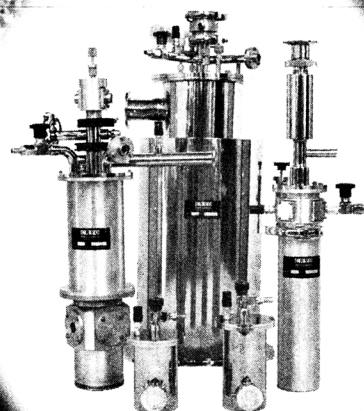


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ment. Nevertheless, Brown tells a fascinating story, and this book can be hard to put down.

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Encyclopedia of Volcanoes

▶ Edited by Haraldur Sigurdsson,
Bruce F. Houghton,
Stephen R. McNutt, Hazel Rymer,
and John Stix
*Academic Press, San Diego, Calif.,
2000. 1417 pp. \$99.95 hc
ISBN 0-12-643140-X*

The *Encyclopedia of Volcanoes* is the product of many years of concerted effort by 112 well-qualified contributors. It is certain to become a standard reference on nearly all aspects of volcanism. Its 82 articles are grouped by editors Haraldur Sigurdsson, Bruce F. Houghton, Stephen R. McNutt, Hazel Rymer, and John Stix, into nine sections dealing with the origins of magmas, eruptive processes, explosive and effusive volcanism, subaqueous and subglacial eruptions, volcanogenic ore deposits, geothermal energy, hazards, and cultural aspects of volcanism. Each article is designed to stand on its own. This has the disadvantage of much repetition (and occasional inconsistencies) and makes the book a good bit longer than necessary. But, with few exceptions, the balance of topics is both broad and comprehensive.

One might not appreciate the true scope of the volume from reading the introductory chapter, "History of Volcanology." This is essentially a condensation of Sigurdsson's recent book *Melting of the Earth*, (Oxford, 1999), in which he discusses his favorite topic, decompression melting, but without mentioning basic eruptive processes or the historic eruptions in which they were first recognized.

The first section (Part I) of the main text deals with the origin and transport of basaltic magmas. I found three articles particularly impressive. The chapter on volatiles in magmas is an excellent summary of a very complex topic. Equally useful is an article on physical properties, which presents almost all the important rheological and thermodynamic properties of magmas in terms of equations of state rather than the usual graphical curves. Similarly, the discussion of magma ascent at shallow levels is the most lucid and concise treatment of

basic eruptive mechanisms I have yet encountered. Much of the material in the rest of this section is repetitious and not always consistent from one chapter to the next. For example, an article on magma chambers tells us that volcanoes are not underlain by large magmatic intrusions, whereas the later article on calderas calls upon large bodies of fluid magma to explain caldera collapse and the huge outpourings of magma that usually accompany caldera formation.

A second section, dealing with the distribution, sizes, and rates of eruptions, includes thoughtful conclusions that Tom Simkin and Lee Siebert draw from their invaluable record of global volcanism. Two articles on sizes and rates of volcanism are informative but less comprehensive than one might like. In a discussion of subduction-related volcanism, for example, we are told that there is no correlation between rates of subduction and volcanism, despite the good correlations found in the Aleutians, Antilles, and Central America, to name only three.

Effusive volcanism is treated in nine articles (Part III), including especially notable ones on the general nature of lava flows and on volcanic fields, flood basalts, and submarine volcanism. The only important topic missing here is large siliceous ignimbrites. Although these are among the most voluminous eruptions on Earth, they are almost totally ignored. It is said that there are too few careful studies of such eruptions to warrant discussing them! The recent studies of Yellowstone, the Bishop Tuff, or the Valley of Ten Thousand Smokes, to say nothing of earlier ones in Nevada, Utah, Middle America, and Chile, seem not to qualify.

Explosive volcanism, including lahars and debris avalanches, is covered in Part IV, along with calderas, cones, and other morphological features. Most of these articles are informative and well presented, but here, too, I found serious omissions. An article on lahars, for example, makes no mention of regional sheets of volcanic mudflows, such as those of the Tuscan and Mehrtan formations in California. The former covered 5000 km², the latter 30 000 km². Those of the Absaroka Range in Montana and Wyoming covered almost 13 000 km², and even more extensive ones have been recognized in Central America. The articles on phreatomagmatic fragmentation, subaqueous eruptions, and subglacial eruptions are of uneven quality and excessively

repetitious, as are those on lava fountains, and on Hawaiian and Strombolian eruptions. This redundancy could have been avoided by consolidating some of the articles, particularly those dealing with the various types of phreatomagmatic eruptions.

The articles on extraterrestrial volcanism in Part V are especially valuable. Until now, there have been few places where one could find good comprehensive summaries of the vast amount of material we have acquired in recent years.

Part VI is devoted mainly to geothermal phenomena. A chapter on volcanic gases duplicates much of the earlier one on volatiles in magmas and a later one on geothermal systems. But a thorough, well-written chapter on the surface manifestations of geothermal systems is an excellent summary of a wide variety of phenomena in diverse tectonic settings.

Volcanic hazards are fully discussed in Part VII. Twelve excellent chapters deal with the effects of various types of volcanic eruptions. Also included are chapters on the hazards that ash poses for aircraft, as well as climatic and biological effects, and the question of mass extinctions. Eight chapters, making up Part VIII, are devoted to monitoring, crisis management, and mitigation. The only important topic I missed here was that of estimating probabilities and risk, but this is touched on briefly in some of the other chapters.

The extensive treatment of volcanic hazards is balanced by a final section (Part IX) dealing with economic and cultural aspects of volcanism. These include geothermal energy, mineral deposits, and volcanic soils, as well as archeology, tourism, and art. The closing chapter reviews the place of volcanoes in novels, movies, and even cartoons. I was surprised to find that the section dealing with films includes a discussion of *Donald Duck in Volcano Valley* but makes no mention of the magnificent films of Maurice Kraft and Haroun Tazieff that have inspired thousands of viewers. Five of Tazieff's films, including the internationally distributed *Rendez-vous with the Devil*, won prizes for their outstanding artistic and educational qualities. Their omission seems odd, at least.

The deficiencies I have noted are only minor blemishes on what is otherwise an impressive body of work. When the volume is revised, as it no doubt will be, these shortcomings can easily be remedied. Meanwhile, the editors and contributors deserve our

thanks for a magnificent volume that will serve as a valuable reference for professional and amateur volcanologists alike.

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Correction

September, page 61—In the review of the book by Abraham Pais, the title should be *The Genius of Science: A Portrait Gallery*.

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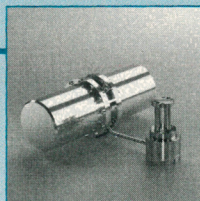
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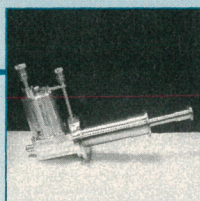
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