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Book Review

Rock Fractures in Geological Processes, by Agust Gudmundsson, Cambridge University Press, 2011; ISBN: 978-0-521-86392-6 (hardback), USD 80.00

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Understanding fracture and interpreting faulting are at the core of tectonics. Fracture, however, plays a role in mechanical weathering, magma transport, and the transport of fluids through the crust. The physics of rock deformation and fracture are thus also of interest in understanding ore formation, extraction of hydrocarbons, geotechnical engineering, hydrogeology, and geomorphology. Gudmundsson's book provides a great resource for anyone interested in rock fracture in these various contexts.

This book covers the basic physics and mathematics of rock fracture and deformation. It explains how to describe and interpret field relationships. It also addresses some elements of fluid flow in fractured rocks. With this breadth it provides a balanced integration of theory and observation. Concepts are clearly explained.

I suspect that the primary use of this book will be for self-guided study. As such, this is an excellent standalone book that has some elements that will appeal to students and researchers at all levels and from all backgrounds. Each chapter begins with a list of objectives for the chapter, not subtle perhaps, but helpful. The notation is explained and summarized in each chapter. There is a handy appendix with rock properties. All "technical" terms are defined. Illustrations are clear, though some of the black and white photos are fuzzy. The modest repetition from chapter-to-chapter is not a distraction.

The inclusion of worked examples in each chapter is my favorite feature, and makes this book perfect for independent study. Each chapter also contains excellent thought-provoking problems that connect geology and mechanics.

The target audience includes upper division undergraduate students. It is presumably owing to this level of readership that vector and tensor notation are generally avoided, much like the classic Geodynamics book by Turcotte and Schubert. Analysis of tensor properties of stress and strain, the mathematics of dealing with anisotropic materials, governing equations, and solution methods are thus limited or missing. Readers will not find, for example, the biharmonic equation in this book, nor a discussion of compatibility conditions. Some topics are left out such as poroelasticity, thermoelasticity and heat transport.

This is a solid and timely book. Owing to the broad relevance of the topic and the clear and pedagogic explanations, it will not become obsolete for a long time.

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