

Volcanoes

IN HISTORY, IN THEORY, IN ERUPTION

by Fred M. Bullard



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TO BESS

For encouragement and never-failing enthusiasm for
the project,

For help on the research and in the preparation of the
manuscript, and

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of the world where living conditions often were
difficult.

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Volcanoes: IN HISTORY, IN THEORY, IN ERUPTION

PROLOGUE

Volcanoes are unquestionably one of the most spectacular and awe-inspiring features of the physical world, and they have contributed to man some of his most exquisite pleasure and some of his most devastating misfortune. The most lofty mountains on the face of the earth, affording majestic scenery enjoyed by millions, are volcanic cones. On the other hand, great volcanic eruptions in historic times have wrought death and destruction to many areas. In ancient times volcanoes were surrounded by mystery and superstition, and even today, notwithstanding the tremendous advances in all sciences, people still ask many unanswered questions about volcanoes. But it is highly probable that when man has learned more about them their terrific power may be harnessed for the benefit of mankind.

This book is an effort to summarize in nontechnical language our present knowledge of volcanoes. Some of the important volcanoes and volcanic regions of the earth are described as examples of the various types of volcanoes. Volcanoes are found in those regions of the earth where mountains are growing. But since they are but one manifestation of active mountain-building processes, it is understandable why the geologic setting must be presented in the description of a volcanic region.

My own interest in volcanoes began while I was a member of a United States Geological Survey expedition to Alaska in 1929. On this

trip I first saw an active volcano and I was tremendously impressed. Only the year before I had received a Ph.D. degree in geology from the University of Michigan and had taken courses with Professor W. H. Hobbs, a distinguished scholar in the field of volcanoes, earthquakes, and mountain building. Nevertheless, when I actually saw the active volcano I realized that I knew very little about it, notwithstanding my college degrees and the fact that I had been teaching geology in a major university for several years. Voicing my thoughts to Dr. S. R. Capps, director of our party, he remarked that if I was really interested in volcanoes I should go to Hawaii and work with Dr. Thomas A. Jaggar, director of the Hawaiian Volcano Observatory and a world-famous authority on volcanoes. He further stated that he thought such a program could be arranged. It was arranged. But a severe economic depression (during the mid-thirties) intervened before I was able to go to Hawaii as an assistant to Dr. Jaggar.

Here I learned the technique of modern volcanic research and acquired some of Dr. Jaggar's enthusiasm for research on volcanoes. Back in Texas in the early forties I saw little opportunity to apply my newly acquired knowledge, except insofar as it was useful in teaching. However, on February 20, 1943, the situation suddenly changed. On that date a new volcano, Parícutin, was born in Mexico. By a fortunate combination of circumstances I was scheduled to teach a course on the volcanoes of Mexico in the 1943 summer school of the National University of Mexico. Naturally, I lost no time in visiting Parícutin and adopting it as a laboratory for my classes. Circumstances also worked out so that I spent a part of each year for the next seven years at Parícutin and was thus able to follow from personal observations almost its entire life history. Another milestone in my quest for knowledge of volcanoes was the opportunity to spend a year as a Fulbright scholar studying the classic volcanoes of the Mediterranean area. With headquarters at the University of Naples and the Vesuvian Volcano Observatory, I studied Vesuvius, Etna, Stromboli, and other volcanoes in Italy, where the science of volcanology actually developed. Later an opportunity to investigate the active volcanoes of Central and South America arose, and that work, which has been under way for several years, is still in progress.

PART ONE: *Facts and Fiction About Volcanoes*

*By turns hot embers from her entrails fly,
And flakes of mountain flame that arch the
sky.*

VIRGIL'S *Aeneid*

I. WHAT IS A VOLCANO?

“WHAT IS A VOLCANO?” is a familiar question. An oft-given answer is that “a volcano is a burning mountain from the top of which issue smoke and fire.” Such a statement, although it does express the popular idea of a volcano, held even today, contains few elements of truth. In the first place, no “burning” in the sense of combustion, such as the burning of wood, occurs in a volcano; moreover, volcanoes are not necessarily mountains; furthermore, the activity takes place not always at the summit but more commonly on the sides or flanks; and finally the “smoke” is not smoke but condensed steam, mixed, frequently, with dust par-