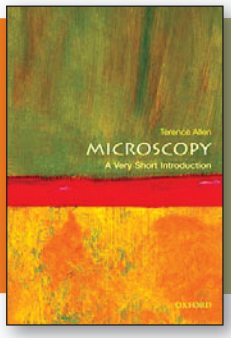
Chapter 3 covers the equations for plasticity of materials through yield condition, flow rule, and hardening mechanisms. The classical failure criteria and several fracture hypotheses are also introduced with well-illustrated graphs and equations.

Chapter 4 introduces straightforward ductile damage mechanics by relating the behavior with the microstructure evolutions to the elastoplastic deformation stage followed by the introduction of Lemaitre and Gurson damage models in one- and three-dimensional circumstances.

Chapter 5 introduces the concepts of failure criteria in the presence of cracks under different stress conditions. The concept of stress concentration based on stress intensity factor, energy release rate, and J-integral is also introduced based on different geometry and defect configurations.

As noted by the author, the purpose of this book is to provide an introduction to damage and fracture mechanics suitable for undergraduates. The author has succeeded in accomplishing the scope and organizing the content in a very readable structure without losing any important information on this topic. Each chapter has sufficient figures/illustrations to help understand the information. There are worked examples in some chapters. The supplementary problems are taken from tutorials in the class, but there are no solutions provided, which encourages students to find the solution on their own with some hints. This book will be useful not only to students, but also junior engineers who frequently utilize these principles. I recommend this book without reservation to anyone who needs to learn fracture mechanics.

Reviewer: Yan Hong *of General Electric, USA.*



Microscopy: A Very Short Introduction

Terence Allen

Oxford University Press, 2015
144 pages, $11.95
ISBN 9780198701262

This book is indeed a short introduction; nevertheless, it is surprisingly complete. It is perfect reading for anyone who wants to extend their knowledge of microscopy but has little time. Because of its length, do not expect to learn in-depth details about microscopy techniques.

In general, this book is mostly about optical (light) and electron microscopy. Both optical and electron microscopy are described very well. Beginners who plan to use these techniques can benefit from this book. It has a good blend and description of almost all modes of operation of these two microscopies. The book slightly touches on other advanced techniques, such as scanning probe and x-ray microscopy. The descriptions of these techniques could be improved by polishing facts and updating the information with recent advancements in those areas. It is unlikely that first-time learners can effectively use this book for the latter techniques.

After a brief historical introduction to the world of optical and electron microscopies (chapter 1), the book starts with a more detailed description of techniques behind optical and electron microscopy (chapter 2). Chapter 3 is an excellent description of the details of light microscopy, parts of an optical microscope, and advanced optical imaging modes, such as dark field and phase contrast, polarized light microscopy, and Nomarski mode. This chapter also touches upon ultraviolet and infrared microscopy, describing fluorescent microscopy and confocal and laser scanning confocal microscopies. It further describes ways to increase resolution by either some image post-processing (deconvolution) or by using several advanced methods commonly referred to as "super-resolution," a recent development of light microscopy.

Chapter 4 is entirely devoted to fluorescent microscopy and its use in biological and medical applications. Chapters 5 and 6 nicely describe transmission and scanning electron microscopies, respectively. Both chapters contain useful information about ways to increase the resolution of the samples, specimen preparation, and ways of labeling samples. Chapter 7 describes "magnification by other routes." This includes scanning, tunneling, and atomic force microscopies, both developed in the last 30 years. This chapter also includes information about near-field optical scanning microscopy using exotic "super lenses" created from metamaterials and lensless microscopy (both optical and x-ray).

Finally, chapter 8 describes the impact of microscopy in forensic science, art, environmental science manufacturing, and the development of food and drugs. It finishes with a description of an elegant version of a super cheap "origami" optical microscope. The last two pages are devoted to a description of further readings, which include only one book for each microscopy. The book's figures are black and white; while they are not extraordinary, they are still useful.

This book is worth reading by anyone who wants to learn (or verify existing knowledge) about optical and electron microscopies. It is an excellent, concise description of these techniques. The book can be improved upon by further expanding the material on scanning probe microscopy. Otherwise, it is a small gem definitely worth having.

Reviewer: Igor Sokolov *is a professor at Tufts University, Medford, Mass., USA.*

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