croscopes configured to sense magnetic and electric forces are not yet commercially available. Researchers build them to map magnetic domains and localized electric charge distributions.

Microscopy *applications,* such as those mentioned above, are treated only briefly in this book, with little critical perspective or comparison with other techniques for addressing similar materials problems. These topics may be covered by the review articles cited by Sarid in the preface. Instead, Sarid has focused on the engineering aspects of building and operating the *instrumentation.* Sarid provides a unified theoretical point of view, beginning with first principles such as the equations of motion for a harmonic oscillator or Maxwell's equations. Sarid typically proceeds with a formal derivation of the operating properties of the component, subsystem, or instrument under discussion accompanied by appropriate diagrams and photographs. An unusual feature is the use of tables to summarize instrument or component specifications and performance as reported in the literature. The bibliography is extensive (ca. 250–300 references). The presentation could be improved by giving a list of symbols and their definitions. Some numerical examples of calculations from the formulas should be presented, probably as graphs indicating performance (or other figure of merit) as a function of operating parameters (or other engineering choices). The caption of Figure 1.1 should be corrected: *the six strain components* should be *the six shear stress components.*

Part One treats the mechanical properties of the cantilever, shows how the sensitivity can be enhanced near resonance, and discusses various sources of noise. Part Two discusses seven techniques for sensing minute perturbations of the cantilever: tunneling, capacitance, optical homodyne, optical heterodyne, laser-diode feedback, polarization, and deflection detection systems. Part Three discusses the three classes of instrument mentioned in the title and briefly surveys some applications. Although the theoretical discussion of instrument operation is complete, in some sense, Sarid misses the opportunity to apply the equations to important experimental issues. For example, the Hamaker constant is introduced in the discussion of van der Waals forces between dissimilar objects, but force minimization by the appropriate choice of a liquid medium for imaging purposes is not mentioned. The important areas of image interpretation and identification of artifacts have been ignored completely.

This book is a valuable contribution to the literature, providing a sound theoretical basis for understanding the operation of and interpreting the images produced by various types of scanning force microscopes. However, it will disappoint readers who are looking for a guide to the applications of these microscopes.

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Chemical Synthesis of Advanced Ceramic Materials. By David Segal. Cambridge University Press, Cambridge, 1991. xv + 182 pp. paper, $24.95 (1989, cloth, $65).

This paperback edition of a book first published in 1989 as the first in a series on the "Chemistry of Solid State Materials" deals with the preparation of ceramic materials. The 10 chapters (plus an appendix) in this relatively short book form a suitable undergraduate text or an overview for those entering the field of ceramics.

The introductory chapter discusses different types of ceramic materials and their applications as refractory materials, composites, bioceramics, electroceramics, combustion- and wear-resistant materials, high-temperature oxide superconductors, and sensors. Properties of the ceramic materials commonly used in these applications, such as toughness, corrosion resistance, thermal expansion, hardness, thermal conductivity, ductility, and electrical resistance, are discussed.

Chapter Two deals with an overview of conventional methods of preparation of ceramics (including precipitation from solution, mixing of powders, and fusion) and has a short section on the need for new preparative techniques for advanced materials. Chapter Three deals with the fabrication of ceramics: sintering, hot pressing, isostatic pressing, reaction-bonding, slip casting, and injection molding.

The next two chapters focus on sol–gel methods. The first deals solely with sol–gel processing of colloids, including a discussion of colloids, hydrolysis, and precipitation methods (especially with reference to applications in the nuclear industry). The second reviews the use of metal alkoxides in sol–gel synthesis with application to coatings and the preparation of submicron powders.

Chapter Six deals with nonaqueous liquid-phase reactions with an emphasis on silanes, while Chapter Seven encompasses the pyrolysis of polysilane polymers, including the synthesis of nitride and oxynitride fibers.

The hydrothermal synthesis of ceramic powders, including a discussion of metal and salt reagents, is presented in Chapter Eight. Chapter Nine treats gas-phase reactions, including flame hydrolysis, nitridations, carbothermic reductions, chemical vapor deposition, plasma processes, and electron beam evaporation methods.

Chapter Ten deals with miscellaneous processes, including the use of gels, supercritical fluids, and freeze drying. The Appendix summarizes methods of particle size determination. Given the length of the text, none of the chapters can be inclusive. To compensate, roughly 300 references are provided to allow the reader to obtain more detailed information.

The reviewer looks forward to additional volumes in this series on the "Chemistry of Solid State Materials" (edited by A. R. West and H. Baxter) and particularly applauds the publication of less expensive paperback editions.

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