crucial to understanding the origin of the continental crust. TTD magmas are thought to have formed by the dehydration melting of basalt during the subduction of young warm oceanic lithosphere—a view supported by the study of adakites, contemporary analogues of Archaean TTDs.

The application of isotope studies to granitic rocks has historically provided major insights into the process of crustal evolution. Here *Johnson et al.* review the application of two previously untried isotopic systems to the origin of granites and the problems of crustal evolution. They show that the Lu–Hf system offers the potential to track the role of garnet in crustal processes and that the Re–Os system may afford the opportunity to monitor the role of a basaltic contribution to the processes of crustal genesis.

In short however, despite my personal reservations about the future direction of granite research, this is an excellent volume. The diversity of topics is wide, the quality of the papers is high and the inclusion of some timely reviews makes this a volume well worth having. I believe it is essential as a library purchase, but at £47.00, perhaps less likely to appear on the book shelves of individual scientists.

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Elastic materials

Davis, R. O. and Selvadurai, A. P. S. 1996. *Elasticity and Geomechanics*. Cambridge University Press. 201 pp. ISBN 0-521-49506-7, Price: £55.00 (hardback); ISBN 0-521-49827-9, Price: £18.95 (paperback).

This book describes the fundamental principles of the elasticity of isotropic materials and illustrates how these principles may be used to solve a range of problems in soil mechanics connected with foundation engineering. It is a textbook written primarily for upper level undergraduate students in engineering geology or civil engineering, with the expressed aim of being sufficiently comprehensive to provide a sound introductory overview of its subject matter to students of that level.

The main body of the book is divided into four chapters. The first develops the basic concepts underpinning linear elasticity theory. This begins with the notion of a continuum and proceeds to show, from the description of the deformation of a continuum, how strain is defined. The discussion of strain is concluded with an account of the strain compatibility equations. This is followed by an account of stress (including a surprisingly brief discussion of the Mohr circle representation), of principal stresses, of stress invariants and of the stress equilibrium equations. The chapter concludes with an introduction of how the notions of stress and strain may be combined to formulate and solve problems in elasticity.

Chapter 2 is concerned with the elastic constants of an elastically isotropic material. Each of the five elastic constants are described in turn, and illustrated with reference to physical examples. Hookes law is then presented in its general form linking the stress and strain matrices, and the notion of the stress and strain deviator matrices is introduced. The theoretical part of the chapter is concluded with a discussion of the relationships between the elastic constants and the bounds that these relationships place on their magnitudes. The second part of the chapter describes how the elastic constants of soils may be evaluated using various laboratory and field techniques. This description is set within the context of the relative advantages and disadvantages each technique has in terms of accuracy and cost.

In chapter 3 the solutions of a number of special problems in elasticity, fundamental to a range of more general geotechnical problems, are described. These include the point load problems of Boussinesq, Kelvin, Cerrutti, and Mindlin, as well as the line load problem of Flamant. The strategy is not to discuss mathematical techniques for finding solutions to these problems but rather, in each case, to formulate the problem and then to show that the solutions derived elsewhere (in standard elasticity texts) do indeed solve it. The chapter concludes with a description of the usefulness of stress functions, as illustrated with Airy's stress function.

The final chapter applies the solutions developed in chapter 3 to some of the basic problems encountered in foundation engineering. The problems considered pass from that of a simply loaded region (e.g. by a liquid storage tank) on the surface of a homogeneous elastic half-space, to more difficult problems involving non-uniform loads, rigid foundations and layered half-spaces. The chapter concludes with a short discussion of the consolidation of soils under structures, with an analysis of some of the previously described field techniques used to determine elastic constants, and with an analysis of the problems associated with constructing earth structures such as embankments.

A highly important part of the book is a suite of seven appendices which are used to remove much of the mathematical discussion from the main body of the text. These include a derivation of the strain compatibility equations, the derivation of essential concepts in Cauchy's formulation of the stress tensor, a proof of the uniqueness of solutions in classical elasticity theory, and accounts of Saint-Venant's principle, of the principles of virtual work, and of Betti's reciprocal theorem.

This is an excellent book. Its real strength lies in its style. This is a subject matter which is liable to appear unnecessarily intimidating to those new to the field, and so to counter this problem the authors have deliberately written the text in an almost conversational tone, but one which at the same time, carries the hallmarks of having been tried and tested on large numbers of students to ensure great clarity of expression. The strategy of removing the more detailed mathematics to the appendices works well, for it allows the reader to follow the main strands of the argument in physical terms, and yet to have the important mathematics to refer to as desired. The text is well illustrated and the problem exercises at the end of each chapter seem to be well chosen. This reviewer also liked the brief historical comments (which are not too long to get in the way), and the references to landmark papers in the development of the subject, all of which serve to heighten the sense that the book conveys a comprehensive overview at introductory level.

The book satisfies its intended function as an undergraduate textbook for courses in engineering geology or civil engineering admirably, although naturally its usefulness will depend upon the desired course content. There is no doubt that substantial parts of it (and in particular, the first two chapters) would also be of value for structural geology undergraduates concerned with the mechanical analysis of geological structures. In addition, although it would be viewed as introductory, it is so well argued that it could serve as a useful, easy to read, companion to the standard elasticity texts used by undergraduate students during first courses in solid mechanics in which a more mathematical treatment of the subject is developed. Given its potential as a background reference for a wide range of undergraduates, it is therefore a little disappointing to see that the book is rather overpriced for its size. One suspects that at £18.95 it will be too expensive to purchase merely as a background text, although for those undergraduates among the targeted readership (i.e. for whom the whole book is directly relevant) it will perhaps be a price well worth paying.

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