17, D-69121, Heidelberg, Germany. 363 pp. Price: US $99.00

Most conventional metals can be extended up to ~50% of their original length prior to fracture. Superplasticity refers to the ability of some fine-grained materials to exhibit very large elongations to failure, with values approaching 8000%. It has been suggested that the famous Damascus swords, using steel from India, were manufactured several centuries ago under conditions favouring superplastic deformation. While most early studies on superplasticity involved metallic alloys over the last century, more recent work has extended the scope of this phenomenon to a much wider range of materials, including intermetallic compounds, ceramics, composites and nanocrystalline materials.

Since superplastic materials exhibit large ductility at relatively low flow stresses, they can be utilized to form complex-shaped components. Thus, for example, a complex-shaped aerospace component that is manufactured conventionally using several different pieces that are riveted or welded together can be formed using a single sheet of a superplastic alloy, with a reduction in weight and cost. Superplastic forming has proven to be a commercially viable technique for producing aerospace components using titanium and aluminum alloys, and there is interest currently in expanding the utilization of the process to mass-manufactured automobile components.

Although there has been considerable interest in the scientific understanding of the superplasticity phenomenon, with a series of conferences being held every three years and several books on the phenomenology of the process, the book under review by Padmanabhan *et al.* considers the topic from a very different angle. There has been a growing recognition in the engineering community of a need to integrate phenomenological and microstructural studies on materials with a mechanistic framework. The book under review develops in a systematic manner, the linkages between phenomenology and mechanics.

After describing briefly the phenomenology of superplastic flow and me-

chanics of solids, the authors discuss the various constitutive equations available for superplastic flow and boundary-value problems with superplastic forming. The mathematical modelling of superplastic forming is developed and the book ends with a discussion on the problems, perspectives and challenges in this area. In addition to the details provided on mechanics and phenomenology, the book contains four appendices that provide useful background information that is necessary to fully appreciate the discussion in the book.

In summary, the book is well produced, with good quality figures and equations, and it is likely to be useful for practising technologists and also at a post-graduate level in teaching/research programmes that seek to fully exploit the linkages between materials science and mechanics.

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Gene Regulation and Metabolism. Julio Collado-Vides and Ralf Hofestädt (eds). The MIT Press, 5 Cambridge Center, Cambridge, MA02142-1407, USA. 2002. 295 pp. Price not mentioned.
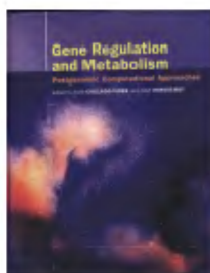
During the last few years, there has been an explosion in the area of genomics and gene sequencing. We have witnessed availability of complete sequences of a large number of organisms, including different species of bacteria, plants and mammals. The completion of sequencing of human, mouse and plant genomes has allowed us to look at organisms at different evolutionary levels. We have been provided with tremendous amount of data that has opened up unlimited possibilities in terms of experimental research

in biology. Along with sequencing efforts, there have also been major initiatives in the area of analysis of all the sequences in order to get the right information. Bio-informatics, therefore, has become a major area of interest for a large number of people who plan to get biological information out of nucleotide sequences.

There are three major areas of bioinformatics that have seen tremendous growth, viz. analysis of sequences for gene prediction and identification, gene regulation and metabolism, and structural bio-informatics, i.e. analysis and prediction of molecular structure. A number of studies have been made in the area of gene prediction and identification. Though the problem has not been completely solved, solutions are available that are good enough to carry out annotation of genomes with reasonable accuracy. One of the major goals of a computational biologist today is to understand gene regulation and metabolism. The book edited by Julio Collado-Vides and Ralf Hofestädt attempts to answer some of the questions based on a series of articles written by various experts in the field. The book attempts to expose its readers to the different ways of analysing metabolic pathways from genomic information, giving details of the technical advances that have taken place in the recent past as well as to provide useful tips in implementing some of these methods in one's laboratory. This book provides sufficient details for those readers who are familiar with the field and can also be easily understood by beginners. It also provides all the necessary information (such as URLs), which helps one to implement or use the techniques discussed in the articles. Most of the articles in the book deal with analysis of gene regulation networks, regulatory elements, metabolic processes and proteome. The book also has enough detailed information regarding databases and data structure for use in data mining. I found some of the chapters, particularly that of McGuire and Church well written, as the authors have given a simple description to many of the complicated mathematical methods, such as 'Gibb's sampling', a method used for detection of regulatory motifs in co-regulated genes. The description is simple enough for a traditional biologist to understand the principle and how it can be used for deduction of regulatory genes. Particu-