

**GRANITES AND
GREENSTONES: A SERIES
OF TABLES AND NOTES FOR
STUDENTS OF PETROLOGY**

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Granites and Greenstones: A Series of Tables and Notes for Students of Petrology by Frank Rutley

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GRANITES

AND

1919

GREENSTONES

A Series of Tables and Notes for
Students of Petrology

BY

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London

THOMAS MURBY

3 LUDGATE CIRCUS BUILDINGS, E.C

1894

BUTLER & TANNER,
THE SELWOOD PRINTING WORKS,
FROME, AND LONDON.

EXTRACTS FROM WORKS PUBLISHED BETWEEN THE YEARS 1820 AND 1860.

"Various classifications of volcanic substances have been proposed, among which the division into Trachytic and Basaltic seems to be that most commonly adopted."

Geological Manual, p. 137. 1833.

DE LA BECHE.

"Trap.—Tabular greenstone and basaltic rocks, from their rising up in step-like masses, were originally so termed; but the name is now extended to all igneous rocks which are not either strictly Granitic or decidedly Volcanic."

Handbook of Geological Terms, 1859.

PAGE.

"Diabas. Syn. Grünstein z. Th. Diorit z. Th. Hyperit z. Th."

Handbuch der Lithologie. 1860.

BLUM.

"The principle of separating from the trap or basalt the "greenstone protrusions," is in part correct; these intrusions consist of two kinds, namely, thin dykes or basaltic veins, and huge amorphous masses of greenstone, or greenstone-porphry, which occasionally form large mountains, and which among igneous rocks are only secondary to granite in point of extent and importance."

Report on the Geology of Londonderry and parts of Tyrone and Fermanagh, p. 77. 1843.

PORTLOCK.

"When these granite-veins are of a large size, they are termed *cleon-courses*. . . . In composition, these elvans are either shorl rock, eurite, felsparite, or even varieties of fine-grained granite."

A Treatise on Primary Geology, p. 22. 1834.

BOASE.

"J'ai été le premier à donner le nom scientifique et général de *Diabase* à la roche décrite et caractérisée sous le nom de *Grünstein* par les minéralogistes allemands."

Classification et Caractères Minéralogiques des Roches, p. 80. 1827.

BRONGNIART.

"By the term granite is here understood every compound rock which is found in irregular masses beneath the lowest strata; including, further, those veins which proceed from them so as to traverse the adjoining rocks . . ."

A Geological Classification of Rocks, p. 225. 1821.

MAC CULLOCH.

"Granites no doubt vary in their chemical composition, and so do greenstones, yet they always so differ from each other as masses of matter that the one can never become the other from mere differences in cooling."

Researches in Theoretical Geology, p. 379. 1834.

DE LA BECHE.

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PREFATORY NOTE

THE title "Granites and Greenstones" has been chosen because it is a comprehensive one. The relation between granites and syenites and between rhyolites and trachytes induced the geologist of former days to look upon these rocks, with their associated dykes, as members of one great group, the most important and characteristic being GRANITE.

In like manner he broadly treated the diorites, gabbros, etc. (together with the basalts, dolerites, and lamprophyres), as representatives of another great group, to which the name GREENSTONE was given. No distinction was drawn between trachytes and andesites; the dyke rocks of the greenstone group were termed traps, while those of the granite group were called elvans. There were thus two great groups of eruptive rocks, Granites and Greenstones, and the geologist of the present day will do well to retain these time-honoured names for use in the field. They may not express very much, but what significance they have is broad, and they are far more valuable for use on a working map than the more precise names with which modern petrography is encumbered.

The tables, placed at the beginning of these notes, indicate the mutual relations of the principal eruptive rocks. Above the name of each rock, symbols are placed, denoting its essential constituents. The symbol consists in most cases of the first three letters of the name of the mineral. In a few instances but one letter is used, sometimes with, at others without smaller qualifying letters or symbols. This plan of abbreviating the names is so simple that the meaning of each symbol is at once apparent; but, to prevent

possible mistakes, the tables are preceded by an index, giving the names in full.

After the tables, come definitions of the terms used to denote the most important microscopic structures. These are succeeded by notes on the mineral constitution of the eruptive rocks, and here lists of the accessory and secondary minerals are given.

The tables showing the classification of the eruptive rocks are divided by horizontal lines into three zones, the volcanic rocks, or lavas, being placed in the uppermost, the dyke-rocks in the middle, and the plutonic rocks in the lowest zone. It should, however, be remembered that there is, in reality, no sharp demarcation between these rocks. On the contrary, the dykes may, in a certain sense, be regarded as constituting a connection between the plutonic masses and their volcanic representatives.* The names of altered and pyroclastic rocks are printed in italics.

The notes on mineral constitution are followed by a series of determinative tables, which differ in some respects from those hitherto published, being to a certain extent simplified, in order to meet the general requirements of students. Chemical formulæ and specific gravities are not given, since they can be found in any good text-book of mineralogy, and the tables are cleared, as far as possible, of matter which does not relate to simple microscopic investigation. Explanatory notes precede the tables, which are accompanied by an index, reference to the latter at once showing upon which table the required mineral will be found. The notes are necessarily brief.

For further information, the student may be referred to Teall's *British Petrography*, and to the works of Lévy and Lacroix, Rosenbusch, Zirkel, v. Lasaulx, Kalkowsky, Gümbel and Jannettaz.

* Veins, dykes and the infillings of volcanic fissures and pipes appear, indeed, to be merely progressive phases of vertical intrusion, while sills may be looked upon as the homologues of lava-flows, especially of those from fissure-eruptions, and laccolites as those of domes. In the latter case the homology is supported by the circumstance that both laccolites and domes are, as a rule, formed from highly viscous magmas which solidified as trachyte, while those sills which are intruded for long distances are generally basic in composition. The difference of the conditions under which on the one hand lava-flows and domes, on the other sills and laccolites are formed, is a sufficient reason why the latter are unaccompanied by tuffs, since the explosions of steam necessary for their production could not take place under the pressure of a great thickness of overlying rock.

TABULAR CLASSIFICATION

OF

ERUPTIVE ROCKS,

THE ESSENTIAL CONSTITUENTS BEING DENOTED BY SYMBOLS.

INDEX OF SYMBOLS.

Arf. Arfvedsonite.	<i>Gran.</i> Granular ground-	O. Orthoclase.
Ang. Augite.	mass.	O ⁴ Anorthoclase.
Bio. Biotite.	Haüy. Häüyne.	O ⁵ Sanidine.
Bro. Bronzite.	Hor. Hornblende.	Oliv. Olivine.
Can. Cancrinite.	Hyp. Hypersthene.	Omp. Omphacite.
Chro. Chromite.	Lep. Lepidolite.	P. Plagioclase.
Cos. Cossyrite.	Leu. Leucite.	^{Alb.} P. Albite.
Dia. Diallage.	Mag. Magnetite.	^{Ano.} P. Anorthite.
Ens. Enstatite.	Melan. Melanite.	Pero. Perowskite.
Eud. Eudialyte.	Melil. Melilite.	Pic. Picotite.
Fel. Felsitic, Microfelsitic, Microcrystalline or Cryptocrystalline-groundmass.	Micro. Microcline.	Q. Quartz.
Gar. Garnet.	Mus. Muscovite.	Serp. Serpentine.
	Nep. Nepheline.	Sma. Smaragdite.
	<i>N.</i> Nepheline	Sod. Sodalite.
	(decomposition products after).	Vit. Vitreous matter.
	<i>N⁵</i> Elaeolite.	

A symbol in italics indicates either a groundmass or else residual, interstitial matter.

A line over a symbol indicates that the mineral is partly or wholly represented by decomposition products.

When a mineral is only present in small quantity, its symbol is given without a capital, e.g. bio. = Biotite, in small quantity.

For accessory and secondary constituents see p. 15 *et seq.*