Book Reviews

Fiery Iceland

Iceland and Mid-Ocean Ridges. Report of a symposium, Reykjavík, Feb.–Mar. 1967. SVEINBJÖRN BJÖRNSSON, Ed. Leiftur, Reykjavík, 1967 (distributed by Jonsson, Reykjavík). 209 pp., illus. Paper, Kr. 250. A publication of Societas Scientiarum Islandica.

The Eruption of Hekla, 1947–1948. Vol. 1 of *The Eruptions of Hekla in Historical Times: A Tephrochronological Study.* S. THORARINSSON. Leiftur, Reykjavík, 1967. 183 pp., illus. Paper, Kr. 250. A publication of Societas Scientiarum Islandica.

". . . a wide chasm formed diagonally across the island from southwest to northeast, through which the trachytic paste gradually emerged." Thus, as early as 1864, in *Journey to the Centre of the Earth,* Jules Verne described the rift of Iceland, a geological feature that has come to the attention of most North American geologists only in the last few years. Iceland rests astride the Mid-Atlantic Ridge, the central rift of which has recently [F. J. Vine, *Science* **154**, 1405 (1966)] been described as the axis of a symmetrically spreading sea floor related to continental drift.

The general topic of midocean ridges as applied to Iceland was discussed during a symposium held in Reykjavík during February and March 1967. The 26 participants were Icelandic earth scientists who have actively studied the phenomena. Nineteen papers by 13 authors discussed the geological, geophysical, and geochemical aspects of Iceland in relation to the Mid-Atlantic Ridge. The discussion that followed presentation of the papers has been included in the proceedings volume; it not only gives more depth to the volume but also gives insight into the personalities of the participants.

Iceland is indeed divided by a Quaternary neovolcanic zone which separates the Tertiary plateau basalt province into a western and an eastern portion. In this zone there have been many eruptions in historical times, and there is much faulting. The lavas found in the zone are mainly basaltic. Sigurdur Thorarinsson and Gudmundur Kjartansson point out the striking similarity between products of volcanic eruption beneath Quaternary glaciers and those beneath the sea. As a whole, though, the papers demonstrate that care must be taken in using Iceland as a natural laboratory for the study of midocean ridges. The neovolcanic zone is quite wide and sinuous, and eruptions take place over an area larger than the active part of the ridge. A new magnetic survey over Iceland does not show the well-defined anomalies present on the ridge to the south. Other evidence also shows dissimilarities. However, the papers amply demonstrate the active nature of Icelandic tectonics and uniformly demonstrate that Iceland must be considered an emergent, if atypical, portion of the Mid-Atlantic Ridge rather than a portion of a sialic continent. The authors are divided, however, as to the interpretation of the data. Most of the authors adhere to the concept of rifting in the neovolcanic zone and some of these adopt the hypothesis of active continental drift and sea floor spreading. On the other hand, a few authors are opposed to active rifting and hence to the attendant broader concepts. They propose other models. The volume includes recommendations for further studies.

In contrast to the short general papers in the symposium volume, S. Thorarinsson's book presents a definitive study of one Icelandic volcano of a special type. The volcano of Hekla lies in the southeastern branch of the neovolcanic belt, about 50 kilometers from the southern coast, and is the most active volcano of Iceland. The volcanic eruptions of Hekla have been interwoven into the history of Iceland since the first settlement of the island a thousand years ago. The ash (tephra) from the eruptions destroyed farms with their crops and animals. At times widespread famine developed. The ash falls have been recorded as far away as the Shetland Islands, 1300 kilometers southeast. By combining studies of the ash layers (tephrochronology) and studies of history, Thorarinsson shows that 14 eruptions of Hekla have occurred since settlement of Iceland, beginning with the 1104 eruption. The latest is that of 1947–1948. Hekla is intermediate between a typical Icelandic linear crater row and a symmetrical stratovolcano like Vesuvius. It has built by repeated eruptions from a fissure, often with several small craters active at the same time. Thorarinsson shows that each eruption begins with a violently explosive Plinian-type eruption of silica-rich ash which generally lasts for a few hours at the most. Most eruptions then change and produce both lava and ash of a more mafic chemistry. The silica content of the initial ash is closely related to the length of the interval between eruptions, during which the lava differentiates in a reservoir at an intermediate depth.

This volume is a rarity in the scientific literature, being at the same time a significant scientific treatise, an important historical analysis, and a pleasure to read. These qualities reflect those of the author, who is not only a renowned volcanologist but a scholar of Icelandic history and a poet famed in Iceland as well. His flowing writing style, even through the translation by Peter G. Foote, wastes few words, while avoiding the intensely dull scientific style of most writers. The reader comes away with a significant insight into both the volcano and the history of a culture living in a harsh environment.

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Viewing the Deeps

Deep-Sea Photography. JOHN BRACKETT HERSEY, Ed. Johns Hopkins Press, Baltimore, 1967. 310 pp., illus. $17.50. Johns Hopkins Oceanographic Studies, No. 3.

The published world of underwater photography has been unequally divided between slick magazines and scientific journals. The former present a profusion of polychromatic underwater scenes, frequently featuring bikini-clad biology, always esthetic, and generally taken in shallow, gin-clear, tropical waters. The latter have published, in the context of scientific data, a smattering of monochromatic photographs, never as pretty but always as revealing, of the relatively drab deep-sea environment. This book goes a long way to even the score, and while it is first a weighty scientific document, it is the 372 remarkable and handsomely

reproduced photographs that carry the day. Many of the photographs are in color stereo pairs, and a folding viewer is included. Pertinent information is conveniently tabulated in the appendix.

In his introduction to one of the 25 chapters, H. E. Edgerton writes, "The photographic process excels all others for the collection and storage of information. It is not a matter of chance, therefore, that great effort has been put into the design, development, and exploitation of camera systems." Hardly anyone will disagree with this premise, yet running through many of the contributions is a mildly defensive attitude that seems unnecessary in view of the profusive insights and results presented. Where the merits of photography are dealt with, however, there is general agreement that in the cases of biological and most geological studies, to be most productive, photographic techniques should be supplemented with (or be supplemental to) the conventional sampling methods of grab, dredge, and core.

The "great effort," with a few notable exceptions, has been centered at institutions concentrated on the northeast Atlantic seaboard, and the book is essentially their family album, with contributions from a few West Coast and British cousins.

About 40 percent of the pages deal with instrumentation, methodology, and representative examples of applications (including identification of World War II wrecks and the search for the sunken submarine U.S.S. *Thresher*). Approximately 10 percent of the pages present the results of physical studies of currents and light scattering, and the remaining 50 percent are about equally divided between geological and biological studies. There is, of course, some overlap between these areas. Individually, some of the pieces are brief to the point of superficiality; others stand as major contributions to our knowledge of the geological and biological deep-sea environment; and a few are redundant, although the retelling fits in well here. But as a whole, the book hangs together remarkably well, with a harmonious mix achieved in large part by logical chapter organization and adequate cross references added by the editor. This book should be of considerable interest to geologists and paleontologists who specialize in sedimentary-rock stratigraphy and the fossil record. Many of the sedimentary features seen on the sea floor (for example, current and oscillatory ripples) and the numerous tracks, trails, and burrows of marine organisms have been preserved in the rocks of the continents. The evidence of deep currents in so many areas has disposed of the old idea in geology that ripple marks are evidence of shallow water. Paleoecologists will find the photographs of modern ecology niches instructive in their study of fossil faunas. There is something here, however, for all oceanographers and a wealth of material for textbook and liaison writers. With its spacious (20 by 28 centimeters) imperial octavo, two-column-page format the book may not fit comfortably on all office bookshelves, but it will not sit long on library shelves.

Aside from the obvious advantages of such collected works over scattered journal articles, it provides space for what most editors and referees generally and rightfully consider nonessential background. The pathway to technological success is a street of broken dreams, littered with discarded instrument carcasses, and oceanography, like any other science, has a history of at least as many experiments that failed as that succeeded. It is refreshing to see some of this in print. For example, the authors of the introductory historical chapter, M. Ewing, J. L. Worzel, and A. C. Vine, give us fascinating insight into their pioneering efforts, failures, and successes with equipment, sponsoring agencies, and ship captains. The editor, J. B. Hersey, in his chapter on the manipulation of deep-sea cameras, takes the space to caution against paying out cable at rates in excess of the freefall terminal velocity of the attached camera, and then parenthetically adds that "in early experience with cameras, this speed was sometimes exceeded, with resulting cable tangles of fantastic complexity!" I have heard more organic words used to describe the results of this common accident, but none so carefully chosen.

During the several years this book has been in press, the art has gone on, with a trend, as prognosticated by several authors, toward increased use of deep submersible vehicles as photographic platforms. An indication of the time lag involved is given by the last chapter, which deals with a study done from the now Smithsonian-bound *Trieste* I.

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Insect Genetics

Genetics of Insect Vectors of Disease. Edited for the World Health Organization by J. W. WRIGHT and R. PAL. Elsevier, New York, 1967. xx + 794 pp., illus. $67.50.

This heavy and expensive tome is filled with information which, as far as this reviewer is aware, has never before been summarized in a single book. Two-fifths of the book (eight chapters) is devoted to the genetics of mosquitoes; three chapters deal with the genetics of muscoid flies and single chapters with the genetics of cockroaches, acarines, and *Triatoma*. A section entitled Applied Genetics consists of chapters on population genetics, physiological genetics, genetics of insecticide resistance, genetics of behavior, and genetics of susceptibility to parasites. Two chapters deal with the genetic control of insect pests. The two final chapters cover the techniques of mass breeding procedures and of genetic and cytogenetic experiments and observations.

Thanks to the dedicated efforts of, among others, R. H. Baker, G. B. Craig, Jr., G. Frizzi, J. B. Kitzmiller, and H. Laven (all of whom are among the authors of this volume), several species of mosquitoes may now be counted among the genetically best-studied animals. Impressive collections of mutants and "marker strains" are now available in *Culex pipiens, Aedes aegypti, Anopheles quadrimaculatus,* and *Anopheles gambiae*. Maps of the giant chromosomes in the salivary gland cells have been made for *Anopheles atroparvus, A. freeborni, A. punctipennis, A. aztecus, A. occidentalis, A. earlei,* and *A. quadrimaculatus*. Chromosomal and genic polymorphisms have been found and studied in natural populations of several species. Complexes of closely related sibling species, morphologically distinguishable only with difficulty, have been found in *Aedes, Culex,* and especially *Anopheles*. These complexes have been extensively studied by crossing experiments, as well as by comparison of the gene arrangements in their chromosomes. Only for drosophila flies and chironomid midges are comparable data available, and, interestingly enough, the process of speciation among mosquitoes shows several peculiarities worthy of further study and thought. Peculiar cytoplasmic incompatibility has been studied in *Culex pipiens* by H. Laven. Strains of this species from Europe and from northern Africa belong to five "cross-