A Journey to Inner Africa
Aslanyan, Anna, Kovalevsky, Egor

Published by Amherst College Press

Aslanyan, Anna and Egor Kovalevsky.
A Journey to Inner Africa.

For additional information about this book
https://muse.jhu.edu/book/85740

For content related to this chapter
https://muse.jhu.edu/related_content?type=book&id=3001793
Addendum

Geographical Aspects of the Basin of the Nile

Gold Deposits of Inner Africa

To proceed with our description of the formation the Nile’s basin, we must transport ourselves into what for its native people was a prehistoric time. According to Herodotus, who gathered the legends of ancient Egypt from the priests, even before the Delta of the Nile had been fully formed and the sedimentary layers covered with deposits of silt, man took possession of the country, continuing to fight the Mediterranean Sea to conquer his land from it, assisting the natural process with his own labor. That period is dated in Egyptian legends and chronicles to beyond our chronology, and I shall therefore not dwell on it, not wishing to increase the number of hypotheses, already numerous, especially with regard to this subject. Instead, I shall immediately proceed to describe the basin of the Nile in its present condition or as we find it in times that are within reach of geology or history, which terms are here understood in a narrow, more definitive sense.

The Nile is an extraordinary river, unique in the world, presenting as it does some peculiarities pertaining to it alone; its character
drastically distinguishing it from the other rivers of the globe. The Nile—concealed in its every action behind a veil that the ancients found impenetrable, not knowing or daring to lift it, afraid of insulting the mystery of the river they deified, and dedicating temples and numerous priests to its worshipping—the Nile has not been quite discovered yet. Despite all the efforts of travelers, its sources have remained unknown since the time of the pharaohs, and many people perished along the way of discovery, sacrificing themselves to science, which silently devastates the ranks of its acolytes. It was not until recently that we learned the reasons for the rising of the Nile at the time when other rivers return to their banks and for its subsiding at a time when other rivers flood their banks. Other rivers flow in a valley that forms a kind of hollow, serving as a natural cradle for them; on the contrary, the banks of the Nile are elevated, sloping not toward the river-bed but away from it, to the sides, toward the deserts; therefore the Nile's waters and silt, having just risen to the height of its banks, soon inundate them and flow beyond, bringing fertility to the country. The ancients said that the Delta is the gift of the Nile, which can be proven by geological facts.

The Delta—that is, the space on the ground formed by the mouths of the Nile River in the shape of the Greek letter Δ (delta)—is clear proof of that; its shells belong to a fresh-water variety, while the layers of the Nile's deposits bear witness to however many centuries they worked to transform an immense swamp that, according to Herodotus, used to stretch down to Lake Moeris. A scientific expedition that accompanied Napoleon to Egypt calculated that the elevation of the continental part of Egypt due to the amount of silt distributed annually by the Nile equals 126 millimeters in every century. In my opinion, this calculation cannot be precise: firstly, the elevation of the banks of the Nile depends not only upon its silt deposits but also upon the deposits of nearby sands, which, despite being obstructed by the mountains, still reach the banks of the Nile, as if attempting to obliterate any beneficial effect due to the joint labors of man and the Nile (which fact is clearly shown by the quartz sand of the desert, whose layers often replace the layers of silt at a significant depth); secondly, the deposits of silt quite depend upon random circumstances which cannot be calculated, such
as the scale of inundation, natural obstacles encountered by the floods in different spots, the tide-rips of the river, &c. Peering closely into the layering of the banks, I found that in certain years the Nile had washed away precisely the entire layer of the previous year, replacing it with a new one of the same thickness, thus renewing the soil and making it fertile without changing its level.

The Nile’s deposits are of the following composition:

1. three-fifths of alumina;
2. somewhat more than one-fifth of carbonate of lime;
3. about one-tenth of free carbon;
4. six or seven-hundredths of oxide of iron, which communicates the red color to its waters during its inundation;
5. two or three-hundredths of carbonate of magnesia; and
6. several atoms of silex.

The view of Egypt during the flooding of the Nile, when it appears to be an enormous archipelago, with treetops, mountains, and villages scattered around elevated parts coming out of them as if they were islands—this view is indescribably beautiful. It is now reliably known, and we can confirm it as eye-witnesses, that inundations are caused by seasonal rains, which fall in whole masses of water, resembling enormous waterfalls, during four or five months near the sources of the Nile.

Two mountain ranges accompany the Nile, protecting it from the sands of the desert, which threaten to devour it as they advance, and keeping the waters of the Nile in its valley, not letting them any farther, and thus sparing them any waste of fertility. The so-called Arabian Mountains, running along the eastern side, come closer to the Nile and in some places invade its bed; the elevation of the range increases as it moves south, and yet its highest point, not far from Thebes, does not exceed 700 meters. In the north, near Cairo, this range forms a group of mountains called the Mokattam Hills, which barely reach a height of 200 meters. To the west of the Nile stretch the Libyan Mountains. These last are nearly the same height as the Arabian range, while also being equally deserted, black, broken, and scattered. As it leaves
the Nile behind, going into the desert, the range becomes significantly lower until it finally merges with the sands completely, while the Mokattam Hills rise as they deviate toward Suez, forming elevated groups of mountains near the Red Sea. Thus the entire basin of the Nile—that is, the entire Egypt—constitutes an area that slopes significantly from east to west.

Nubia, with its Great and Lesser Nubian Deserts, has almost the same aspect, the only difference being in that its elevation toward the south, near Sennaar, is much more pronounced. The Sudan and Abyssinia—that is, the space between the countries of Inner Africa that are barely known by hearsay and the Red Sea in the east, stretching to the confluence of the White and the Blue Nile in the north (which includes the countries we have explored)—these lands are very different in form. Here the ground rises abruptly and significantly from west to east, changing from 800-foot-high mountains in Wadai to immense, snow-covered mountains in Abyssinia, which reach 10,000 feet and more above the sea level.

Those who believe that the interior of Africa—beyond the equator, on the other side of the so-called Moon Mountains—is a depression are mistaken, their opinion appearing as wrong as the previously held one, that this part of the continent is quite deserted. Enough information has now been gathered about these countries to allow one to positively say that the interior of Africa is much inhabited; as for the absence of any significant depression, this fact is corroborated by the rivers that flow out of it at a significant rate, which suggests the sloping of the continent in the same succession from east to west.

Having described the exterior aspect of the lands which form the basin of the Nile and which it irrigates, giving them life and vegetation, I shall say a few words about the river itself and then go on to describe the geological formation of its basin.

I have already expressed my opinion of the sources of the Nile in the above account of my journey to Inner Africa. At any rate, the Nile proper consists of two merging rivers, the White and the Blue, or Bahr-el-Abiad and Bahr-el-Azrak. The waters of the former come out of marshy plains and therefore flow slowly, being muddy, unwholesome,
and white in color; the waters of the latter, rolling off the high ground of Abyssinia, are clear and blue in color; the natives think them salutary, and indeed, the Blue Nile’s water is the best water for drinking. The two rivers merge near Khartoum, in lat. 15°37’10” N. and long. 30°17’30” E. Thence the Nile flows solitary, in meanders, two of which are so large that they nearly embrace the entire enormous space between the Great and the Lesser Nubian Deserts; frequently obstructed by cataracts between Shendi and Aswan, the river, as if against its will, rushes sideways, seeking a new outlet for itself. Linant Bey calculates the amount of water carried by the Nile in every 24 hours to be, at low water, 79,532,551,728 cubic meters for the Rosetta branch and 71,033,840,640 cubic meters for the Damietta branch and, at high water, 478,317,838,960 and 227,196,828,480, respectively.

Humboldt and many other scientists have noted with surprise that the Nile is the only river in the world that, along such a great stretch, lets in only one river, the Atbarah, which flows into it from the right. I have now succeeded in discovering another river which flows into the Nile, from the left, and which the Arabs call the Aboud: it runs through the Lesser Nubian Desert, merging with the Nile somewhat below Meroë (a detailed description can be found in the second part of my *Journey*).

I have already described the composition of soil in the Delta of the Nile. The prominences closest to the mouth of the river, which subsequently turn into the Mokattam Hills, are composed of tertiary sandstone, marl, and limestone, all of them abundant with the following fossils: *Nummulites sp.*, *Voluta sp.*, *Cardium protractum*, *Fusus sp.*, *Nerinea sp.*, *Trochus sp.*, *Mactra sp.*, *Madrepora*, *Nummulites polygratus*, *Dentalium sp.*, *Solen sp.*, *Turbo sp.*, and *Crassatella sulcata* (see the collection of fossils submitted to the Institute of Mining).

Let us trace, if only briefly, the formation of the Nile’s basin from thence to the places that are to be the subject of our special study.

The low, lifeless ranges of the Libyan and Arabian Mountains stretch along the Nile’s banks with remarkable uniformity, composed of tertiary limestone and marl, which between Suez and Cairo are replaced by a narrow strip of sandstone, also tertiary, this last turning in places
into chalky limestone (between Keneh and Esneh) or giving way to quartz sandstone (between Esneh and the cataracts of Aswan). It is from this last that granite and granite syenite rise, forming the cataracts of Aswan and Elephantine Island, as well as enormous quarries near Aswan, which in the time of the pharaohs provided Egyptian cities and temples with giant pillars, obelisks, and statues. One can still discern a colossus in one the cliffs, barely carved, not yet sawn off, remaining there since the time of the pharaohs, as if to indicate the method by which ancient sculptors carved their works of art. The above-mentioned sandstone is occasionally covered with molasse; in my opinion, and contrary to Russegger’s claim, it can never be classified as a greensand formation.

The strata of marl, clay, limestone, and sandstone—which combination constitutes, for the most part, the basin of the Nile in Egypt and Nubia—cannot be classified as *Zechstein* in the German notation nor as lower sediments of *New Red Sandstone* in the English one. They are, in my opinion, more recently formed than both of those and differ in their fossils. There is a chalk formation, composed of several strata of greyish chalk, marl, and sandstone; we encountered no new fossils in it except those already known and typical of the chalk formations of Europe: *Belemnites micronatus, Terebratula carnea, Catillus*, &c. Above the layers of white chalk we occasionally encountered nummulite limestone. Generally, the lower strata of tertiary soil (*période cocène*) are less developed than the other two (*miocène et pliocène*).

We left the Nile behind at Korosko to go ever deeper inside the country, into the Great Nubian Desert; as we went farther from the basin of the Nile, we left behind its formations, which in many respects are unique and pertain to it alone, and hence shall be called the Nile system hereafter. On the surface of the mountains, which grew somewhat higher, quartzite appeared, in places turning into clay slate containing grantolite, often cut through by traprock and subsequently interspersed with limestone; I therefore believe that plutonic effusions must have happened after the deposition of grantolite slate, during the formation of the lower strata, and that they made no influence on the elevation of the Nile’s basin, being regularly interspersed with raised sedimentary formations.
Farther on, one encounters crystal rock formations in a much developed state. A day’s journey to the wells of el-Murat, strata of talcum slate are broken through by fissured diorite and aphanite, which in their turn are replaced by porphyry, blue elvan, and syenite; the mountains gradually rise and, being scattered one by one or in small groups here, merge into a range in the east, near the Sea of Reeds, separate and rather elevated, where crystal rocks prevail. On the other side of the wells of el-Murat, mica and chlorite slate dominate, cut through in many places by transparent quartz veins or by masses of layered quartz rock with solitary grains of quartz and feldspar, which appear to be clay slate transformed by granite, for nearby there are strata of granite, perhaps forming a granite axis that runs here. At the foot-hills we encountered dolerite, and finally, as we left the desert behind and approached the Nile, we entered once again the *system of the Nile’s basin*, to use our term. A narrow edge coming close to the Nile is covered with strata of alluvial foliar clay, which forms a fertile strip, although hardened in places (where it awaits new silt deposits to be brought by the Nile), which occasionally contains impressions of plants.

Mountains that stand apart from one another, scattered around the boundless plain, their aspect and, finally, numerous ferruginous boulders, hollow or with ferruginous ochre inside and partially wind-eroded—these features gave Russegger reasons to suggest their volcanic origin.

Prior to arriving at el-Murat, we had another occasion to convince ourselves of the validity of a remark made by Murchison regarding the fact that the appearance of volcanic rock proves the presence of metal-bearing deposits—especially in the spots where the former touch sedimentary strata, through which they are effused outside. This connexion between certain plutonic and sedimentary strata and precious metals also applies to the occurrence of gold-bearing deposits, which originate from the erosion of lodes. Having collected, in accordance with the above indication, some sand, we washed it at the wells of el-Murat and obtained signs of gold.

Along a stretch of about three days’ journey to Khartoum, as well as between Khartoum and Roseires (two weeks’ sailing), the banks
of the Nile and the space embraced by its two tributaries—the White and the Blue Nile, or Bahr-el-Abiad and Bahr-el-Azrak—which space is occupied by the Peninsula of Sennaar, is a plain sloping toward the banks of the White Nile, rising in Abyssinia, and covered with marl and conglomerate. The banks of the Nile are not sheltered by any mountain ridge; protection from the advance of sands is no longer required here, for we are already in the belt of seasonal rains, where permanent vegetation serves (if not all year round) to consolidate the sands and prevent them from producing a destructive effect. Conglomerate is for the most part bound by limestone mass and reveals, when broken, grains of quartz and numerous fresh-water shells, among which we noticed the so-called Etheria caillaudi, Unio, Iridina, and Anodonta.

Toward foot-hills Nubian sandstone appears again, sometimes accompanied by hematite, and finally, the foot-hills themselves emerge at Roseires in separate small groups, consisting of north-inclined strata of clay slate and crossed in many places by veins of wind-eroded quartz. The group of Moe Mountains, standing separately, is much more significant and consists of granite very similar to that of Aswan; we shall turn to it later.

The banks are overgrown with vegetation, which becomes the thicker and wilder the closer one gets to the foot-hills; the date-palm, Phoenix dactylifera, begins to disappear; while the doum, Cucifera thebaica, still grows in abundance; soon a third variety of the palm-tree appears, not yet described by anyone, as far as I can judge, and known locally as douleb—I have written of it in my Journey; there are plentiful Acacia heterocarpa, Acacia nilotica, Acacia gummifera, Mimosa habbas, as well as several kinds of cassia, among which we noticed Cassia acutifolia, Cassia senna, and Cassia sabun; also widespread are Tamarindus indica, Bauhinia tamarindacea, Clitoria ternatea, Glycine moringaeflora, Vernonia amygdalina, Inula undulata, Ethulia gracilis, Eclipta erecta, Cynanchum heterophyllum, Asclepias lanfora, Strychnos innocua, Sorghum vulgare, Sida mutica, Sterculia setigera, Ficus sycomorus, Ficus platypylla, Ficus glumosa, Nauclea microphylla, Heliotropium pallens, Cordia, Celosia trigyna, Acanthus

1 It is unclear which species of the genus Kovalevsky has in mind.
addendum

polystachyus, Rucelia nubica,2 Sesamum orientale, Tribulus terrestris, Tamarix orientalis, Ziziphus purifolia, Pistia stratiotes, Terminalia psidiifolia, and Balanites aegyptiaca. Finally, let me mention the annona fruit, previously unknown to me, and the hokan, as they call it in Sennaar, prior to concluding this brief inventory with that giant of vegetation, the baobab, Adansonia digitata, which I have described in detail in my Journey.

The ground rises almost imperceptibly from the Mediterranean Sea and the mouth of the Nile to the very confluence of the White Nile and the Blue Nile, near the city of Khartoum in the East Sudan, so that across the immense space between Alexandria and Aswan the Nile valley barely rises by 170 Paris feet,3 and between Aswan and Khartoum, by 870. Meanwhile, Roseires, situated at the foot-hills, lies at a height of 1,600 feet already, the mountains rising quickly from thence.

Prior to entering the mountains, which constitute the subject of my study, I must define their significance in relation to an immense range (wrongly named the Moon Mountains) which runs through southern Africa, its western extremity crossing the equator, the Moon Mountains making up only the spurs of the range. This subject—so obscure until now, having been the aim of researches conducted by different people, from Herodotus in the ancient time to the D’Abbadies, d’Arnaud, &c. recently—certainly cannot be explained positively and completely by my own explorations, which bold thought I am too far from entertaining; yet nevertheless, some facts gathered in the location, others related by people familiar with those parts (albeit ignorant), and finally, rocks delivered from the vicinity of the equator give me the right to report here my suppositions based on such a large amount of information.

The central axis of the range commences in lat. 12° N. and long. 39° E. and runs to the south-west, gradually lowering and inclining toward the equator, which it crosses perhaps near long. 18° or 19° E.

Thus this mountain range replaces the waters of the Blue Nile, which flows south at first but, upon encountering this impassable obstacle, describes an arc, deviating westward, toward the foot-hills, and then, having been obstructed here also, seeks a passage in the range’s very

2 Again, it is unclear which species of the genus is referenced here.
3 One Paris foot equals 1.06575 feet.
slopes, using them as a natural incline for its waters, and flows out to the north. Farther on, two or three insignificant rivers take their origin in the range’s northern declivity, followed by the Yabous and the Toumat, and finally, by two or three tributaries of the White Nile and by its sources themselves. Between the White Nile and the Toumat, a less significant mountain range intrudes, its waters flowing into the White Nile on the western side and into the Toumat and the Blue Nile on the eastern side: it is this chain that we shall call the Toumat range hereafter.

The following rivers have their source in the southern side of the central axis of the Inner African range: the Wabah or Wabi or Hainis; the Gojeb; the Omo; and possibly the Niger at the south-western extremity.

Thus the principal mountain range of Inner Africa presents a visible water divide, *divortium aquarum*, waters hardly ever crossing it anywhere; in this it differs from the Alps and the Urals. The only exception is a small stream flowing down across the western slope; yet its banks, their exposed parts revealing broken, over-steepened strata of rock, prove that this rock crevice was formed earlier, by ancient tremor and the tearing of the Earth’s crust, and thus constituted a bed ready for the effluxion of waters rather than being broken by them in later times.

At its beginning, the range sometimes reaches significant heights, crossing the snow line; thus, as Rüppell indicates, the mountain range rises to a height of 13,000 to 14,000 Paris feet in Abyssinia, in the province of Gojam, south of Lake Zana, or Dembea; the Selah Mountains reach 12,000 Paris feet; Mount Bua-Gat, the highest in the Semien range, is 14,000 feet above the sea level; the mountain valley of Voghera lies at a height of 8,500 feet; and that of Gondar at 6,500 feet.

According to my observations, the source of the Toumat is situated at a height less than 3,000 feet, while the nearest separate mountains reach 4,000 feet. The part of the principal mountain range of Inner Africa visible from thence—or, it would be better to say, its separate peaks, clearly outlined—cannot be more than 7,600 feet in height, while the

---

4 Mount Bwahit, in the Amhara region of Ethiopia.
mountains seen from the upper reaches of the Nile by d’Arnaud, being in my opinion a continuation of the same range, hardly reach 6,000 feet.

The spur of the principal mountain system of Inner Africa which runs between the Toumat and the White Nile, closer to the former—the one I have named the Toumat Spur—was the subject of my geological research. One can say almost certainly that the north-facing edges of the principal range of Inner Africa are composed of chloritic and talcum slate, cut through with gneiss and syenite, the latter being its most recent elements. My opinion is corroborated by streams issuing from this declivity, especially during seasonal rains, which bring with them broken pieces of the above-mentioned rocks. The Toumat ridge, which breaks away from the central mountain chain, also reveals in its sides talcum and mica slate, topped with diorite and diabase in the mountains of Dohosh, Fasadur, and Doul. Here, as well as in the Urals and the Altai Mountains, greenstone rocks are the most reliable indicators of the location of gold-bearing deposits. At the foot of the mountains, in the west, talcum slate is often displaced by thin-foliar chloritic slate and eventually by sandstone, or greywacke slate, similar to many Silurian and Devonian strata.

High-rising separate groups of the mountains of Falogut are composed of gneiss, those of Fazangoru of chloritic slate veined with white, wind-eroded quartz, just as the gneiss of Falogut is full of thin layers of feldspar; the mountains of Fazoglu, Dassi, and some others are very similar in their formation to other separate groups of mountains, their tops being composed of gneiss and their feet of chloritic slate, visibly broken by the effusion of crystal rocks. Hills of quartz run along the Adi khor, constituting the river-bed itself.

Generally, the same phenomenon can be observed here as in the Urals: as the central ridge rose, the formations emerging near it suffered the most from strong and constant vibration and tension in the Earth’s crust, therefore growing quite disordered, their strata bent and broken; yet as one moves away from the center of these forcible cataclysms, the formations are deposited more systematically and wider until eventually, far from the central axis, the crystal rocks disappear altogether; chloritic and mica slate are transformed into flagstone,
quartzite, conglomerate, and psammite; finally, granite and syenite as such do not appear in rock masses but as deposited boulders or in eroded transitional state. Farther south, Paleozoic remnants are closely related to lava rocks, which are very likely to be their contemporaries; erupted rocks have changed any original features—transformed them, so to speak—to such an extent that it is nearly impossible to determine the general line of these highly perturbed, torn, and over-steepened ranges of sediments.

Commencing to describe my explorations of gold-bearing deposits, I am very glad not to be obliged to begin with refutation of discoveries made by my foreign predecessors in the matter, discoveries so brilliant that they dazzled the Viceroy at first; as we shall see, they have already been proven wrong by factual evidence. Thus they reported to Mohammed Ali that at the Adi khor, 1,000 hundredweights of sand (about 2,500 pooods) produced between 160 and 240 lots of gold, with the richest sand producing 251 lots... They also added that, although the deposits were not as rich as those in Siberia, they were nevertheless reliable. I would hope they would be reliable if indeed they were so rich; as for the comparison with Siberian deposits, those who say that their composition is richer still than in the above-mentioned examples know very little about them. As I have written in my Journey, despite the remote location of the country and the difficulties of traveling there, Mohammed Ali himself and an entire commission, consisting mostly of foreigners, went there in order to explore and verify these treasures—there turned out to be no gold at all!...

Above the spot explored by them, there is indeed a small layer of sand, although quite deep, which contains up to ½ zolotniks per 100 pooods, but their prospecting pits missed even that layer; thus all the great preparations for the proposed works, as well as the entire supply of mercury (their intention having been amalgamation) were abandoned. It was quite disappointing.

5 Author’s note: Khor: a local name for a gully made by a stream of water during seasonal rains.
6 Author’s note: Russegger, op. cit., section 11, pp. 739, 757.
7 The highest yield is 1.25 ounce per 1,000 pounds. The figures mentioned below are all significantly lower.
I commenced my explorations near the Khassan mountains, having seen exposed blue elvan and greenstone porphyry there for the first time, and soon discovered a deposit that occurred along a dry khor flowing into the Toumat on your right as you look downstream (see map), at a rather significant depth (up to one and a half sazhens\(^8\) below the surface). The layer visibly deviated to the slope of the nearby mountains, where it came ever closer to the surface, its gold becoming larger in grain size and richer in composition—so much so that on one of the slopes its concentration sometimes reached 2 zolotniks per 100 poods, while the gold-bearing layer occurred no deeper than two or even one quarter\(^9\) below the surface. It was average in thickness, about one arshin;\(^10\) the entire deposit, according to an approximate calculation, contained up to 25 poods\(^11\) of gold.

Bearing in mind, on the one hand, the cheap cost of the workers assigned to me—negro soldiers who cost the government about a piaster (six kopeks in silver) a-day and who were to be settled in a place where any reliable deposits would be discovered—and on the other hand, the impatience and urge of the Viceroy, who wished to obtain results as soon as possible, as well as the short length of time and the proximity of the rainy season, I wasted no time in commencing to build a factory near the Toumat, for there one could always find water under a thin layer of sand (where it tends to occur) beyond the rainy season. The distance from the deposit was about 1½ or 2 versts.\(^12\) The road to the factory ran along a slope and was rather convenient for the transportation of sand.

Having entrusted the construction of the factory to workmen brought from Cairo under the supervision of a Russian foreman, and having left some of the detachment’s men with them, I proceeded, accompanied by the rest, further into the interior of Africa.

The reader of my Journey will be familiar with the direction I took and with all the circumstances that accompanied me along the way;

---

8 Approximately 10.5 feet.
9 Approximately 1.75 feet.
10 Approximately 2.33 feet.
11 Approximately 900 pounds.
12 Between one and 1.3 miles.
the exploration of gold deposits and other intended objects forced me to go deep inside Africa, to places that had never been reached before, neither by European travelers nor even by Mohammed Ali’s soldiers, these last having been driven not so much by their desire to conquer the authorities of the Sudan as by their avariciousness or by negro-hunting. I shall describe here only my geological researches conducted along the way.

We followed the dry bed of the Toumat, with no other guide but the river and the compass. During the rainy season the Toumat is a large and fast river, which we were to witness subsequently with our own eyes; but at the beginning, it was only at occasional spots that a horse, stepping through the layer of sand and burying its hooves in it, would reach water. The banks were clifft and gently sloping; the mountains stood in a distance. The soil touched by our pits was, for the most part, composed of eroded granite and syenite; it was only at Kamamil that the pits descended onto diorite, the concentration of gold in a deposit resting on the latter being quite significant—namely, up to 1½ zolotniks per 100 poods.

Had I discovered it earlier, I would have chosen this mine over the first for the works, given its regularity and the span of its stratum; yet now it was no longer possible to proceed to build two factories simultaneously, for we lacked experienced men suitable for the business, having been unable to split our resources at the very beginning. However, I proposed that, as men learned the business, we should establish another gold-washing factory, with an encampment attached to it, which was to form a part of a line of military settlements in the Toumat Mountains, intended, among other things, to keep the negro lands under control and to defend them from the raids of the Galla and the Abyssinians.

The deposit—composed of broken diorite, talcum slate, and quartz, bound together with eroded iron clay—is also abundant in ferruginous concentrate; occurring in a hollow, it is quite deep there, up to two sazhens, but toward the bed of the Toumat, it comes out straight onto the surface; the dry river-bed provided us with a means by which to examine the deposit, and we obtained up to ¾ zolotniks per 100 poods. The gold becomes richer near the slopes of the mountains,
and even the most mountainous area of Kamamil has a thin stratum of sand, composed of broken quartz mixed with a small amount of eroded clay, resting on quartz soil and apparently formed at a later time, originating from the erosion of a quartz rock seam running along here.

Moving farther up the Toumat, we encountered crests of granite, which form the cataracts of the river at high water. The granite is dense, fine-grained, and crowns the tops of the mountains that run from west to south-east, quite parallel to the central axis of the principal range of Inner Africa, as if dependent on its elevation or effused simultaneously with it.

Farther up the Toumat, a third gold-bearing deposit occurred, contained in eroded granite and poor in composition.

Even before that, at the very foothills of the Toumat ridge, we discovered a rich deposit of ironstone and iron clay; and in the upper reaches of the Toumat, we found a wonderful deposit of lodestone.

Having come to the upper reaches of the Toumat, we found ourselves on the south-west extremity of the Toumat ridge. From thence our gaze could reach the foot of what is denominated on the maps as the Moon Mountains, Jebel-el-Khamar, a name unknown among the natives; the reader will have noticed that we have referred to it as the principal mountain range of Inner Africa and will have understood our reason. Later we visited Doul, the western extremity of the Toumat ridge, thus criss-crossing it, so to speak, in every direction.

At the foot of Mount Doul there are gold deposits known to the negroes from time immemorial; they are not rich but embrace an extremely large space, not only in the hollow of Doul but also in most of the hollows of nearby mountains. The deposits in these parts are notable for most regular crystals of gold occurring in them, particularly cubic in shape; also for dual crystals of gold, particularly cubic in shape; as well as for dual and triple crystals of sulphur-ore.

As I have noted in my Journey, Mohammed Ali read in some Arabic manuscript that the ancient pharaohs of Egypt had obtained gold from Doul. The terrain here is so dug-up, over-steepened, and cluttered with waste-dumps, already overgrown with colossal trees, that I am almost prepared to believe the manuscript, especially since I found an ancient
tool here, a kind of stone pick (of blue elvan). The deposits might have been richer in the past but depleted back then; the ancients might have been satisfied with their richness, for they were able to succeed, if not by their skill, then by the mass of their men, being in possession of innumerable numbers of slaves used to build the pyramids and ancient temples; the present-day rulers of Egypt, too, overcome seemingly insuperable obstacles thanks to their vast number of workers, who are paid so little for their labor. The following, of course, is a mere a supposition: the negroes could have also produced gold since ancient times. At any rate, ancient Ophir,\textsuperscript{13} whence they obtained gold in the time of Solomon, could be located here, in Inner Africa, rather than in India—especially considering historical evidence, which brings my supposition so close to the heart of the matter; whatever the truth, it could never be situated in America, as Montezinos\textsuperscript{14} believes, very skilfully replacing Peru by Piru, then by Phiru, and finally, by Ophir. Nowadays, they may well commence to search for ancient Ophir in California.

Having observed the Toumat ridge in all its directions, I was convinced that the bulk of the gold deposit on this northern side of the principal range was contained in the basin of the Toumat and mostly on its left side.

Upon our arrival at Khassan, I completed the construction of the factory and the installation of four machines with rakes and iron sieves attached to their heads, designed for the grinding and washing of sand. In order to avoid any future rumors or misunderstandings, I invited the Governor-General of the East Sudan to attend the opening of the factory, as well as to keep—jointly with myself and two German-educated Arab officers who managed the factory—a daily work log, the original of which I later submitted to Ibrahim Pasha, the former Viceroy of Egypt, while also submitting a copy issued by the ministry to my own superiors.

At first the works progressed slowly: the negroes took a long time to understand the operation of the machines, using which they washed

\textsuperscript{13} A wealthy city port, the source of gold and other riches, mentioned in the Bible. Starting in the 15\textsuperscript{th} century, various European explorers attempted to locate Ophir in India, Africa, Asia, or America.

\textsuperscript{14} Antonio de Montezinos (Aaron Levi, d. circa 1650), a Portuguese traveler; claimed to have found in present-day Ecuador Native American people aware of the Judaic tradition.
barely 300 or 400 poods daily, whereas in Russia workers do 1,000 poods; by the end of the first week, however, they began accustoming themselves to the work, achieving 700 poods now. The total composition in a week’s work turned out to be one zolotnik per 100 poods of sand. I brought the gold to Ibrahim Pasha. A calculation showed that it would cost the government 68 kopeks in silver per zolotnik. The gold from the works was tested in the Laboratory; being of varying quality, it is generally good, marked 81 to 92.

Ibrahim Pasha, who quite understood the importance of the development of gold-mines in his country, embarked on the matter with all his fervor, but then his industrious life was cut short.

Will the production of gold take hold in the Egyptian lands? Will other giant enterprises established by the reformer of Egypt take hold? It is difficult to say; but generally, it is very doubtful, especially bearing in mind the close-minded stubbornness and superstitions of the present-day Governor-General, Khalid Pasha, who is able to destroy but not to create. Mohammed Ali, who dreamed of the discovery of gold (that favorite idea of his whole life), who spent several million piasters on the business over 20 years, undertaking a most dangerous journey to the Sudan, where he was struck by an illness due to his complete disappointment in the success of the matter—Mohammed Ali was not destined to see this enterprise realized, even though he still talks, dimly and unconsciously, of the search for gold.

On our return journey, we crossed the Lesser Nubian Desert, situated on the left side of the Nile. Its formation is very similar to that of the Great Nubian Desert, the mountains of both, as if related to each other, running from west to south-east, parallel to the central axis of the mountains of Inner Africa. In the Lesser Nubian Desert, it is only sandstone, especially that occurring at the entrance and exit to it, that is composed of narrow stony bands, so similar to trachyte in their glass-like fracture and outer aspect that I am prepared to take them for trachyte, its deposits being displaced in their open pits by foliated stone and trachytic tuff.