# AN INTRODUCTION TO THE STUDY OF PETROLOGY: THE IGNEOUS ROCKS

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# AN INTRODUCTION TO THE STUDY OF

# PETROLOGY:

## THE IGNEOUS ROCKS

BY

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# PREFACE.

A LITTLE book that should briefly describe the mineral constituents and internal structures of the Igneous Rocks, their mode of occurrence at the surface and their origin beneath the crust of the earth, has long been a *desideratum* among English text-books of Science.

With the view of filling this gap this little book has been prepared; and it is hoped that it will be found useful, not only as an introduction to the subject, but also as a handy work of reference.

Von Lasaulx's *Einleitung in die Petrographie* served me as a model in the first instance; but in working out my scheme I have thought it desirable to deviate considerably from the

arrangement adopted in that excellent little book. In the verification of data Rosenbusch's *Mikroskopische Physiographie* (2 vols.), Fouqué and Lévy's *Minéralogie Micrographique*, Lévy and Lacroix's *Les Minéraux des Roches* and Teall's *British Petrography* have been of great assistance to me; and the illustrations are, in many cases, taken from these works. I have also to thank the Council of the Geological Society and the Editor of the Geological Magazine for permission to reproduce illustrations that have appeared in their journals. The work has profited much by a careful revision of the proof sheets kindly undertaken by Mr. A. Pringle, B.Sc., of the Museum of Practical Geology, London.

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# PETROLOGY.

## I.

## INTRODUCTION.

**Petrology** is that department of geological science which has for its object the investigation of the characters and relations of rocks, that is to say, of the various materials of which the earth's crust is built up. A **rock** may be defined as a mineral aggregate, possessing a more or less persistent geological character. In studying rocks, therefore, we have three points of departure: (1) their geological relations, or mode of occurrence; (2) their constituent minerals; and (3) the mode of aggregation of the constituent minerals, or rock-structure.

In classifying rocks, we must allow each of these factors its proper value. The exclusive use of one of them would lead to incongruous results. Two rocks, for example, may be composed of the same minerals and yet have originated in totally dissimilar ways, the result being a difference both in structure and in mode of occurrence. Thus, a granite, a felspathic grit and a gneiss may all three be composed of quartz felspar and mica; but in structure and mode of origin they differ widely. The granite, having been produced

by the consolidation of a molten magma or paste at some considerable depth beneath the surface, possesses a coarse-grained, highly crystalline structure. The grit, on the other hand, is composed of fragments of minerals, derived from the disintegration of other rocks, that have been transported and deposited by the agency of moving water. While in gneiss there is a banded structure, generally considered to have been produced by a re-arrangement of the minerals since the first formation of the rock.[1]

The three rocks made use of in our example, may be taken as types of the three chief classes into which rocks may be divided; viz., **Igneous, Aqueous** and **Metamorphic.**

It is the purpose of the following pages to discuss briefly the characters of the chief Igneous rocks.

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[1] The banding of some gneisses, however, is possibly an original structure, comparable to "fluxion-structure" in lavas.

## II.

## MODE OF OCCURRENCE OF THE IGNEOUS ROCKS.

The **Igneous Rocks** are those that have been formed by the consolidation of molten material. We have good reason for believing that the temperature of the interior of the earth is very high—high enough, indeed, to melt all rocks with which we are acquainted at the surface. It is probable, however, that the liquefaction of the igneous masses is held in check by the enormous pressure existing at such great depths. The discussion of this question need not detain us. For, whether the interior of the earth is occupied by rock in the molten condition, or by solid material at a sufficiently high temperature to become liquid under a diminished pressure, the ultimate result is the same: at the moment of eruption the pressure is relieved and the liquid rock injected in the direction of least resistance. According to the nature of the resistance presented by the environment, the molten rock pierces the solid crust of the earth to a greater or less distance; perhaps, ultimately reaching the surface and flowing out in the form of