

**INTRODUCTORY  
TEXT-BOOK  
OF GEOLOGY**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649502202

Introductory Text-Book of Geology by David Page

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**DAVID PAGE**

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OF

GEOLOGY

BY

DAVID PAGE, F.G.S.



WILLIAM BLACKWOOD AND SONS  
EDINBURGH AND LONDON  
MDCCLIV

*188. c. 30.*

## P R E F A C E.

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THE object of this little Treatise is to furnish an elementary outline of the science of Geology. In its preparation the utmost care has been taken to present a simple but accurate view of the subject, to lead the learner from things familiar to facts less obvious, and from a knowledge of facts to the consideration of the laws by which they are governed. By adopting such a method, Geology, instead of being a dry accumulation of facts, and its study a mere task of memory, becomes one of the most attractive departments of natural science, and affords one of the finest fields for the exercise of the observing and reflective faculties. The treatise, though initiatory, is arranged on a strictly scientific basis, the author being convinced that the student's progress is best promoted by commencing at once with the technical treatment of his subject, and making him feel that he is step by step acquiring the power to master for himself the higher and more difficult deductions. Such a course may require closer attention, and cost him a little more labour at the

outset, but it will be found as he advances to be the more pleasant as well as more profitable mode of procedure. Every science, like every manual art, has a style and mode of handling peculiar to itself—a fact too often lost sight of in volumes professing to be “Popular Treatises” and “Easy Introductions.” A soldier does not acquire the ready use of his musket by being trained to handle a broomstick; neither can a student become familiar with the truths of his science, or be taught to apply them, unless through the medium of the language and illustration appropriate to the subject. Whatever may be the defects of this manual, the author has endeavoured to write as a geologist—to afford the pupil an accurate outline of the science, should he stop short at this stage of his progress, and to present him, should he wish to prosecute the study, with a gradual introduction to a more advanced and comprehensive text-book. In either case the treatise is complete as far as it goes; and the student who has mastered its details will have acquired no insignificant amount of geological information.

EDINBURGH, August 1854.

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# GEOLOGY.

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## I.

GEOLOGY: A HISTORY OF THE STRUCTURE AND CONDITIONS OF THE GLOBE, AS MANIFESTED IN ITS CRUST OR PORTION ACCESSIBLE TO HUMAN INVESTIGATION.

### Objects and Scope of the Science.

1. GEOLOGY (from two Greek words—*gê*, the earth, and *logos*, a discourse or reasoning) embraces, in its widest sense, the constitution and history of our globe. Its object is to examine the various materials of which our planet is composed, to describe their appearance and relative positions, to investigate their nature and mode of formation, and generally to discover the laws which seem to regulate their arrangement.

2. As a department of natural science, Geology confines itself more especially to a consideration of the mineral or rocky constituents of the earth, and leaves its surface configuration to Geography, its vegetable life to Botany, its animal life to Zoology, and the elementary constitution of bodies to the science of Chemistry. Being unable to penetrate beyond a few thousand feet into the solid substance of the globe, the labours of geologists are chiefly confined to the external film or crust; hence we speak of the "crust of the globe," meaning thereby that portion of the rocky structure accessible to human investigation.

3. The materials composing this crust are rocks or minerals of various kinds—as granite, basalt, roofing-slate, sandstone, marble, coal, chalk, clay, and sand—some hard and compact, others soft and incoherent. These substances do not occur

indiscriminately in every part of the world, nor, when found, do they always appear in the same position. Granite, for example, may be found in one district of a country, marble in another, coal in a third, and chalk in a fourth; and some of these rocks occur in regular layers or strata (*stratum*, strewn or spread out), while others rise up in shapeless mountain-masses. It is evident that substances differing so widely in composition and structure must have been formed under different circumstances, and by different causes; and it becomes the task of the geologist to discover these causes, and thus infer as to the former conditions of the world.

4. When we sink a well, for example, and dig through certain clays, sands, and gravels, and find them succeeding each other in layers, we are instantly reminded of the operations of water, and are led to inquire whether these clays, sands, and gravels owed their origin to rivers, to lakes, or to sea. In our investigation we may also discover shells, bones, and fragments of plants imbedded in the clays and sands; and thus we have a further clue to the history of the strata through which we pass, according as the shells and bones are the remains of animals that lived in fresh-water lakes and rivers, or inhabited the waters of the ocean. Again, in making a railway-cutting, excavating a tunnel, or sinking a coal-pit, we may pass through many successions of strata—such as clay, sandstone, coal, ironstone, limestone, and the like; and each succession of strata may contain the remains or impressions of different plants and animals. Such differences can only be accounted for by supposing each stratum or set of strata to have been formed by different agencies, and under different conditions of climate, as well as under an arrangement of sea and land differing from that now existing.

5. In making these investigations, the geologist is guided by his knowledge of what is now taking place on the surface of the globe—assigning similar results to similar or analogous causes. Thus, in the present day, we see rivers carrying down sand and mud and gravel, and depositing them in layers either in lakes, in estuaries, or along the bottom of the ocean. By this process many lakes and estuaries have, within a comparatively recent period, been filled up and converted into dry land. We see also the tides and waves wasting away the sea-cliffs in one district, and accumulating expanses of sand and salt-marsh in some sheltered locality. By this agency thousands of acres of land have been washed away and covered by the sea, even within the memory of man; while by the same means new tracts have been formed