

THE GEOLOGY OF CYPRUS

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NOTE.—In the following pages the pronoun *we* has been used because the whole of the original manuscript has been revised, altered, and added to by both of us, so that we are jointly responsible for most of the opinions expressed therein. At the same time, as Mr. Jukes-Browne has not visited Cyprus, for all statements referring to observations made on the spot Mr. Bellamy is responsible, except where other authorities are mentioned. On the other hand, all the descriptions of the lithological composition and microscopical structure of rocks, as well as comments on the fossils and inferences as to the relative age of the several rock-groups, are by Mr. Jukes-Browne.

THE GEOLOGY OF CYPRUS.

CHAPTER I.

PHYSICAL FEATURES AND GEOLOGICAL FORMATIONS.

THE island of Cyprus is situated in the extreme eastern basin of the Mediterranean Sea, about equally distant from the coast of Asia Minor or Caramania on the north and Syria on the east; the distance in each case being about 60 miles.

The island measures about 140 miles in length from south-west to north-east and about 60 miles from north to south, and contains about 3584 square miles. The coast-line is very irregular, and is indented with several extensive bays, chief of which are the Krysokhou, Morphou, Famagusta, Larnaca, Akrotiri, and Episkopi. On the south coast an irregularly rectangular promontory juts out to the south-west of Limassol, known as Akrotiri, on which is situated the Limassol Salt Lake, and divides the Episkopi from the Akrotiri bays; this peninsula culminates to the south-east in Cape Gata.

At the western extremity the district of Paphos tapers off in a north-westerly direction to form the promontory of the Acamas, terminating in Cape Acamas; and on the eastern seaboard south of Famagusta is another promontory which culminates in the conspicuous headland of Cape Greco.

To the north-east the land trends away to form the remarkable horn-like peninsula called the Carpas, which is about 45 miles long and never more than 7 or 8 miles wide, terminating in Cape Andreas, off which are situated the Klides Islands.

The island may be described as divided into two portions, a southern and a northern, by the great central plains which are known as the Messoria or Messorian plains. These extend from the shores of Famagusta Bay on the east to those of Morphou Bay on the west, and are nearly 60 miles long and about 12 to 15 wide.

They constitute an undulating tract of country, whose greatest

altitude is reached in the neighbourhood of Nicosia, which is just under 500 feet above sea-level.

These central plains are bounded on the north by the Kyrenia Mountains, which rise steeply from both flanks to altitudes of 2500 and 3000 feet, though the width of area above 1500 feet is seldom more than 4 or 5 miles. On the south and south-west is a much larger area of mountainous country, including the Machera, the Adelphi, the Troödos and the Tillyria Mountains. Of these the highest is Mount Troödos or "Chionistra," sometimes also, but erroneously, called Mount Olympus, 6406 feet above the sea. Mount Adelphi rises to over 5000 feet, and there are numerous other peaks exceeding an altitude of 4000 feet.

The low country is generally given over to the cultivation of cereals, the upper levels to the growth of the vine, and the summits are more or less clad in forest trees.

Previous Publications.

The earliest methodical description of the geology of Cyprus is that by A. Gaudry. His explorations were made in the years 1853 and 1854, and were published by the Geological Society of France in 1859.* His memoir is an elaborate one, dealing not only with the succession of stratified rocks so far as he could distinguish them, but also with the igneous rocks and with the mineral substances found in the island. It was accompanied by a geological map on a scale of $\frac{1}{250,000}$ (or 3.9 stat. miles to an inch), but it is entitled *Essai d'une carte géologique*, and is therefore only a sketch map, based on a rough and not very accurate survey of the island by de Mas Latrie.

The island was also visited about this time by the German geologist Unger, who, in collaboration with M. Kotschy, published an account of its geology in 1865,† differing on some points from the conclusions of M. Gaudry.

In 1880 Mr. R. Russell was sent out to report on the means of obtaining a better water-supply in Cyprus; the results of his examination were published in a Foreign Office paper, and in the report of the British Association for 1881.

Still later the island was visited by Prof. A. Bergeat (now of Clausthal), who chiefly studied the massive igneous rocks. His researches were published in 1892 in a paper which contains an excellent account of the igneous rocks, together with some interesting observations on the sedimentary series.‡ These will be referred to more

* *Mém. Soc. Géol. de France*, series 2, tom. vii., pp. 149-314.

† *Die Insel Cypern*. F. Unger and T. Kotschy. 8vo. Vienna (1865).

‡ *Tscherm. Min. and Petr. Mitth.*, vol. xii., p. 263. Vienna.

particularly in the sequel, and we are indebted to Dr. J. W. Evans for calling our attention to this memoir.

An excellent map of the island having been prepared in 1882 by Captain H. H. Kitchener, this formed a suitable basis for a more complete and accurate geological map, the materials for which were obtained during a residence of five years in Cyprus. The resulting geological map on a scale of $5\frac{1}{2}$ miles to an inch has recently been issued.*

Rock specimens taken from the different formations were brought home and examined in this country, others have since been sent over by Mr. Nicolls, the present Director of Public Works, so that the following pages embody the results of observations in the field and the consideration of specimens and notes at home.

Geological Formations in Cyprus.

The oldest formation found in Cyprus appears to be partly of Cretaceous and partly of Eocene age, but as no fossils have yet been obtained from its older limestones and marbles this is not certain, and consequently possible error will be avoided by giving it a local name. For this we have chosen *Trypanian* from Mount Trypa or "Trypa Vounos," a summit on the Kyrenian range on the northern side of the island.

Between the Trypanian limestones and the Tertiary sandstone series there seems to be a gap and unconformity, and again we are unable to fix the precise age of the deposits which form the basal part of this series. They were compared by Gaudry to the "Macignos" of Italy, and referred to the Eocene period, but as they seem to pass up into the Miocene deposits they are more likely to be mainly of Oligocene age. We propose to call them *Kythræan* from the town of Kythraë, where they are well developed and exposed.

The succeeding deposits are fossiliferous, and have been identified as belonging to the Miocene series, but as they have some special features, it will still be convenient to continue the use of local nomenclature and to call them *Idalian*, from the ancient town of Idalia (now Dali). In this we are really following Mr. Russell, who called them the "Idalia Beds."

Above the Miocene there is another break and unconformity, and during this interval great masses of volcanic rocks were thrust up through the pre-existing strata. A subsequent subsidence in Pliocene time allowed of further deposition, and the succession closes with some accumulations of Pleistocene date.

* A Geological Map of Cyprus, compiled by C. V. Bellamy, and printed in colours, with an explanatory key of 16 pages. E. Stanford, London, 1905. Price 6s.

The succession, characters, and approximate thicknesses of these formations are shown in descending order by the following table:—

NAME AND AGE.	CHARACTERS.	THICKNESS.
Pleistocene . . .	{ Alluvial deposits, sandy limestones, sands and conglomerates . . . }	up to 50
Pliocene . . .	{ Shelly limestones, with calcareous sands and sandstones . . . }	100 to 150
Break . . .	Intrusion of igneous rocks . . .	
Italian. {	Newer (Miocene). { White shelly limestones, white chalky limestones, and marly chalks with layers of flint . . . }	about 1000
	Older (Oligocene?) { Grey and yellowish marls, with beds of gypsum . . . }	400
	Kythræan (Upper Eocene or Oli- gocene) . . . { Grey felspathic sandstones and sandy shales . . . }	11500
Tyrranian. {	Eocene? . . . Greenish shales with hornstone bands	1100
	Cretaceous? . . . Grey limestones and dolomites, white and pink marbles, both massive and laminated . . . }	possibly 5000

CHAPTER II.

THE TRYPANIAN SERIES. (CRETACEOUS—EOCENE).

The Compact Limestones.

THE range of the Kyrenia Mountains, which forms the northern rampart to the Central Plains, commences on the west a little to the north-west of the village of Kormakiti and about $5\frac{1}{2}$ miles eastward of the cape of that name.

The place where the Trypanian rocks rise to the surface is known under the name of "Skasmata" (? the precipices), a term suggestive of the peculiar physical features of the neighbourhood.

From this point the range extends for a length of 28 miles in a direction east by south to the neighbourhood of Kythrea, and thence onwards for another 30 miles in a direction east by north to near Komi-kebir, at the commencement of the Carpas, that is to say, for a distance of 58 miles in all.

The tract of country occupied by the Trypanian limestones is nowhere more than $2\frac{1}{2}$ miles in width, although the summits of the range reach altitudes ranging from 2000 to 3000 feet throughout the greater part of its length, as the following heights will show.

Commencing at the western end, the most prominent points are: Kornos Vounos, a conspicuous feature of the landscape and the point at which the main range of hills commences, 3106 feet; Trypa Vouno, 3085 feet; Buffavento, 3135 feet; Kakotissa, 3014 feet; Pentadactylos, 2405 feet; Yaila, 3065 feet; Olymbos (the true Cyprian Mount Olympus), 2431 feet; and Sina Oros, 2380 feet.

Beyond the last-named summit the hills slowly diminish in altitude until the neighbourhood of Komi-kebir is reached, to the north of which the ridge is about 1000 feet above the sea.

When it is remembered that at no point are any of these summits as much as 4 miles from the coast along a horizontal line, an idea will be obtained of the precipitous character of the hills, and how abruptly the rocks which compose the hill-range rise from those which form the slope between it and the sea. The highest point, indeed, (Buffavento,) is little more than 3 miles distant from the coast-line.