EMERALD MINING IN EGYPT

A Long-Abandoned Industry

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Foreword :

Archeological research has proved beyond doubt that the Ancient Egyptians were not acquainted with many precious stones such as emeralds, diamonds, ruby and sapphires [1]. Beryl of which emerald is the jewel form, does not occur until Ptolemaic times [2]. However, the mineralogical terms of the Greeks and Arabs for emerald were lacking in precision. The Greek "Smaragdus" and the Arabic "Zumurrud" (at least in the early centuries of Arab administration) were all embracing including all minerals of the emerald species i.e, emerald matrix, beryl and peridot. This, perhaps, explains the tales of Herodotus and some Arab historians of emerald statues, obelisks and other curiosities [3].

In this article an attempt is being made to show a long struggle of Man against one of the most inhospitable and desolate environment, in the hope of gaining one of the gifts of Nature, emerald and plenty of it. The search took him a long way from the Nile Valley where, at last, he found amidst the geological museum of the Red Sea Hills metamorphic mica-schists rich in beryls. The ruins of his mining settlements and workings are still evident over a wide area in the Sikait-Zabara district (Fig. 1.) Because of inaccessibility and distance (7days

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1. Granville, S. R. (Ed.) The Legacy of Egypt, Oxford. 1947, p. 15. Only were precious stones such as turquoise, lapis, lazuli familiar — see J. Wilson. The Culture o Ancient Egypt, Chicago, 1963, p. 128.

2. Ball, J. The Geography and Geology of S. Eastern Egypt, Cairo, 1912, p.3.

3. Thomas, E.S. "The mineral Industry of Egypt" Precious stones: Emeralds Cairo Sc. J. vol. III, No 28 1904 p. 267.

from the Nile Valley) the preparation of the gems had to be carried out on the spot, thus avoiding considerable expense and trouble in transporting bulky material. This in fact necessitated the establishment, where suitable, of seemingly long-lasting mining settements (or encampments) served with wells and water reservoirs, watch towers worship places (temples and mosques) in additon to requisite stores and mecanichal aids. Emerald mining, like that of gold and other precious stones (in the E. Desert and Sinai) was mostly the monopoly of the goverment exploited, at least in the Greco-Roman period, through the use of what seems to be a kind of forced labour. Intensive as this exploitation was, Egypt remained for 1,800 years or so the only source of World's emeralds. As a corollary, these stones must have been of good quality and not mere beryls as modern mining engineers allege. "It is hard to believe, states Murray, "that these so very extensive workings were excavated to obtain stones of poor quality" [1].

I

THE EVIRONMENT

To appreciate the conditions under which mining operations were conducted and miners lived, it may be useful to discribe the physical environment which has underwent only slight climatic fluctuation since the opening of the workings in the 4th century B.C. [2].

The renouned Sikait-Zabara emerald-producing district is situated in the hilly sector of the south Eastern Desert between latitudes 24° '37—24° '47 N extending approximately from north to south for 15 kilometres. It may be of interest to note that Ptolemy places the Smaraggud Mt. (Gebel Zabara) a little higher than its true position. The journey to the mines took 7 or 8 days in which a distance of about 200 Kilometres had to be covered.

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1. Murray, G.W., „Trogodytica. The Red Sea Littoral in Ptolemaic Times" Geog. J. Vol. 133, part I March, 1967 pp. 24 – 33.

2. Huzayyin, S. "Changes in Climate, Vegetation and Human Adjustment in the Saharo-Arabian Belt." Man's Role in Changing the Face of the Earth. Ed. W. Thomas and Others, Chicago, 1955, p. 567 et seq.

Butzer, k. "Environment and Human Ecology in Egypt". Bull. Soc. geog. D'Egypte. T. XXXII. 1954 pp. 63 — 74.

Speaking of the Eastern Desert in general, the most striking feature is its dissected nature. Dry wadis with their ramifications cut the desert into hill-masses and minor plateaux especially on the west and north, making it all the more inaccessible as we penetrate deeper into the Red Sea Hills. In their upper parts wadis resemble torrent beds, but gradually develop into long flat winding watercourses with cliffs of rocks on their sides, sometimes 20 feet in height and beds of sand and pebbles in which all the lithological constituents of the surroundings are represented. In the highlands, the predominants types of scenery are extensive sandy plains and gaunt, bare, rugged mountains, though barness becomes slightly relieved in the Elba Mountain which occupies the far south-eastern corner.

Land forms are mostly a reflection of solid geology. Thus stone plateaux side by side with granite bosses, spiky granite peaks over 1500ms. above sea-level, and broken masses of gneiss. Crushing of the older rocks igneous and metamorphic is almost everywhere evidenced. Good building stones abound, and a variety of minerals (gold, copper etc.) occur though in modest quantities [1].

The climate of the region is predominantly a desert type, though it becomes slightly moist eastward of the watershed which extends not far from the Red Sea coast-line. The change from the cold cloudy weather (in Jan and Feb.) to the typical hot weather of the desert, is brought about very suddenly by a change of wind direction. Cool north-west winds are felt in the north part, while hot damp winds from the south-east prevail in the south. The hot-dry, sand-laden "Khamasin" winds usually blow for four or five days together in March and April. They cause a sharp rise in temperature (over a 45°C. in the shade) and fill air with sand dust. Rain falls in most years, but its quantity is very variable, in some years there is barely enough to keep the wells replenished, and much of the scanty vegetation dries up; in others, heavy storms produce very rapid downrushes in the wadis, filling them for short periods with raging torrents. With the exception of Gebel Elba which is fairly wooded, the other mountains make a dreary waste of naked rocks [2]. Both animal and plant life, however, is

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1. Ball, J. (1912) op. cit. p. 23.

2. On Gebel Elba see "Gebel Elba" by I. R. Fahmy. Fac. of Medicine, Cairo Pub. No. 7. 1938.

mainly restricted to wadis, namely drainage lines. For reasons not yet fully understood members of the local fauna, notably, ostriches and zebras have recently disappeared, leaving behind vestiges of their past existence [1].

Water supply is everywhere scanty and is obtained from very widely scattered springs, rock pools (in the mountains) and wells sunk in the alluvial deposits of wadi-floors. Being entirely dependent on the rainfall, their yield is ofter barely sufficient for Man and Animal. The Eastern Desert possesses no artesian water-supplies similar to those of the oases of the Western Desert [2]. In consequence it is only at very few places that any cultivation can be practised. This condition applies to the past as well. Of the sources of water, rock basins in the mountains yield the purest water and form the principal supply of pastoralists while springs and wells are mostly used by travellers and traders for their easier accessiblity [3]. It is to be noted that the coastal plain is waterless except for salty wells near the sea.

A closer view of the Sikait-Zabara district (Fig. 1) will bring home the actual scene and the kinds of minerals, the ancient mining expeditions knew so well. Approaching the district from the south-east we shall come across Wadi Nugrus and thence up its tributary, Wadi Sikait, which drains Gebel Sikait from the west, the eastern flanks being drained by wadi Um Gamil. Gebel Sikait itself 771 ms above sea-level is a rugged ridge of schists and serpentine in the upper part situated in the midst of hilly country 14 kms south-east ofGebel Zabara and 24 Kms from the Red Sea as the crow flies. Tthe district between Gebel Sikait and the sea consists of an expanse of low hills through which small wadis wind in and out. Towards the west, the hills are higher and beyond them is an arid plain. To the north and south mountains rise in the distance. Ancient miners found the Wadi Sikait asuitable

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1. According to S. Huzayyin (The Place of Egypt in Prehistory, 1941) the contemporary conditions of aridity did not set in until after 2500 B.C.. G. Murray (1951) on the other hand, concludes that the present climatic conditons set in after 500 B.C.

2. Hall, J. Contribution to the Geography of Egypt Cairo, 1952, p. 11

3. Mac Alister, D.,,The Emerald Mines of N. Etbai", Geog. J Vol. XVI. No. 5, Nov. 1900, p. 548.

It has been found that the water of certain wells and springs is either purgative (due to the absorption of magnesium salt) or so salty as to be only drinkable by camels.

place to climb the mountain from. It was not a difficult ascent especially after the construction of a road now broken[1]. The abundance of ruins near-by and the many old emerald mines met with at the foot of the mountain testify to the intensity of past exploitation. In addition to beryl, the mountain possesses a variety of minerals. Tourmaline, actinolite, various micas, chlorite, talc and crystals of calcite are among the commonest minerals available[2]. Figure (2) represents a geological section of Gebel sikait made by D. Mac. Alister(1900) and it is apparent from the accompaning remarks (referred to by inserted numbers) how rich in minerals this Gebel has been[3]. Proceeding across the hilly

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1. Roads were essentially built in the Eastern Desert to facilitate the movement of the Eastern trade. And wherever a road traversed the desert, some mineral more or less valuable was sure to turn up near the passes.

2. Mac Alister, op., cit. p. 543 -- 45.
See also Ball, J (1912) op. cit., p. 169 et seq.
Floyer, E. The Mines of the N. Etbai. Q. J. R. Asiat. Soc. Vol. XXIV, Oct. 1892, pp. 811 — 833.

3. Inserted numbers and what they indicate — see Fig. 1.
   1. Coarse talc schist with graphite.
   2. Hornblende rock.
   3. Quartz.
   4. Fissile mica schist and trough hornblende schist.
   5. (Mined) Mica schist and impure talc schist, beryl.
   6. Quartz prophyry (brownish — red crystals)
   7. Fissile yellow quartzose mica schist.
   8. Talc schist with graphite.
   9. Quartzose mica schist.
   10. Fissile mica schist chrysolite and talc schist in pokets.
   11. (Mined) Quartzose mica schist, beryl.
   12. Talc schist with ferruginous calcite nodules.
   13. Micaceous hornblende schist.
   14. Quartzose mica schist.
   15. Coarse mica schist.
   16. Schorl and tourmaline, actinolite.
   17. Schorlaceous schist, fibrous.
   18. Quartz reef.
   19. Garnet rok (hornblende and quartz).
   20. Quartzose hornblende schist.
   21. Quartzose actinbte schist.
   22. Fissile hornblende schist.
   23. (Mined) Quartdose mica schist, beryl.
   24. Talc schist with ferruginous calcite nodules.
   25. Greissen, rich in quartz.

country to the north west we come to Gebel Zabara, a mountain mass rising to 1,361 ms above sea - level and at the same time forms a southward extension of the Hangalia range. The mountain is drained on the north and east sides by feeders of the Wadi Gadir (especially wadi Zabara), while its western flanks, are partly drained by the wadi El-Noum. Gebel Zabara is chiefly made up of schists of various types with beryl veins extending in the north-east part[1]. The ruins in the wadi Zabara near the old emerald mines, show that beryl was found at some 500 ms above sea-level.

II

EMERALD EXPLOITATION

Egypt's mineral wealth was to the Ancient World proverbial. This wealth essentially concentrated in the mountains rising east of Coptos and Appollonos and was exploited by the Ancient Egyptians if not by their predecessors. However, emeralds were among the gems that Egypt knew of late, probably not earlier than the time of the Greek domination (332 — 30 B. C.) Under the Ptolemies Egypt was in principle a royal domain and so regal rights were excercised all over the existing

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= 26. Greissen.
27. Coarse impure talc schist.
28. Quartzose mica schist.
29. (Mined) Mica schist, beryl.
30. Talc schist with ferruginous impurities.
31. Argillaceous mica schist.
32. Fine - grained salty mica schist.
33. Fissile hornblende schist.
34. Fine-grained salty mica schist.
35. Quartzose mica schist.
36. Fine - grained micaceous hornblende schist, poor in hornblende.
37. Jasper.
38. Granite.
39. Amphibolite rock, poor in hornblende.
40. Agrillaceous slate with dendrites.
41. Impure talc schist.
42. Schistose amphibolite rock poor in hornblende.
43. Light spotted apple-green serpentine, chrysolite, rephite, and metamorphosed siliceous limestone.
44. Subtranslucent green serpentine, olivine, and nests of talc schist which contain soluble salts, stockworks of actinolite.

1. Ball, J. (1912) op., cit. P. 169.

mineral wealth [1]. In the same way mines were in Roman times controlled by the treasurey and either exploited directly or worked by private contracts [2].

Our information on emerald mining in the Eastern Desert is derived from two main sources: 1. historical records and inscriptions 2. investigations carried out in recent years by certain explorers. Arabic documents furnish us with good information while Greek and Roman sources give no clue to many questions. It is the recent investigations that have enabled us to make a general characterization of this activity in antiquity.

The Greco-Roman Period :

The earliest direct reference to emerald exploitation in Egypt is made by Strabo (C. 63 B.C. — A.D. 24) who informs us that "on the road crossing the Eastern Desert between the Nile (Coptos) and the Red Sea there are the mines of peridots (obviously emeralds) and other precious stones "Here Arabians (the local inhabitants) excavate deep tunnels from which they extract emeralds" [3]. In all probability his "Troglodytes" or cave-dwellers worked in the mines. [4] The road from Coptos to Berenice past the emerald mountains is mentioned with lists of halting stations and water reservoirs and their distances from each other both by Pliny (A. D. 24 - 79) and the writer of the Antonine Itenerary (A.D. 285—305). Appollonos (Arab Idfu) became at one time an important starting-station on the road to the mines. From it (Fig.3) the road ran past Bir Abad to a place called now Kanais, some 40 Kms from the Nile. Further on, it reached a place named Midrik. The next station was Samut, a place scattered with ruins. After Samut the road ran past Gebel Dweig where it joined that of Coptos. Further on, after passing over the watershed the road continued past Gebel Abu Had to the Wadi Gemal and thence up to the wadi Nugrus and Wadi Sikait to the mines.

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1. Preaux., C. L'Economie Royale des Lagides, Bruxelles, 1939, pp.253—67.
2. Milne, J. A. History of Egypt-Under Roman Rule, London, 1924, p.16.
3. Kamel, W. Strabo in Egypt, Cairo, 1953, p. 112. (Arabic text).
4. Murray, G. (1967) op., cit., p.p 24 — 33.

the other jewels for the peculiar virtues ascribed to it, the many purposes it may be put to and lastly for its light weight compared with other precious stones [1].

The Arab Period :

The same factors that were behind the exploitation of Egyptian emerald in antiquity i.e. the productivity of the mines and the wide and ever increasing demand for the stone continued in operation in Medieval Egypt. One is even inclined to state that emerald exploitation was more active and intense in the Middle Ages than in antiquity.

Qift then Qous replaced Idfu (old Appollonos) as the terminus of the road starting from "El-Khareba" (mining district) [2]. Leaving "El-Kareba" the road crossed the watershed heading southwards to wadi Barramia thence it continued north-westwards partly following the wadi Hammamat before it reached Qous.

To quote Masoudi (10 the century A.D.) "Emerald is to be found within the admininstrative district of Qift, in southern upper Egypt. Thence the road to the mines begins. The place in which the mines are located is called El-kharaba (the ruined) a mountainous desert. The Bedja (taken for the indigenous Abbada tribes) protect this place and receive royalities from whoever comes to dig the stone" [3]. Idrisi and Abu El-Feda refer to the mines and the roads leading to them but their description contains palpable errors. It is Makrizi (1364 — 1442) who furnishes us with a fairly informative account on emerald mines and their exploitation [4].

According to this historiographer, it took from seven to eight days to reach the mines from Qous [5]. As to the mines they were located in the center of a chain of mountains and to the north of the highest

1. Masoudi, Mourouj Al-Thahab, Vol. I. Cairo 1938, p. 329. (Arabic text)
2. Makrizi, Al-Khetat, Cairo, 1905 vol. I. p. 376
3. Masoudi op., cit., p. 338
4. Makrizi op., cit., pp. 313 — 318 and P. 376.
5. Ibid, p. 376

peak named "Karkashenda". An Arab manuscript entitled "Precious stones "written in 1182 A.D. by Abou El-Abbas El-Teisachi describes the talcose matrix in which the stones are found[1]. Makrizi also speaks of two kinds of talc matrix, camphor talc and silver talc (as well as jeroui stone?). Emeralds, continues Makrizi, "are found in dark deep caverns where miners work with lamps and use guiding cords lest they lose their way in the labyrinth of passages, whence they dig the stones with pickaxes[2]. With the utmost care emerald was then handled. "The newly extracted emerald is thrown into warm oil, wrapped in cotton and finally packed in linen"[3]. The reports of Masoudi and Makrizi reveal that the southern portion of the Eastern Desert (from which gold, copper and emeralds were extracted) was in the Arab period a prosperous land inhabited by warlike tribes of mixed origin. "The tribe of Rabi-a, states Masoudi, "mixed with the Bedjah (the natives) and as a result grew in strength and wealth"[4]. Though under the protection of these nomads (whose chiefs received royalities) the mines were policed by soldiers and officers sent by the Sultan. However, it was through the agency of a certain contractor that the mines were worked. Furthermore, we are informed that a bureau with overseers and scribes looked after the mines and their labour force[5]. Miners wages and other expenses were being paid by the Sultan through this office. This in fact confirms our view that in the Arab period paid labour replaced the age-old forced labour of former times. The number of workers was never fixed. If the government became really anxious to increase emerald production many workers were recruited, and if for some reason or other it lost interest, the number deceased appreciably. A duty that overseers had to perform daily before the end of the working hours was a careful and scrupulous search privately applied to every worker lest he hid a precious stone. Yet despite this precaution some workers succeeded in getting away with gems[6]. As regards

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1. For comment see. A-M. De Rogiere Description de l'Egypte Vol. XXI. Paris D.M. ccc. xxvi, pp. 116 — 121

B. Quatremère, E. E. Memoires Geographiques et Historiques sur l'Egypte. Tome second, Paris, 1811, p. 174.

2. Makrizi op., cit., p. 313.

3. Ibid.

4. Masoudi, op., cit., p. 338.

5. Makrizi op., cit., p. 376.

6. Ibid., op., cit., p. 376

Arab mining sttlemets they represent a continuation of previous ones. Expectedly they were bumble villages built up of rubble stones and stood close to the mines but slightly above the bed of wadis.

Abou-El-Abbas El-Tcisachi (1182 A.D.) names six mines worked in his days, but the places referred to by these names, cannot be indentified[1]. Further though emerald was essentially extracted from subterranean pits, small amounts of inferior quality) were found embedded in wadis floors. However, four kinds of emeralds came to be known as early as the tenth century[2].

1. El-Mur المر — very beautiful, costly and flawless, as brilliants and bright as white-beet.

2. El-Bahari (Maritime) البحري — myrtle coloured, prized by the kings of Sind India, Zinj and China.

3. El-Maghrebi (Occidental) المغربي — so named because it is much sought after by the kings of France, Lombardy, Andalusia, Gallicia. Gascony and Russia.

4. El-Assum الأصم — the commonest and most inferor, pale green and not brilliant.

Masoudi and Dimashki (10th and 14th century respectively) also distinguish the following four grades of emeralds[3]:

1. El-Thubabi الذبابي - (likened in colour to that of the cantharides fly) is of true brilliant green colour and the most costly and precious of all. One carat of it may cost as much as 4 dinars.

2. El-Rihani الريحاني - (myrtle leaf hued) is a second grade stone but preferred by orientals and negroes.

3. El-Salki السلقي — White-beet coloured.

4. El-Sabouni الصابوني — has the appearance of Egyptian soap; being dull in colour is of little value.

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1. M. De Rozière, op., cit, p. 120 et seq.

2. Masoudi, op., cit., 338 and p. 339.

3. Ibid.

Dimashki, Nukhbat El-Dahre, Leipzig, 1923, p. 76. (Arabic text).

Regarding the size of Egyptian emeralds El-Teisachi mentions that the biggest stones are from twelve to fifteen millimetres in diameter, the average being seven to eight millimetres[1]. In terms of weight Masoudi gives five mithkals (three-quarter of an ounce) as the weight of the heaviest emerald found. But Makrizi cites a stone weighing one rotl (about one lb) and another found in 1286 A.D. weighing 165 mithkals (about 25 ounces)[2]. The unanimity of Arab writers in their admiration of Egyptian emeralds and the world-wide reputation these gems had, go far to refute the assertions of modern engineers and jewellers who deny that the Egyptian mines ever have produced good stones. Furthermore, the early Arab jewellers who appreciated the value of high-quality gems considered Egypt the sole producer of the most precious emerald stones[3]. We are even inclined to suggest that in this period great efforts were spent to increase emerald production in order to meet an ever increasing demand at home and abroad. The prodigious amounts of emeralds bequeathed by members of the reigning dynasty[4], and the unanimous admiration shown by foreign kings to certain Egyptian emerald stones, strengthen this view.

Of superstitions connected with the stone, Masoudi relates that its colour is said to improve early in the month and under the full moon, that the stones vary in abundance according to the season, weather, and origin of the blowing wind, and that the stones destroy the eyes of serpents that rashly gaz upon them[5].

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1. Thomas, S. op., cit., p. 268

2. Makrizi-kitab Al-soluuk Vol. 2, 1st part Cairo, 1941, p. 12. (Arabic text) See also Taghri Bardi.—Al-Noujoum Al-Zahira Vol. 8, Cairo 1939, p. 215. (Arabic text).

3. In this connection the well-known Arab writer El-Ga-hiz (9th century A.D.) states clearly in one of his essays that the best emerald stones in his days are imported from Egypt. See his "Al-Tabassur Bittijarah", Cairo 1935, p. 27 (Arabic text).

4. One of the daughter of Mo-izz, states Makrizi, "left at her death an ardebb (about five bushels) of emeralds" see Makrizi Al-Khetat. Vol. II, p. 263. Also of signicance is the fact that the receipts from emerald mines were at one time assigned to the emirs, mamluks, and army. — Lane-poole – A History of Egypt-in the Middle Ages, London, 1961, p. 304.

5. Masoudi, op. cit., p. 339.

Emerald was carried from the mines to Cairo, thence it made its way to the far corners of the oecumene. It was coveted and higly-prized by kings for the many virtues ascribed to it. To mention a few, it was held to be a perservative against epilepsy, it cured dysentery and snake bites, it assited women in childbirth, it drove away evil spirit, and because of its colour was believed to be good for eyesight.

After 18 centuries of active exploitation the mines showed signs of exhaustion and had to be abandoned. Makrizi approximately fixes the year 765 A.H. (a. 1365 A. D.) as marking the end of emerald mining in Egypt[1]. But it is likely that production of inferior stones continued, though on a very small scale, until Pezaro conquered Peru (1520), a new country rich in emerald[2]. Thus, a mineral exploitation that increased Egypt's wealth and fixed Man's labour for so long at an inhospitable and desolate place, came to an end[3].

1. Makrizi, Al Khetat. Vol. I. p., 376.

2. Ismalun, M., op. cit., p. 188.

3. During the 19th century, and the early years of this century certain attempts were made towards re-opening the mines but they failed.

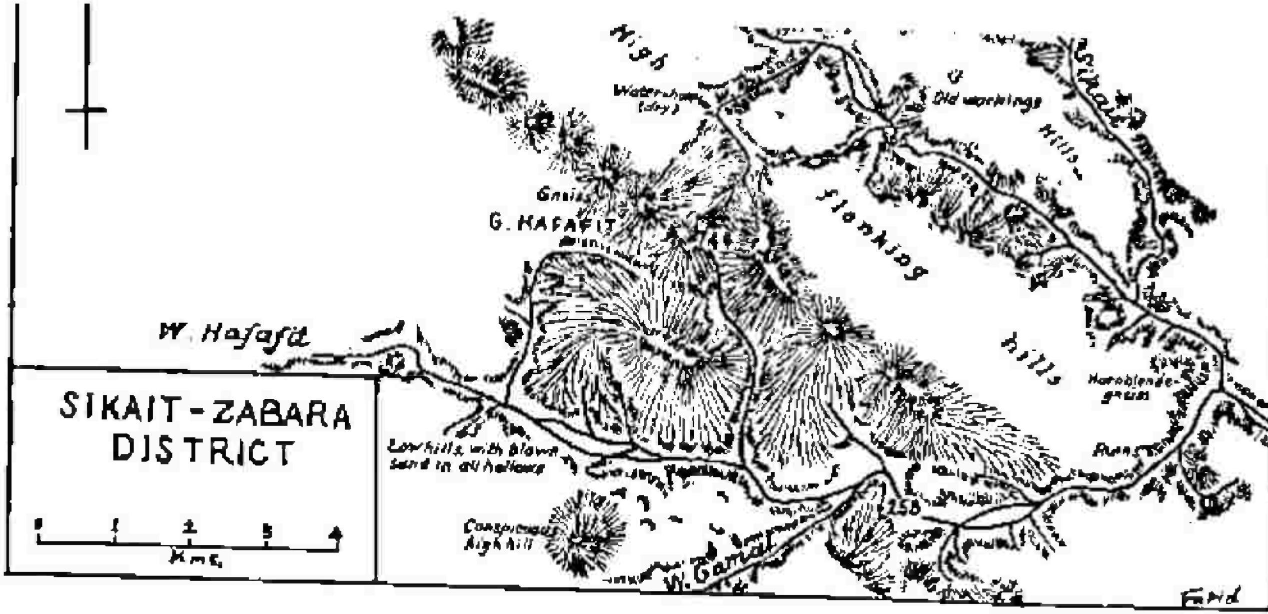
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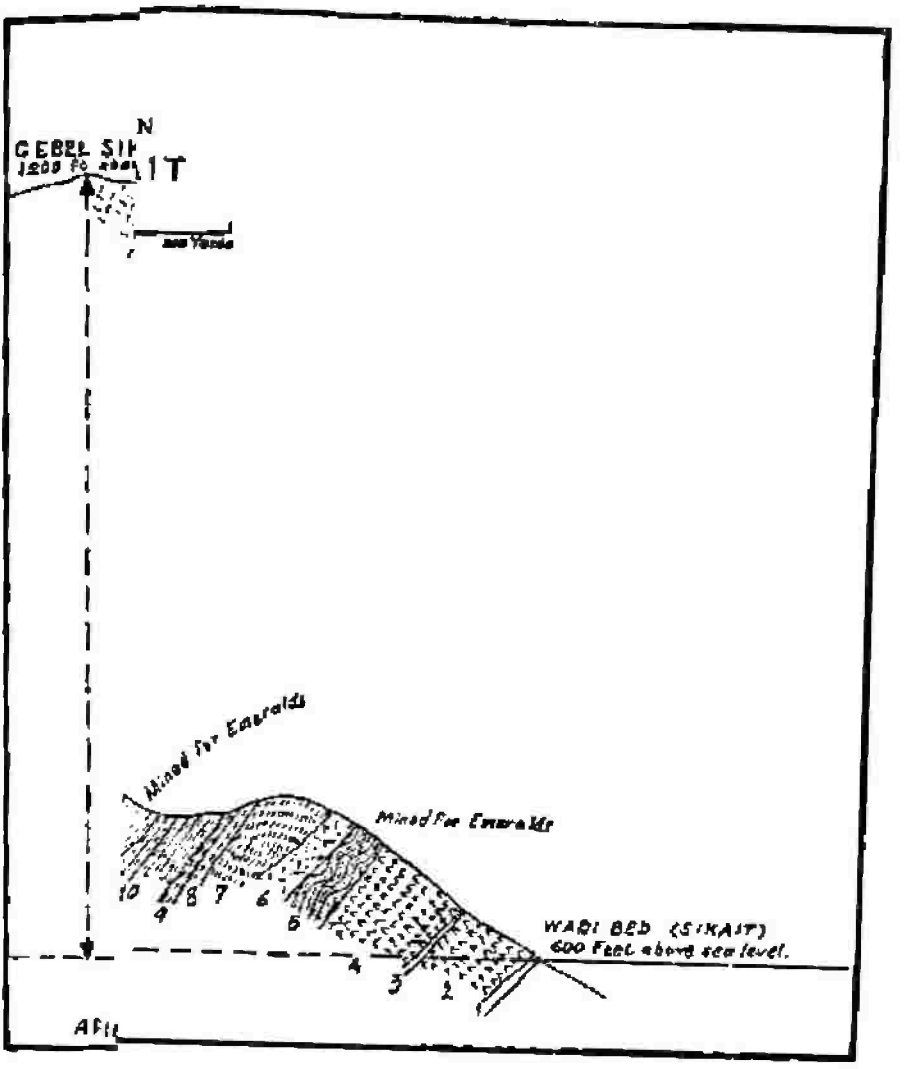
Fig. 1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