

# ***Understanding the Earth: A New Synthesis***

Edited by **G. C. Brown, C. J. Hawkesworth, R. C. L. Wilson**, Published by the Cambridge University Press. 1992. 551 pages. ISBN: 0-521-37020-5. 551 pages.

## Review by **Christopher G. Kendall**

This textbook was put together by some of the academic staff of the Earth Science Department at the Open University in Great Britain and contains 25 chapters, which are divided into eight sections. This source book is intended to be a supplement to introductory texts for the first year Earth Science undergraduate and geological enthusiast. It provides easy access to concepts that are not always available in undergraduate libraries, giving the reader an up to date and well informed synopsis on the current high profile research topics of the earth sciences.

The first section of the book begins with chapters on the origin of the Earth and its relationship to the solar system. Chapters include: a discussion of the solar system, supplemented by beautiful photographs of the moon, the surface of Mars, Phobos (a Martian moon), Jupiter, Venus, etc.; the origin of the Earth is discussed in terms of data gathered from other satellites, planets, meteorites, and the Earth itself; an investigation of the Earth's interior from a seismic point of view; and a chapter on experimental petrology with a discussion of the chemical composition of the interior of the Earth and its relationship to crustal melting and rock metamorphism. This latter chapter theorizes that the Earth was formed from the glancing impact of a planet-sized body with the Earth. The result was that both cores of these planets were incorporated to form the current Earth; and the moon was formed from the mantle of the impactor.

Chapters five through eight are focused on magma generation within the Earth and how this magma has evolved; the calculation and determination of geological time; and the origin of the continents. Chapters nine through twelve deal with sea floor spreading, plate tectonics and continental drift, hydrothermal ore deposits, metamorphism and fluids. Chapters thirteen through fifteen focus on seismic reflection profiling, the structure of the continental lithosphere, deformation of the continental crust, and the formation of the sedimentary basins.

Chapters sixteen through nineteen deal with clastic sediments, limestones through time, hydrocarbon source rocks, event stratigraphy, and a dynamic view of the sedimentary record. Chapters 20 & 21 are on sequence stratigraphy and interplate stress. These latter chapters examine the effects of eustasy and tectonics on sedimentary basin evolution and the origin of the sedimentary sequences recognized in seismic and outcrops.

Chapters 22 & 23 discuss the use of fossils and the evolutionary theory. Finally, chapters 24 & 25 deal with paleopetrology and volcanic hazards.

This book is packed with facts, and I recommend it as a source text for most geologists and geophysicists. As the editors point out, the book is not intended to cover all of geology, but it does summarize some of the latest advances in the geosciences of the last decade.

I was surprised to discover not only a discussion on plate tectonics, a subject finally making its way into introductory texts for undergraduates, but to find a fairly decent and well thought out discussion of sequence stratigraphy and its relationship to eustasy. At the same time, it is

also a surprise to find a matching discussion of the possibility that the accommodation space we see in the sedimentary record may also be produced by a response to interplate stress rather than a movement in worldwide sea level. There's even a discussion on hydrocarbons. There is a really well written section on carbonates and how they are formed. This ties variations in the basic mineralogy of cements and sediments, the life forms that produced them, and how they varied through time. There is a discussion on clastics organized on the basis of depositional systems describing how clastics are transported to their depositional setting, how sedimentary structures formed, and how different facies models can be erected for settings from the deep sea, the shore and the continental interior.

This is far more than an introductory textbook for undergraduates. When I was an undergraduate, I used a comparable text, Arthur Holms' *Physical Geology* as my source book. However, *Understanding the Earth* has advanced beyond Holms and yet, is written in the same straightforward manner and is illustrated with beautiful photos and line drawings. In fact, both the geological layman and the geological expert will find information here which would normally only be found by culling numerous publications and journals to synthesize the information.

I'm sure that I'll be referring to this text quite often when I'm in need of information about a current geological research topic - particularly when preparing to give lectures. This is a great text for background information and if someone needs to bone up on some current topical theme of modern geological research, it may very well be covered in this volume.

I think that the Open University should be congratulated on producing such a complete synthesis. My students and I will be using this text for some time to come.