

PROUT'S EXPEDITION

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GENERAL REPORT

ON THE

PROVINCE OF KORDOFAN

Submitted to General C. P. STONE,

CHIEF OF THE GENERAL STAFF EGYPTIAN ARMY

BY

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CORPS OF ENGINEERS

COMMANDING EXPEDITION OF RECONNAISSANCE.

Made at EL-OBEIYAD (Kordofan), March 12th, 1876.



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WAR OFFICE,

CABINET OF THE CHIEF.

BUREAU OF THE GENERAL STAFF.

CAIRO, *June* 1877.

MEMORANDUM.

In December, 1874, an expedition of reconnaissance left Cairo under the command of Colonel Colston, of the Egyptian General Staff, with orders to ascend the Nile in boats as far as Wady Halfa, and then proceed, by land, along the left bank of the Nile, to Debbé, whence reconnaissance was to be made, first, of a portion of Wady Massoul (or Matoul), and, afterwards, of one of the routes from Debbé to El-Obeiyad.

Colonel Colston had under his orders, Lieut.-Colonel Reed, of the General Staff, as second in command, five junior Officers of the Staff, a naturalist (Dr Pfund), an Army Surgeon, a squad of Staff-Soldiers, a section of Artillery and a platoon of Infantry.

The expedition was expected to arrive at El-Obeiyad, capital of Kordofan, at least one month before the commencement of the rainy-season of 1875, and, after a short rest there, was to proceed to Darfour, and there cooperate with the Staff Expedition under Colonel Purdy, for the rapid reconnoissance of that country and for subsequent explorations further south in Central Africa.

Before the arrival of the party at Dongola, Col. Colston became satisfied that his second in command, Lieut.-Col. Reed, would not be able to bear the fatigues of such an expedition, and he therefore ordered that officer to

return to Cairo, and applied to the Chief of the General Staff for another field officer.

On the 2nd of February 1875, Major Prout, who was then serving as Chief of the 3rd Section of the General Staff Bureau, in the War Office at Cairo, was designated as successor to Lieut.-Col. Reed, and was ordered to proceed, by the way of Suez, Suakin, Berber and Khartoom, to join Col. Colston.

The orders, letters, reports, maps and telegrams which will be found in the appendix, set forth clearly the route followed by Major Prout, the valuable work performed by him during the journey, the circumstances under which he joined Col. Colston, and those under which the responsibilities of the command of the expedition fell upon him.

The report on Kordofan itself, with the map of the

Province and the conscientious appendices, the route-maps and special reports, evidence how much can be done by an able, instructed and honest-minded officer, in those regions, in one year, when that officer thinks less of the risks and discomforts around him, than of the accomplishment of duty for duty's sake.

STONE,

General of Division,

Chief of the General Staff.



PREFATORY REMARKS.

It was on the 8th June, 1875, at Bara, in Kordofan, that Col. COLSTON turned over to me the command of COLSTON'S EXPEDITION OF RECONNAISSANCE, which was afterwards known as PROUT'S EXPEDITION.

It is unnecessary for me to say that the command which Colonel COLSTON had continued to hold through weeks of painful and alarming illness, he gave up, at last, only when he was supposed to be dying.

It is to be supposed that His Highness the Khedive saw with real regret, the necessity which compelled him to confirm the transfer of the command, particularly after the gallant fortitude of Colonel COLSTON became known to His Highness.

I am bound to say, that the pleasure with which I received the flattering responsibility of a command so important, was quite drowned in the sorrow which I felt at the loss of a chief whom I so esteemed, and so respected.

The expedition, when I took command of it, consisted of Doctor PFUND, naturalist, and his assistant, six officers of the General Staff, four officers of the line, a surgeon, and about ninety men, infantry, artillery, and staff soldiers.

The only changes in the personnel of the expedition since that time, have been the return to Cairo, of Lieutenant AMAR ROUCHDY of the General Staff, a corporal and eight soldiers, (all detailed to accompany Colonel COLSTON), and the death of five soldiers and one servant at El Obeiyad.

On the 12th of June, 1875, the expedition arrived at El Obeiyad. The rainy season had already begun.

Although the rains were less constant and severe than had been supposed, yet it soon became apparent that little could be done during the rainy season, on account, chiefly, of the unhealthiness of the time.

During the months of August and September, fifty per cent of the expedition, were almost constantly on the sick report.

Still, some work was done. In July, August and September, several reconnaissances were made by the various officers of the expedition, amounting, in the aggregate, to seventeen hundred (1700) kilometres.

Dr. PFUND, also, made repeated excursions to collect

specimens in botany. Meanwhile, many astronomical observations were made at El Obeiyad.

At the close of the rainy season, the health of the members of the expedition was soon reëstablished; but then came long delays in getting means of transportation, and it was December, before I could start for a general reconnaissance in the south and east.

About the same time, Adjutant-Major HAMBY, started for the last reconnaissance in the north-east.

These final reconnaissances which amounted to sixteen hundred kilometres, were finished by the 21st of January, 1876.

On the 10th of February, 1876, Adjutant-Major HAMBY started with one-third of the expedition, for El Facher, Darfour.

At the time of writing, (March 1876), I am still waiting for means of transportation to take the remainder of the expedition to Darfour.

The results of the work of the expedition, from June 1875, to February 1876, are given in the following report and its appendices, in the general map of the Province of Kordofan, in a planetable plan of El Obeiyad, in a small sketch map, showing the distribution of forests, in certain

sections on several routes of march, and in the reports and collections in natural history by Dr. PFUND.

The arrangement of the General Report is as follows:—

PART I. Geography, Topography and Inhabitants.

PART II. Soil and Water-Supply.

PART III. Products, Resources and Commerce.

PART IV. Climate.

APPENDIX A, an account of the method of constructing the general map, and the sources of the information used, the probable errors of the map, and a summary of the Astronomical Observations, and

APPENDIX B, tables of the Barometrical Observations used in determining the altitudes, with the methods of observation and reduction.

(*signed*) H. G. PROUT,
Major of Engineers.



PROVINCE OF KORDOFAN.

PART I.

GEOGRAPHY—TOPOGRAPHY—INHABITANTS.

GEOGRAPHICAL LIMITS.

WE may say that the Province of Kordofan is situated between the parallels 12° and 16° of north latitude, and the $29^{\circ} 30'$ and the $32^{\circ} 30'$ meridians of longitude east from Greenwich.

This is, however, only approximate. The limits of the jurisdiction of the *Mudir* (governor) of Kordofan are not well defined. In the north, we find villages in longitude 30° and latitude $14^{\circ} 15'$ (Katoul), in longitude $31^{\circ} 45'$ and latitude $15^{\circ} 40'$ (Safi), and in longitude $32^{\circ} 15'$ and latitude $14^{\circ} 30'$ (as Shegèg) at the northeastern limit of Kordofan. There are no villages north of these; but the *Kababisch*, who roam over the steppes between these villages and the Nile, pay tribute to the province of Kordofan.

On the east, between latitudes 13° and $15^{\circ} 30'$, the Nile flows between the $32^{\circ} 30'$ and the 33° meridians, but the authority of the Governor of Kordofan ceases at from ten to twenty miles from the Nile on the west.

On the south are the nomadic Bagarra, and the negro tribes of the mountains of Tagalla and Dar-Nouba, who are nominally subject to the Government, and who pay an uncertain tribute to the Governor of Kordofan.

On the west, the line of the jurisdiction of Kordofan is drawn at the western limit of the range of the Beni-Hamid bedouins, a somewhat uncertain line passing near Abou-Har-raze, longitude $30^{\circ} 30'$ and Kagga, longitude $29^{\circ} 30'$.

TOPOGRAPHY.

In physical appearance, Kordofan is very monotonous. It is a rolling steppe country, marked by no abrupt or grand accidents. In the unending succession of undulating plains, a hill of fifty feet high is a landmark for a day's journey. In the west, isolated peaks rise from fifty to two hundred and fifty metres above the plains. Such are Gebel-Abou-Senoon, Gebel-Kordofan and many other mountains, which are noticeable on the maps, and conspicuous in the land—not from any grandeur or importance—merely from their isolation.

In the northwest, the groups of Kagga and Katoul, and south of lake Rahad the group of Daïer, are compact mountain masses which cover considerable areas — areas so con-

siderable, in fact, that these groups have an especial importance as offering strongholds to brigands

South of the thirteenth parallel, the face of the country changes from rolling steppes, to flat, fertile and thickly wooded plains, from which plains rise, abruptly, with no preface of outlying foot-hills, the rugged mountains of Tagalla and Dar-Nouba.

The steppes of Kordofan are from four hundred and ten to five hundred and seventy metres above the level of the sea; the greatest altitude being attained at El Obeiyad and near the mountains in the north and south.

Scenery.—On these steppes, one landscape is much like another. One sees around him a broad sweep of rolling plain of a dull brown hue. Here and there are scattered thickets of small acacias, and a huge *adansonia* is occasionally projected in rude lines against the sky. Villages of weather-stained, conical straw huts gleam in the sunlight; broad red stains mark the *dokhn* fields, which were green during the *Khérif*; foot-paths wind in red lines from village to village; groups of men, with lances on their shoulders, of women, carrying water-jars; and small flocks of goats and sheep and herds of beeves give a languid movement to the scene.

For the last two or three months of the rainy season, when everything is in foliage, and when the plains are green, this landscape is pretty; but its beauty is very transitory. By the middle of October it will have taken the dull burnt-up color which will remain until late in the following June.

Many of the villages have numerous shade-trees of *higlik* (*Balamitis Egyptica*) which add much to the beauty of the landscape.

The *Khérif* (rainy season) begins about the middle of June. Early in July, the grass of the plains has become green, the acacias have put on their graceful and varied foliage, the *baobabs* (adansonnias) and *higliks* are clothed in dark green, the rare tamarinds are masses of tender green and pale rose-color, the corn has begun to shoot, and from that time to the end of September, a journey through the country will be agreeable and attractive.

All the remainder of the year, the parched land under a burning sky is dreary in the extreme. Only a waste of sand can be more forlorn.

INHABITANTS.

All the country thus defined and described, is more or less peopled by village-dwellers, while, on the outskirts roam the various tribes of nomads.

In the central region, the villages are numerous. Anywhere to the north and east of El Obeiyad, within a radius of sixty miles, the traveller is seldom an hour out of sight of villages. It is probably true that the settled part of Kordofan is the most thickly peopled portion of the Soudan.

Their Villages.—The villages are groups of *tokels* and *rakoubas*, seldom surrounded by a general enclosure; but

each individual dwelling is usually enclosed by a hedge of thorns. Each *tokel* is a cylindrical structure, from fifteen to twenty feet in diameter, three to five feet high, and surmounted by a high conical roof; the whole composed of stalks of corn (*dokhn*) and herbage lashed to a framework. The apex of this cone is often finished by a stick run through a bottle; and when an ostrich egg is placed above and below the bottle, the very climax of architectural decoration is reached.

The *rakouba* is a simple parallelogram, enclosed and covered by *dokhn* stalks.

The *tokels* are quite rain-proof, are cool and airy, endure five or six years, and are, altogether, very good dwellings for the climate.

It often happens that these villages are occupied only during the *khérif*, and by slaves sent to cultivate *dokhn*. The fact of a village being found at any place is not at all a proof that constant water is near. Indeed, I should say that most of the villages in Kordofan must bring water from a distance of several hours; and it is a fact that, during the summer, the inhabitants of certain neighborhoods make journeys of two days, or two days and a half, to go for and return with water.

Distribution and Numbers of Population. — The settled and agricultural population is scattered pretty uniformly over the area north of the thirteenth parallel, inhabiting the villages above described, excepting the considerable population concentrated at El Obeiyad.

I. VILLAGE PEOPLE. — The distribution and numbers of

the settled population are as follows; the numbers having been given officially by the Governor. I think that probably they are more or less exaggerated:

El Obeiyad	30,000 (?)
Department of Khoorsi (359 villages)	42,000
" " Taïara (119 ")	18,000
" " Bara (171 ")	23,840
" " Abou-Harraze (80 ")	16,830
District of El Ghodiat (32 ")	6,870
6 villages Sheik Mohammed	1,500
16 " Fellata	4,000
14 " Hemaoni	7,700
12 " Abou-Safieh	4,000
25 " Gebal Kagg and Katoul	5,000
7 " Haraza	2,000
12 " Dar El	3,000
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TOTAL SETTLED POPULATION.....	164,740

II. NOMADS. — If it be difficult to determine accurately the numbers of the settled inhabitants, it is necessarily more difficult to estimate the numbers of the nomads.

The nomad tribes under the government of Kordofan may, however, be summed up nearly as follows:—

1st.—The *Bagarra-El-Hawazma*—These bedouins range from El Birkeh south to the mountains of Dar-Nouba, and carry their predatory excursions even beyond those mountains. Their proper country now may be limited by the meridians of 30° and $30^{\circ} 45'$ and the parallels of $11^{\circ} 30'$ and $12^{\circ} 45'$. They number, perhaps 15,000.

2nd. — *Bagarra-Habaniéh* — Range from the Birket-el-Rahad, east to Shirkéleh, and south to Tagalla; that is, between longitudes $31^{\circ} 15'$ and 32° and latitudes $12^{\circ} 15'$ and $12^{\circ} 45'$. They number, about 8,000.

3d. — Bedouins *Manateh-el-Gimeh*, who are also Bagarra — Range between the country of the Habaniéh and the Nile, and on the south to the country of the Bagarra Selim. They number about 25,000.

4th. — *Beni-Gerar* — In the east of the department of Khourisi, and about Gebel-Tiones. Number 2,500.

5th. — *Kababish* — Range from Kordofan north to the Nile. This is the finest tribe in the Soudan to the west of the Nile. They number about 60,000.

6th. — *El-Mahalia* — In the southwest of the department of Abou-Harrazé; but they range as far north as Gebel-Kagga. They number 2,000.

7th. — Bedouins of *Sheik Kanana* — Same range as the Mahalia. Number about 1,500.

Thus, the total of nomads is about 114,000. Total population, settled and nomadic 278,740.

As I have stated, these numbers were given me officially by the *mouderich*, but at best they can be only an approximation.

III. MOUNTAIN TRIBES. — Besides these bedouins who acknowledge allegiance to the Egyptian Government, and who pay with some regularity their taxes, there are in the south, the inhabitants of Gebel-Daïer and of the Tagalla

country and Dar-Nouba, who, though subjected, seem to be very turbulent; and who are certainly little known * * * They are much feared by the village people of Kordofan.

RACES.

1st.—*Village People*.—The settled population of Kordofan is very heterogeneous. This is especially true in and about El Obeiyad. In the villages north of the thirteenth parallel, we find under the names of *Ghodiāt Gilledat*, *Gowameh* and various local names, the oldest race in the country, who still make up the mass of the agricultural population, and are the base of the population of El Obeiyad.

Of the Koungarra, who coming from Dar-Four, conquered the country and were in turn conquered by the forces of Mehemet-Aly, few remain who have continued to live apart from their conquerors, and have kept their blood from intermixture; there are none, I believe, who have not adopted Arabic as the language of daily use. A few hundreds live in a group of villages north of El Obeiyad. These are all that I found outside of that city. Many of them inhabit El Obeiyad, mingling with the numerous races which make up the population of that motly town. The number of those still living apart has been estimated at about one thousand men.

Before the conquest of Kordofan by the Egyptian forces, the population was undoubtedly a mixture of races; and since that time new elements of confusion of races have been added.

The conquest and occupation have brought in the Turkish blood and that of the *fellah* of Lower Egypt, while the Bashibazooks who constantly patrol the length and breadth of the province, have left in its villages the blood of all the races of Asia-Minor.

Greeks and Levantines have left their mark on the population of a country where the women are far from chaste, and the men have few scruples about continence.

In the train of these people have come Abyssinian slaves, whose offspring is another element in the population.

But the great source of instability and confusion in the types has been, and still is, the constant influx from the heathen negro tribes to the south of Kordofan and Dar-Four.

Noubans, Dinkas, Bongos, in short, all the tribes which have been within the range of the slave-traders of the Soudan, are represented here, either as pure types or as intermixed through generations with the medly of races which have come in from the north. On the whole, therefore, it is not easy to say who are the inhabitants of Kordofan.

Physical Type. — In the thoroughly confused population of El Obeiyad, we see all the variety of face, form and color which is to be found from Italy to the land of the Niam-Niam. There is, however, a prevailing type which is quite well marked. It may be called the resultant rather than the indigeneous; and it is seen in the mass of the free citizens of El Obeiyad.

They are dark-brown, with a slight reddish tinge in color,

of good height, well formed; but rather slender when compared either with the European types or the *fellahs*. The face is oval, with rather broad cheek bones; the brow is not bad, but narrower and lower than in the European. The eyes are large and full, the nose straight, the lips fuller than is consistent with a classical type, and the mouth decidedly large and coarse. The chin is quite small. No objection can be made to the facial angle. In fact, these people are often good-looking, and sometimes handsome.

The hair is woolly, but worn long and elaborately braided by the women, while the men, having adopted the turban, or at least the *taki* (skull-cap), shave the head.

As I have already said, there are, around El Obeiyad, some groups of villages, where live, still apart from the other races, the remaining members of the race which last ruled Kordofan — the Koungarra and M'Sabaât. The latter name is a local one taken by a branch of the people after they came to Kordofan. Each of these branches has its *Soultan* or *Soultans*, who are about equivalent to the lesser *Sheiks-el-Belad* of Lower Egypt. I have seen several of the same race coming from Dar-Four as prisoners of war.

Generally speaking, these people are tall, but quite slender, with long slim hands and feet. The head is small, the brow low and narrow, the facial angle not prognathous. The head is broad through the temples, the ears very small, the eyes large and full, the nose short and rather flattened, and the lips very prominent; but it is the prominence seen in the

profiles of the present reigning family of England rather than that of the true negro profile.

They are very black; and the hair is woolly. These people will no doubt have been fully and accurately described by the officers of the expedition now in Dar-Four.

In the mountains of Katoul and Kagga, are colonies of negroes from the country south, known as Dar-Nouba. A small colony of the same negroes is found at Gebel-Kohn, and evidently the same race inhabits Gebel-Daïer. These people will be described when I come to speak of Nouba.

I have mentioned the Ghodiat, Gilledat and the Gowanieh as forming the great mass of the settled population of Kordofan. These people are, beyond a doubt, the oldest occupants of the land of whom any trace is now left. They have no traditions of when or whence they came. Their simple theory is, that they were here from the beginning.

Whatever their origin, they are not to be classed with the true negro. While they would take a lower place in the scale of humanity than the bedouins of the Soudan, they are higher than the Koungarra, who, in turn, rank above the negroes of the mountains south of Kordofan.

These Ghodiat etc., have the red color of the bedouins, yet they are not as black as the Koungarra. They are stouter in body and limb, than either the bedouins or the Koungarra, and they have a fine muscular developement. What I have already described as the type of face and head in El Obeiyad, is equally true of the village-dwellers. Not rarely one finds

among them, young girls, whose oval faces and large lustrous eyes are extremely pretty. Like most barbarous people, they are ugly in old age.

I have said that I should not class these people as negroes; but it is for the ethnologist to decide where they are to be placed. Is it not probable that they are of the same race of the Danagla, the Barabra and the Gallaine of the Nile valley?

There remain to be mentioned certain colonists scattered throughout Kordofan from the thirteenth parallel to the fifteenth. Of these, the most numerous are the Danagla, from the banks of the Nile. They are found in a group of villages west from the route from Es-Saffi to El Obeiyad, and in the east they are found at Gebel Kohn and at Shate.

North of El Obeiyad, one finds a few small villages of a people calling themselves Takrouri, a name found by Sir Samuel Baker near Abyssinia. South of El Obeiyad, are villages of Fellata. Probably, both Takrouri and Fellata colonists, are people from the west of Wadaï, who have been left here by pilgrims passing to and from Mecca.

At one place, I found a few villages inhabited by people who asserted that they were Bisharine, descended from some wanderers from the east of the Nile; and one officer of this expedition claims to have found, in the north, a colony from Bagdad!

2nd. — *Nomads*. — The various bedouin tribes who range on all sides of Kordofan, who constantly frequent the market of El Obeiyad, and who have occasionally settled down to

agriculture, and to village life in various parts of the country, are a striking and interesting part of the population.

The bedouins, whether Kababish or Bagarra, are, without doubt, far superior, mentally and physically, to the Koun-garra, the Noubans, or even the race of the Ghodiat, the Gilledat and the Gowameh. I have not observed carefully enough to indicate the physical differences between the Kababish and the Bagarra, and between the various sub-tribes of the latter. I will attempt, therefore, no description of the Kababish, of whose country I have seen nothing.

The range of the Bagarra has already been indicated.

Within the limits above defined, the Bagarra of Kordofan wander with their herds, changing their localities according to the varying conditions of water and pasturage and the requirements of their scanty agriculture: seldom, almost never, building permanent villages, but dwelling in camps.

Their favorite and most frequented camping places are found about the series of small lakes distributed along the water-course designated on the accompanying map as KHOR-ABOU-HABLE, and about the bayoux and in the valleys near the western banks of the White Nile. From these camps they pass, at the coming of the Khérif, into the valleys south and west, and are gradually driven north again as the season advances, and water becomes scarce and the flies troublesome.

A bedouin camp (*fergan*) is composed of groups of huts, each hut a tortoise-shaped structure of mats placed over a

frame-work, twelve to twenty feet long, ten to twelve feet wide, and rising to an extreme height of about five feet. Each group of huts is disposed in a form approximating the circular, with a thorn hedge around the whole. Within this circle, the nearly naked population performs its domestic affairs by day, and here the cattle and goats are herded by night.

As the refuse of the kitchen and the droppings of the cattle, not to mention other kinds of filth, are never removed, the effluvia from this court is overpowering to ordinary mortals.

The inquisitive traveller, who forgets stench in the search of knowledge and penetrates one of these camps, will find a picture of primitive simplicity and of perfect idleness. Groups of dark red-brown men and women loll and loiter in the shade with seemingly no other occupation than to sweetly do nothing; and the naked children seem neither more nor less busy than their seniors. Only the dogs, are active and bustling. Yet, as will be seen hereafter, these Bagarra have a real business in life, which is at times sufficiently active, and certainly serious.

I have questioned many Bagarra as to their origin. All assert that their race came from Arabia. That may or may not be. Certainly they have a quite different type from that of the Arabs of Syria and the Hejaz.

The face is round, the nose is straight and well shaped, but rather thick than fine, and nearly approaching the aquiline ;

the lips are thicker than those of the Arabs of the eastern desert; the hair is crisp, the beard is very thin. In color they are a dark red-bronze, like the color of some smoked bacon skin. The North-American Indians have no better claim than they to be called "red-men."

Physical type. — I doubt if any civilized people, except, perhaps, the best class of the English, could compare with them in stature or proportions. I have never seen a peasantry at all comparable to them.

Doctor Livingstone has thought the Manyuema men "far superior in shape of head and generally in physical form to the whole Anthropological Society." I have never seen the Anthropological Society of which Doctor Livingstone speaks, but it is an uncommonly fine body of men if they can rival, in physical beauty, an equal number of men, taken at random, from amongst the Bagarra.

Their erect athletic bodies, their sinewy limbs, and their small shapely hands and feet would be admired, would be remarkable, even, in any part of the world.

3rd. — *Mountain Tribes.* — We will now consider the inhabitants of Dar-Nouba, Gebel-Daïer and Tagalla.

With the orders under which I acted, the force under my command, and the time at my disposal, I did not consider myself warranted in penetrating either of those regions where we were likely to be met with hostility, and where, even if received with friendliness, we must ever be apprehensive of treachery. My knowledge of Nouba, Daïer and Tagalla is

therefore merely that gained in a hurried journey along the northern borders.

I will here interrupt the order of the report by a brief special notice of those regions, their geography, topography and general aspect.

NOUBA. — Dar-Nouba is the the mountain region between the $29^{\circ} 45'$ and $30^{\circ} 30'$ meridians, and extending southward from the parallel of $12^{\circ} 15'$ for perhaps one degree.

Every person who has travelled in Central Africa, will understand how impossible it is, to fix with any precision the limits of a country not actually seen.

Limited and ill-defined as is the area of Dar-Nouba, it is still a definite name in the Soudan, particularly in Kordofan, where *Noubowi* is nearly equivalent to black slave, so many slaves has Nouba given to Kordofan.

At Gebel-Dilling are several villages, and from this mountain one may see a considerable part of the territory of Nouba. Here, at Gebel-Dilling, four granite points rise, bare and rugged, to four or five hundred feet above the plains. Around these peaks lie broad plains, from which rise, from time to time, other similar peaks.

From the northwest around by the west, and south, to the southeast, the view is shut in, at from fifteen to twenty kilometres, by high mountains of very rugged lines. Northward stretch the broad plains which slope to the Birkeh, down which slope winds the water-course which drains the northern and eastern face of the mountains. These plains are un-

inhabited, and densely wooded. The forests are generally of acacia; but there are also found here, deleb-palms, higliks, baobabs, ebony, fig-sycamores and many trees quite unknown to me. It is almost unnecessary to add that the forests have no value for timber or lumber.

The dwellings of the people are in the niches and on the terraces of the mountains. There they build tokels of door-stalks and herbage, quite like the tokels already described as common to Kordofan, but of decidedly more graceful form. The roof is a symmetrical dome, terminating in a pointed spire. They build picturesque graneries of clay, in a tall sugar-loaf form; besides which, the crevices in the rocks often furnish them shelter and magazines.

In these villages, perched in the mountain sides, reached by winding slippery footpaths, the people of Nouba live in comparative security from the attacks of the predatory horsemen of the plains.

DAÏER. — Gebel-Daïer is a compact group of mountains covering an area of from one to five hundred square kilometres. When seen from some distance, these mountains present on every side a lofty unbroken front. They are the highest mountains, relatively to the surrounding country, to be found in Kordofan; rising at least three hundred metres above the plains, which, on the northern and eastern sides, have an altitude of about five hundred and twenty metres above the sea.

I regret somewhat that I did not try to pass within the

mountains, imprudent as such an effort would have been. I am told that in the interior of the group is a great basin, copiously watered with ponds and springs, where grow many trees of strange varieties, and where are found numerous kinds of animals and wild fowl. This basin presents itself, in fact, to the vivid imagination of the Arabs, as a sort of "Happy Valley of Rasselas." It is neither cultivated nor inhabited.

Like the Noubans, the people of Daïer build their villages on the mountain sides at some height above the plains; and ordinarily they seek situations hidden by outlying spurs of hills.

To these strongholds in the rugged granite crags, they can retreat after their frays in the valleys; and here they are comparatively safe from the brigand Bagarra. * * * *

TAGALLA. — At about thirty kilometres southeast of Gebel-Daïer is Gebel-Wadelka, a small detached group belonging to the mountains of Tagalla; and somewhat southerly and easterly, is the main mass of Tagalla.

Like all the other mountains mentioned above, these are granitic peaks of bare, precipitous, rugged slopes, and bold sky-lines.

The mountain country subject to the sway of the king of Tagalla, is included between the $31^{\circ} 30'$ and $32^{\circ} 30'$ meridians of longitude, and extends from the $12^{\circ} 45'$ parallel of latitude perhaps fifty kilometres towards the south.

Here again, it is impossible for me to define, with any ex-

actitude, the southern limit; but the mountains indicated on accompanying map determine with sufficient precision the northern limit of the country. The people talked vaguely of mountains extending "far far" to the southward, and of many days' journey across the dominions of the king, Adam Omar, the monarch of the Tagalla; but from the descriptions of *bashi-bazooks* who had made the circuit of the mountains with Mousa Pasha, some years since, I judge that the width north and south of this mountain area cannot exceed fifty kilometres.

Gebel-Wadelka has two striking features which I observed nowhere else. The first, is the terracing of its slopes. Our route for perhaps eight kilometres passed close to the base of the mountain, which has a height of about one hundred and fifty metres. Throughout the whole distance, and from the base to the summit of the mountains, are irregular horizontal terraces, having a height of from one-half a metre to a metre, and an extreme width of about five metres.

The terraces are supported by rude walls, and the surface is of broken stone and soil. Considering the number of the inhabitants, their laziness, and the extent of the work, this arrangement must be the result of many years, perhaps even centuries of toil.

I was told that the object of the terraces was to provide comparatively safe places for the threshing and winnowing of corn, processes which can be performed in the fields only at the constant risk of attacks from the Bagarra, and from other robbers who constantly range the country.

The other remarkable feature of this mountain which I have mentioned, are the springs of water which gush from its sides. Of these I saw three; of which two were nearly dry. There are, it is said, several more. The third of those which I saw, issues from the rocks at about one-half the altitude of the mountain, with a velocity and a volume which might furnish five gallons a minute. The water trickles down the mountain sides from one little basin to another, and quickly sinks into the soil at the base.

These springs are the sole water supply of the mountain. *It is said* that many such springs are found on the slopes of Gebel-Daïer.

Between Gebel-Wadelka and the main mass of the mountains is a beautiful valley, thickly wooded, and covered with luxuriant herbage. The mass of the forests are composed of acacias and a low thornless tree called *libban*; but over these low forests rise many deleb-palms, tall and graceful; large and beautiful tamarinds abound, and many baobabs are dotted over the valley. On the mountain sides one sees many *Euphorbia Candelabra*.

Between Wadelka and Daïer is a flat, fertile, heavily wooded country, traversed by water courses tributary to Abou-Hable; but like the valley between Wadelka and Tagalla, it is quite uninhabited.

As at Daïer and Nouba, the dwellings of the people are all on the mountain sides. Indeed, it is not rare to see groups of huts on the very crest of the mountains, outlined

against the sky. Oftener, however, the villages are found hidden in a snug recess behind an outlying spur.

Race and Type.—The inhabitants of Nouba, Daïer and Tagalla are unmistakably negroes, though of a race, I judge, superior to the Shillook and the Dinka. They are, I think, as black as the human skin can be, with a small facial angle, large lower jaw, low narrow brow and long occiput. The nose is flat and expanded, the lips are thick and protruding. They are of low stature, and slender figure, with thin legs and long heels. They are extremely ugly; the women are especially insignificant in form, and hideous in face. Yet, they seem uncommonly lithe and active, and are said to have great endurance.

I was particularly struck by the grace and energy of their movements, as one morning a party of warriors came to meet me from one of the villages of Daïer. Fifteen or twenty men clothed only in breech-clouts and sandals, shining with grease, armed with light lances and shields, came charging down a long grassy slope. They came on in perfect line, at a sharp trot, with a beautiful light gait, which I am sure they could hold for hours. I could easily see how they might be formidable in a fight, if they had the courage and intelligence to make a concerted and determined charge; and it was with a feeling of comfort that I saw close behind me a squad of soldiers, each with his Remington rifle on his thigh. At Gebel-Dilling and at Tagalla, certain individuals gave evidence, in color of skin and form of features, of an admix-

ture of blood—a result not only of some affiliation with the Bagarra, but also of the fact that those mountains are, to some extent, places of refuge for outlaws and adventurers of many races. At Gebel-Dilling I saw an ex-lieutenant of the regular army, who had campaigned in Syria, and an old sergeant. Both were running about with breech-clouts and lances.

DRESS.

Village People.—The better class of the men in town, and occasionally a sheik or *faki* in the villages, have adopted the costume of people of a similar class in Lower Egypt, modified somewhat—that is, silk and woolen stuffs are mostly replaced by white cotton, and the turban and *tarbousch* are replaced by the white *taki*.

The great mass of the men wear only a voluminous piece of white cotton, coarse and dirty, wound about the body and over the shoulders. They often wear sandals, but rarely cover their head.

Most of the bedouins, and a large proportion of the men of the villages, let the hair grow long, and plait it in thick braids running back from the brow over the crown to the nape of the neck. Naturally, more variety is seen in the dress of the women. Children of both sexes go naked up to perhaps ten years of age, or are clothed only in a string of beads or cowrie shells about the loins, anklets and bracelets of the same, and a leathern talisman tied about the arm. If the little girls wear more than this, it is a *rahat*, a girdle

tied about the loins from which hang a multitude of thin leather thongs descending to cover the upper third of the thigh.

The rahat is the foundation of all female dress in the Sudan so far as I can learn. It seems to be the essential first element. This rahat, more or less decorated with cowrie shells, is often the only garment of girls till they marry.

As the girl advances to maturity, she assumes the one other garment worn by female slaves, village women and the middle class of the town, that is, a simple piece of cotton, blue or isabelle color, one end of which is wrapped lightly about the lower part of the person, descending below the knees, the other end being wrapped around the body, and finally, thrown over the left shoulder, or at times over the head.

The right shoulder, breast and arm are left exposed. How this garment is kept in place is a mystery. How long a time will elapse before it shall begin to take definite coherent form, I cannot venture to predict.

"In order of time, decoration precedes dress," if we may believe a profound and philosophical observer; so the little naked girls, the budding young women in rahats, the peasant women, the bourgeoisie of El Obeiyad, and the vestals and matrons of higher fashion, all unite in scrupulously observing and perpetuating the mode of arranging the hair.

The mode is something like this : the hair, which is worn quite long, is plaited in tight little braids, which hang perpendicularly around the head and descend to the shoulders.

These braids are usually cut of different lengths, so as to give the head the appearance of having been thatched in successive layers. The whole mass of braids is saturated with grease, and, in the case of those who can afford it, powdered aromatic bark is freely sprinkled over the whole ; the resultant odor is not agreeable. Bits of colored cloth, cowrie shells, colored beads and gilt ornaments are arranged amongst the braids. Here, as in some of the more civilized parts of the world, the demi-monde set the fashions ; therefore a description of the dress of those women will give a sufficient idea of the dress of those who are wealthy enough to make a more ambitious toilette than that which I have described, but who have not yet adopted a Turkish or Egyptian dress.

One ample piece of semi-transparent white muslin striped with red, is wound in many folds around the body, half hiding and half revealing the legs, body and left arm and shoulder. The right arm, shoulder and breast are naked. On the feet, are worn sandals, often three centimetres thick. The ankles and wrists are decorated with huge ornaments of ivory, rhinoceros horn, or colored beads. Colored beads and other *suc-suc* are also entwined in the elaborately greased, braided and powdered hair. Across the brow is a coronet of circular gilt ornaments, and similar ornaments hang from the ears and nostrils. It is not uncommon to see one of these women with a huge gilt ring in one nostril, and from this ring a gilt chain passing back and attached to the head-dress — an arrangement probably invented by some tyranical

husband, who placed wives and dromedaries in the same class of animals.

It is due to the more respectable women of El Obeiyad, to add that the white cotton garment, is with them, generally opaque and voluminous; and that it conceals effectually, not only the whole person, but the head and face as well.

Nomads. — The dress of the Bagarra is much the same as that already described as worn by the lower class of the village people. The men wear a voluminous piece of coarse and dirty cotton, sometimes shaped into a rude robe; on their feet, thin sandals; on their heads, nothing. The older men shave the head; the younger men wear their long locks, gathered in a mass of small braids at the back of the head. The dress of the women is confined to a piece of cotton, nasty but ample. They are fond of *suc-suc*, and usually wear nose-rings.

Mountain Tribes. — The negroes of the southern mountains are even more primitive. The dress of the men is simply a breech-cloth, confined at the waist, and descending to cover the upper third of the thigh; sandals on the feet; talismans on the arms; hair braided tightly, and drawn back on the crown, and decorated with *suc-suc*. Over all, a plentiful and shining coat of grease.

The dress of the women is much the same, except that the hair is not braided. Of course, even here, one sees more pretentious toilets amongst the more important personages. The princes of the house of Mek Adam-Omar, who visited

me at Tagalla, were dressed quite in the Arabic style, with turbans and white robes.

ARMS.

Village People. — Although the village people are not predatory or warlike in general, yet they never stir abroad without arms. Each man carries one lance, and often two or three. Their lances are short, light, rudely shaped, and carelessly mounted. The head of the lance is flame-shaped, without barbs or blood-gutters. The variety of cruel-looking spears seen in El Obeiyad and the villages, with all sorts of intricate and fantastic barbs, have come from the more warlike people in the west. Fire-arms are rarely seen amongst them.

Bagarra. — The Bagarra, on the contrary, who are constantly plundering and making war, are better armed. With them, also, the lance is the essential weapon, though the two-edged Solingen sword is often carried. Guns are very rare. Their lances are remarkably long and heavy; and are often admirably made. The head is from forty to sixty centimetres long, seven to ten centimetres wide at the widest part, flame-shaped, and perfectly symmetrical. The total length of head and staff is about three metres. This lance, in the hands of a strong man, and expert horseman, is a very dangerous weapon.

The negroes of the southern mountains, are even better armed than the Bagarra. Fire-arms are often seen amongst them. These are ordinarily double-barrelled percussion

guns; of very poor quality, but yet, are superior to the guns usually carried by the *bashibazook* soldiers. Every man who does not carry a gun, carries several spears. In his right hand, a long light lance; in his left hand, three or four short-barbed spears, and on his left arm, an oval shield of giraffe skin. Every man whom I saw at Gebel-Da'ër, had, hanging by his right thigh, a sheath-knife about forty centimetres long.

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OCCUPATIONS.

Village People. — The principal, indeed, almost the sole occupation of the inhabitants of the villages, is agriculture.

During the rainy season, they plant, cultivate, and gather one crop of *dokhn*; and in the rest of the year, they eat and drink this crop.

Being brutally lazy, and their processes being of the rudest, the operations of this simple production and consumption are quite enough for them. As the meal of the *dokhn* is prepared by crushing the grain between two stones, manipulated by a woman, it will be seen that when a woman has prepared the bread for one day's use, she has little time or energy left for other pursuits. If she prepares a jar of *merrissa* (beer), and attends to her maternal duties, her day will be sufficiently occupied.

It must be remembered also, that the procuring of water for the small daily wants of even a savage household, is in itself, in this land, a serious work.

This water must be drawn from wells from thirty to fifty metres deep, by a bucket at the end of a cord; and, when raised to the surface, it must often be carried five or six hours' journey to the place where it is used.

These village people, herd a few cattle and goats, and a very few sheep. In certain places, they cultivate small plots of beans, peanuts, cotton and sesame.

When a villager of Kordofan has grown and consumed a few crops of *dokhn*, when he has made a few thousand journeys to the more or less distant wells, when he has bartered in the market of El Obeiyad, a little *dokhn* and beer, against some yards of coarse cotton cloth, he has filled the measure of the average life of a Kordofanian.

Special trades are very rare; because the wants of the people are few, and the resources still fewer. In certain villages of the southeast, mats and baskets are made of dom-palm leaves. In others, baskets and bags of the bast of the baobab and of the *hashab* acacia are a specialty; and the villages of Ta'ara are celebrated for *angarebs* (bedsteads), of this same bast. In some of the villages are found iron workers, who make rude hoes, knives and hatchets.

All of these industries are so limited and exceptional that they have no commercial signification.

In El Obeiyad itself, there is, naturally, a greater variety of pursuits; but here, those who follow special trades are mostly Turks, Arabs and Levantines; and their labour is demanded by the foreign population of official persons, troops and tra-

ders, rather than by the permanent inhabitants of the country.

Bagarra. — The Bagarra are cattle breeders. They cultivate little, and have no trades. Although the range of any one tribe is narrow, yet they are true nomads, never building permanent villages; wandering restlessly, living entirely on the produce of their herds. They do not make even their own arms. They are hunters, of some skill and daring.

They pass often into the mountains of Tagalla and Nouba, and even farther south, to hunt the giraffe and the elephant.

Besides cattle breeding and hunting, they have another occupation: that is to say, WAR. They wage war without rest, upon each other and upon the mountain tribes.

Their first object in fighting is, probably, to steal cattle and slaves; yet, one cannot help thinking that they love fighting for its own sake.

These thousands of turbulent and daring horsemen, who never lose the habit of war, are a most dangerous element in the population of Kordofan.

Tagalla. — I learned little of the people of Tagalla. They seem to cultivate corn (*dokhn* and *doora*), cotton and a few vegetables. They make so much of the coarse cotton stuff known as *damoor* that they can send more or less of it out of the country. The chief industry of the country has been, heretofore, slaving.

They consider it disgraceful to hunt; and they look upon the Bagarra, who come into their country to hunt giraffe and elephants, as too active to be respectable. They have

many iron workers, who make spears, knives, hoes, etc., from iron brought from Kordofan.

The inhabitants of Gebel-Daïer cultivate *doora* at home, and plunder abroad. I could learn of no other occupation amongst them.

The people of Nouba seem peacefully agricultural. It is said that they are quite skilful in iron-work, furnishing many fine lances to the Bagarra. Like the people of Daïer, they have few flocks and herds.

AMUSEMENTS.

In the course of considerable journeying through Kordofan, I have not seen, that I remember, a single approach to gayety in any of the villages. Even the little children seem to be constantly weighed down with the gravity of life in this land. There is sufficient evidence that *merrissa* is drunk in considerable quantities; but even drinking seems to be a serious matter, to be begun with solemnity, and finished with grave decorum. In short, it is a care-ridden people, thankful to have the nights pass in dull repose, and during the daylight hours, striving languidly and sadly to keep from dying of want.

In El Obeiyad alone, this is not precisely true. There, a large population of dissolute women and lazy men, contrive to lead a lighter life, and there the animal spirits rise often to gayety.

This gayety takes one stereotyped form. By day, the population of the town is mostly gathered in the market-

place, where lively bartering goes on with loud wrangling and hubbub all day, and where a drunken person always induces wide-spread and boisterous mirth.

This is the daily excitement, year in, and year out, of the greater part of the population of the city. This, however, is supposed to be the *business* of life. The *amusement* is in the evening. Every moonlight night, the town resounds on all sides with the beating of tom-toms, the lullilooing of the women, the shrill monotonous of women-singers, and the deep gutturals of the male assistants. These sounds indicate evening parties, with music and dancing.

Should one, attracted by these sounds, and urged by a proper zeal for information, make himself a guest at one of these parties, he will see a type of them all, and he will see the one amusement of the citizen of El Obeiyad.

He will find himself in the thorn-enclosed space between two or three *tokels*, where the light of a little fire flickers on the foliage of the higliks above, and on the swarthy group below. He will see, squatting on mats and *angarebs*, a dozen men and women of various colors, and in various degrees of nudity. Somewhere in the group, he will see some jars of *merrissa*, on which the guests make frequent and prolonged attacks. In the group will be, also, several drums, of clay covered with skin on which the musicians thump with singular perseverance, but with no variety of note or time. A few women seated, will be chanting an amorous song, with little regard for the drum accompaniment.

Before these, three or four dancing-girls will be contorting themselves. These dancing-girls differ neither in appearance nor dress from the women of El Obeiyad already described; in fact, they are not a distinct class. Any maid or matron may dance at one of these *soirées*.

The dance is without grace or variety. It is simply thus:—

The dancers stand in line, and after some preliminary and remarkable wringing of the lower part of their persons, they advance on the spectator, their heads thrown back as far as possible, and turning violently from side to side, their chests and abdomens protruded to the utmost that nature will permit.

In this way they advance with some regard for the time of the music, clapping their hands, swaying their heads, writhing and stepping high, letting their garments slip from their bosoms and, finally, falling on their knees before the honored and the charmed spectator, where they continue to sway their heads and writhe their abdomens till they are released by a conventional phrase which may be translated, “hope and despair not;” after which they retreat, to rally and repeat the same performance. * * * * *

At times, several men advance to meet this line, jumping up and down, brandishing sticks over their heads, and uttering deep guttural cries like the growling of wild beasts. Plentiful shrill lullilooing is added by the women around,—indeed, this is an important element in all ceremonies, whatever their cause.

Such, with slight variations, are the diversions of an evening, with all classes, and at all times.

They seem to lack any other sports or amusements.

CUSTOMS.

Circumcision. — Of course, in a Mussulman community, circumcision is practiced; and here, as amongst certain classes in Lower Egypt, girls, as well as boys, are subjected to a surgical operation.

I do not learn that the manner of performing the operation, or the attendant ceremonies, differ in any way from the customs of corresponding classes in Egypt.

Marriage. — Amongst the better classes, the marriage customs do not seem to differ from those of Egypt. With the lower classes, some peculiar practices seem to obtain.

It is said that the aspirant to the hand of a young woman, goes to the father, with a *dot* according to his wealth. If the father finds the dot sufficient, considering the market value of his daughter, he and the young man, go together before a *faki*, when the contract is concluded. The friends of the bride and bridegroom, then assemble, men and women together, and pass seven days and seven nights, in singing, dancing and drinking; at the end of which festivities, only, is the marriage considered as consummated.

It is beyond a doubt, that the custom of allowing to the wife, each fourth night, is widely observed. It is agreed, according to this practice, that, for three nights, the wife

shall faithfully share the bed of her husband; but each fourth night she shall be free to entertain her friends.

Amongst the Gowameh (one of the old races) is found a still more singular practice. With them, no girl has the right to marry until she shall have presented to her brother a child as his bondman. The father of this child, she chooses when and where she will.

If the girl has bad luck in getting the child, and convinces her brother that she has sought faithfully in field and forest, in the village and by wells, it is optional with the brother to permit her to marry.

Burial. — With the better classes, funerals are conducted as in Lower Egypt. The body is washed and clothed, and then carried out to the cemetery, escorted by a train of men chanting verses, and of women wailing, screaming, waving their hands and rending imaginary garments. It is not uncommon to see ashes and dust sprinkled on the heads of the mourning women.

The body is placed in a grave of proper depth, a little mound is raised over it, and the surface is frequently strewn with bits of quartz.

No distinctive marks are placed over the grave.

In the case of a *faki* of especial sanctity, sticks, from which flutter bits of white cotton, surround the grave. This, I have noticed, throughout the line from the Red Sea to El Obeiyad.

The great mass of the dead, at El Obeiyad, are hardly

buried at all. A trench of about twenty-five centimetres depth is dug, in which the body is laid, and barely covered with earth. As a consequence, it is unearthed immediately, by the hyenas, perhaps by dogs from the town.

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Religion.—Kordofan is a Mussulman province; but while sheiks of religion and *fakis* are numerous and influential, and although those of the inhabitants who are really Mussulman, are fanatic, yet, I do not think there is much religious feeling amongst the people at large.

The truth is, they are not, as a people, developed beyond the stage of brutal superstition. They have not yet come to a scale of sufficient intelligence, or intellectual activity, to be religious. The superstitions of one religion, are as good for them, as those of another.

The mosques are frequented only by the more intelligent and wealthier merchants, and by the professional *fakis*; and only those classes, and the Egyptian officials, assist in the public prayers.

I do not remember to have ever seen a man praying in the villages, or to have seen, out of El Obeiyad, any other evidence of a religion, than the talisman to be found in every hut, and the occasional *rakooba* where a *faki* has been instructing his little class.

Superstition, carefully cultivated and assiduously exploited by the *fakis*, is apparent everywhere. Almost every person, whatever the sex, age, or condition, wears talismans written

by the *faki*. It is not uncommon to find a paper with cabalistic words, written by a *faki*, tied under the wings of fowls, and similar papers are worn by riding-animals, and are freely distributed in the interior of the huts. What with the sale of charms, and the practice of medicine, the *fakis* seem to thrive.

A Roman-Catholic mission has been established here some years; but I cannot see that it has produced the slightest effect.

No doubt, the people of the mission have softened the lot of some sick and suffering people; they may have saved some from a life of a painful slavery. In these works they have done good; but I doubt if their teaching will leave the slightest trace on the religion of the country.

This mission has an establishment at El Obeiyad; and had, for about a year, another at Dar-Nouba. The latter never did anything, and was ultimately broken up by the hostility of the country, and the bad climate. At the El Obeiyad establishment, there is a school, in which they gather blacks whom they buy.

These are at once given their freedom; but they remain at the mission, where they receive instruction and support. They seem never able to live away from the church.

The Bagarra are, evidently, better Mussulmans than the village people. They keep up their knowledge of the prayers and religious observances; and they observe the fasts with rigor.

Generally, the mountain negroes are heathen. In Tagalla, however, the king is a Mussulman, and many of the mountains are devoutly religious. They send young men to El Obeiyad and to Khartoom, to receive religious instruction, and they have many *fakis* always amongst them. They seem better instructed and more strict than the Bagarra.

Morals and General Character.—A people, in the low stage of development in which we find the natives of Kordofan, can hardly be said to have any morals. If the moral sense be dormant in the infancy of individuals, the same must be true of peoples. When the people of Kordofan do not kill and steal, it is rather through fear, than from any sense of moral obligation.

Murder is common, as the skeletons bleaching on the plains about El Obeiyad seem to testify.

In a residence of some months at El Obeiyad, I made daily rides of a few miles out of the town, and I rarely failed to come upon human remains.

Although I heard little of the gossip of the town, at least seven cases came to my knowledge, of negroes or soldiers being murdered within a few miles of town. No person thinks of going out of town unarmed. Men coming into market, always carry from one to four spears; and no slave goes out to gather wood or to herd animals, without arms.

Petty theft, seems to be less common than murder; but cattle-stealing frays are almost constantly on foot, on the borders, and in the more remote districts.

From all I could learn, adultery is the rule. Men seem to think little of the incontinence of their wives. I am told, that, in spite of the somewhat severe surgical measures which are taken to insure the chastity of girls, few young girls are chaste; and that the men set little value on the previous chastity of their brides.

Of truthfulness, *for truth's sake*, these people, of course, have no idea. Self-interest must teach, even savages, to be fairly honest, and to keep their words sometimes.

In short, we may say that the people of Kordofan, have no morals.

Whether or not they are courageous, I have had no opportunity to know. To judge from the way in which a whole village population runs to the corn-fields on the approach of three mounted men, I should say that they are abject cowards. The history of the subjugation of the country, would probably throw some light on their character, in this respect.

Courage, endurance, and fortitude, are not usually counted amongst the attributes of a quiet agricultural people, never making war, or hunting, and having no games, no occupations which excite emulation or ambition.

The incessant brigandage going on around the frontiers of the province, has, no doubt, raised up a breed of active and hardy men; but these, are mostly nomad bedouins. Industry or thrift they have not. Each person cultivates barely enough land to yield scanty food of *dokhn* for his family, in a fair season. Any surplus is produced by the labor of slaves.

No improvement in their processes of cultivation, can have been made in centuries; indeed, they are as rude as possible.

Passing through the country, one is constantly struck by the few people seen in the fields, and the proportionately great number of men seen sunning themselves in the villages. Many illustrations of their laziness and unthrift, may be seen in the market-place of El Obeiyad. Here, a man will sit all day, and haggle over his bundle of dried grass, and carry it off at night, unsold, when he knows, that if he were to sell it for the price offered, he could get another, for the mere trouble of gathering it. This stupid indolence, pervades their whole lives. It is next to impossible to hire laborers. Neither money nor food, will tempt them to work. Only the lash of necessity, will stir them from their sloth.

Many barbarians show cleverness and aptitude in some direction. These people show none. For fifty years they have had before their eyes, the spectacle of a superior race, wearing clothes. They have only learned to draw a fluttering rag around their bodies.

How many generations have drawn water from their deep wells, by hauling hand over hand, a rope, at the end of which is a bucket holding half-a-gallon? And how many generations will continue to do so?

The first man who attempted to reduce grain to meal, may have done it as do these people to-day — by rubbing it between two flat stones in much the condition and form in which they were picked up.

But few, of the very small number of implements known to them are made in their own country, and those are made in the rudest manner.

Although the Bagarra, from the south, ride their bulls and horses into the market-place of El Obeiyad every day; although their neighbours, on all sides, cross the country constantly with burden camels and fleet dromedaries; yet the village people have learned to breed and train for burden, only the donkey; and he, is here, an ill-bred feeble beast.

I may here sum up in a few words what I have said of the character of the people of Kordofan.

They are a mean-spirited, incontinent, lazy, rascally race, in whom I see the material, for very good slaves, but who will disappear from the face of the earth before they are sensibly elevated above their present condition. They have nothing in common with thrifty fellah of Lower Egypt.

From an economical point of view, any attempt to improve their condition will probably be unprofitable.

In the philanthropist, and in the missionary, they may excite an intense interest. It is not, however, as sufferers to be relieved, or, as sinners to be saved, that we are to consider them here; but as subjects of the Egyptian Government. As such, they will never add, I am convinced, to the wealth, to the strength, or, to the glory of the state.

PROVINCE OF KORDOFAN.

PART II.

SOIL AND WATER-SUPPLY.

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SOIL.

THROUGHOUT Kordofan, we find a soil of great uniformity. It is a granite sand, mixed with clay. At times, the clay is predominant; but usually, the sand is in far greater mass than the clay.

In the north, and east, especially, the sand is predominant. In the small basins of Bara, Abou-Harraze and Melbeis, and in general to the south of El Obeiyad, we find a larger admixture of clay.

As we pass southward, we find, all along the water-course which rises in Dar-Nouba, and sinks in latitude 13° , longitude $32^{\circ} 25'$, and along its southern tributaries, the same soil of sand and clay, but with the clay in such proportion, that the soil has become somewhat plastic.

Here, also, we find a forest-country, undergrown with dense vegetation, where, over large areas, the decaying vegetation has formed a rich black mould. This is especially the case between El Birkeh and the mountains of Nouba, and between Gebel-Daïer and Tagalla.

There, the vegetation is luxuriant, and the forests are dense.

There, some weeks after the rains have ended, one finds the black soil cracked in wide and deep fissures, like the deposit of inundation of Lower Egypt.

South of the parallel of $12^{\circ} 30'$, and west of the meridian of 32° is, beyond all comparison, the richest soil of Kordofan. Here, between the parallels of $11^{\circ} 30'$ and $12^{\circ} 30'$ might, no doubt, be found ten thousand square kilometres of clay loam, with a certain admixture of feldspar, which, could it be watered, would produce magnificent crops of sugar-cane, corn, tobacco and cotton.

The whole remaining area of Kordofan, so far as I have seen it, as far north as the fifteenth parallel, is inferior in soil to the region just indicated, but still it is a strong and productive soil. It is largely feldspathic, with more or less iron, and considerable mica.

It lacks only water to produce well.

In certain regions, long the seat of a quite dense population, there is evidence of the exhaustion of the soil; but this is the result of years, perhaps centuries, of continued cultivation of the same crop. Worn-out land is oftenest to be

seen in the neighbourhoods of Bara and Taïara; and I may briefly say that all of Kordofan south of the fifteenth parallel, has a productive soil; that ninety-five per cent is cultivable, and that the soil of that part, south of the parallel of $12^{\circ} 30'$, is uncommonly rich.

How much this soil may be made to produce, depends first and chiefly upon the water-supply, which will now be considered.

WATER-SUPPLY.

The entire water-supply of Kordofan is:—

1st — The *permanent*, which is found in the wells, and in the lakes known as El Birkeh, El Rahad and Sheirkeleh; and

2nd — The *temporary* supply of rain-water, during the *Khérif*.

Aside from these two sources, no drop of water is to be found in all Kordofan.

There is not a lake or a pond in all this country (always excepting the three small lakes above named) which is not dry within a few weeks after the yearly rains cease; nor a running stream or a spring to be found even during the rains.

The water-courses (*Khor*) indicated on the map, contain water for but a few hours at a time, and while rain is actually falling. I am quite sure, that no drop of water finds its way from Kordofan to the Nile.

Kordofan is, to-day, an arid, unproductive land, capable of

supporting but a sparse and barbarous population, and of yielding but a scanty revenue.

Whether or not, it can ever be anything else, depends upon the possibility of materially increasing the available quantity of water furnished by the two sources above indicated.

To solve this problem, we must first make ourselves acquainted with the topography and geology of the land, the distribution and characteristics of the existing wells; and we must determine the annual rain-fall.

Study of North Kordofan. — We will consider only that part of Kordofan south of the parallel $14^{\circ} 30'$; for to the north is an atmoor, hopelessly arid; and we will leave, for the present, the part south of the parallel $12^{\circ} 45'$ for especial consideration.

The portion of Kordofan between those two parallels is a steppe country, rolling more or less abruptly, from four hundred and twenty to five hundred and eighty metres above the sea, the level changing gradually on any one section, and with no general direction of drainage. In fact, at any given point, the local drainage is so slight, that light as is the soil, marks of running water are seldom seen on the surface.

So far as can be determined in a country without upheavals or sections, the geological character of Kordofan is this :

A thick stratum of granitic detritus, remarkably uniform in thickness, overlies a more or less thick and unbroken stratum of mica schist, which is found at from one hundred to one hundred and fifty feet below the surface.

The stratum of detritus has already been described. It is light, highly feldspathic, abounding in mica, and contains more or less, very impure clay. At various places, isolated peaks of granite crop out, indicating, by their disposition, the direction of the ancient ranges, now abraided down.

West of the line connecting Abou-Harraze and Gebel-Katoul, and north of the parallel $14^{\circ} 30'$, water is found at such rare intervals, that the regions outside of these lines are uninhabitable atmoors, and are ranged over by nomadic tribes, who pass quickly from well to well. These regions must, forever, remain what they now are: wastes to be dreaded half the year, and to be frequented during the rainy season only by wandering shepherds and camel-breeders.

The country east of the meridian $32^{\circ} 30'$, may be considered in connection with the banks of the White Nile.

Between the parallels of $12^{\circ} 45'$ and $14^{\circ} 30'$ west of the meridian of $32^{\circ} 30'$ and limited on the west by the line of Abou-Harraze and Gebel-Katoul, is the district in which live the greater part, almost the entire mass, in fact, of the village-people of Kordofan; and it is with reference to this region, that any scheme for increasing the water-supply, must be formed.

The basins of Abou-Harraze, of Cagmar, of Bara, and of Melbeis, are quite exceptional, and need not be considered at present. To each of these basins, we will allot one hundred square kilometres. The area which remains, is forty-three thousand square kilometres.

The officers, of the expedition under my orders, have determined the existence in the above area, of eight hundred wells, of which the water may be drunk. To include the wells which may have escaped our knowledge, we will add one hundred, which gives nine hundred wells in an area of forty-three thousand square kilometres.

Excepting certain groups of shallow water-holes found in the *khors* and at the base of the mountains, these wells are narrow shafts, going down twenty-five to fifty metres to, or somewhat into, the mica schist.

Many of them are brackish; one-fourth of them, at the least, are dry one-half the year, and most of them yield but little water, excepting during the last weeks of the Khérif.

The theory of the water-supply of this country, as already presented by Col. Colston, is sufficiently simple.

The water, which, during the rainy season has leached through the porous surface stratum, is arrested at the impenetrable stratum of schist, and now flows slowly along the surface of that stratum, collecting in the depressions. Those wells which go down into one of these depressions will, when exhausted by rapid use, fill quickly, and will furnish a more or less large and permanent supply of water, according to the size of the reservoir and the area which drains into it. On the other hand, the wells which strike the uniform slope of the impenetrable stratum, will yield water only when they penetrate into the schist forming an artificial reservoir, which is quickly exhausted and fills slowly.

It is apparent that the nappe of water flowing underground in Kordofan is fed only by the annual rain-fall, precipitated on the surface and filtering down to the impenetrable stratum.

There is no region of high mountains precipitating great quantities of rain-water to drain into the reservoirs of Kordofan; nor is there any river or lake system, so placed with relation to Kordofan, that its reservoirs could be fed by infiltration. Northward to the Nile, stretches an atmoor on which the rain-fall is even less than in Kordofan, and which is lower in general level than the steppes which we are now considering.

On the east, the Nile is five hundred feet lower than the level of any considerable area of Kordofan.

On the south, are the almost unknown regions of Nouba and Tagalla, which, evidently, drain *generally* south and east.

West of Kordofan, is Dar Four, a region lower, in general level, than Kordofan (according to the determinations of Cols. Purdy and Mason in Dar Four, and of Maj. Prout in Kordofan), where the annual rain-fall is equally mean and uncertain in quantity, and, withal, separated from Kordofan by an almost waterless atmoor.

I repeat, that the wells of Kordofan must be fed entirely by the water which falls on its own area.

During the rainy-season of 1875, the total rain-fall at El Obeiyad was thirty-two centimetres. As this was hardly an average year, we will say that the mean annual rain-fall may be thirty-five centimetres.

What percentage of this water escapes evaporation at or near the surface, drains down to the impenetrable stratum, and becomes available for the supply of the wells?

This being the whole water-supply of Kordofan, it is to be supposed, that during the year, many of the nine hundred wells will become entirely dry, and that most of them will, late in the year, yield but little water.

Such, we find to be actually the case. After the *dokhn* is gathered, and as the season advances, entire villages migrate to the vicinity of the more plentiful and permanent wells, there to remain until the beginning of the summer rains permits them to return to their proper pastures and corn-fields. This is not in particularly dry years alone, it is the ordinary habit in extensive districts.

In El Obeiyad, water becomes a regular article of commerce soon after the close of the rains. The consumer pays, not merely for the labor of bringing the water; he pays to the owner of the well, a price constantly increasing as the supply diminishes.

In October of 1875, water was sold at one-half an Egyptian piastre the vase of about one and one-half or two gallons. In February of 1876, the same quantity was sold in the town for three piastres.

Late in the summer, a vase of water usually sells for twelve piastres (Egyptian), and in 1873, it was sold for one dollar the vase.

Outside of El Obeiyad, there is not a well within a circle

of twenty miles radius, which can be relied upon later than December, excepting the group at Melbeis, ten miles south.

El Obeiyad is, at least, ten times larger than any other town in the province. Its neighbourhood is the most peopled and best cultivated part of Kordofan. It is not to be supposed, then, that the scarcity of water in El Obeiyad, and its vicinity is exceptional. In fact, the supply there is exceptionally sure and large.

Nine hundred wells, scattered over forty-three thousand square kilometres, thirty-five metres deep, furnishing little water at best; perhaps, one half of them dry for several months in the year, and many of them salt. Such is the permanent water-supply of Kordofan, as it is found to-day.

Certainly, no portion of this water is available for agriculture, for stock-raising, except on the most limited scale, or for any extensive industry. It is sufficient to keep a thin population, with a very few domestic animals, from dying of thirst. More is not to be expected from it.

Can this supply be increased? And how?

To a very small extent, by digging new wells; that is absolutely the only means.

Experimental wells, sunk in many parts of the country, would, no doubt, find water where none is now known to exist. That is to say: unknown underground reservoirs would probably be found.

It is not likely that many reservoirs of importance remain unknown; for, since ages, the want of water has been so keenly

felt, that many searches must have been made for it; and a place in which water has been found, would not have been abandoned or forgotten.

Further, the supply of water could be somewhat increased, by digging more wells in places where they already exist. Of course, artesian wells are not to be thought of.

It follows from what has been said of the character of the existing wells, and of the original source of the water which is found in them, that all to be hoped for in increasing the numbers of wells, is to make life in Kordofan possible to a few thousands more of people with the simplest wants, the rudest industries and the lowest producing capacity.

It remains to consider the temporary supply of water, that falls during the rainy season, in order, if possible, to economize and utilize this supply immediately upon the surface of the ground.

We have before estimated the rain-fall for 1875 at thirty-two centimetres, equal to about 12.6 inches. This seems to have been somewhat less than the annual rain-fall average, although there are many years in which less rain falls.

When we consider that the soil of Kordofan is very light, and exposed to a tropical sun, and that the usual difference between the wet and the dry-bulb thermometer at mid-day is, during the *Khérif*, from five to eight degrees centigrade, and at other seasons twelve degrees, it will be apparent that this rain-fall is entirely insufficient, even during the *Khérif*, for any other crop than *dokhn*, except in those rare and small

places where the clay is close to the surface, and where the impermeable stratum, the schist, is at little depth.

Still, a portion of this scanty supply of water runs off, and is lost for immediate use, and it becomes an important question, whether or not this portion could be saved and utilized for agriculture, or for the other needs of the people.

In July, I received from the Chief of Staff, a letter containing the following paragraph :

“ It is believed, from the reports of previous travellers, that generally the geological formation is such as to favour the construction of grand reservoirs in some of the valleys, in such manner that enormous reserves of water may, without extraordinary expense, be held for use in the dry season. ”

I have studied this subject during an entire rain-season, and for some months after the rain had ceased, and I am curious to see the reports which could have given rise to so hopeful an opinion.

It is so far from just, that I do not hesitate to say that the topography, the geology, atmospheric conditions and the amount of rain-fall, combine to make it forever impracticable to construct reservoirs that shall have any influence on agriculture at any time, or that shall be available for stock-raising or for any industry whatever, for more than two months after the cessation of the rain.

I have said that the country is a rolling steppe, having no general direction of drainage. I may add, that in but few parts, is there any local drainage.

Leaving out of account the routes along the banks of the Nile, and the route from north of Shirkéleh to the Nile, I have marched in Kordofan, north of latitude $12^{\circ} 45'$, six hundred miles. In all that distance, I did not see the slightest mark of running water, except close to the base of the mountains, and in the immediate neighbourhood of El Obeiyad; this, notwithstanding the fact that the light surface is protected by no clothing of turf.

The face of the country, generally, is gently undulating—a slight rise succeeding a slight depression, with unending monotony, each little hollow being independant of all others.

During a rain, the water falling on any given unit of surface, is probably absorbed then and there; but in the most violent and protracted storms, small pools form in the hollows, to be absorbed entirely within two or three hours after the rains cease.

To gather, by artificial canals, the water from a multitude of these small pools, and to conduct it into a grand reservoir, would require such an amount of labour, and such a minute and extensive system of canals, as would make the cost of the water collected, about equal, I should say, to the cost of the same quantity of *vin ordinaire*.

The peculiarities of soil and topography which I have just mentioned, make reservoirs out of the question for much the larger part of northern Kordofan.

Nevertheless, the circumstances are occasionally more favorable. In the immediate vicinity of El Obeiyad, there is

more clay in the surface, and the slopes are comparatively uniform. In consequence, a portion of the water which falls on an area of about four hundred square kilometres, drains into a water-course which flows northerly about twenty kilometres, and finally sinks. Along this course of drainage, the people of El Obeiyad and of the neighbouring villages have made reservoirs, which are important auxiliaries for a small part of the year, although quite useless for agriculture.

Southward from near El Obeiyad, are water-courses which drain to Melbeis, and water-courses coming from near Abou-Harraz, Melbeis, and Gebel-Kordofan, conduct more or less water to the lake known as El Rahad. On these water-courses reservoirs could be made.

In all of northern Kordofan, the people are accustomed to establish reservoirs wherever the local drainage will fill them, and wherever the ground will hold water for a time.

The most of these reservoirs are indicated on the accompanying map. They are useful only during the rainy season, and they prove how hopeless it is to think of ameliorating the water-supply by this means.

Of ten *foulas* (reservoirs) seen by me between El Obeiyad and Gebel-Kagga, in August and September, Dr. Pfund saw several in the first week of October.

All which he saw were then dry, although the rains had not entirely ceased !

The conditions in the neighbourhood El Obeiyad being more favorable for the construction and employment of

reservoirs than in almost any other part of Kordofan, we will consider the reservoirs in that vicinity.

In El Obeiyad and near by, there are two reservoirs, each of which has a depth of about two metres below the natural surface, and is surrounded by banks about two metres high; and each covers an area of about six hundred to one thousand square metres. There are also several smaller reservoirs. Five or six miles down the valley are several similar reservoirs. During the Kherif of 1875, three were filled nearly to the level of the natural surface.

Of these reservoirs, all but the two large ones at El Obeiyad and one large one at Gebel-Kourbag were dry within a week after the rains had ceased!

Two of the larger ones, were dry before the end of December, and the last drop was dried out of the reservoirs when I returned to El Obeiyad, on the 21st of January.

No other result was to be expected. Thin sheets of water spread out under a tropical sun, on a porous soil, in an excessively dry atmosphere, must vanish like mist. It follows that to preserve water in reservoirs for the dry season, even in the places where water may be economically collected, these reservoirs must have a considerable depth compared with the exposed surface, and they must be lined with water-proof, masonry, or cement.

While reservoirs of this class might be well constructed for the use of passing troops and caravans, they would be too expensive for stock-raising and agriculture.

Even supposing that such reservoirs already exist, their application to agriculture would hardly pay. They must be so deep, and the slopes of the land are so gradual, that the water could not be distributed directly from the reservoirs by conductors and sluices. It would be necessary to raise it to the surface, by hand or by mechanical appliances.

Furthermore, the water could not be distributed by simple ditches on the surface, as in Lower Egypt. It would all be absorbed by the porous soil in passing. Conductors, of tiles, wood, or masonry, would be necessary.

All that I have said is of little weight in comparison with one fact, which is, that the rain-fall, in any one year, is insufficient to irrigate for agriculture throughout the year, one-fifth of the area of Kordofan, supposing our means of economizing and applying the water to be so perfect that the *whole mass* which falls could be used for irrigation.

In the actual season of the rains, any other crop than *dokhn* must be watered almost every day.

Further, even this scanty rain-fall is uncertain.

Dokhn requires very little water; but every year more or less of the crop dies for want of it. It follows that any attempt to materially improve the water-supply of Kordofan can only be successful by increasing the quantity of water which actually falls on the surface; in other words, it would be a struggle against the impossible.

In truth, considerations of humanity, as well as of economy, warn us against any extensive operations to increase the

water-supply; for, let us suppose the wells to have been increased until the yield from that source is a maximum; that an extensive and costly system of reservoirs has been established; that, encouraged by the increased supply of water, the population has multiplied; more land has been put under cultivation; the variety of crops has extended; and the flocks and herds have increased. Then, a dry year comes. The wells dry up, the empty reservoirs glow in a summer temperature of 130° Fahrenheit, famine follows, and in one year, death sweeps away all the increase. The only trace of the unfortunate improvement, will be seen in the deserted hamlets, the yawning reservoirs, and the increase of the public debt.

The inhabitants can be trusted to find the means of supplying their small wants. Any public improvement would be a waste of money and life.

* * * * *

In the south, the conditions are somewhat different. It is evident that more rain falls on the southern mountains than on the plains of northern Kordofan.

I am assured that the rainy season in Tagalla lasts six months. The more tenacious soil, and the more uniform surface of the plains, allow the water from wider areas to drain into a general system, which is never the case in the north.

As a consequence of these conditions, we find that the Khor Abou-Hable, which rises in Dar-Nouba, flows one hun-

dred and ninety miles, before it finally sinks; and during the rainy season, running water is found in its course for days together. It is said, that the water of this *khôr* has even found its way to the Nile, in certain unusual years, — a statement to be doubted.

In its course, this *khôr* forms the three small lakes known as *El Birkeh*, (the name given in Manuel's map, *Birket-Koli*, I have never heard) *El Rahad*, and *Shirkéleh*.

El Birkeh covers an area of five and a half square kilometres, El Rahad, an area of twelve, and Shirkéleh an area of sixteen square kilometres.

El Birkeh dries up as the season advances, but water can always be found in the basin, by digging one or two metres. El Rahad becomes entirely dry some years; other years there is a little water on the surface until the beginning of the rains.

Shirkéleh ordinarily becomes dry before the *Khérif*. In both of these basins, as in that of El Birkeh, water is always found at a depth of two or three metres.

Along the whole course of Khor Abou-Hable, until the meridian of 32° is passed, as well as on most, if not all of its southern tributaries, the people find water by digging two, three, or four metres, in the dry bed of the torrent.

I do not say, that at any one point in the course of the *khôr*, water could there be found; but there are well known points, where the Bagarra always look for water, and always find it, whatever the season.

This water is the nappe, flowing underground from the southern mountains.

It is not only probable, but it is almost certain, that in all the area between the Khor Abou-Hable and the mountains, water could be found at a depth of from five to eight metres; and that it would be found oftener and more abundantly, than in any equal area of northern Kordofan.

From its being near the surface, it would be more available for stock, and for small fields, if it were found in sufficient quantities. Further, reservoirs could be constructed along these southern water-courses, with more hope of success, although, even here, they would be useful but a small part of the year.

This region, which I have before mentioned, is incomparably richer than northern Kordofan, is also much better watered, and is therefore, fit for the seat of a larger population.

At present, it is almost uninhabited, because it is unsafe. An agricultural population, like the northern village-people, could not live there.

The obvious course for the government to adopt, for the development of this southern region, is to establish such a system of military posts and patrols, as would keep in awe, the Bagarra and the mountain tribes. Then, the government officials, and the wealthier traders of Kordofan, can send their laborers to build villages, and to cultivate the rich plains between Abou-Hable and the mountains.

Immigration will follow as soon as it shall be known that

life and property are there safe. The people will dig wells according to their needs.

Later, when the value of the region for agriculture, and for stock-breeding is proved beyond a question, will be the proper time to think of a system of reservoirs. Thus, the development of the country, will be natural and permanent, will be effected at the least cost, and will have its results.

For the government to send people there, at present, to make wells, and establish reservoirs, would be a mistake. The workmen must be guarded, must carry from a distance, all means of living, and when the improvements are made, it would remain to find the population to profit by them.

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Special Conditions.—I have spoken before of the basins of Cagmar, Abou-Harraze, Bara and Melbeis.

These are depressions, considerably below the general level. Bara is ninety feet below Khoursi, six kilometres south-east; *three hundred feet* below El Obeiyad, which is sixty kilometres south; and one hundred and ten feet below Hemaoni forty kilometres west.

In these depressions, water collects in such quantities, and the surface of the ground is so near the impermeable stratum, that water is found in abundance the year round, at depths of from one to six metres.

Cagmar and Abou-Harraze, I have not seen.

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The area of the basin of Bara, as well as that of the basin of Melbeis, is not more than twenty-five, or thirty square

kilometres. The areas of Cagmar and Abou-Harraze, respectively, are not more than one hundred square kilometres, at a very liberal estimate, and may be considerably less.

These basins are too small, then, to derive any importance from what they can produce; but they are very important as water stations for passing caravans, and as drinking places for animals; and they furnish water to the villages for many miles around.

Banks of the Nile. — Before leaving, finally, this subject, of the water-supply, I may mention the west bank of the White Nile, between Faki-Kohé, Lat. $13^{\circ} 21'$, and Khartoom, Lat. $15^{\circ} 37'$. This region, although not in the province of Kordofan, was included in the country which I was ordered to examine. Here, on the west bank of the White Nile, and including the small islands in the stream, are, at least, two thousand square kilometres of alluvial land, much of which is usually inundated by the high Nile, and all of which could be watered, either by small canals, conducting the water to the fields, or by pumping-engines on the bank.

It is a region as fertile as Lower Egypt. Colonists from Upper Egypt have not found the climate unhealthy; it all lies within one day, by steamer, from Khartoom.

Not one-fourth of this fertile land is now cultivated; none of it is cultivated up to its capacity. That part of it which is not inundated should produce two crops a year of sugar, cotton or wheat. All of it should produce, at least, one valuable crop.



PROVINCE OF KORDOFAN.

PART III.

PRODUCTS, RESOURCES AND COMMERCE.



PROVINCE OF KORDOFAN.

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PRODUCTS.

WE will consider first the products in general, and then in detail, the source of each product, and the chances of increasing it.

The figures, which I will now give, were furnished to the Governor of Kordofan, by the merchants, in 1871. They are a maximum, for a fruitful year. They include the quantities produced by the Hamre Arabs, now under the jurisdiction of the Governor of the province of Darfour.

I do not give the quantities as exact. It was quite impossible for me to make the strict and minute inquiries necessary to get at the true figures, in a country where statistics do not exist, and where, any information which may have been collected, is in the hands of the traders and other

persons, who will falsify and conceal figures whenever self-interest is to be so served.

The quantities which follow are sufficiently near the truth to be better than nothing.

Consumed yearly in the Province :

<i>Doorah</i> and <i>Dokhn</i>	400,000	<i>ardebs.</i>
Sesame	5,000	"
<i>Foule Kordofani</i> (peanuts)	500	"
White Beans	2,000	"
Wheat	300	"
Dried Bamieh (Okra)	200	"
Salt	3,000	"
Onions	1,700	"
Tobacco	300	<i>cwts.</i>
Cotton (with seed)	500	"
Iron	1,000	"

EXPORTED :

Gum From 35,000 to 70,000 *cwts.*

Feathers, (Ostrich) :

Owam (first quality, white)	40	<i>cwts.</i>
Black	200	"
Rubda (mixed, short, female)	350	"
Abou-Hariba (short, young birds)	2	"

Raw Hides

7,000 *hides.*

NOTE. — These quantities include *all* the commerce in feathers in Cairo, of which much the larger part is from El Obeiyad.

Corn. — *Dokhn* is the only crop of vital importance. It is the sole food of nine-tenths of the people, and from its stalks, they build their houses.

It is a cereal (*penicilaria typhoides*: Dr. Pfund). It grows

during the *Khérif*, on the sandy ridges, even better than in the valleys, and requires but little water. Four months are required to make a crop, from planting to harvesting.

On a journey, and in the fields, the grain is eaten raw, or, simply boiled. In the house, it is crushed between two stones, is mixed with water, and is baked in thin wafers (*kissera*), or, it is boiled in a thick *purée* (*asida*), with morsels of meat or various leaves; or, it is made into a crude sweetish, nasty beer (*merissa*), which is drunk in enormous quantities, throughout the land.

The *dokhn* is nearly all produced north of the thirteenth parallel, or, in the neighbourhood of the lakes Birkeh and Rahad.

The Hamre Arabs, are said to produce much *dokhn*, which should now be subtracted from the 400,000 *ardebs* indicated above.

We will say, for the sake of giving an approximation, that they produce 50,000 *ardebs*.

In unfavorable years, the quantity produced, is much less than that given above, and if two or three bad years follow each other, the result is a famine, such as that which was suffered some ten years ago, when *dokhn* became almost unprocurable, and many people died of starvation.

The quantity of *doorah* which is produced, is small, as compared with that of the *dokhn*. It comes mostly from the vicinity of the mountains.

I have before shown, that there is no possibility of irrigating any of the land of northern Kordofan, even for a short time in the year. Therefore, whatever crop is produced, must be grown during the rainy season, and but one crop a year, can ever be grown there.

The only means left for increasing the supply of *dokhn*, is to increase the area cultivated.

Of the 43,000 square kilometres included between latitudes $12^{\circ} 45'$ and $14^{\circ} 30'$, every metre will produce *dokhn*; but probably, not one-fifth of the area is planted.

The producing area may be increased in three ways. 1st. By increasing the working population. 2nd. By making the present population work harder. 3rd. By introducing improved processes.

The want of water forbids any sudden and forced increase of population, and will, probably forever, forbid any considerable increase. Moreover, it would be unwise to urge emigration from the banks of the Nile, or from Eastern Soudan into Kordofan, as labor must be worth more in the more fruitful regions.

If a small number of negroes from the heathen tribes in the south, could be brought every year to settle in Kordofan, it would be a gain on both sides. But that involves slavery; for the negroes will not emigrate there voluntarily.

If the village people were to be protected from the brigands, who steal their cattle and their corn, and from the rapacity of the *bashibazouks*, there would, no doubt, result a

slow but steady increase of population from the natural increase, attendant upon increased prosperity, and also from immigration.

Thus, the revenues of Kordofan would be increased, and the difficulties of government would be lessened.

I do not see the way, precisely, to make the present population more industrious. If they were protected, in their property, from the brigands; if they felt sure of becoming enriched by increased production, they would, probably, work harder.

The present processes of cultivation are as rude as possible.

The ground is freed from weeds by a crescent-shaped iron, fixed to the end of a pole, which is pushed before the laborer and cuts the weeds. The *dokhn* is then placed in holes made by another iron instrument, and covered with earth. During its growth, it is kept more or less free from weeds. When ripe, the ears are broken off, one by one, from the stalks, and piled together till perfectly dry. Then, the ears are spread on a hard, smooth surface of earth, and beaten with sticks to separate the corn.

Finally, the corn is winnowed with small fans.

If ploughs and cultivating implements, drawn by animals, were introduced, to prepare the ground and keep down the weeds; if the threshing and winnowing were done by machines, naturally, a much greater area could be cultivated by the present population.

I see no other way to increase the production of *dokhn*.

Even supposing the production of *dokhn* indefinitely increased, the market will always be limited to the Soudan, for, the people who can get wheat, maize, barley, and oats, will not consume *dokhn*.

If southern Kordofan, between latitude $12^{\circ} 45'$ and the mountains, were put under cultivation, as suggested herein, the production of *dokhn* would perhaps be doubled.

VARIOUS PRODUCTS.

The production of sesame, beans, wheat, *bamieh* (okra), onions, cotton and tobacco, is divided between the districts where water is most abundant.

It can never be important. As all these crops require much water, it is useless to think of largely increasing them in Kordofan.

Salt. — The salt of Kordofan is produced from three groups of wells in latitude $14^{\circ} 20'$, longitude $30^{\circ} 45'$.

It is procured by evaporation. I have never seen the wells, and the descriptions of the officers, who visited them, give but a vague idea of their capacity.

The salt is dark colored and very bitter.

Iron. — Iron is procured from three ore-beds. Two of these lie northeast of El Obeiyad, distant from that place about one hundred kilometres, and, northwest, distant about eighty kilometres.

The ore is brown hematite. It is found in small fragments, imbedded in the sand at little depth.

How widely it is distributed, it is impossible to tell with-

out an examination more careful and extensive than I could make. Probably, it exists in large quantities.

In the vicinity of these beds of ore, as generally in northern Kordofan, there are no forests; there are groups, only, of small acacias, which could furnish fuel to large furnaces only for a very short time. There is no flux in the country, nor is there the material for constructing furnace stacks. Therefore, whatever may be the wealth of ore, it can never be worked (economically) in large quantities; nor can it be shipped with profit, unless coal be found within the limits of the Egyptian possessions, and a railroad be built to the Nile.

Gum. — The gray-barked acacia, which furnishes the best gum, is found in great numbers in the east of Kordofan, between latitudes $12^{\circ} 30'$ and $13^{\circ} 30'$, and Taiara is the chief point of collection. It is more or less abundant in all parts of the province.

Considerable quantities of gum come from Magen in the north-west.

In the south, are immense forests of the red-barked acacia (*latgh*), which produces a quality of gum, of a certain value in commerce, though inferior to the gum of the gray-bark, (*hashab*).

Other gum-producing acacias are scattered over the province, in greater numbers.

I should say, that the gum-forests of Kordofan are not exploited to one-half their capacity. This is mere conjecture; but it is certain that the *latgh* from the south, fur-

nishes no gum to the market of El Obeiyad, and that in journeys of hundreds of miles, throughout the length and breadth of the land, I have very seldom seen people collecting gum. I am quite unable to suggest any profitable means of increasing the production.

The merchants now pay, in Kordofan, such a price, that their profits in Cairo, are not more than four or five per cent. Therefore, they cannot raise the price. Yet, they cannot send their own people into the forests to gather gum, even were it safe, for, the collection of it from the trees, is a process so tedious and unremunerative, that it can only be done by the lowest class of labor. The labor of men, is worth more in the corn-fields, and at the wells, than in the acacia-forests.

RESOURCES.

Ostrich Feathers. — Although I have included ostrich feathers amongst the products of Kordofan, yet, they can hardly be counted as an actual product of the territory. They come, mostly, from Darfour, and El Obeiyad is merely the point of collection.

In all of my journeys through Kordofan, I did not see or hear of more than a dozen ostriches. It is only west of the mountains of Kagga, that one begins to find them numerous.

This should not be; and with a more intelligent and enterprising population, it would not be. Kordofan is the home

of the ostrich; but the unthrift and short-sighted greed of the people, have driven him out.

If he were introduced again, cared for, and protected from slaughter, he would add, materially, to the revenues of Kordofan. Indeed, ostrich culture is almost the only industry which could be made profitable, in the province. Even that, should be undertaken with caution, for ostrich feathers may, at any time, cease to be a valuable article of commerce.

Cattle. — The raw-hides come from the Bagarra, and from the slaughter-houses of El Obeiyad.

I have said that the Bagarra are cattle-breeders. Their herds are large, and the cattle are really beautiful.

The cattle are of the humped variety, seen throughout the Soudan, I suppose. They are very docile, and the bulls are usually trained to the saddle, and carry burdens.

From the numbers seen at the various watering-places, I should say that amongst the Bagarra who range in southern Kordofan, including the Gimeh on the Nile, but not including the Selim, there must be one hundred thousand (100,000) beeves.

The product from this number is small. They do not seem to be fertile in increase, and they yield but little milk.

These Bagarra cattle have developed a capacity to live with little water. It is said that they require drink only every second or third day.

The grazing-area around each drinking-place is, then, limited by the distance which cattle, grazing, can go in one day and a half. Let us suppose this distance to be ten miles. There are, then, around the southern lakes of Kordofan, and around the wells where water is found at a depth not so great as to make it impracticable to use them for stock, about six thousand (6,000) square kilometres of grazing area.

In the hills, west of the White Nile, between latitudes 13° and $14^{\circ} 30'$, adopting the same basis of calculation, and leaving six kilometres alongside the Nile for cultivation, there are two thousand square kilometres, which could be grazed at all seasons.

The whole eight thousand square kilometres could be heavily stocked; for, during four months of the year, many of the cattle could find water in other ranges.

To include those places in southern Kordofan, where herds of fifty, or one hundred cattle can graze and be watered from the deeper wells, we will add two thousand square kilometres.

We have, then, as the whole area fit for grazing in the ranges of the Kordofan Bagarra, ten thousand (10,000) square kilometres.

It must be remembered that in these ten thousand square kilometres, the vegetation is not renewed by constant rains, but that the cattle must subsist throughout the year on the herbage which grows during the *Khêrif*.

If, then, as I have supposed, the Kordofan Bagarra have 100,000 head of cattle, their country must already be stocked to nearly its full capacity.*

In northern Kordofan, the cattle are few in number. So few, indeed, that they need not be counted in the resources of the country.

Camels. — The camels of the Kababish, are to be counted by the tens of thousands. I have never heard an estimate of their number.

The Hammid Arabs, and the Hamre, in the north-west and in the west, have many camels, also.

Amongst the village-people, camels are seldom found. It is a tedious affair for the Governor to procure from the villages, two hundred camels for service. In the south, there are no camels.

There seems to be no doubt that the camels cannot be successfully bred south of latitude 13° or $13^{\circ} 30'$. The few bred amongst the village-people here, are degenerate animals, without speed or endurance, and they give little in-

* NOTE. — It would seem that this estimate of capacity is too small. On the steppes of Mexico, where the climatic conditions are similar, one thousand cattle are maintained throughout the year on one square league of land. The square league of Mexico contains about four thousand and five hundred *feddans* of land. Ten thousand square kilometres contain 2,500,000 *feddans*. Allowing five *feddans* to each animal, that area ought to maintain 500,000. — S.

crease. Their numbers must be constantly recruited by importation.

In the villages of Kordofan, are found goats, donkeys, and sheep; and, amongst the Bagarra, are found a few thousand horses. It is sufficient to mention the fact. None of these animals are numerous enough to demand particular study.

I believe that I have now enumerated all the products and resources of Kordofan.

COMMERCE.

Export-Trade. — The value in Cairo of the exports from Kordofan is approximately: —

Gum.....	£ 55,000
Raw-Hides	2,500
Feathers:	
White.....	£ 70,000
Black	6,000
Gray	10,000
	<hr/>
	£ 86,000

It must be particularly noticed that these quantities include the total commerce in feathers, which passes by Cairo, from Soudan, whether they come from the Blue Nile, from Darfour, by Siout, or Kordofan.

Much the larger quantity passes by the latter route. For me, it was impossible to determine the exact proportion from each source.

Let us suppose that the value of the feathers passing by El Obeiyad is £ 75,000.

Total Value of Exports.—The total value of the Kordofan export-trade amounts to £ 132,500.

The ivory-trade passing through Kordofan was never great, and is now dead.

Value of the Import-Trade.—The value of the imports consumed in Kordofan is, approximately:—

Cotton Fabrics	£ 40,000
All other Imports	10,000
TOTAL	£ 50,000

In the cotton-fabrics are included: bleached sheeting, prints, unbleached coarse sheeting, coarse blue cotton from Manchester, and coarse blue cotton from Egypt.

In all other imports, the most important articles are:—

Cutlery and metal work, liquors and tobacco, sugar, rice, coffee, etc.

Glass beads, imitations of cut agates and the merchandise generally known as *suc-suc*.

Large quantities of cotton-fabrics are brought by the El-Obeiyad merchants and forwarded at once to Darfour. These are not included in the above estimate.

That this import-trade is so small, will not seem surprising when we remember that the total population of the province is but 280,000, including nomads, and that nine-tenths of this population are primitive barbarians, who require no

other food than *dokhn*, and no other clothing than a simple piece of cotton.

Further, no great immediate increase in that import-trade, is to be expected; and for the same reasons which make the trade now so small. The wants of the people are yet to be created.

That no marked increase in the export-trade, is to be looked for in the near future, has been shown in the preceding pages of this report.

END OF PART III.

PROVINCE OF KORDOFAN.

PART IV. *CLIMATE.*

PROVINCE OF KORDOFAN.

PART IV.

CLIMATE.

THIS chapter will be but brief and general. The meteorological phenomena of each day, must be sought in the report of Dr. Pfund, whose careful observations will certainly be of great scientific interest.

My own barometrical observations, are given in Appendix B.

Division of the Year.—The year, in Kordofan, is divided into three seasons, of varying duration, and ill-defined limits; viz.,—

1st.—The *Khérif*, or, rainy-season;

2d.—The *Shitta*, or, winter;

3d.—The *Seff*, or, Summer.

Rainy-Season.—The *Khérif* begins early in June. Some

hot afternoon, dense clouds will suddenly appear in the south, and, without the least warning, there will come a tremendous shower, of some hours duration. After this preliminary shower, days may pass without rain, and it will probably be July, before the wind is finally settled in the South and Southwest. From this time till late in September, showers may be expected any afternoon, but will probably occur only every three or four days; usually violent, but of short duration.

They continue till the end of September, or the first week in October. In 1875, the first rain was on the 5th June, the last on the 10th October.

During these four months, the temperature is remarkably uniform, the centigrade thermometer indicating:—

			WET.	DRY.
At	7	A. M.	23°	25°
"	9	A. M.	24	28
"	1	P. M.	24	32
"	3	P. M.	24	33

The wind is almost constantly from the South, and Southwest; and large masses of cumulous clouds overcast the sky.

Sickness and Mortality during the Rainy-Season. — Notwithstanding the fact that the maximum temperature is seldom above 33° centigrade, and that in the hottest part of the day there is a difference of 9° centigrade between the wet and dry bulbs, yet one finds the weather very oppressive.

From day to day one loses strength, energy and spirits. All food becomes loathsome, all action brings fatigue. The blood is fevered, the skin is turbid, and, sooner or later, the most resolute man is pretty sure to go to bed, for a longer or shorer time, actually ill with fever.

The fever is intermittent; with, often, if not ordinarily, a low typhoid character.

Almost no person but the native escapes. Those Arabs and Turks who have been years in the country, expect a more or less serious illness towards the end of the rainy season.

The mortality, at this season, is frightful. Of the expedition under my command, six per cent, died in four months; and this, notwithstanding the fact that the people were well fed, well sheltered and carefully attended to when sick.

* * * * *

I do not consider the climate of Kordofan, during the rainy-season, positively dangerous to those persons who can take care of themselves. As Dr. LIVINGSTONE has written, — “Men may escape death, in an unhealthy place, but the system is enfeebled, and life reduced to its lowest ebb. * *

“Important results can hardly be looked for when one’s vitality is preoccupied with wrestling with the unhealthiness of the situation, night and day.”

Winter.—Towards the end of September, the wind becomes changeable, and blows often from the North, while high, light clouds take the place of the dense cumulous masses. By the middle of October, the wind is settled in the North, and

continues to blow steadily from that quarter throughout the winter.

The thermometer slowly falls. The means of a number of observations in November are : —

		WET.	DRY.	
7	A. M.	16°	24°	CENTIGRADE
9	A. M.	16	25	"
12	M.	20	30	"
2	P. M.	21	32	"

The means for December are : —

		WET.	DRY.	
7	A. M.	15°	18°	CENTIGRADE
12	M.	21	31	"
3	P. M.	24	34	"

The means for January and February are : —

		WET.	DRY.	
7	A. M.	12°	15°	CENTIGRADE
1	P. M.	19	27	"
2	P. M.	20	31	"

Although there is little difference in the afternoon maxima, it will be noticed that the range of the thermometers, and the difference between the wet and dry bulbs, are much increased. From the beginning of November, to the beginning of March, the nights are cool.

The influence of the dry air, the north wind and the fresh

nights soon puts an end to the fevers of the *Khérif*. The winter climate of Kordofan, is really delightful.

Summer. — In March, summer begins. With it come drought, sultry nights and terribly hot days.

In May, the afternoon temperature is 41° centigrade.

(*Signed*) H. G. PROUT,

Major of Engineers,

Chief of the Expedition

EL OBEIYAD (Kordofan) March 12th, 1876.

END OF THE GENERAL REPORT.

PROVINCE OF KORDOFAN

APPENDIX A.

ON THE CONSTRUCTION OF THE MAP.

PROVINCE OF KORDOFAN.

APPENDIX A.

ON THE CONSTRUCTION OF THE MAP.

That it may be known how much or how little value should be attached to the general map of the Province of Kordofan which is submitted with this report, I present the following explanation of the manner in which that map has been constructed.

Area, etc. — The map embraces the area between the 29th and the 33d meridians of Longitude east of Greenwich, and between the parallels of $11^{\circ} 30'$ and 16° north Latitude. It is platted to a scale of one to four hundred thousand ($\frac{1}{400000}$) and the meridians and parallels are projected for each thirty minutes of space.

Method of Projection. — Those lines are projected by the polyconic method, as developed in "Lee's Tables and Formulæ" (edition of 1873), published by authority of the Chief of Engineers of the United States Army.

Having no tables which embrace Latitudes so near the Equator, I was obliged to compute all the coördinates for the projection.

The quantities $Dm.$ as measured on the line of the central meridian, were computed from the formula: $Dm. = 121,525.183 - 610.336 \cos. 2 \phi + 1,302 \cos. 4 \phi + 0.002 \cos. 6 \phi$, $Dm.$ being expressed in yards and ϕ being the middle Latitude.

These values were reduced to metres by Kaler's value of metre ($\log. = 0.038,871,6286$).

The coördinates of $s p$ and $s m$, for the intersections of the meridians and parellels, were interpolated by constant differences from the values

given in Lee's Tables, and the quantities thus obtained were compared in several instances with the quantities derived by independent computations from the formulæ given on pages 106 and 107 of Lee's Tables.

INITIAL POINTS.

Khartoom and El Obeiyad. — Khartoom and El Obeiyad were placed on the map from the independent astronomical determinations of Major Prout, no regard having been had to any other determinations whatsoever. It is not to be supposed that no other travellers have made determinations of these positions worth consideration; nor that the determinations by Major Prout are finally reliable; most unfortunately, the data upon which other men have based their determinations, were not attainable.

Khartoom Latitude. — The position of Khartoom was fixed as follows: The Latitude was obtained from Circum-meridian altitudes, taken with a sextant and artificial horizon. Six different stars were observed. A total of seventy-seven observed altitudes was taken, thirty-five south of the zenith, and forty-two north.

The final mean was $15^{\circ} 37' 03''.68$; the greatest single result was from a north star, viz: $15^{\circ} 38' 20''$.; the least single result was from south star, viz: $15^{\circ} 36' 26''$. A range which indicates a considerable error of excentricity, the effects of which are disagreeably evident in the Longitude determinations. On the whole, it is not probable that a more precise determination of the Latitude of Khartoom will soon be desired or obtained.

Khartoom Longitude. — The Longitude of Khartoom was determined by lunar distances of Jupiter and Antaris, east, and Pollux and Regulus, west of the Moon.

Twenty-two groups of distances were taken, each group consisting of three observed distances. The distances east were about equal, in number and position, to the distances west.

The final result was 2h. 11' 34".61, east of Greenwich. The greatest single result was 2h. 13' 27".6, by Jupiter, east; the least single result was 2h. 8' 59" by Pollux, west; a range of 4' 27" of time! Certainly, such a result is only to be accepted as better than nothing. Possibly it is considerably better than any previous determination of this Longitude.

It is due to the observer to say that he had but one sextant, therefore, synchronous observations of distance and altitudes, were impossible. The sextant had an error of eccentricity, varying greatly and irregularly for different parts of the arc. The observer had not the time to make necessary observations to determine this error with sufficient exactitude. The only formulæ and tables at his command, for reduction were those of Bowditch's Navigator, edition of 1868.

El Obeiyad Latitude. — The position of El Obeiyad was fixed as follows : —

The Latitude was obtained from Circum-meridian altitudes of stars, north and south of the zenith.

Thirty-eight observed altitudes were taken, giving a final mean of 13° 10' 04".04.

The greatest single result, was from a north star, 13° 10' 43".6, the least, was from a west star, 13° 09' 53". The probable error of the final mean I have not computed; but it will certainly be but a few seconds.

El Obeiyad Longitude. — The Longitude of El Obeiyad, was determined by Lunar distances, and by Eclipses of Jupiter's satellites; and, like the Longitude determinations at Khartoom, it is very unsatisfactory.

Careful observations were obtained of the Eclipse of the Sun on September 29th, 1875, which, when computed, will give a valuable check on the Longitude.

Lunar distances were taken of Mars and Jupiter, east, and of Mars, Jupiter and Regulus, west; in all, thirteen groups of three observed

distances each; and three observations were obtained of Jupiters' satellites.

The final mean is 2h. 03' 26".24, east of Greenwich.

The least single result, is 1h. 57' 31" by a western distance; the greatest single result is 2h. 05' 36" by an eastern distance.

The mean by the satellites of Jupiter, is 2h. 3' 57".87.

The increased range in the single results is probably due to the fact that it was thought better to attempt no correction of the observations for eccentricity, but to trust to a careful selection of the east and west positions so that they should be about equal in number and distance.

Here, as at Khartoom, the observer had no assistant to observe the altitudes, nor any of the improved tables or formulæ for reduction.

No attempt was made to determine, independently, any other Longitudes than those of Khartoom and El Obeiyad, but all of the Longitudes on the map have been referred to those two points in the manner to be hereinafter described.

The Longitudes of all points on the Nile, and for some fifteen Kilometres west of the Nile, depend upon Khartoom. All the other Longitudes depend upon El Obeiyad.

It follows, then, that when the Khartoom and El Obeiyad Longitudes shall be determined by electric telegraph (which might now be done) the corrections of all the Longitudes of the map can be easily made.

SOURCES OF INFORMATION.

Reconnaissances — The material for the construction of the map has been obtained from the following reconnaissances: —

MAJOR PROUT, Khartoom to El Obeiyad, 374 kilometres (already lithographed).

MAJOR PROUT, El Obeiyad, viâ Hemaoui and Meguinis to Gebel Kagga and return viâ Meguinis and Abou Senoon, 442 kilometres.

MAJOR PROUT, El Obeiyad to Dar Nouba, Gebel Tagalla and the White Nile, and return by Gebel Kohn, 925 kilometres.

ADJ.-MAJOR HAMDY, from Es-Saffi to El Obeiyad, under the orders of Col. Colston, 315 kilometres.

ADJ.-MAJOR HAMDY, eastward to Farréh, and return, 356 kilometres.

ADJ.-MAJOR HAMDY, northwest, to Shershan, thence easterly to Shegèg and return viâ Khoorsi, 570 kilometres.

LIEUT. YUSSUF HELMY and LIEUT. KHALIL FOUZY, south to El Birkeh, thence viâ El Rahad to Gebel Khohn and return, 416 kilometres.

Two expeditions to Abou Harraze and Gebel Abou-Senoon.

Direct determination of distances. — In all these expeditions, the linear distance has been determined by the time of marching, and the direction by the prismatic compass.

It is only on the routes of Major Prout, that any astronomical checks have been made; still these have often been sufficient to give some slight control of the positions determined by the various officers, and to convince one that the work with prismatic compass and watch has been carefully done.

Astronomical Checks. — The astronomical checks on the routes of Major Prout have been:—

1st.—Latitude by direct determination;

2nd.—Longitude by computed difference of Longitude between two points, having the difference of Latitude, and the azimuth of the line connecting the points.

Latitudes.—In the entire area of the map, the positions of which the Latitudes have been independently determined, are twenty-one in number.

The following is a list of the positions, with the number of observations, the bodies observed and the mean result:—

PLACE.	NO. OF OBSERV'S	BODY OBSERVED: NORTH OR SOUTH.	MEAN RESULT
KHARTOOM	77	γ URSÆ-MAJ. N. β CORVI S. β URSÆ-MIN. N. β SCORPH S. γ DRACONIS N. α URSÆ-MAJ. N.	15° 37' 04" N.
TIRRA EL HADRA	20	γ URSÆ-MAJ. N. β CORVI S.	14° 20' 17" N.
BARRA	25	α LIBRÆ S. β SCORPH S. γ URSÆ-MAJ. N.	13° 42' 13" N.
EL OBEIYAD	35	β URSÆ-MIN N. β SCORPH S.	13° 10' 04" N.
MEGUINIS	19	β DRACONIS N. γ DRACONIS N. γ MARS S.	13° 50' 18" N.
GOUMBARRA (Gebel-Katoul)		γ DRACONIS N. γ MARS S.	14° 12' 37" N.
BIR SODERI (near Kagga)	12	MARS S.	14° 25' 25" N.
FERTANGOUL	13	α CASSIOPÆ N. β CETI S.	12° 54' 37" N.
EL BIRKEH	22	α CASSIOPÆ N. β CETI S.	12° 33' 03" N.
EL NILA	12	α CASSIOPÆ N. β CETI S.	12° 12' 21" N.
EL RAHAD	25	α CASSIOPÆ N. γ SUN S.	12° 40' 40" N.
WADLKA	11	SUN S.	12° 14' 41" N.
TAKOBA	12	SUN S.	12° 22' 34" N.
SHIRKELEH	24	γ SUN S. α PERSÆ N.	12° 48' 24" N.
MUAOUËLE	20	γ SUN S. α PERSÆ N.	13° 02' 14" N.
FAKI-KOHÉ	39	γ SUN S. α PERSÆ N.	13° 23' 36" N.
KARANAK	15	SUN S.	13° 46' 41" N.
DUËME	27	γ SUN S. α PERSÆ N.	13° 59' 30" N.
GEBEL-KOHN	22	γ SUN S. α PERSÆ N.	13° 12' 35" N.
TAÏARA	22	γ SUN S. α PERSÆ N.	13° 13' 01" N.
GEBEL-KORDOFAN	16	SUN S.	13° 04' 56" N.

In every instance, the error of the time-piece used in the observations, has been determined with sufficient precision; the observations have been taken on both sides of the meridian, and within ten minutes of the time of culmination, and the reduction to the meridian has been made by the formula:

$$x = k \left\{ i \frac{\cos. l. \cos. D}{\cos. a.} \right\} - m. \tan. a \left\{ i \frac{\cos. l. \cos. D}{\cos. a.} \right\}^2 \text{ where}$$

$$k = \frac{2 \sin.^2 \frac{1}{2} p.}{\sin. 1''}, \quad m = \frac{2 \sin.^4 \frac{1}{2} p.}{\sin. 1''},$$

$a = 90^\circ + D - l$, l = assumed Latitude, D = declination of body, p = its hour angle, and x = correction in seconds. The values of k have been taken from Lee's Tables. In the reductions, the second term

$$\left(m. \tan. a \left\{ i \frac{\cos. l. \cos. D}{\cos. a.} \right\}^2 \right)$$

has not been used.

The bodies observed, have been so chosen, that the altitudes north of the zenith, were nearly equal, in number and position, to those south of the zenith, thus eliminating, as far as practicable, instrumental errors. In all cases, when the error of eccentricity was not thus eliminated, the Latitude has been corrected for that error, as deduced from other observations.

Not only have the bodies been carefully selected, and the methods of reduction been the most exact practicable, but each individual altitude was taken with conscientious care. In the whole number of observations made, I dare say that not more than six observed altitudes have been rejected in the final computations. I have no hesitation in presenting the results as worthy of great confidence.

The positions connected in Longitude with El Obeiyad, by the method of difference of Latitudes and observed azimuths, are:—

1. Gebel Abou-Senoon, determined from El Obeiyad.
2. Gebel-Meguénis, determined from Abou-Senoon.
3. Goombarra (Gebel-Katoul), determined from Abou-Senoon.
4. Gebel-Kagga, determined from Katoul.
5. Gebel-Kordofan, determined from El Obeiyad.
6. Fertangoul, determined from Gebel-Kordofan.
7. El Rahad, determined from Gebel-Kordofan.
8. Gebel-Daïer, determined from Gebel Kordofan.
9. Wadelka, determined from Gebel-Daïer.
10. Gebel-Kohn, determined from Gebel-Daïer.
11. Taïara, determined from Gebel-Daïer.

Connected with Khartoom, is Duème, determined from Gebel-Arashkol. In this determination, the position of Gebel-Arashkol, as established by the line from Khartoom, was assumed as just, although the mountain was not visited. There may, therefore, be a considerable error in the difference between the Longitudes of Khartoom and Duème, and I have only accepted this determination as probably much more exact than the difference between the Longitudes of Duème and El Obeiyad, for the reason that the first difference depends on the *direction* of the line of march, while the second depends upon the *distance* marched; and the error in direction is probably much less than the error in distance.

I do not ask much confidence in the Longitudes of the map. The determinations just mentioned, have a certain value as checks upon the work with prismatic compass and watch. They are more exact than any independent determinations which I might have made by lunar distances or Eclipses, except by a long series of observations; for such a series, I had not the time.

Sources of Error in Longitude.— The principal sources of error in these determinations are:—

1st. — They are affected by errors in Longitude of the initial points.

2nd. — The azimuths were determined with a magnetic compass too small for great precision, and only at El Obeiyad was the magnetic declination accurately known.

3rd. — It was often (usually, in fact) impossible to get the azimuths between precisely the same points at which the Latitudes had been found.

Compilation. — In the platting of the map, each reconnaissance has been platted on a separate sheet, without regard to the astronomical work. The points determined by the astronomy, were placed on the general map. The lines connecting the astronomical points, were then transferred to the general map, any errors in Latitude and Longitude being distributed amongst the courses proportionately to their lengths.

Altitudes. — The data from which were computed the altitudes above the sea-level, as indicated on the map, will be given in Appendix B.

Conclusion. — Finally, when we consider the area covered, the instruments used and the time occupied, it is evident that the map must be regarded merely as a map of reconnaissance; and, as such only, it must be judged. I hope that, as a map of reconnaissance, it will not be found a failure.

The compilation of the detached sheets has been made by Lieuts. Mohammed Mahir and Halil Fouzy of the General Staff, under the constant supervision of Major Prout.

The pen-work has been done entirely by Lieut. Halil Fouzy.

H. G. PROUT,

Major of Engineers,
Commanding Expedition.

PROVINCE OF KORDOFAN

APPENDIX B.

*BAROMETRICAL OBSERVATIONS FOR DETERMINATION
OF ALTITUDES.*

PROVINCE OF KORDOFAN.

APPENDIX B.

BAROMETRICAL OBSERVATIONS FOR DETERMINATION OF ALTITUDES.

It is not practicable to give a complete copy of the barometrical observations from which have been computed the altitudes which appear on the General Map; but the data given in the following tables will enable every person to judge, to some extent, of the accuracy of the results which I have obtained.

Those results will never be freed from all doubt, unless, as now seems improbable, the instruments with which the observations were made, can soon be subjected to definitive tests and comparisons.

Barometers Employed. — The instruments employed, were two aneroid barometers; viz,—

No. 1, — A French instrument, maker's name not known; a carefully graduated and well made instrument.

No. 2, — An English instrument, by Elliott Bros., with fine index and careful graduation.

Mode of Observation. — Observations have been made at all hours from 7 A. M. to 6 P. M.

The observations have all been reduced to a given hour, namely seven o'clock A. M.

TABLE I.

Horary Oscillation. — The reductions to 7 A. M. dependent on the horary oscillation, are given in Table I. They were obtained as follows:—

Hourly observations, made at one place, for several successive days, were platted as diagrams to a large scale. A straight line was drawn from 7 A. M. of one day, to 7 A. M. of the next day. The distance of each hourly position, above or below this line, was measured off; and the arithmetical mean of all the distances, thus measured for any one hour, was used as the correction to 7 A. M. for any observations made at that hour. These are the corrections in Table I.

TABLE II.

Deduced Altitudes. — In Table II. are given the number of observations made at each point at which the altitude has been found, the mean of the observations, the mean temperature of the air, and the deduced altitude.

Column four gives the arithmetical mean of the observed barometer after reducing each observation to 7 A. M. by Table I.

The means given in column four for barometer No. 1, are all affected by the quantity 1.6085 for a change in index made at Berber. This change was necessary, because the graduated scale is short on No. 1, and the amount of change was carefully determined.

Formula of Reduction. — The altitudes in column six are deduced from the formula:

$$Z = \log. \frac{h.}{H} \times 60384.3 \text{ Eng. ft. } \left(1 + \frac{t + t' - 64}{900} \right);$$

where Z = difference of altitude; h = height of barometer at Suakim (Red Sea, Lat. $19^{\circ} 07'$); H = height of barometer at the place where the altitude is sought; and t and t' are the temperatures of the air at the two stations.

The tabular values of

$$\log. \frac{h.}{H} \quad 60384.3;$$

and of

$$\left(1 + \frac{t + t' - 64}{900} \right)$$

were taken from Lee's Tables (Tables and Formulæ, etc.; Professional Papers; Corps of Engineers, U. S. Army, 1873.). At the head of Table II. are given the constant values of h and t for Suakim.

TABLE III.

Monthly Means. — In Table III. are given the monthly means of observed heights of barometers. The means of Barometer No. 2, are corrected for its index error at Suakim, supposing that an aneroid barometer should register thirty inches at sea-level, whatever the temperature and latitude. This index error is -0.011 . The means of Barometer No. 1 are corrected for its index error at Suakim, and for the index error due to the before mentioned change at Berber. The total index error is $-0.47 - 1.6085 = -2.0785$.

Unknown Index Error. — From a consideration of these tables, it is evident, that at least one of the barometers has an undetermined index error; and it is further evident, that this index error existed before the observations were made at Berber. It would seem to be small.

(signed) H. G. PROUT,

Major of Engineers,

Commanding Expedition.

TABLE I.
Correction to reduce observed barometer to 7 A. M. by H. G. PROUT.

BAROMETER N. 1.

PERIOD.	PLACE.	LAT.	A. M.				NOON	P. M.					
			8.	9.	10.	11.		1.	2.	3.	4.	5.	6.
1875													
March.....	SUAKIM.....	19°07'	-.012	-.019	-.008	-.008	+.019	+.037	+.037	+.064	+.072	+.076	+.041
April 14-37	BERBER.....	18 00	-.022	-.034	-.068	-.033	-.042	-.034	+.004	+.023	+.056	+.028	+.019
May 6-16	KHARTOUM ..	15 37	-.031	-.052	-.052	-.047	-.044	-.020	+.001	+.014	+.028	+.025	+.024
June 16 {	EL OBEIYAD	13 10	-.017	-.025	-.029	-.028	-.010	+.013	+.032	+.050	+.069	+.064	+.064
July 23 }													
August....	EL OBEIYAD	—	-.016	-.027	-.037	-.029	-.014	+.021	+.028	+.046	+.066	+.053	
Sept.....	EL OBEIYAD	—	-.016	-.024	-.036	-.015	+.005	+.024	+.051	+.065	+.082	+.068	+.078(?)
Nov. 5 }	EL OBEIYAD	—											
Dec. 3 }			-.044	-.051	-.049	-.044	+.007	+.017	+.037	+.040	+.045	+.024	

BAROMETER N. 2.

March.....	SUAKIM.....	19 07	-.012	-.025	-.004	-.008	+.017	+.045	+.073	+.073	+.074	+.078	+.053
April 14-37	BERBER.....	18 00	-.017	-.026	-.036	-.019	+.009	+.027	+.063	+.067	+.122	+.104	+.095
May 6-16	KHARTOUM ..	15 37	-.012	-.028	-.023	-.004	+.020	+.043	+.037	+.089	+.106	+.095	+.099(?)
June 16 {	EL OBEIYAD	13 10	-.018	-.022	-.017	+.003	+.020	+.054	+.008	+.092	+.086	+.085	
July 23 }													
August....	EL OBEIYAD	—	-.013	-.029	-.027	-.018	+.002	+.034	+.045	+.060	+.085	+.076	
Sept.....	EL OBEIYAD	—	-.015	-.019	-.017	-.000	+.023	+.041	+.067	+.086	+.106	+.091	+.097
Nov. 5 }	EL OBEIYAD	—											
Dec. 3 }			-.027	-.034	-.025	-.017	+.021	+.048	+.073	+.075	+.081	+.060	

TABLE II.

 Barometrical Observations for Altitude,
by H. G. PROUT.

 No. 1., 30.47 ;
h = No. 2., 30.011

 $\theta = 85^{\circ}$ Ph.

Date.	Place.	No. of Obsr.	Mean Barom.		t	Altitude.		Mean Altitude	Note. — From altitudes of Berber, Khartoom, Helba, Bara and El Obeiyad 20 ft. have been subtracted.
			No. 1.	No. 2.		No. 1.	No. 2.		
1875-6									
April 14-27	BERBER	60	29.283	28.756	91°	1176.4	1252.2	1214.3	About 20 ft. above mean Nile.
May 6-19	KHARTOOM	67	29.090	28.556	96	1372.8	1471.8	1422.3	"
" 27	HELBA	4	29.142	28.604	104	1330.6	1423.5	1381.7	"
June 5-8	BARA	6	28.889	28.348	89	1567.7	1677.5	1622.6	Wells 20 ft. deep
June 12-July 8	EL OBEIYAD	100	28.581	28.068	85	1876.5	1962.6	1919.5	" 80 to 130 ft. deep.
August 29	FAKI DOW	2	28.741	28.184	100	1731.0	1756.0	1743.0	" 120 ft. deep.
" 30	HEMAOUI	3	28.798	28.249	98	1672.0	1795.0	1734.0	" 110 "
Sept. 1	MEGUENIS	4	28.686	28.163	89	1774.0	1866.0	1820.0	" 80 "
" 2	OM DOBAN	2	28.8225	28.280	97	1648.0	1761.0	1704.0	" 15 "
" 3	GOMBOURRA	3	28.680	28.127	98	1795.0	1922.0	1853.0	"
" 4-5	TIBRI	8	28.469	27.981	96	2023.0	2132.0	2072.0	"
" 7	OM RAHALI	2	28.505	28.008	85	1958.0	2030.0	1994.0	"
" 10	SHITANGOUL	2	28.533	28.005	95	1945.0	2030.0	1988.0	"
" 11	ABIAR TINE	2	28.322	28.196	92	1745.0	1832.0	1789.0	"
" 14	ABOU-SENOON (Hella)	1	28.596	28.046	88	1865.0	1991.0	1928.0	"

TABLE II. — Barometrical Observations for Altitudes, by H. G. PROUT, — Continued.

t = 85° Fh.

h = No. 1. 30. 47.
No. 2. 30. 011.

Date.	Place.	No. of Obs.	Mean Barom.		t	Altitude.		Mean Altitude.	NOTE. — From altitude of Berber, Khartoom, Helba, Bara and El Obeyad 20 ft. have been subtracted.			
			No. 1.	No. 2.		No. 1.	No. 2.					
1875-6												
" 14	ABOU-SENOON (mountain)	2	27.821	27.357	85°	2567.0	2715.0	2641.0				
Jan. 18-19	TALARRA	8	28.844	28.352	79	1598.0	1657.0	1627.0				
Dec. 7	FERTANGOUL	4	28.655	28.131	92.5	1799.5	1896.3	1847.9				
" 9-16	EL BIRKEH	12	28.753	28.253	82.4	1681.3	1749.9	1715.6				
" 10	GHAHOUSH	3	28.579	27.996	94	1866.0	2036.0	1951.0				
" 11	SOUNGOUNKIH	3	28.488	27.991	89	1962.0	2032.0	1997.0				
" 12	EN NILA	2	28.374	27.901	85	-----	-----	2006.0				
" 15	EL HIGGIS	2	28.629	28.130	90	-----	-----	1854.0				
" 18	ALLOUBA	3	28.830	28.350	82	-----	-----	1639.0				
" 19-21	EL RAHAD	11	28.920	28.438	76	-----	-----	1540.0				
" 24	WADELKA	3	28.258	27.807	78	-----	-----	2263.0				
" 26-27	TAKOBA	7	28.590	28.086	82	1860.7	1936.9	1899.0				
" 30-31	SHIRKELEH	6	28.957	28.425	87	1496.0	1563.0	1555.0				
Jan. 1	GELEBEN HARR.	2	28.980	28.440	96	1559.0	1593.0	1576.0				
" 3-4	MUAOULE	7	29.190	28.671	85	1359.0	1340.0	1349.0				
" 8	KARANAK	5	29.167	28.658	85	1282.0	1351.0	1316.0	25 ft. above Nile.			
" 9-10	DUÈME	10	29.196	28.709	79	1245.0	1292.0	1268.0	10 " " "			
" 13	DARAFISSA	-----	29.135	28.624	88	1318.0	1403.0	1360.0				
" 15	GEBEL-KOHN	5	29.027	28.538	81	1416.0	1469.0	1443.0				

TABLE III.

Monthly Mean of observed barometers reduced to 7 A. M.
by H. G. PROUT.

Date.	Place.	Mean barometer.		Mean temperature of air.	
		No. 1.	No. 2.		
1875					
June...	EL OBEIYAD	28.1157	28.0394	88° Fharenheit.	38 Observa- tions
July ..	EL OBEIYAD	28.1054	28.0719	83 "	96 "
Aug. ...	EL OBEIYAD	28.0950	28.0727	80 "	68 "
Sept...	EL OBEIYAD	28.0976	28.0661	80 "	65 "
Oct. ...	EL OBEIYAD	28.0928	28.0529	84 "	49 "
Nov...	EL OBEIYAD	28.0917	28.0770	78 "	68 "

END OF APPENDIX B.



PROVINCE OF KORDOFAN

APPENDIX C.

ORDERS AND REPORTS.



PROVINCE OF KORDOFAN.

APPENDIX C.

ORDERS AND REPORTS.

[*Translation from the French.*]

WAR OFFICE,

Bureau of the General Staff.

CAIRO, 2nd February, 1875.

Special Order

No. 5.

Major Prout is hereby relieved from duty as Chief of the third Section of the Bureau, and is designated for service with the expedition of reconnaissance under the orders of Col. Colston, to replace Lt.-Colonel Reed, who is on his way returning from the expedition, being ill.

By order of His Highness the Prince Minister of War.

(*signed*) STONE,

Chief of the General Staff.

WAR OFFICE,

Bureau of the General Staff.

CAIRO, 16th *February*, 1875.

Major PROUT,
Corps of Engineers,
Cairo.

Major:

His Highness the Prince-Minister of War directs that Sub-Lieut. Mehemmed Maher, one Corporal and six men, be attached to you for your journey, and that you proceed by rail to Suez, thence to Suakim, and that from Suakim to Berber you make a careful reconnaissance of the route, noticing particularly the water-supply, and making studies of any practicable manner of improving the supplies of water at convenient distances along the caravan-route.

From Berber, you will transmit your report and map of the reconnaissance, and then proceed to Khartoom, where you will consult with the local authorities, as to the most useful route to be reconnoitred from that place to El Obeiyad, the capital of the Province of Kordofan.

You will please communicate by telegraph from Khartoom, the route or the line decided upon to be reconnoitered; and that being approved from this Ministry, you will proceed to make the reconnaissance to El Obeiyad.

Should you arrive at El Obeiyad before the arrival at that place of Col. Colston and his party, you will please to encamp near that city, and occupy your time, while waiting for him, first, in making a map of your reconnaissance from Khartoom to El Obeiyad, and afterwards in reconnoitering the vicinity of the latter, reporting yourself and party to him on his arrival.

Should Col. Colston be near El Obeiyad, on your arrival, you will please join him and report yourself and party to him for duty.

Should Col. Colston have already left El Obeiyad, on your arrival you will not wait to make up your report and map of reconnaissance from Khartoom, but, preserving your notes, will, after necessary repose for your party, proceed to follow his route and join him in Darfour and report yourself and party to him for duty.

On the route from Suakim to Berber, you are authorized to employ not to exceed thirty days.

It is hoped that you will be able to make the reconnaissance in less than that time, with sufficient accuracy.

Orders will be issued to the respective Governors of Suakim and Berber, to facilitate your operations, and the same to the Governor-General of the Soudan at Khartoom.

You will please make requisition immediately for the necessary instruments etc. for your use in the work indicated.

Very respectfully

I am,

Major,

Your most obedient servant,

(signed) STONE,

Chief of Staff.

WAR OFFICE,
Bureau of the General Staff.

Cabinet of the Chief.

CAIRO, 9th March, 1875.

Major:

Owing to delays in preparation of camels &c. at Suakim, His Highness the Prince Minister of War orders the delay of your departure until the coming week.

Very Respectfully

I am, Major,

Your obedient Servant

(signed) STONE,

Chief of Staff.

To

Major PROUT,

Corps of Engineers,

Cairo.

WAR OFFICE,

Bureau of the General Staff.

CAIRO, 10th March, 1875.

Major PROUT,

Corps of Engineers.

Major:

The preparations having been made more rapidly than was hoped, H. H. the Prince Minister of War directs that you depart for Suez on Friday morning next, the 12th inst.

Very Respectfully,

Your most obedient servant,

(signed) STONE,

Chief of Staff.

WAR OFFICE,

Bureau of the General Staff.

Cabinet of the Chief.

CAIRO, 10th *March*, 1875.

Major:

I enclose to you herewith two letters written by His Highness the Prince Minister of War, one addressed to the Governor of Suez, and the other to the Governor of Suakim, giving orders for facilitating the objects of your expedition.

Very Respectfully

I am,

Major,

Your obedient servant.

(*signed*) STONE,

Chief of Staff.

To

Major PROUT,

Corps of Engineers.

Suez.

BERBER, *April*, 25th, 1877.

General:

In compliance with your letter of instructions of the date of February 16th, 1875, I have the honor to submit the following report of a reconnaissance of the route from Suakim to Berber, with a plan and profile of the route, a table of mean barometrical observations for altitudes, a table of some characteristic thermometrical observations, and a list of the results of some astronomical observations.

I was detained at Suakim from March 21st to March 28th, partly for barometrical and astronomical work, and partly waiting for camels.

The time spent on the route was from noon of March 28th to 8:30 P. M. of April 14th.

I regret that, owing to the haziness of the atmosphere during the first part of the journey, I was unable to get a definite idea of the confused mountain system near the coast.

I am, General,

Very respectfully,

Your obedient Servant

(signed) H. G. PROUT

Major of Engineer

To General STONE,

Chief of Staff.



*REPORT OF A RECONNAISSANCE FROM SUAKIM
TO BERBER*

The following report will consist of :—

1st. — A general account of the route passed over;

2nd. — A list of the wells, with suggestions as to the means of improving the water-supply on the route;

3rd. — Some discussion of the route as a possible line of a railroad.

General Description. — The point of departure for caravans from Suakim to Berber, is from the wells, about three kilometres inland, which are the only source of water-supply for the town.

For fifteen kilometres, the route is northwesterly across a smooth and level plain, covered with gravel and small boulders. This plain rises, slightly, from the sea to the mountains, and is frequently traversed by the beds of torrents, which flow from the mountains during the rains. As the surface is stoney and the slope gentle, these water-courses are never deep nor abrupt. Small acacias, from two to three metres high, are scattered over the plain; but there is no other vegetation.

At fourteen to fifteen kilometres, we pass the first point of a high spur, which runs out from the main range towards the coast, and in the low foot-hills of this spur are the wells of El Handouk. Here one may camp in a rocky and sandy waste, foul with the filth of many caravans.

For eight kilometres more, the route continues across the same hard barren plain, to a point where the Wady O-Taon debouches on to the coast plains.

Here, we pass at once into the mountains. The foot-hills on either side are from one to four kilometres distant, rocky and abrupt; and immediately behind them, the view is limited by mountains rising

from three to five hundred metres above the sea-level, with sharp slopes and rugged lines.

The Wady is scarcely more than the boulder bed of a mountain torrent; but in the wider parts, a thin deposit of sandy loam supports a few acacias.

We pass the wells of O-Taon, and at thirty-three kilometres from Suakim, the foot-hills close in upon the bed of the torrent to separate Wady O-Taon from the Wady Sinkat.

The valley of Sinkat is about five kilometres in each direction, enclosed by high and rugged mountains. Through it flows the same torrent which we have followed since entering the mountains, its bed being here broad and rocky. Acacias of small size are abundant in the valley; and even now, after two years without rain, many juicy shrubs are found for the camels and goats, and a few bedouins remain here with their wretched herds.

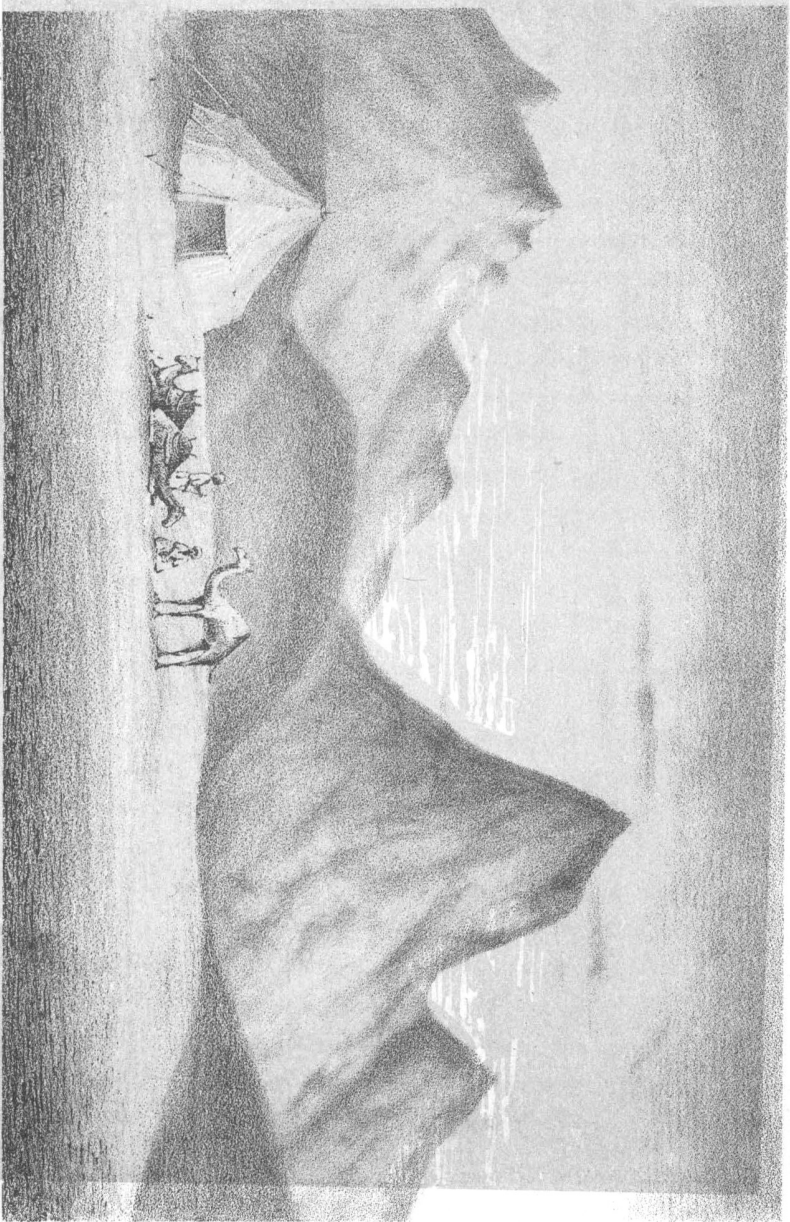
At forty-one kilometres from Suakim, the valley becomes a mere defile, hemmed in by the mountain-sides, with little more than space for the torrent.

At fifty-three kilometres, is reached the summit of the divide, at the head of this torrent, which Dr Schweinfurth considers the divide between the waters of the Red Sea and the Nile. This I think, very doubtful; as we continue to rise rapidly for fifty kilometres west of this pass.

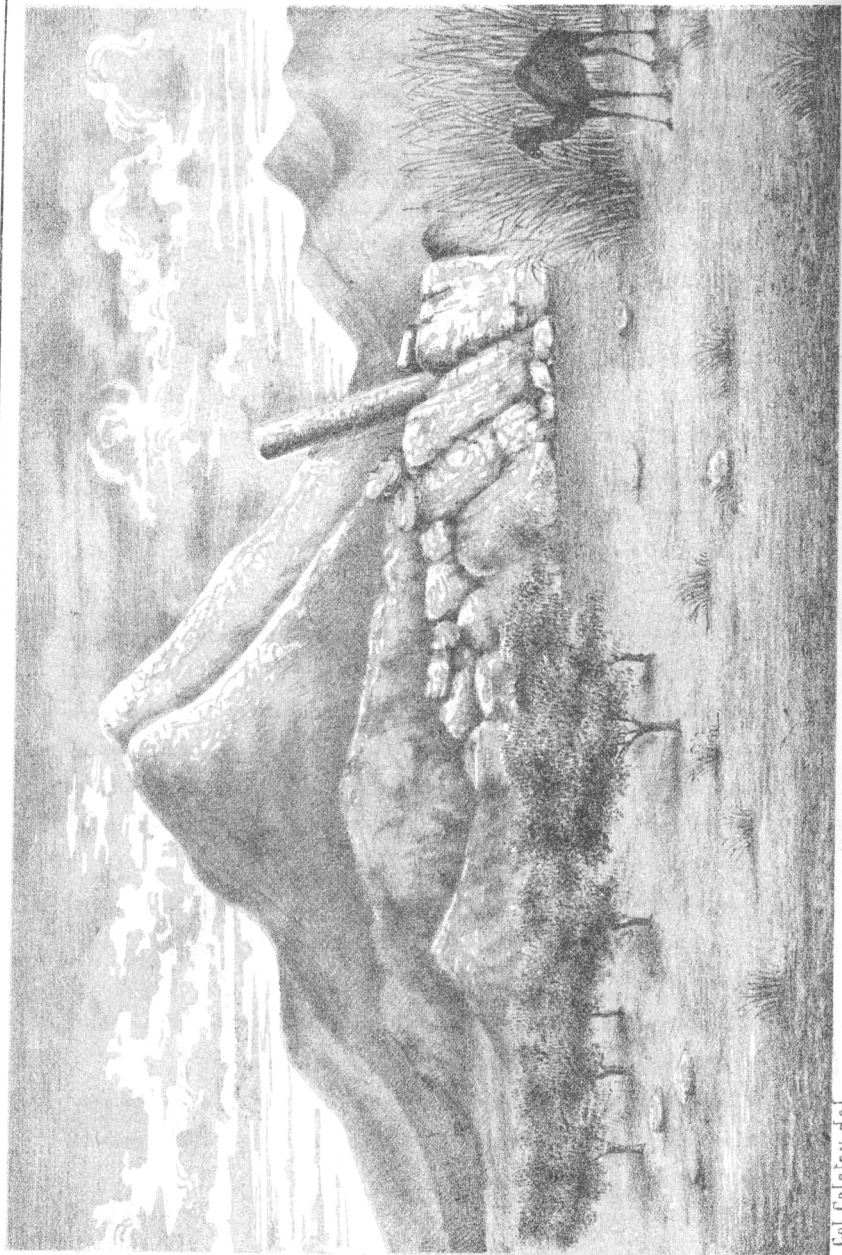
Indeed, that accomplished and careful observer has erred greatly in the estimates of the altitudes in this region, or his translator or English printer has misrepresented him.

Thus, the valley of Sinkat, has an altitude of about nine hundred and sixty feet, instead of three thousand, and this "elevated pass" is not more than one thousand six hundred feet above the sea: while the altitude of three thousand feet, is only reached in the pass between Wady Ahmed and Wady Haratree.

Col. Johnston del.



H. RAYON lith.



This low summit, then, is approached and left by easy gradients. A descent on the west, of not more than thirty metres, brings us on to the plain of Wady O-Mareg, a crooked valley, from two to four kilometres in width which we follow about ten kilometres, when the hills again close in. This valley has a large growth of small trees and shrubs, acacias, dragon-trees and varieties unknown to me; but no water.

For fifteen kilometres, westward of O-Mareg, the route winds amongst rocky foot-hills, with high peaks and crests rising in confused masses on the north and south.

There are frequent dry beds of mountains torrents, and, at times, a stunted and leafless acacia or dragon-tree; but the mountain-sides are dry and bare.

At seventy-six kilometres from Suakim, the broad valley, Wady Ahmed, suddenly opens out. The ascent and descent approaching it from the east, are so gradual as to be scarcely perceptible.

This valley is about sixteen kilometres across, east and west, and has probably about the same extent north and south. The surface is mostly gravelly, strewn with frequent fragments of trap and porphyry, excepting that in the lowest parts, where the water flows in time of rains, there are limited areas of light soil, where are found a few small trees and shrubs, and where, at rare intervals, a very small patch of *doora* is cultivated.

At ninety-six kilometres from Suakim, a short, but steep and narrow pass, leads through a high, abrupt mountain range, from Wady Ahmed to Wady Haratree.

The latter Wady, in the lower part of its course, is but a defile, winding between the granite slopes of the mountains.

Toward the north, glimpses were had of small tributary valleys, which looked as if they might afford slight pasturage for the flocks of the bedouins.

We follow down Wady Haratree about five kilometres, when it suddenly debouches on to a broad plain, across which the course is straight southwest for twelve kilometres to Bir Salalaat.

This plain is a barren, covered with fragments of rocks, with occasional low spurs of rocky hills, running out from the northern mountains.

In the shallow water-courses, is a thin soil, supporting a coarse burned herbage and the usual growth of stunted acacias and dragon-trees.

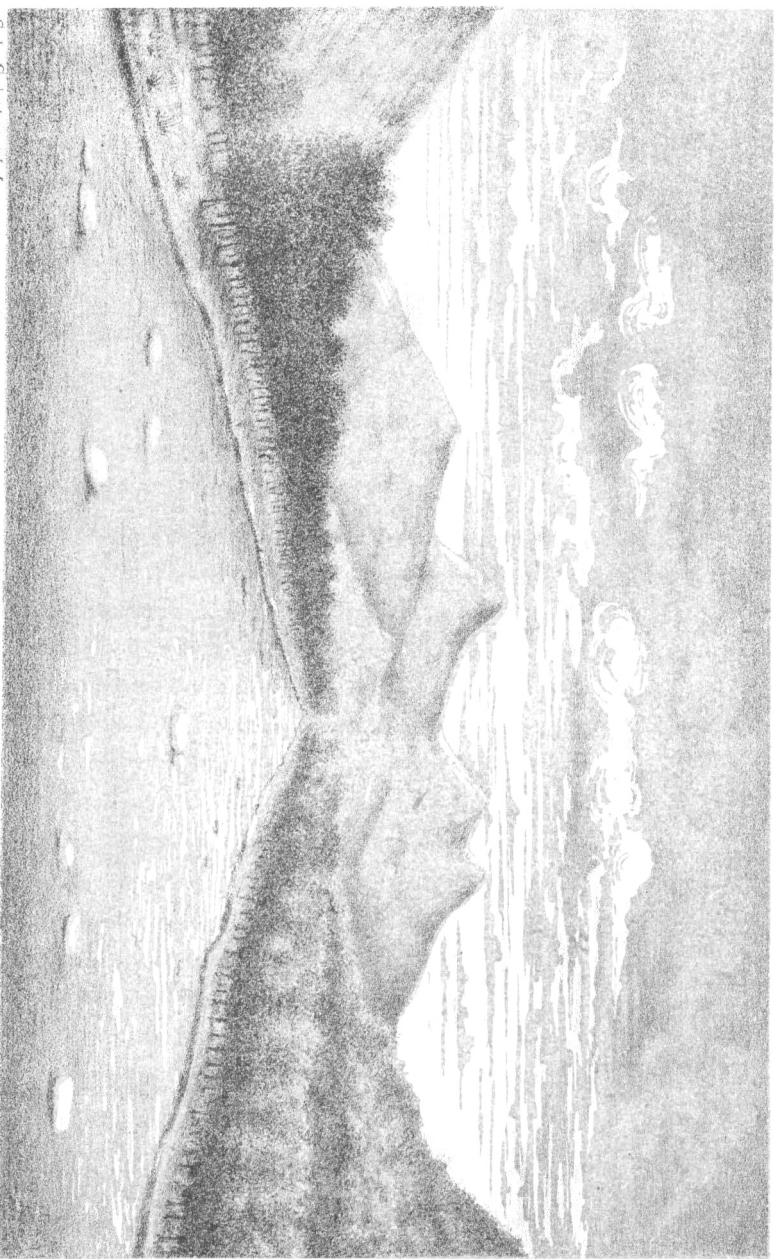
West of this plain, the low hills close in, and at one hundred and twenty-four kilometres, we enter the Wady O-Habdl.

For seven kilometres, the course is through a barren treeless valley, strewn with an unusual quantity of fragments of porphyry and trap. Then, we enter the foot-hills, and, at one hundred and forty-one kilometres from Suakim, pass through a mountain chain, by a steep, tortuous pass, which leads into the Wady Kokreet.

A march of fourteen kilometres down this Wady takes us out of the mountains on to a broad level plain, barren and rocky. Twelve kilometres across this plain, and twelve more through the rocky hills, bring us to the narrow Wady Yumga; and a further march of six kilometres, amongst low granite hills, leads to the pretty valley of Ariab, one hundred and ninety kilometres from Suakim.

This valley is about eight kilometres long and three wide, its long axis northwest and southeast. It contains the most grazing, or browsing rather, for camels and goats. Many large acacias are found here. A number of families of bedouins seem to be established here with their flocks, amongst which I saw a few beeves.

Twenty kilometres more, lead us out of the declining mountains, and for forty or fifty kilometres farther, the route is over barren plains, with occasional masses of low hills, till Wady Lémeb is



Col. Colston, del

reached. Here is a broad plain of light loam, bearing much coarse dry grass, and little other herbage. North and south of this plain, are seen distant mountain peaks, and just west of it is *O-Fik*, the last mountain on the route.

O-Fik is passed at one hundred and sixty-five kilometres from Suakim. Beyond this, nine kilometres across a sterile plain brings us to the dunes and wells of *O-Baek*. This is a belt of sand dunes, about eight kilometres wide, running nearly north and south, and rising perhaps twenty-five metres above the plain. From these dunes to the Nile, stretches a stoney plain, waterless and treeless.

About twenty kilometres from the dunes, is a solitary granite hill, the *Heremite* — a landmark for travelers; and near this hill the plain is covered with fragments of petrified wood.

Route practicable for wagons—The whole of this route is, to-day, quite practicable for wagons. The greatest part of it is, indeed, an admirable road for wheels; at present, some difficulty would be found in getting wagons over the passes of Haratree and Kokreeb, and the dunes of *O-Baek*.

At these three points some work, not much, but rather expensive, must be done to make the route a wagon-road.

Water-supply — After leaving the wells of Suakim, which furnish much and very good water, the first wells met with, are those of *El Hundouk*, fifteen kilometres from Suakim. Here are five wells; one sweet, the others furnishing water rather brackish, but yet drunk by animals and by the bedouins.

It would be safe to rely upon these wells for water for two hundred and fifty men and five hundred animals at a time.

At twenty-seven and-a-half kilometres from Suakim, are the wells of *O-Tuon*, — two wells, safe to supply good water, enough for two hundred and fifty men and as many horses.

In the valley of Sinkat, are the wells of *Hambouk*. These are three holes in the bed of the torrent, scarcely a metre deep, filling slowly. When I was encamped there, two hundred men and as many horses, with three hundred camels, kept them drained. The water is good.

The next wells are at *Kisibil*, at sixty-five kilometres. Here are two wells, one now choked with sand, the other is a small uncurbed hole, two metres deep, filling slowly, with sweet water. In its present state, it could be relied on only for a small party.

The next wells, are in Wady Haratree,—*El Bir Tamai* and *El Bir Tuahwah*, at one hundred, and one hundred and four kilometres respectively. These are deep, and stoned, and give a large supply of good water. I think they are safe to furnish water for six hundred men and their animals.

Next, are the wells of *Salalaat*. These, are at one hundred and nineteen kilometres from Suakim, two large wells, curbed with wood, and supplying a large quantity of good water.

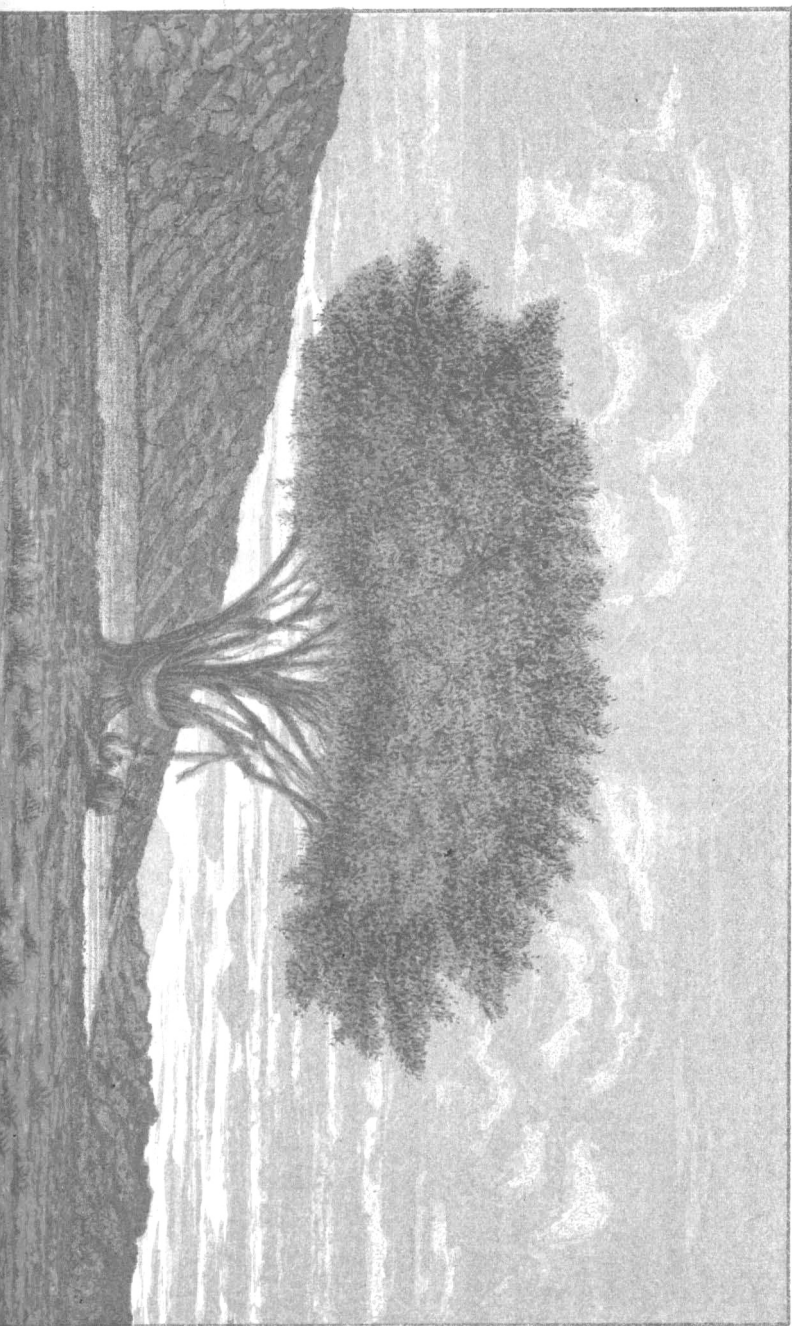
At one hundred and fifty-three kilometres, in the head of Wady Kokroub, is *Bir Hayabu*, a shallow hole in the bed of the torrent, furnishing good water, but a small supply in its present state.

At one hundred and fifty-four kilometres, is the *Bir El-Matre*, a hole in the sand, where water is procured as it is wanted by scooping out the sand with the hands.

At one hundred and fifty-six kilometres, is *Bir Abd-el-Hab*, a large, deep, curbed well, furnishing a large quantity of good water.

The next wells, are those of *Ariab*. Here, at one hundred and ninety kilometres from Suakim, are three large, well constructed wells, of most excellent water.

The supply of water can be relied upon for as large a party as is ever likely to cross this desert.





To the south, on a route from which we diverged, near Wady Kokrub and joined again near Wady Lémeh, is the well of *Roway*, well-known, but said to yield but a small quantity of water.

After leaving El Ariab, no water is found until O-Baek is reached, two hundred and seventy-seven kilometres from Suakim. Here, are now about thirty wells, which are constantly filling, and new ones being dug. These wells are small shafts, sunk about ten or fifteen metres in the sand, and sustained by wooden curbing. The water, when they are first sunk, is drinkable, though saltish. Later, it becomes unfit for use, except for animals. The supply is quite limited.

By good management, four hundred men and their animals could be supplied here, but not more, I should say.

Leaving O-Baek, no water is to be had for eighty-two kilometres until *Bir Mahobé* is reached, two hours march from the Nile — This well is large and excellent.

Present Supply — As no rain has fallen in these mountains for two years (as I am informed), the present supply of water may be considered permanent.

It will be seen that the portion of the route from Suakim to Ariab, that is to say for one hundred and ninety kilometres, is already pretty well supplied with water; the greatest distance between wells being thirty five kilometres.

To make this supply sufficient for any future need, two or three large wells should be constructed in the valley of Sinkat; not in the bed of the torrent. There is no doubt that water will be found there.

The wells of Disibil should be enlarged, deepened and curbed.

An effort should be made to find water in the bottom of Wady Ahmed; I think it could be found. A well here would divide the march of thirty-five kilometres.

Between Bir *Salaat* and Bir *Hayaba*, twenty-three and half kilometres, is there little promise of water to be had by digging; but in the vicinity of Hayaba, in head of Wady Haratree, one or two large wells should be constructed.

The Bir El Mattre should be enlarged, deepened and curbed.

Between Bir *Abd-el-Hab* and Ariab, a distance of thirty-four kilometres, there seems no chance of getting water; but at both those points the supply is ample.

It remains to consider the one hundred and seventy kilometres between Ariab and the well of Mahobé divided by the wells of O-Back, into two waterless stages of eighty-seven and eighty-two kilometres.

At the Wady *El Eiahmib*, fifty-nine kilometres from Ariab, water could be found, I think, without great difficulty. Here is a loamy bottom, with many acacias and small shrubs, all showing enough verdure to indicate some moisture; and deep tracks of camels show that the surface was soft mud not many months ago. I should recommend a serious trial for water at this point.

In the Wady Lémeh, seventy-one kilometres from Ariab, water might, perhaps, be found; but the chances are not so favorable as at El Eiahmib.

No other point in the eighty-seven kilometres, promises water by digging. If water cannot be found at El Eiahmib, the only resource is to sink artesian wells at proper distances.

From the nature of the surface, it would be difficult to establish cisterns to be filled by the rains; and the cost of establishing cisterns, which would furnish water for two years without rain, will always prevent the execution of this plan.

At O-Back, the water-supply may, doubtless, be improved; the only limit seems to be the number of wells. Those now existing, are



COL. COLSTON DEL.

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GRANITIC BOULDERS IN WADY EIAHMIE

all small, and, of course, are dug only just deep enough to get water. I would recommend the experiment of a large, deep and well constructed well here.

From O-Baek to Mahobé, eighty-two kilometres, there seems to be little probability of finding water by digging. The best chance, is in the Wady *Abou Salem*, sixty-six kilometres from O-Baek.

O-Baek is less than two hundred feet above the Nile, and there is little doubt that artesian wells any where on the intervening plain would reach water at no great depth: although, most likely at such depth as to make the ordinary process of digging impracticable.

Line of Railway. — *The route between Souakim and Berber considered as the possible line of a railway.*

It is unnecessary for me to dwell upon the importance or desirability of a line of railway from the Red-Sea to the Soudan.

A line of four hundred kilometres, which places the produce of the Soudan at once in a sea-port, which realizes Mr. Fowler's idea of the advantages to result from connecting the Soudan railway with the Red-Sea, and which brings Berber within six days of Cairo — such a line needs no advocate.

Its advantages are so great and obvious, that many projects for its construction must have been entertained, and amongst these, the line from Suakim to Berber must have received attention; and, undoubtedly, studies of that line have been made.

Whatever reasons may exist against the construction of a railway between Suakim and Berber, I am prepared to say that the face of the country presents no insurmountable difficulty.

On the contrary; throughout far the greater part of the distance, a railway could be built with unusual ease and economy; and, from my hasty examination of the line, it seems so obvious a position and so easy a route, that the more I think of it, the more diffidence I feel

in presenting my opinion of it, thinking that some great and apparent objection must have escaped my notice.

Gradients.—It will be seen from the plan and the barometrical altitudes which accompany this report, that the steepest general gradient on the line, that between camps 3 and 4, is one and one-tenth per cent. That is, of course, supposing the relative altitudes of the camps to have been accurately determined, and the difference of altitudes to be uniformly distributed over the distance.

The difference between a gradient of one and one-tenth per cent., and one of two per cent., that adopted as the maximum for the Soudan railway, will cover any probable error in either of these particulars, except in the cases to be hereafter mentioned.

Earthwork and Masonry.— The surface, throughout, is such as to require little earthwork, and no masonry would be required except culverts to pass the water during the rains, and, in certain places, walls to protect the road-way from the torrents. This masonry would always be of a rough kind, and the material is at hand.

Wood.— As is generally the case in Africa, there is no wood for sleepers, and little for fuel.

Water.—Water for Engines exists throughout, excepting the eighty-two kilometres from Bir Mahobé to O-Baek, and the eighty-seven kilometres from O-Baek to Ariab.

Especial difficulties.— The four points on this line which would present difficulty are:

1st. — The Wady at the head of the Sinkat, forty-eight kilometres from Suakim. Here, for about six kilometres, considerable work would be necessary, to protect the roadway from the torrent; and the passage from this Wady into O-Moreg would present some difficulty in alignment.

2nd. — The pass from Wady Ahmed into Haratree, 96 kilometres from Suakim.

Here, some heavy rock-cutting would be unavoidable. Possibly, a tunnel would be necessary. A lower pass should be sought farther north. I think, one could be found within ten kilometres; if not, I think, that a careful instrumental study of this pass would show that it could be surmounted without excessive curves, gradients or rock-cuttings. This is the most formidable point on the line.

3rd. — The pass into Wady Kokrub 151 kilometres from Suakim.

Of this pass, also, careful instrumental study should be made before the line is pronounced impracticable or too expensive.

About ten kilometres, west of Ariab, some heavy rock-work would be required. This could probably be avoided by passing south, by Roway.

The 4th point demanding special study, is the passage of the sand dunes of O-Baek. These are about eight kilometres wide, by the camel route, and would give trouble with drifting sand unless another crossing could be found.

In comparison with the railway lines across the plains of Lower Egypt, this line seems formidable. When compared with other mountain lines, it would seem that it could be cheaply constructed, and profitably worked.

Whoever pronounces it impracticable, should be prepared to support his opinion with such evidence as can only be procured by an instrumental examination of the points indicated.

Harbour. — What I have said has greater meaning, if it be true, as I have been told, that a more commodious and easier entered harbour than Suakim has been found a few miles up the coast.

(signed) H. G. PROUT.

Major of Engineers.

THERMOMETRICAL OBSERVATIONS FROM SOUAKIM TO BERBER,

Taken by Major PROUT, in March and April 1875.

[Centigrade Thermometers.]

Place.	Date.	Time.	Wet.	Dry.	
		h. m.			
CAMP NO. 3.	March 30th	5 — P.M.	22 —	27. 5	NOTE. — There are many more observations at Berber, but these are sufficient to indicate the April weather.
“ “ “	“ 31st	6 45 A.M.	---	18 —	
“ “ 4.	“ “	2 — P.M.	---	31 —	
“ “ “	“ “	3 — “	26. 5	31 —	
“ “ “	“ “	4 — “	23 —	31 —	
“ “ “	April 1st	7 — A.M.	18. 5	20. 5	
“ “ 5.	“ “	NOON.	22 —	31. 8	
“ “ “	“ “	3 — P.M.	24 —	34. 5	
“ “ “	“ “	4 — “	24 —	32 —	
“ “ “	“ 2nd	7 — A.M.	---	21. 5	
“ “ 6.	“ “	1 — P.M.	27 —	34. 4	
“ “ “	“ “	2 — “	---	35 —	
“ “ “	“ “	4 — “	24. 2	34 —	
“ “ “	“ 3rd	7 — A.M.	20. 5	25. 5	
“ “ 7.	“ 4th	4 — P.M.	---	37 —	
“ “ “	“ “	5 — “	---	35. 3	
“ “ 8.	“ 5th	3 — “	23. 2	35. 8	
“ “ “	“ “	2 — “	22 —	36 —	
“ “ 9.	“ 6th	6 — “	21. 9	32. 7	
“ “ “	“ 7th	7 — A.M.	19. 5	26 —	
“ “ “	“ “	8 — “	20. 5	30 —	
“ “ “	“ “	11 — “	21 —	38. 7	
“ “ “	“ “	NOON.	26 —	39 —	
“ “ “	“ “	2 — P.M.	26 —	40. 5	
“ “ “	“ “	4 — “	---	37 —	
“ “ 10.	“ 9th	4 — “	---	37. 5	
“ “ “	“ “	5 — “	---	36. 5	
“ “ “	“ “	6 — “	---	---	
“ “ 11.	“ 10th	4 — “	23. 5	36 —	
“ “ “	“ “	5 — “	22. 5	35. 3	

THERMOMETRICAL OBSERVATIONS Etc. Continued.

Place.	Date.	Time.	Wet.	Dry.	
		h. m.			
CAMP No. 11	April 10th	6 — P.M.	21 —	33. 3	
" " 12	" 11th	10 — A.M.	---	32 —	
" " "	" "	NOON.	23 —	39. 7	
" " "	" "	3 — P.M.	---	36. 5	
" " 13	" 12th	6 — "	---	---	
" " "	" "	5 30 A.M.	---	---	
BERBER.	" 14th	NOON.	24 —	32 —	
"	" "	2 — P.M.	23 —	33. 8	
"	" "	5 — "	25. 2	35 —	
"	" "	6 — "	24 —	34. 4	
"	" 16th	7 — A.M.	22. 5	29. 5	
"	" "	8 — "	23 —	31 —	
"	" "	10 — "	26. 5	35. 5	
"	" "	11 — "	25. 5	35 —	
"	" "	1 — P.M.	28. 5	38. 8	
"	" "	2 — "	27. 5	39. 5	
"	" "	3 — "	26. 5	39 —	
"	" "	4 — "	---	39. 5	
"	" "	5 — "	26 —	39. 5	
"	" "	6 — "	26 —	39 —	
"	" 17th	7 — A.M.	22. 5	30. 5	
"	" "	9 — "	---	35 —	
"	" "	11 — "	26. 5	37 —	
"	" "	NOON.	---	38. 8	
"	" "	2 — P.M.	---	38. 8	
"	" "	3 — "	---	39 —	
"	" "	4 — "	---	39. 2	

See note in the preceding page.

MEAN BAROMETRICAL OBSERVATIONS FOR ALTITUDES FROM SUAKIM TO BERBER,

Taken by Major Prout, in March and April, 1875.

BAROMETERS { No. 1. A French Prolosteric (large).
No. 2. An Elliott Aneroid (medium).

NOTE. — No attempt was made to set the instruments at Sea-Level. The Suakim observations were made at six metres above the sea. The means are from Observations reduced to 7 A. M. by carefully determined hourly corrections.

Place.	Total No. of Observations.	Mean at 7 A. M.		Mean Thermom. (F)	Deducted alts. above the sea.		Mean in metres corrected to Sea-Level.
		No. 1.	No. 2.		No. 1.	No. 2.	
SUAKIM, -----					ft. inc.		
CAMP No. 1.	39 of each	30-47	30-01 1	85°	20-0	112-6	42-3
" " 2.	2 " "	30-34	29-89	80	125-3	963-4	292-4
" " 3.	3 " "	29-53	" 04	85	915-8	2127-0	634-8
" " 4.	3 No. 1, 4 No. 2	28-46	27-91 5	81	2000-8	2931-2	899-4
" " 5.	5 No. 2.	-----	27-15	85	-----	3045-0	934-1
" " 6.	5 No. 2.	-----	27-06 4	87	-----	2715-2	833-0
" " 7.	6 No. 2.	-----	27-36 7	88	-----	2483-0	762-8
" " 8.	3 No. 2.	-----	27-60	97	-----	2256-0	693-6
" " 9.	2 No. 2.	-----	27-81 5	97	-----	2003-8	587-3
" " 10.	6 of each	28-65 3	28-02 7	90	1810-6	1719-1	500-7
" " 11.	3 " "	" 94 3	" 32 3	100	1527-5	1532-6	447-7
" " 12.	3 " "	29-10	" 50	98	1365-6	1481-8	430-7
" " 13.	2 " "	" 15 5	" 54 5	95	1306-3	1370-0	400-1
" " 14.	2 " "	" 22 5	" 63 5	85	1218-2	1318-4	386-6
" " 15.	3 " "	" 27	" 68	86	1179-1	1276-0	379-4
BERBER, -----	50	" 28 3	" 74 2	92 5	1173-2		

RÉSULTS OF ASTRONOMICAL OBSERVATIONS

FROM SUAKIM TO BERBER,

Taken by Major PROUT, in March and April, 1875.

(Sextant, ELLIOT BROS.)
 (Chronometer No. 2249 FRODSHAM.)
 (" " 160 HORNBY.)

SUAKIM : Lat. by English Charts 19° 06' 45"
 " " by Circum-Mer. obs.° } 19 07 07.7 (adopted).
 Prout, March 23-24 }
 " Long. by English Charts..... 37 20 40. (adopted).

CAMP No. 9: Lat. by Circum-Merid. Alt.
 ϕ Ursæ Maj. and α Urs. Maj.
 Prout : mean of 21 obs. 18 43 40 (adopted).

MEHEREF (Mouderich of Berber) :

Lat. by Circum-Mer. altitudes
 ϕ Urs. Maj. } Mean of
 α " " } 25 obs. Prout. 17 59 33.4 (adopted).
 α Hydræ }
 Long. mean of chronometer... 34 15 — (doubtful).
 " by Mannuel map..... 34 15 17.3 (adopted).

This chronometer Longitude is of course unreliable after such a journey, and it is by chance that it agrees so closely.

I chose to accept Manuel's Longitude rather than delay the work of platting the route or to wait for more or less doubtful sextant observations.

END OF APPENDIX C.

PROVINCE OF KORDOFAN

APPENDIX D.

ASTRONOMICAL OBSERVATIONS.

TELEGRAM

From Major PROUT, at Khartoom to General STONE-PACHA,

dated the 29th Rabé-Awel, 1292. = 5th May, 1877.

(Translation from the Arabic)

“The map and report were sent by mail on the 26th April-1875.
I intend to go to El Obeylad by the route which passes by Abou
Djerad,

Shall I find Colonel Colston here ? ”

•

TELEGRAM

From General STONE-PACHA, Chief of the General Staff, Cairo,

3rd Rabé-Sana, 1292.=1875. to Major PROUT, Khartoom.

“ Determine accurately the Latitude and Longitude of Khartoom.
You will find Colonel Colston at El Obeiyad. ”

WAR OFFICE

Bureau of the General Staff.

Cabinet of the Chief.

CAIRO, 12th June 1875.

MAJOR:

I am to-day in receipt of your letter of the 15th May ult., covering record of observations for Latitude and Longitude of Khartoom; for which I tender you my thanks.

The computations you recommend will be made here by Major Hall of the Engineer-Corps.

Trusting that you retain your health, and that you will find your important service interesting as well as exceedingly useful,

I am,

Major,

Very respectfully,

Your most obedient servant.

(signed) STONE

Chief of Staff.

Major Prout,

Corp of Engineers,

El Obeiyad,

Kordofan.

PROVINCE OF KORDOFAN

ASTRONOMICAL OBSERVATIONS.

TAKEN AT KHARTOOM, SOUDAN, EGYPT,

BY

H. G. PROUT,

Major of Engineers, Egyptian Army.

NOTE—All observations are made at the Palace of Giafar-Pasha, North of the Blue-Nile, about one thousand metres North and six hundred metres East of the Divan of the Government, in the town proper.

May 6th, 1875,—Latitude by Circum-Meridian Altitudes of γ Ursa Majoris, North.

Assumed Latitude. $15^{\circ} 37' 30''$. Assumed error of chro. $+14' 09''$

Declination of star $54^{\circ} 23' 27'' 5$. North—Index error— $10' 29''$.

Observed time P. M.			Double Alts. of γ Ursa Maj.		
8 h.	23 m.	15 s.	102°	$32'$	$15''$
"	25	00	"	34	20
"	26	35	"	36	50
"	28	20	"	37	35
"	29	55	"	39	20
"	31	15	"	39	55
"	32	38	"	43	30
"	34	05	"	39	55
"	35	43	"	43	50
"	37	44	"	42	05
"	39	41	"	41	05
"	41	20	"	40	50
"	44	10	"	36	25
"	45	55	"	37	50
"	48	20	"	34	25
"	49	46	"	30	40
"	51	36	"	28	15

This sight
rejected from
final mean.

Mean Latitude from 16 observed Altitudes= $15^{\circ} 38' 20''$. 4.

May 6th, 1875. — Latitude by Circum-Merid. Altitudes of β Corvi, South, Major Prout observer and recorder.

Assumed Latitude $15^{\circ} 38' 00''$. Assumed error of Chro. $+14' 09''$.

Declination of star $22^{\circ} 42' 34''$. 8. Index error $-10' 29''$.

Observed time P. M.			Double Altitudes of β Corvi.		
9 h.	13 m.	22 s.	103°	33'	20"
„	14	38	„	39	50
„	16	15	„	38	50
„	17	56	„	35	50
„	20	32	„	35	00
„	22	08	„	32	30

Mean Latitude from six observed Altitudes $= 15^{\circ} 35' 00''$. 25.

NOTE.—Observer was suffering from nervous head-ache and extreme fatigue of the eyes. It would be better to reject all these from any carefully computed mean.—
 PROUT.

May 7th 1875. — Latitude by Circum-Meridian Altitudes of β Corvi, South, Major Prout observer and recorder.

Assumed Latitude $15^{\circ} 37' 30''$. Assumed error of chro. $+14' 05''$.

Declination of star $22^{\circ} 42' 34''$. 9. Index error $-11' 28''$.

Observed time P. M.			Double Alts. of β Corvi.		
9 h.	00 m.	15 s.	103°	18'	20"
„	02	40	„	25	45
„	04	09	„	28	20
„	05	27	„	31	15
„	06	34	„	32	50
„	07	46	„	32	50
„	09	08	„	33	35
„	10	40	„	31	15
„	12	10	„	35	30
„	13	25	„	33	30
„	14	42	„	34	50
„	15	57	„	33	30
„	17	35	„	33	45
„	18	54	„	32	25
„	21	05	„	29	20
„	22	52	„	25	40
„	24	06	„	25	10
„	25	32	„	19	35
„	27	47	„	14	20

Mean Latitude from nineteen observed Altitudes $= 15^{\circ} 36' 26''$. 37.

May 16th, 1875. — Latitude by Circum-Meridian Altitudes of α Ursa Majoris; North, Major Prout observer and recorder.

Assumed Latitude $15^{\circ} 37' 06''$. Error of chro. + 13 m. 52 s. 36.

Declination of star. Index error. — $10''$. 6.

Observed time P. M.	Double Alts. of α Ursa Maj.
7 h. 03 m. 33 s.	$86^{\circ} 24' 40''$
„ 05 30	„ 25 00
„ 10 54	„ 24 55
„ 12 29	„ 23 40
„ 13 52	„ 23 25
„ 15 12	„ 21 45
„ 16 30	„ 20 05

Mean Latitude from seven observed Altitudes = $15^{\circ} 37' 13''$ 36.

May 16th, 1875. — Latitude by Circum-Meridian Altitudes of β Ursa Minoris, North, Major Prout observer and recorder.

Assumed Latitude $15^{\circ} 37' 06''$. Error of chro. + $13' 52''$. 11.

Declination of star Index error — $10''$. 6.

Observed time.	Double Altitudes of β Ursa Minoris.
10 h. 50 m. 51 s.	$61^{\circ} 54' 20''$
„ 52 46	„ 57 45
„ 54 59	„ 57 45
„ 57 19	„ 57 35
„ 58 49	„ 57 35
11 00 15	„ 57 35
„ 01 38	„ 57 45
„ 03 07	„ 57 25
„ 04 56	„ 57 05
„ 07 07	„ 56 55
„ 09 36	„ 55 55
„ 11 09	„ 55 15

Mean Latitude from twelve observed Altitudes = $15^{\circ} 37' 26''$

May 16th, 1875. — Latitude by Circum-Meridian Alts. of α Scorpii, South; Major Prout observer and recorder.

Assumed Latitude.	Error of chro. $+ 13^{\circ} 52'' . 04$		
Declination of star.	Index error $- 10'' . 6$.		
Observed time.	Double Altitudes of α Scorpii.		
12 h. 01 m. 43s.	109°	49'	15"
„ 03 14	„	50	55
„ 04 34	„	51	45
„ 05 43	„	51	15
„ 06 55	„	52	55
„ 08 04	„	52	50
„ 09 24	„	52	25
„ 10 46	„	51	35
„ 12 31	„	50	05
„ 14 05	„	47	30

Mean Latitude from ten observed Altitudes, $= 15^{\circ} 36' 34'' . 44$

May 16th. 1875. — Latitude by Circum-Meridian Altitudes of γ Draconis, North; Major Prout observer and recorder.

Assumed Latitude, $15^{\circ} 37' 6''$. Error of chro. $+ 13' 52'' . 02$.

Declination of star	Index error $- 10'' . 6$.		
Observed time.	Double Altitudes of γ Draconis.		
12 h. 26 m. 43 s.	87°	40'	40"
„ 28 47	„	41	40
„ 30 19	„	42	25
„ 32 12	„	42	15
„ 33 56	„	41	40
„ 35 44	„	41	10
„ 38 07	„	40	00

Mean Latitude from seven observed Altitudes $15^{\circ} 37' 29''$.

NOTE. — Final mean adopted, the result of seventy-seven observed double Altitudes of six different stars, thirty-five South of the Zenith, and forty-two North

Latitude of Khartoom $= 15^{\circ} 37' 03'' . 68$.

NOTE. — This, it will be observed, is about $7'$ North of Latitude by the Mannuel Map, but I have great confidence in my results.

H. G. P.

May 9th, 1875. — Longitude by Lunar distances of Jupiter, East; Major Prout observer and Lieut. M. Mahir recorder.

Error of chro. + 14 m. 03 s. 24. Index error = — 11' 06". 3.

Double Alt. of Jupiter.	Observed time
73° 58' 50"	6 h. 56 m. 39 s.

Double Altitude of Moon's L. L.	
87 03 20	6 58 24

Distances Jupiter East and Moon's L. W.	
99 29 15	7 00 40
„ 27 45	„ 02 38
„ 26 15	„ 05 03

Double Alt. of Moon's L. L.	
83 24 50	7 06 40

Double Alt. of Jupiter.	
79 27 10	7 09 04

Longitude, East of Greenwich, = 2 h. 10 m. 27 s. 2.

NOTE. — See Note on reduction of Longitude observations at the end of these observations.

H. G. P.

May 9th, 1875. — Longitude by Lunar distances of Jupiter; Major Prout observer and Lieut. M. Mahir recorder.

Double Alt. of Jupiter.	Observed time
80° 56' 50"	7 h. 12 m. 27 s.

Double Alt. of Moon's L. L.	
80 23 50	7 13 37

Distances Jupiter East, Moon's L. W.	Observed time.
99° 22' 50"	7 h. 16 m. 32
„ 20 50	„ 18 04

Double Alt. of Moon's L. L.	
77 18 25	7 21 13

Double Alt. of Jupiter.	
85 34 30	7 23 06

Longitude, East of Greenwich = 2 h. 12' 22" 7.

May 9th, 1875. — Longitude by Lunar distances of Jupiter

Double Alt. of Jupiter.

93°	17'	50"	7h.	41m.	18s.
-----	-----	-----	-----	------	------

Double Alt. of Moon's L. L.

68	08	30	7	42	34
----	----	----	---	----	----

Distances Jupiter East
and Moon's L. W.

99	09	55	7	44	10
„	07	50	„	45	18
„	07	50	„	46	29

Double Alt. of Moon's L. L.

65	57	50	7	47	39
----	----	----	---	----	----

Double Alt. of Jupiter,

96	38	55	7	49	28
----	----	----	---	----	----

Longitude, East of Greenwich = 2 h, 12 m, 44 s. 7.

May 11th, 1875—Longitude by Lunar distances of Jupiter; Major Prout observer, Lieut. M. Mahir recorder.

Error of chro. + 14 m. 00 s. 05. Index Error—12' 05". 83.

Double Altitude of Jupiter,

Observed time,

125°	37'	50"	9h.	03m.	54s.
------	-----	-----	-----	------	------

Double Altitude of Moon's L. L.

81	35	45	9	05	26
----	----	----	---	----	----

Distance of Jupiter East,
and Moon's L. W.

Observed time.

70	36	50	9	06	57
„	36	45	„	08	50
„	35	50	„	09	02

Double Altitude, Moon's L. L.

79 [?]	77	26	55	9	10	10
--------	----	----	----	---	----	----

Double Altitude of Jupiter,

127	27	50	9	11	07
-----	----	----	---	----	----

Longitude, East of Greenwich = 2 h. 10 m. 39 s. 8.

May 11th 1875. — Longitude by Lunar distances of Jupiter; Major Prout observer and Lieut. M. Mahir recorder,

Double Altitude of Jupiter	Observed time.
127° 44' 20"	9 h. 13 m. 46 s.

Double Altitude of Moon's L. L.	
76 54 05	9 15 45

Distances of Jupiter East, and Moon's L. W.	
70 32 25	9 16 58
„ 32 10	„ 17 55
„ 31 45	„ 18 59

Double Altitude of Moon's L. L.	
74 42 50	9 20 33

Double Altitude of Jupiter.	
129 36 20	9 22 07

Longitude, East of Greenwich = 2h. 10m. 45s.

May 11th, 1875. — Longitude by Lunar distances of Jupiter, East; Major Prout observer and Lieut. M. Mahir recorder.

Error of chro. + 14 m. 00 s. 4. Index Error—12' 05". 83.

Double Altitude of Jupiter.	Observed time.
130° 05' 30"	9 h. 24 m. 44 s.

Double Altitude of Moon's L. L.	
72 08 30	9 26 10

Distances Jupiter East, Moon's L. W.	
70 28 00	9 27 42
„ 27 45	„ 28 46
„ 26 20	„ 29 43

Double Altitude of Moon's L. L.	
70 20 40	9 30 40

Double Altitude of Jupiter.	
131 15 30	9 32 18

Longitude East of Greenwich = 2h. 11m. 07s. 7.

May 12th, 1875,—Longitude by Lunar distances and Jupiter East

Error of chro. 13 m. 58 s. 54. Index Error +11' 20"

Double Altitude of Jupiter	Observed time
106° 52' 20"	8h. 03m. 01s.

Double Altitude of Moon's L. L.	
131 55 45	8 04 35

Distances Jupiter East Moon's L. W.	
57 18 20	8 05 49
57 18 30	8 06 39
57 17 40	8 07 24

Double Altitude of Moon's L. L.	
130 03 25	8 08 30

Double Altitude of Jupiter,	
109 30 20	8 09 57

Longitude East of Greenwich=2 h. 12 m. 31 s. 8,

May 12th, 1875—Longitude by Lunar distances of Jupiter East

Major Prout observer, Lieut. M. Mahir recorder:

Error of chro: +13 m. 58 s. 54 Index error +11' 20"

Double Altitude of Jupiter	Observed time
117° 01' 15"	8h. 31m. 22s.

Double Altitudes of Moon's L. L.	
118 47 40	8 32 25

Distance of Jupiter and Moon's L. W.	
57 07 50	8 33 55
57 08 00	8 35 25
57 07 40	8 37 00

Double Altitude of Moon's L. L.	
116 08 30	8 38 11

Double Altitude of Jupiter,	
119 38 20	8 39 31

Longitude East of Greenwich 2 h. 13 m. 28 s.

May 12th, 1875.—Longitude by Lunar distances of Jupiter, (East)
Major Prout observer, Lieut. M. Mahir recorder.

Error of chro. +11 m. 20 s. Index error +13'. 58". 52.

Double Altitude of Jupiter	Observed time.
125° 57' 50"	9h. 02m. 16s.

Double Altitude of Moon's L. L.	
104 07 50	9 03 39

Distance of Jupiter and Moon's L. L.	
56 57 20	9 04 56
„ 56 00	“ 05 56
„ 56 20	“ 07 09

Double Altitude of Moon's L. L.	
101 55 00	9 08 20

Double Altitude of Jupiter,	
127 49 45	9 10 35

Longitude East of Greenwich = 2 h. 14 m. 02 s. 1.

May 12th 1875. Longitude by Lunar distances of Pollux, West;
Mejor Prout observer, Lieut. M. Mahir recorder.

Error of chro. +13m. 58s. 50, Index error +11' 20"

Double Altitude of Pollux,	Observed time,
62° 27' 30"	8h. 13m. 10s.

Double Altitude of Moon's L. L.	
127 20 55	8 14 14

Distance of Pollux and Moon's L. W.	
34 33 30	8 16 54
„ 32 45	„ 18 05
„ 33 30	„ 18 47

Double Altitude of Moon's L. L.	
124 43 10	8 19 53

Double Altitude of Pollux:	
58 45 40	8 21 36

Longitude East of Greenwich = 2h. 11m. 51s. 6

May 12th 1875. Longitude by Lunar distances of Pollux, West;
Major Prout observer, Lieut. M. Mahir recorder.

Error of chro. +13m. 58s. 52. Index error +11' 20"

Double Altitude of Pollux:	Observed time:
49° 30' 15"	8h. 42m. 36s.

Double Altitude of Moon's L. L.	
113 22 50	8 43 57

Distance of Pollux and Moon's L. W.	
34 43 20	8 45 39
„ 44 30	„ 46 43
„ 45 10	„ 47 34

Double Altitude of Moon's L. L.	
111 03 40	8 48 57

Double Altitude of Jupiter	
46 07 50	8 50 20

Longitude East of Greenwich =2 h. 11 m. 35 s. 7.

May 12th, 1875.—Longitude by Lunar distances of Antares, East;
Major Prout observer; Lieut. M. Mahir recorder.

Error of chro. +13 m. 58 s. 51. Index error +11' 20"

Double Altitude of Antares	Observed time
64° 35' 10"	10 h. 03 m. 46 s.

Double Altitude of Moon's L. L.	
75 19 30	10 05 03

Distance of Antares and Moon's L. W.	
101 03 50	10 08 23
100 59 55	„ 09 40
101 01 20	„ 10 51

Double Altitude of Moon's L. L.	
72 08 30	10 11 52

Double Altitude of Antares	
67 55 10	10 13 56

Longitude East of Greenwich =2 h. 11 m. 19 s.

May 14th, 1875. — Longitude by Lunar distances of Jupiter East;

Major Prout observer, Lieut. M. Mahir recorder.

Error of chro. +13 m. 55 s. 43. Index error —28". 5.

Double Altitude of Jupiter,	Observed time,
70° 03' 40"	6h. 26m. 25s.

Double Altitude of Moon's Up. L.

135 03 30	6 27 34
-----------	---------

Distance of Jupiter and Moon's L. W.

32 19 10	6 28 32
----------	---------

„ 19 15	„ 29 32
---------	---------

„ 18 40	„ 30 25
---------	---------

Double Altitude of Moon's Up. L.

136 48 40	6 31 37
-----------	---------

Double Altitude of Jupiter

72 49 30	6 32 41
----------	---------

Longitude East of Greenwich = 2 h. 12 m. 54 s. 6.

May 14th 1875. Longitude by Lunar distances of Jupiter, East;

Major Prout observer; Lieut. M. Mahir recorder.

Error of chro. +13 m. 55 s. 26. Index error —28". 5.

Double Altitude of Jupiter.	Observed time,
132° 29' 40"	9h. 30m. 08s.

Double Altitude of Moon's L. L.

126 16 20	9 31 29
-----------	---------

Distance of Jupiter and Moon's L. W.

31 22 20	9 03 07
----------	---------

„ 22 10	„ 34 02
---------	---------

„ 22 20	„ 34 57
---------	---------

Double Altitude of Moon's L. L.

124 22 40	9 35 40
-----------	---------

Double Altitude of Jupiter.

132 59 50	9 37 18
-----------	---------

Longitude East of Greenwich = 2 h. 14 m. 00 s. 7.

May 14th 1875. Longitude by Lunar distance of Antares, East;
Major Prout observer; Lieut. M. Mahir recorder.

Error of chro. +13 m. 55 s. 19. Index error —28". 5.

Double Altitude of Antares,	Observed time,
71° 26' 20"	10h. 16m. 23s.

Double Altitude of Moon's L. L.	
105 07 50	10 17 57

Distance of Antares and Moon's L. W.	
75 47 20	10 20 27
„ 46 45	„ 21 31
„ 45 30	„ 22 28

Double Altitude of Moon's L. L.	
102 32 20"	10 23 30

Double Altitude of Antares,	
74 02 40	10 24 50

Longitude East of Greenwich = 2 h. 12 m. 52 s. 4.

May 14th 1875.—Longitude by Lunar distance of Antares;
Major Prout observer; Lieut. M. Mahir recorder.

Error of chro. +13 m. 55 s. 18. Index error —28". 5.

Double Altitude of Antares	Observer time:
74° 38' 30"	10h. 27m. 57s.

Double Altitude of Moon's L. L:	
100 15 10	10 28 26

Distances of Antares and Moon's L. W.	
75 43 50	10 30 16
„ 42 40	„ 31 31
„ 42 10	„ 32 46

Double Altitude of Moon's L. L.	
97 55 30	10 33 49

Double Altitude of Antares	
77 03 40	10 35 19

Longitude East of Greenwich 2 h. 12 m. 56 s. 7.

May 15th 1875.—Longitude by Lunar distances of Pollux, West;
Major Prout observer; Lieut. M. Mahir recorder.

Error of chro. +13m. 53s. 83. Index error —09"

Double Altitude of Pollux	Observed time:
91° 37' 40"	6h. 55m. 44s.

Double Altitude of Moon's Up. L.

122 18 40	6 57 20
-----------	---------

Distance of Pollux and Moon's L. W.

72 14 40	6 59 53
„ 14 20	7 01 03
„ 14 10	7 02 04

Double Altitude of Moon's Up. L.

126 45 45	7 03 42
-----------	---------

Double Altitude of Pollux:

87 30 40	7 05 04
----------	---------

Longitude East of Greenwich 2h. 10m. 58s.

May 15th 1875.—Longitude by Lunar distances of Pollux, West.
Major Prout observer; Lieut. M. Mahir recorder.

Error of chro. +13m. 53s. 8. Index error —09".

Double Altitude of Pollux:	Observed time:
86° 55' 40"	7h. 06m. 27s.

Double Altitude of Moon's Up. L.

128 14 30	7 07 36
-----------	---------

Distance of Pollux and Moon's W. L.

72 17 55	7 09 08
„ 18 10	„ 10 32
„ 18 30	„ 12 27

Double Altitude of Moon's Up. L.

129 59 30	7 12 19
-----------	---------

Double Altitude of Pollux:

83 44 40	7 13 42
----------	---------

Longitude East of Greenwich 2h. 11m. 20s. 8.

May 15th 1875—Longitude by Lunar distance of Regulus, West
Major Prout observer; Lieut. M. Mahir recorder.

Error of chro. +13 m. 53 s. 7. Index error —10"

Double Altitude of Regulus,	Observed time
66° 19' 50"	10h- 10m- 10s-

Double Altitude of Moon's L. L.	
120 13 20	10 11 20

Distance of Regulus and Moon's L. W.	
36 36 55	10 12 40
„ 37 30	„ 14 07
„ 38 10	„ 15 21

Double Altitude of Moon's L. L.	
118 11 20	10 16 21

Double Altitude of Regulus	
62 42 45	10 17 43

Longitude East of Greenwich 2 h- 08 m. 42 s. 77.

May 15th 1875—Longitude by Lunar distances of Regulus, West
Major Prout observer; Lieut. M. Mahir recorder.

Error of chro. +13 m. 53 s. 6. Index error —10"

Double Altitude of Regulus	Observed time
62° 18' 50"	10h. 18m. 55s.

Double Altitude of Moon's L. L.	
116 34 30	10 20 15

Distance of Regulus and Moon's L. W.	
36 39 45	10 21 39
„ 40 15	„ 22 36
„ 39 55	„ 23 32

Double Altitude of Moon's L. L.	
114 44 15	10 24 35

Double Altitude of Regulus:	
58 27 40	10 26 31

Longitude East of Greenwich 2h. 09m. 23s. 77.

May 15th, 1875—Longitude by Lunar distances of Regulus, West;

Major Prout observer; Lieut. M. Mahir recorder:

Error of chro. +13m. 53s. 6. Index error—10"

Double Altitude of Regulus	Observed time
56° 28' 40"	10h. 31m. 03s.

Double Altitude of Moon's L. L.	
111 14 10	10 32 52

Distances of Regulus and Moon's L. W.	
36 43 55	10 34 26
„ 44 05	„ 35 36
„ 43 50	„ 35 50(?)

Double Altitude of Moon's L. L.	
109 02 55	10 38 00

Double Altitude of Regulus	
51 07 20	10 41 53

Longitude East of Greenwich=2 h. 09 m. 36 s. 91.

May 16th 1875—Longitude by Lunar distances of Pollux, West:

Major Prout observer; Lieut. M. Mahir recorder:

Error of chro. +13 m. 52 s. 27. Index error—10" 6.

Double Altitude of Pollux	Observed time:
48° 51' 30"	8h. 28m. 57s.

Double Altitude of Moon's Up. L:	
131 33(?) 30	8 30 19

Distance of Pollux and Moon's L. W.	
84 54 50	8 31 47
„ 55 20	„ 32 38
„ 55 55	„ 33 29

Double Altitude of Moon's Up. L.	
132 24 50	8 34 54

Double Altitude of Pollux:	
45 17 55	8 37 06

Longitude East of Greenwich 2h. 08m. 59s.

NOTE— Upon the reduction of the foregoing Longitude observations. From the Latitude observations I deduced the following approximate errors of eccentricity of the sextant. Viz:

At 105°	Error =	-1'	36"
-- 87	,,	= -0	35
-- 63	,,	= -0	47

Partly for want of time, and partly because of the difficulty of getting properly situated stars from the list at my command, I made no other effort to find the error of eccentricity, which is evidently large and irregular.

In all cases where the angular distance of the star is greater than 63° I have applied a proportional correction for the error of the eccentricity. The other cases are nearly balanced in number and in position, therefore for the final mean I have taken simply the arithmetical mean of the sum of the single results.

As I have other opportunity to determine the permanent errors of the sextant and time to revise the computations this mean may be considerably changed; it probably will, I should say.

H. G. P.

Mean Longitude of Kartoom East of Greenwich:
= 2 h. 11 m. 34 s. 613. = 32° 53' 39". 2.

END OF APPENDIX D.

REPORT OF RECONNAISSANCE

BETWEEN

KHARTOOM AND EL OBEIYAD

(WITH MAP.)

ON the 20th of May, 1875, at 4 h. 45' P. M., I left *Omadourman*, the depot of Khartoom, with my detachment and a caravan of forty-four camels.

From that time I marched thirteen consecutive days, to *Hoursi*.

During six days, I skirted the western bank of the White Nile; and seven days were employed in crossing the country in a southwesterly direction.

Of the thirteen camps which I occupied, only three were in places where there was no water; and near one of those camps, I could have reached a well, had I so desired, by marching the caravan nine and a-half hours that day, instead of seven and a-half.

HOURS OF MARCHING:

From Omadourman	to	Camp No. 1.	2h. 45'
„	Camp No. 1.	to „	2. 6. 25'
„	„	„ 2. „	„ 3. 7. 0'
„	„	„ 3. „	„ 4. 7. 0'
„	„	„ 4. „	„ 5. 7. 0'
„	„	„ 5. „	„ 6. 9. 30'
„	„	„ 5. „	„ 7. 6. 45'
„	„	„ 7. „	„ 8. 6. 20'
„	„	„ 8. „	„ 9. 6. 25'
„	„	„ 9. „	„ 10. 7. 30'
„	„	„ 10. „	„ 11. 5. 30'
„	„	„ 11. „	„ 12. 7. 20'
„	„	„ 12. „	„ 13. 10. 0'

The total of hours actually marched by the caravan was, then,

89h. 30', making a mean of 6 h. 53' per day. for the thirteen days.

The distance between Hoursi and El-Obeiyad is about 60 kilometres; that is to say, two days' march of 9 or 10 hours each for the caravan.

The journey from Khartoom to El-Obeiyad can, therefore, be made with a caravan, in fifteen days of continuous travel, without forced march.

Water on the route.—Between the Nile and El-Obeiyad, water is found at the following named places:—

1st.—At *Tira-el-Hadra*, at a distance of one and a-half mile from the Nile, there is a very shallow lake, which always contains a large quantity of water; but this water is so filled with organic matter, that it is very disagreeable to drink, and doubtless it must be very unwholesome.

2nd.—At *Abou-Garad*, at a distance of two hours' march from Tira-el-Hadra, there are wells which furnish a small quantity of pretty bad water.

3rd.—At *Bir-el-Helba*, distant thirteen hours march from Tira-el-Hadra, are found some twenty wells, from thirty-five to forty metres deep, which could furnish water, probably for 500 men with their animals: but this water is slightly brackish.

Nearly all the men of the detachment had slight attacks of diarrhæa after having partaken of this water during two days.

4th.—At *Bir Id-el-Nibeg*, six hours and twenty five minutes' march from Helba, there are several wells, of from thirty to forty metres depth, in which the water arrives slowly.—This water is sweet; but, as I found 200 soldiers there when I arrived, it was already exhausted.

5th.—At *Abou-Shoka*, at 11 hours' march from Id-el-Nibeg, there are two wells, of about 48 metres depth, which furnish a large quantity of excellent water.

6th. —At *Bir-Illouan*, distant 13 hours' march from Id-el-Nibeg, there is a large and deep well, which also affords a large quantity of good water.

7th.—8th.—At distances of two and four hours' march, respectively, from *Bir-Illouan*, there are villages, having wells, where one would be sure to find sufficient water for several hundred men.

9th. At 9h. 30' distance from *Bir-Illouan*, *Bir-Farragâd* is reached, where there is a large quantity of good water.

10th.—Between *Bir Farragâd* and *Omm Ghîba*, seven hours' march, there are three small villages, where, doubtless, water would be found.

11th.—At *Om-Ghîba* there is abundance of good water, as well as at *Hoursi*, two hours and a half farther on.

12th.—The distance from *Hoursi* to *El Obeiyad*, by the direct road, is 50 kilometres, along which road there is but little water; but by the route which passes by *Bara*, water is found at two points at least, but not in large quantity-

From the Nile to *El Obeiyad*, water is found in sufficient quantity for present wants; and this quantity could be largely increased by digging other wells; but as all these wells are from 30 to 50 metres deep, the labour of drawing water from them is very great, and much hard work is required for drawing a sufficient quantity for a large detachment. What is now wanted, is some good mechanism for drawing up the water, more than a greater number of wells.

Pasturage.—Abundant pasturage is found, for camels, throughout the line between *Omadourman* and *El Obeiyad*.

Condition of the road.—The whole route, from *Omadourman* to *El Obeiyad* is, in its present state, perfectly practicable for wheeled vehicles. —The first wagon-train passing over it, should have with

it, picks spades and axes, for cutting ramps in the banks of some torrent beds, and for cutting a few small trees in the passage of the forest at Haashaba.—No more extensive work than this would be required to make a good wagon-road.

Railway.—A railway might here be constructed with very little moving of earth, beyond what would be required for establishing proper drainage. Fuel for the locomotives, for several years' consumption, could be found within a few kilometres of the line.

The Banks of the Nile.—From Omadourman to Tira-el-Hadra, on the west bank of the White Nile, there is a strip of alluvial soil, which varies in width from one to six kilometres, and which is evidently overflowed by the river in the season of high water. To the west of that, there is a narrow slope of gravel, bounded by rather low hills, generally situated at from three to ten kilometres from the river.

I am unable to state whether to the west of these hills, there are sandy deserts or grassy plains.

The Soil, etc.—The abovementioned strip of alluvial soil widens as one goes south. It seems to be very fertile, but it is not well cultivated.

At the time of my journey, we were not in the harvesting season, but from time to time I noticed traces of the cotton plant, and yet more frequently, those of *doorah*. The cotton which I saw had a coarse and short fibre.

Here then, is a tract of eight hundred square kilometres of fertile land, which could be watered by small canals, and which, for the want of organized labour and system, produces hardly enough to feed a sparse and savage population.

Large herds of handsome cattle as well as flocks of goats graze on the western hills.

A few sheep, also, are seen, and the people own many donkeys.

Everywhere throughout this country, are seen more or less of gum-producing acacias in isolated groups, or in small low forests; and from time to time are seen magnificent groves of acacias.

Villages. — The villages are numerous, especially along the southern half of the route. They are invariably composed of huts built of *doorah*-stalks and grass, in the well-known conical tokel form, or in small and very low paralellograms.

* * * * *

Tira-el-Hadra. — At Tira-el-Hadra, the route definitely leaves the Nile, turning to the west-southwest across the plains.

At the distance of about six kilometres from the Nile, there is a permanent lake of about two kilometres length and one of width, and, apparently, quite shallow—In all parts of the lake are to be seen trees and small islands covered with vegetation.

I think that this lake is formed by infiltration of water from the Nile; but it is evident that during the annual overflow of the river, the lake receives water directly from it. Here are found many small villages, and the usual cultivation of *doorah*, as well as a little cotton.

To the west of this lake, the face of the country, thence to El Obeiyad, is uniform.

The general aspect of this country is that of great rolling plains, covered, during the season of my passage, with high brown herbage, sprinkled with groups, groves and forests of leafless *mimosas*, in which hide vast numbers of guinea-fowl and gazelles.

At intervals, instead of these grass-covered plains, there is found a patch of naked sandy soil, on which *dokhn* is cultivated during the rainy-season. There are seen villages where the wells are from

thirty to forty metres deep. Around these wells, are seen grouped herds of cattle, and flocks of sheep and goats.

Agriculture—Agriculture is here in its most primitive state. On the beginning of the Khérif, the land is cleared of the dead grass covering it; seed is placed in holes and covered by a movement of the planter's foot, and the rest is left to Nature.

The only important crop is *Dokhn*. From time to time a little cotton is seen, and, sometimes, a very industrious sheik cultivates a little *mellohieh* and *bamieh*.

The lack of sufficient water will always prevent a great advance in agriculture throughout this entire region.

It is impossible to cultivate anything which cannot grow and mature during the three months of the rainy-season; and even the annual rains are much less certain and less regular than has been generally supposed.

Capacity for pasturage—This lack of water, also, limits, necessarily, the capacity of the country for pasturage; because the herds can never graze very far from the wells.

Products. — The production of gum must be very considerable.

The red color of the soil indicates a wide distribution of iron ore. — At a distance of forty kilometres to the eastward of Hoursi, there exists a deposit of iron ore, which is worked. The ore is found in lumps of irregular size, in the sand, at a depth of two or three metres from the surface.

I hope to be able to gather statistics with some degree of exactness of the population and the products of this region for a general report on Kordofan.

Conclusion. — On the first day of June, I arrived at Hoursi, about sixty kilometres to the northeast of El Obeiyad.

There I received a letter from Col. Colston, informing me of his serious illness, and I immediately joined him.

Shortly afterwards, I took command of the expedition, with which I arrived at El Obeiyad on the 12th of June, 1875.

The work done subsequent to the first of June, will therefore be included in the general report of the operations of the expedition in the reconnaissance of Kordofan.

(*signed*) H. G. PROUT.

Major of Engineers.

APPENDIX (b.)

TELEGRAM

WAR OFFICE

Bureau of the General Staff,

Cairo, 14th June 1875.

Major PROUT,

Commanding Expedition of Reconnaissance,

OBEIYAD, KORDOFAN.

Choose the most healthy of unexplored portions of Kordofan, and work there with the expedition, selecting a convenient local meridian to which all work shall refer.

Communicate frequently with me, and send maps and reports as often as practicable.

Do your best for comfortable return of Col. Colston to Khartoom.

(signed) STONE

Chief of Staff.

APPENDIX (c.)

WAR OFFICE
Bureau of the Chief of Staff,
Cairo, 14th June 1875.

Major PROUT,
Commanding Expedition of Reconnaissance,
OBEIYAD, KORDOFAN.

MAJOR:

Yesterday afternoon I received a telegram from Col. Colston, dated Bara, 30th Raba-el-Aker (corresponding to 4th June, I think) informing me of his arrival at that point, of the general results of his expedition thus far, and also, information which caused me great distress, of his very serious and, as he feared, mortal illness. He also informed me that he had there met you, coming from Khartoom, and that he, being unable to longer command the expedition under his orders, would turn over that command to you; while he desired, should his strength prove sufficient, to go to Khartoom and there place himself under medical treatment.

I having immediately laid before His Highness the Khedive the telegram in question, His Highness, expressing great sympathy for Col. Colston, and great satisfaction with the high sense of duty displayed by him in continuing, as he had done, to advance with his command under such adverse conditions of health, was pleased to direct me to send orders by telegraph confirming you in command of the expedition, and directing that Col. Colston, in case his condition would permit it, be transported with all possible care to Khartoom for treatment.—Should it be considered best, Col. Colston will be ordered back to Cairo.

In accordance with the desires of His Highness, I have to-day telegraphed to Col. Colston, and I have also telegraphed as follows to you:

“ Major **PROUT**,

“ Commanding Expedition of Reconnaissance,
“ **OBEIYAD, KORDOFAN.**

“ Choose the most healthy of the unexplored portions of Kordofan,
“ and work there with the expedition. Communicate frequently with
“ me and send reports and maps as often as practicable.— Do your
“ best for comfortable return of Colonel Colston to **Khartoom.** ”

These telegrams have been sent to Khartoom with another to the Governor there, directing the latter, by order of His Highness the Khedive, to cause the two telegrams to be forwarded as promptly as possible.

You will please read with great care all the letters of instruction which have been written to Col. Colston, and will act in accordance therewith.

You will find that, under the original instructions, you will be required to enter Darfour as soon as practicable, after making a plan of Obeiyad, and country adjacent; but by more recent instructions, you will find that the operations of your party are restricted to the Province of Kordofan. Your position is one of great responsibility, and the results of your work will be, not only very valuable to Egypt, but most interesting to the whole scientific and commercial world.

I expect to send another Egyptian Officer of American birth and training to join you in the early autumn.

As the line of telegraph will probably be extended within a few months to Obeiyad, I would suggest that point as the local meridian

to which your work should be referred, as the relative longitude could be determined with ease. But all such questions are left for the decision of yourself on the spot.

Lieut.-Col. Mason has determined the Longitude of El-Facher, finding a very large error in the existing maps.

With the one caution to you to maintain a strict and wise discipline in your command, and wishing, for you and your whole force, good health and a distinguished service,

I am, Major,

Very respectfully,

Your most obedient servant,

(signed) STONE

Chief of Staff.

A P P E N D I X (d).

WAR OFFICE

Bureau of the Chief of Staff,

Cairo, 22nd June 1875.

Major PROUT,

Commanding Expedition of Reconnaissance

OBEIYAD, KORDOFAN.

MAJOR:

Your telegraphic despatch respecting supplies was received yesterday, and the matter having been submitted to His Highness the Khedive, he was pleased to direct that the supplies for your Officers must be furnished by the Government. Therefore in accordance with

the Khedivial order, I have telegraphed you to-day that you will make requisitions for necessary supplies from the local authorities, and that is proposed to send you fresh supplies from here in September.

With such knowledge as we are in possession of, it is not supposed that you will be able to carry on very extensive operations of survey during the rainy-season, which is probably now upon you; but it is hoped that you will be able to accomplish something in that way, and a great deal in gathering and reporting the statistics of the country, its population, its products of all kinds, its advantages and disadvantages for commerce, agriculture and stock raising etc.

It is supposed that only one crop per annum can be made in that country, by reason of the long dry season, and also that in some years the rain-fall is not sufficient to assure even one good crop. This is a matter of vast importance, and you will please make careful studies to ascertain whether or not great reservoirs may be made to receive and hold the rain-fall and allow it to be dispensed for agriculture at the needful time.

It is believed from reports of previous travellers, that generally the geological formation is such as to favor the preparation of grand reservoirs in some of the valleys, in such manner that enormous reserves of water may, without extraordinary expense, be held for use in the dry season.

You will please not only make studies of this matter, but also localize them, with plans and estimates.

Wishing you continued good health,

I am, Major,

Your most obedient servant,

(*signed*) STONE

Chief of Staff.

P. S.—As we are yet without news of Col. Colston, we hope that his condition of health has improved beyond what he hoped.

A P P E N D I X (e).

WAR OFFICE

Bureau of the Chief of Staff,
Cairo, 1st July 1875.

Major PROUT,
Commanding Expedition of Reconnaissance,
OBEIYAD, KORDOFAN,

MAJOR:

The 1st Case of specimens forwarded by Col. Colston, collected by Dr. Pfund between Siout and Dongola, has arrived at this Bureau.

I have caused the case to be opened, and the specimens seem to be in excellent condition. They have been carefully placed in a proper armoire, and I shall take the advice of a good botanist as to the best manner of preserving them until the return of Dr. Pfund.

Considering the unfortunate illness of Col. Colston, it will be necessary to charge Dr. Pfund with such geological reconnaissances as he may feel competent to make.

Very respectfully,

I am, Major,

Your most obedient servant,

(signed) STONE
Chief of Staff.

APPENDIX (f).

To OBEIYAD, July 5th, 1875.
General STONE,
Chief of Staff.

GENERAL:

* * * * *
* * * * *

I have just sent an expedition some fifty or sixty miles southwest, to examine some lakes, said to exist in that direction.

I shall await the return of that party, to finish certain maps before I forward anything to you.

The Latitude of Obeiyad (subject to some little change by other observations) may be considered as 13° 10' 16".

There has, as yet, been very little rain. So far as that goes, we might have gone on to El Facher perfectly well.

I am anxiously awaiting instructions from you as to the future movements of the expedition.

* * * * *

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT

Maj. of Engineers, commanding Expedition.

APPENDIX (g).

WAR OFFICE

Bureau of the General Staff,
CAIRO, 6th July 1875.

MAJOR:

I enclose herewith a copy of your route map from Souakin to Berber, and another of the route followed by Col. Purdy from Dongola to Tendelty.

I am awaiting with great interest the map of your route from Khartoom to Obeiyad, and that of Col. Colston of his reconnaissance from Debbé to Mahtool, and from Debbé to Obeiyad.

These will be lithographed as soon as received.

Very respectfully

I am, Major,

Your most obedient servant,

(signed) STONE
Chief of Staff.

MAJOR PROUT,
Commanding Expedition of Reconnaissance.
OBEIYAD, KORDOFAN.

APPENDIX (h).

WAR OFFICE

Bureau of the General Staff,
CAIRO, 28th July 1875.

MAJOR;

I am this day in receipt of your letter of the 27th June ult. and am happy to learn that Col. Colston had slightly improved in health though, unfortunately, only slightly. — We all hope that, with the rest

and the kind care he is receiving, he will soon recover sufficiently to be transported carefully to Khartoom, and thence hither.

It is highly satisfactory to learn that the general health of your command was good, and that work was progressing.

The maps and reports are anxiously awaited, and I am happy to note that you expect to be able to have some useful work done (besides the plan of the city) during the rainy-season.

Hoping for the continued good health of yourself and party,

I am, Major,

Very respectfully,

Your most obedient servant,

(signed) STONE
Chief of Staff.

Major PROUT,

Commanding Expedition of Reconnaissance.

OBEIYAD, KORDOFAN.

APPENDIX (i).

WAR OFFICE

Bureau of the General Staff,
Cairo, 7th Sept. 1875.

Major PROUT,

Commanding Expedition of Reconnaissance,
OBEIYAD, KORDOFAN.

MAJOR;

Your report of reconnaissance from Khartoom to Obeiyad, together with map of route and reports on observations with thermometer and barometer are received.

Your previous report and the map to which you refer in your letter of August 5th, 1875 (Suakim—Berber), were duly received in good order, and have been acknowledged.

Printed copies (in Arabic) were sent to you several weeks since.

Your report just received, is clear and distinct, and I tender you my thanks for it.

Very respectfully

I am, Major,

Your most obedient servant,

(signed) STONE
Chief of Staff.

APPENDIX (k).

WAR OFFICE

Bureau of the Chief of Staff,

Cairo, 23rd Sept. 1875.

Major PROUT,

Commanding Expedition of Reconnaissance,

OBBIYAD, KORDOFAN.

MAJOR:

It is the desire of His Highness the KHEDIVE that the complete reconnaissance of the territory of Darfour, and the reasonably accurate survey of the richer and more densely populated and interesting portions of that country, should be effected with the shortest delay practicable; and that, when the complete reconnaissance shall be effected, Col. Purdy shall, with his party, undertake more distant work.

In order to carry out these views, His Highness directs that you shall transfer your force to Darfour, and, keeping it intact, shall work

with it to expedite said reconnaissance; and, the reconnaissance completed, that you shall then, after the departure of Col. Purdy, undertake and carry out the more detailed and exact work indicated above.

You will therefore please transfer your force to Dafour, receive from Col. Purdy directions as to the portions of the country to which you shall apply yourself and your force, for reconnaissance, and work actively in that duty.

It is to be well understood that the maps and reports of the work undertaken in Kordofan, shall be completed and forwarded before commencing the Darfour work.

Stores of various kinds are now being prepared to be forwarded to you, as well as to Col. Purdy, and will be sent viâ Suakim and Khartoom.

Instructions will be sent to Col. Purdy, in conformity with these, to indicate the portion of Darfour in which you will employ your force.

All maps and reports of 'reconnaissance in Darfour' will be sent through Col. Purdy, unless, owing to relative positions, much time would be lost, in which case, such as he may indicate, may be sent directly, and he furnished with a copy simultaneously.

In order to keep distinct the history of each expedition, your maps and reports will always have the heading, in French : "*Expedition Prout*", or in English, "Prout's Expedition"—and your work will be done in well defined sections of country.

Col. Purdy having, at present, no naturalist in his party, Dr. Pfund will be detached at such times as may be convenient, to visit points of interest, botanically or mineralogically, in sections outside of those in which you work, in order that the scientific reconnaissance of the country may be complete.

It is hoped that a good naturalist will join Col. Purdy after a brief delay.

Thanking you for the active and intelligent manner in which you have been carrying on your work in the field,

I am, Major,

Very respectfully,

Your most obedient servant,

(signed) STONE

Chief of Staff.

A P P E N D I X (1).

WAR OFFICE

Bureau of the Chief of Staff,

Cairo, 28th Sept. 1875.

Major PROUT,

Commanding Expedition of Reconnaissance,

OBEIYAD, KORDOFAN,

MAJOR:

I have the honour to acknowledge the receipt, yesterday, of the following papers from you :—

1st. Letter of the 23rd August, 1875, transmitting the Report (in Arabic) of Adjutant-Major Ahmed Hamdy, on the route from Debbé to El Obeiyad, accompanied by a zinc case containing the map of reconnaissance of said route.

2nd. Letter of the 23rd August acknowledging receipt (20th August) of telegram, dated 29th July, and giving interesting details concerning the health of the command.

3rd. Letter of the 23rd August concerning copy of French translation of your letter to the Governor of Kordofan concerning rations for the Command.

The maps prepared by Adj.-Maj. Hamdy are very creditable in appearance and execution.

The details regarding the improvement in health of Col. Colston are very cheering, and those concerning the general health of the officers and soldiers of the expedition are encouraging. The matter of rations for the officers and soldiers has been laid before His Highness the Prince Minister of War, who is doubtful whether it be practicable or not to furnish hard bread in the Government of Kordofan, but he authorises the sending from this point, of hard bread and flour for your expedition.

Very respectfully,

I am, Major,

Your most obedient servant

(signed) STONE

Chief of Staff.

APPENDIX (m).

EL OBEIYAD, September 16th, 1875.

To

GENERAL STONE
Chief of Staff,
CAIRO.

GENERAL:

Your letter of July the 28th, (No. 179) was received in September the 8th at *Gebel-Kagga*.

I left El Obeiyad on the 28th August, and returned on the 16th September. The total distance travelled, was about two hundred and eighty miles, in a direction N.N.W., and returning along the western frontier of Kordofan. Gebel Kagga is one hundred and forty-four miles from El Obeiyad, and marks the northwest limit of the inhabited or inhabitable territory of Kordofan.

Twenty-five miles southwest of Gebel Kagga, is Gebel Katoul. These are, for Africa, lofty mountains, and conspicuous landmarks. Both are placed on Petermann's maps, at least one degree too far south.

I have been able to determine, with considerable accuracy, the Latitudes and Azimuths of a series of points from Gebel Kordofan (South of El Obeiyad) to Gebel Kagga. This will enable me to plat the map of N. W. Kordofan with much more accuracy than by a march alone.

At Gebel Katoul, I met Dr. Pfund, who has been occupied, since the 14th August, in collecting along the western frontier from Abou-Harraze northward. He has amassed a great quantity of specimens

in botany, which he considers very interesting. He is accompanied by a staff-officer, who is instructed to make a careful reconnaissance of the region which they may pass through.

Dr. Pfund intends to return by the way of Bara; but the great amount of sickness in the command will make it necessary for me to recall him as soon as possible.

At the same time with my reconnaissance, Adj.-Maj. Hamdy went E.N.E., between the route which I followed from the Nile here, and a route already reconnoitred directly east by Lieut. Yussuf Helmy.

As soon as the health of the command will permit, I shall send another expedition north of my route from the Nile to El Obeiyad. — That will complete, probably, my operations North of the parallel of El Obeiyad.—A belt will be left along the Nile which may be supplied by some officer *en-route*.

It is still wet, and must be very unhealthy South of this parallel.

My intention is to put the map of the whole *Mouderieh* (province) on one sheet; and I shall send tracings of the portions as finished. — I think it far better for me to make the compilations here than to send on maps of separate reconnaissances, for, I know, better than anyone else, the value of each officer's work, and I have many checks upon positions which another person could not command.

On my expedition to Gebel Kagga I suffered for several days from a slight, but painful attack of fever; and, before I got back, about half of the party with me were attacked. Two soldiers whom I left behind, as unable to travel, have not yet come in.

I found that Dr. Pfund's party had suffered almost as severely as my own.

On my arrival at El Obeiyad, yesterday, I was met by none but invalids. Officers, soldiers and servants have all succumbed to the fever. I had instructed the Doctor of the expedition to make a

careful study of the diseases which occur at the close of the Khérif; but he is himself one of the most ill of the invalids.

Fortunately, none of the party have died; a result which I attribute to their being well fed and kept out of the hospital.

* * * * *

The rainy-season seems to be as unfavorable for camels and horses, as for men. Three of my dromedaries died after a few days' marching: and the Adj.-Major also lost three; while my horse lost flesh and strength from hour to hour, although our marches were not at all exhausting.

I hear similar accounts of the health of the members of Colonel Purdy's Expedition.

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Major of Engineers,

Commanding Expedition of Reconnaissance.

APPENDIX (n.)

WAR OFFICE

Bureau of the Chief of Staff,

Cairo, 7th Oct. 1875.

Major PROUT,
 Commanding Expedition of Reconnaissance,
 OBEIYAD, KORDOFAN.

MAJOR:

I am this day in receipt of your letter of September 16th ult.

I congratulate you on the amount of useful and interesting work which you have been able to accomplish and which is yet to be accomplished.

By the work of yourself and your Officers, Kordofan will soon appear on the maps of the world as a well reconnoitred country.

I agree perfectly with you in your estimate of the importance of good nourishment as a means of maintaining health in your command, and trust that you will not fail to watch this matter with the same care that you have hitherto exercised. It is to be hoped that as the rains have now ceased, the causes of fever will disappear.

Your intention to plat the whole Province of Kordofan on one sheet, is approved for the good reason which you advance; but I trust you will, from time to time, make partial reports on such statistics of the country as you may be able to gather, without waiting for the final report.

The Ministry of Commerce receives with great interest every word which comes from your region regarding the commerce of Kordofan, and I beg that your reports on that subject may be as full and as clear as possible.

* * * * *

I enclose herein two copies of the map of your route from Khar-toom to El Obeiyad. It has just been printed in this Bureau.

* * * * *

Please ascertain the amount of iron made at the mines in operation and report the nature and quality of the ore, as well as the forest capacity of their vicinity.

Hoping that the season is now more healthful, and that your health and that of your command is and will remain perfect,

I am, Major,

Your most obedient servant,

(signed) STONE,
Chief of Staff.

APPENDIX (c).

EL OBEIYAD, 25th September, 1875.

To

General STONE,
Chief of Staff,
CAIRO.

GENERAL:

I wrote to you on the 16th September informing you of my return from an expedition to the North-West, and of the general health of the command.

Since that time, I have been occupied in calculating the astronomical notes of that expedition, and fixing the coördinates of various points for the general map of Kordofan.

I am almost without assistance : as most of the Officers are ill with fever — some of them seriously so.

Adj.-Maj. Hamdy has been very ill for a week. The daily sick-report shows from twenty-seven to thirty men sick. One soldier of the infantry has died. Our servants are all sick.

The Arab Surgeon of the expedition, although still quite ill, displays an unlooked-for energy in attending the sick.

I felt compelled to recal Dr. Pfund, now absent forty-one days.

The people here say that this is unusually healthy Khérif.

Within a few days past, the North winds have set in, and the wet and dry bulb thermometers suddenly began to show a difference of 16° or 18° Fah. instead of 4° or 5°; and I look for a rapid change in the health of the expedition. It is true, however, that we are assured that the worst time will come a month later.

Col. Colston continues to improve, very slowly. My own health is excellent.

I am,

General,

Very respectfully,

Your obedient Servant,

(signed) H. G. PROUT,

Major of Engineers,

Commanding Expedition of Reconnaissance.

To General STONE,

Chief of the Staff,

CAIRO.

APPENDIX (p).

WAR OFFICE
Bureau of the General Staff,
CAIRO, 2nd Nov., 1875.

To Major PROUT,
Commanding Expedition of Reconnaissance,
OBEIYAD, KORDOFAN.

MAJOR:

I have the honor to acknowledge the receipt of your valuable report of observations of the recent eclipse of the Sun, made at Obeiyad, and to thank you for the thoughtfulness which adds so much to the value of your important work.

I am,

Major,

Very respectfully,

Your obedient servant,

(signed) STONE
Chief of Staff.

APPENDIX (q).

OBEIYAD, Oct. 16th, 1875.

GENERAL:

I have the honor to inform you that Dr. Pfund is returned from his expedition; his total journey having been about four hundred miles.

He examined all of North-Western Kordofan and went to Gebel Seroug in Darfour.

He has amassed a great quantity of specimens in botany, and made very many valuable notes about the country.

The Officer who accompanied him has been ill during the latter part of the journey; and for the geographical result of the most interesting part of his route, I shall have to trust entirely to the notes taken by Dr. Pfund.

The health of the members of the expedition is improving; but most of the officers are still quite unwell, and from twenty-five to thirty-five soldiers are on the daily sick-report.

I am anxious to get the whole expedition started southward by the end of Ramadan; but in spite of my very early demands for rations, it is quite likely that the soldiers of the expedition may not receive either bread, lentils or beans by that time.

* * * * *

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Maj. of Engineers, commanding Expedition.

A P P E N D I X (rⁿ).

EL OBEIYAD, November 2nd, 1875.

To

GENERAL STONE
Chief of Staff,
CAIRO.

GENERAL:

I have the honor to acknowledge the receipt, on the 30th October, of your two letters of September 23rd.

I have already made requisitions for the camels, equipage and supplies necessary to take my expedition to Darfour, and I shall be ready to start by the end of November, if the camels can be had so soon, which seems doubtful.

For the last six weeks, I have not been able to undertake any field work, on account of the great amount of sickness in the expedition. Some weeks ago, however, I asked for camels enough to enable me, with the greater part of the soldiers of the expedition, to pass from the soatheastern corner of the province of Kordofan to the Nile, along the frontier of Tagalla, striking the Nile between 11° and 12° North Latitude. If they come soon enough, I shall, while waiting for transportation for the whole expedition, make some short excursions southward.

In your letter of instructions of the 23rd September, you say:—

“ It is to be well understood that the maps and reports of the work
“ undertaken in Kordofan, shall be completed and forwarded before
“ commencing the Darfour work.”

From this, I feel that I am not authorized to undertake any new

work that might delay the time of the departure of the expedition for Darfour beyond the time necessary for the Government of Kordofan to procure our transportation.

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Major of Engineers,
Commanding Expedition of Reconnaissance.

APPENDIX (s).

EL OBEIYAD, Nov. 28th, 1875.

To

GENERAL STONE,
Chief of Staff,
Cairo.

GENERAL:

I have the honor to ask that you cause to be procured and forwarded to me, or to the Surgeon of the expedition under my command, a quantity of Sulphate of Quinine.

The supply of quinine brought with the expedition is now already exhausted. A requisition has been made for two hundred drachms to be procured from Khartoom; but even if that quantity can be obtained there, the quantity is almost certain to be bad. I need not enlarge upon the importance of having an abundant quantity of good quinine with the expeditions.

It is probable that we have now passed the season of danger for this year; but I hope there will be no delay in sending us this most necessary medicine.

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Maj. of Engineers, Chief of Exp.

APPENDIX (t).

EL OBEIYAD; Nov. 29th, 1875.

GENERAL:

As I have already informed you by telegraph, Col. Colston started, on his return, on the 25th inst.

Lieut. Amer Rouchdy of the General Staff, goes with him, with a Corporal and nine men.

Dr. Pfund goes with Col. Colston as far as Khartoom. It did not seem advisable to let the Colonel, in his delicate and uncertain state of health, start without someone with him who might observe, and, if necessary, ameliorate the effects of travelling. Moreover, Dr. Pfund has not yet examined any of the eastern parts of Kordofan, and it is certain that he can return before we are ready to start for Darfour.

To go to that country, we shall need at least 230 camels, and perhaps 400 men. I should not be surprised if that number is not ready before the 1st of February. Therefore, that our time may be profitably occupied, I shall, while waiting for transportation, push on the work in Kordofan.

To-morrow, or the next day, Adj.-Maj. Hamdy will start with a few men, on an expedition which may occupy a month, and which will complete the survey of Kordofan, North of the 13th parallel. He will go N. W., between the routes already reconnoitred, to Shersharr; where there is said to be a considerable deposit of salt. Thence he will go eastward, crossing the route from Debbé at Cagmar, and traversing the country of the Kababisch, to Sheghig, the limit of Kordofan; and from there he will return, by Khoorsi, to El-Obeiyad.

I propose to start, with all our available force, and with some soldiers from the Mouderieh, for the southern and least known part of Kordofan. As that region is still quite hostile (everybody, from the Governor-General down, warns me against the Tagalla and Noubra), I shall be obliged to take a considerable force with me, and the difficulty of getting transportation is correspondingly increased.

I hope to start in a few days, however.

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Major of Engineers,

Commanding Exp. of Reconnaissance.

APPENDIX (u).

WAR OFFICE

Bureau of the Chief of Staff,

Cairo, 1st Jan. 1876.

Major PROUT,
Commanding Expedition of Reconnaissance,
OBEIYAD, KORDOFAN.

MAJOR:

I am this day in receipt of your letters of the 28th and 29th November 1875.

I have this day ordered for your command thirty bottles of Sulphate of Quinine, and also a quantity of Valerianate of Quinine, which shall be despatched without delay. Other medical supplies will, I hope, soon follow.

I beg to return you my thanks for the active and energetic manner in which you are pushing forward the work of your expedition. I trust, however, that in the expedition to the southward, which you propose undertaking, you may have taken every precaution for the safety of your command, and that you will prudently watch any indication of hostility on the part of the natives, in order that your command may not be exposed to unnecessary risk.

Wishing you much success and a happy new year,

I am, Major,

Very respectfully,

Your most obedient servant,

(signed) STONE,

Chief of Staff.

APPENDIX (*v*).

EL OBEIYAD, January 24th, 1876.

To

GENERAL STONE,
Chief of Staff,
Cairo.

GENERAL:

In my letters of November 29th and December 5th last, I have explained to you my reasons for undertaking other field-work in Kordofan, and the field-work proposed. I have now the honor to submit to you the following brief account of the work done in December and January:—

On the 6th of December, I left El Obeiyad with two Officers of the General Staff, three Officers of the line, forty non-commissioned officers and soldiers of Infantry and Artillery, and twenty-five bashi-bazooks.

I went South about 25° West, 116 miles, to Gebel Dilling, in the country called, generally, *Nouba*, a mountain region inhabited by negro tribes.

From this point, I had proposed to go eastward to Tagalla; but the want of water sufficient for my train obliged me to return on my route to El Birkeh [Birket-Koli of Manuel's map] in Latitude 12°-33'.

From El Birkeh, I went eastward to *Er-Rahad*, 45 miles. The Latitude of *Er-Rahad* is 12°-41'.—From *Er-Rahad* I passed southeasterly by the eastern base of *Gebel Daier*, and at 50 miles from *Er-Rahad*, I came to *Gebel Wadelki*, in Latitude 12°-15'. *Wadelki* is an isolated mountain belonging to the system of the mountains of Tagalla.

From Wadelki, I passed 22 miles along the northern base of the mountains of Tagalla, when, at Latitude $12^{\circ}23'$, I was again forced to turn northward to get water. At this point, therefore, I finally left the mountain region.

I marched nearly due North to *Sheikeleh*, Latitude $12^{\circ}48'$ and from *Sheikeleh* I turned towards the Nile. I came to the White Nile at a village, called *Falci Kohé* opposite the island of *Abba*, in Latitude $13^{\circ}23'$.

I then marched along the West bank of the White Nile to Duème, in Latitude 14° . From Duème I turned towards El Obeiyad, marching Southwest and West across the steppe country, and I arrived at El Obeiyad on the 21st of January.

The total distance marched was seven hundred miles, and the time occupied was forty-seven days [*]. The journey could hardly be made in less time. I believe I got out of the camels all the work of which they were capable. I sent back the artillery, ammunition and a part of the soldiers, shortly after leaving the mountains, and thus materially relieved the caravan.

Within the area enclosed by the line of march of this exploration, I have determined, with considerable care, the Latitudes of thirteen different points. These Latitudes have been determined by Circum-meridian Altitudes of bodies North and South of the Zenith; from twenty to thirty observed Altitudes having been obtained for each pair of stars observed.

At each Latitude station, the local time was carefully determined. Consequently, I am confident that the deduced Latitudes are in all cases correct within a very few seconds.

(*) The amount of careful explorations thus accomplished by Major Prout in the short space of six weeks, in a country hitherto unexplored, is a striking example of the advantages possessed by an explorer in having under his command a well organized and sufficiently armed force.

I should say that the extreme error is not likely to be more than fifteen seconds for the Latitude of any one station; in most cases it is probably less.

As a check upon the Longitudes, I have the difference of Latitudes and the Azimuths of a connected series of points from El Obeiyad to Wadelki, as well as the difference of Latitude and the Azimuth between Duème and Gebel Arashkol, and between Gebel Kohn and Daïer. I shall be able to determine, therefore, the Longitudes as referred to El Obeiyad or to Khartoom, of the limiting points of the area which has just been reconnoitred.

The Longitudes thus determined will be more exact than any absolute Longitude determinations which I might have made with the time and means at my disposal.

I have made many careful observations with the two good aneroid barometers which I have, which will give at least the relative Altitudes of many points. But it is to be regretted that I have not had with me since leaving Cairo, either mercurial barometers or boiling-point thermometers.—With mercurial barometers, especially, I might have made observations of much scientific value [*].

I will close by saying that the region covered by my route from El Obeiyad to the Nile, is the portion of Kordofan heretofore the least known and the most promising.

It is the only large area in Kordofan in which much agricultural developement is possible; and it is the portion which most demands the attention of the Government and which will best repay such attention.

(*) NOTE—Mercurial barometers were ordered from England for these expeditions, but, unfortunately, they were broken in transportation between England and Cairo.

During my absence, Adj.-Maj. Ahmed Hamdy made the reconnaissance of which I have already indicated the route.

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Commanding Expedition of Reconnaissance.

APPENDIX (w).

EL OBEIYAD, February 3rd, 1876.

To

GENERAL STONE,

Chief of Staff,

Cairo.

GENERAL:

I have the honor to acknowledge the receipt, on the 30th January, of your despatch (telegraphic) of the 29th January, commanding me to send an Officer to Khartoom to receive the stores from Cairo.

In obedience to that order, Sub-Lieut. Mohammed Mahir was sent to Khartoom, and on the same day I announced to you, by telegraph, his departure.

I have the honor to inform you that Adj.-Maj. Hamdy will start for Darfour next Tuesday, with a division of the expedition.

I divide the expedition in two parts for this journey, as it is not easy to find water on the route for a large number of men and animals at this time of the year.

I am,

General,

Very respectfully,

Your obedient Servant,

(signed) H. G. PROUT,

Major of Engineers,

Commanding Expedition of Reconnaissance.

APPENDIX (x).

EL OBEIYAD, Febr. 10th, 1876.

TO GENERAL STONE,

Chief of Staff,

CAIRO.

GENERAL:

I have the honor to acknowledge the receipt, on the 5th February, of your letter of January 1st (No. 2).

The quinine which you have ordered, cannot fail to be most useful.

Other medical stores, however, we do not need for a long time; having been able to get a large quantity from Khartoom.

Both Dr. Pfund and Dr. Mohammed Amin recommend that no more stores be sent at present, as they would only be spoiled by the climate and wasted in transportation.

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Maj. of Engineers, commanding Expedition.

APPENDIX (y).

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EL OBEIYAD, Febr. 10th, 1876

To

GENERAL STONE,

Chief of Staff,

CAIRO,

GENERAL:

I have the honor to inform you that Adj.-Maj. Ahmed Hamdy has started to-day for El Fascher, with orders to report to Col. Purdy.

With him have gone Lieut. Yussuf Helmy, General Staff, Sub-Lt. Hassan Azmy of the Artillery, all the soldiers of the Artillery and a few of the Infantry.

He takes with him all of the ammunition (except that stored here) and some other heavy baggage.

The *mitrailleuse* and all its equipment, with 5000 cartridges, I have left in store here.

I shall follow with the rest of the expedition in a short time. Dr. Pfund and I are both extremely busy preparing for departure.

I am,

General,

Very respectfully,

Your obedient servant

(signed) H. G. PROUT,

Maj. Eng. Conmadg. Exped.

—

APPENDIX (2).

EL OBEIYAD, March 16th, 1876.

To

GENERAL STONE,
Chief of Staff,
Cairo.

GENERAL:

On the 23rd of February, I sent to you, through the Governor of Kordofan, a case containing the general map of Kordofan, a plan of El Obeiyad, and a map of two routes of reconnaissance, by Adjutant-Major Hamdy; also a packet containing appendices *A* and *B* to the "General Report on Kordofan".

On the 13th March, I sent to you a packet containing the "General Report on Kordofan", a small map showing the distribution of forests, and sections on several routes of march.

The collections of Dr. Pfund will all be delivered to the Governor of Kordofan, for transmission to you, as soon as they are ready; that is to say, to-morrow, or the next day.

Yesterday, I sent you a telegraphic despatch to say that I shall start on Sunday the 19th March for El Fascher.

Before my departure for Tagalla, I asked that the camels might be ready for me at the instant of my return. I procured a letter from the Governor-General of Soudan, to urge the preparation of the camels. In spite of all my efforts, it was only yesterday that the necessary number was completed.

I attach no blame to the Governor for the delay; I think he has

done his best to get the camels. It is really very difficult to find them in Kordofan, since all those belonging to the Kababisch have been devoted to the transportation of the materials for the telegraph line in construction.

Many camels have died in the transportation of the telegraph and of troops within the last year, and many have not returned from Darfour.

* * * * *

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Commanding Expedition of Reconnaissance.

APPENDIX (aa).

EL OBEIYAD, March 18th, 1876.

To

GENERAL STONE,

Chief of Staff,

Cairo.

GENERAL:

I have the honor to inform you that I have, to-day, delivered to the Governor of Kordofan, four cases which contain the collections in botany made by Dr. Pfund in the Province of Kordofan.

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Maj. of Engineers, commanding Expedition.

APPENDIX (bb.)

EL FASCHER, April 29th, 1876.

To

GENERAL STONE,

Chief of Staff,

CAIRO.

GENERAL;

I arrived at El Fascher with the expedition under my orders on the 24th April, having left El Obeiyad the 21st March.

The journey was made tedious by the fact that the camels furnished me were very wretched animals.

Out of about 300 camels, including fresh animals taken on the route, fifty-five died, and many more were abandoned by the way.

This happened, although I made short marches and frequent rests, and saw that the camels were properly cared for.

So many complaints had been made to me of the quality of camels furnished in Kordofan, that I determined to try thoroughly the effect of easy marching and good care.

The result is, that I am convinced that the camels bred in the villages of Kordofan are inferior in strength and endurance to any that I have seen elsewhere.

* * * * *

I shall send you, before long, a map of the route from Kordofan to Fascher.

Col. Mason and I have arranged for certain Longitude observations here.

I am,

General,

Very respectfully,

Your most obedient servant,

(signed) H. G. PROUT,

Maj. Eng., Commandg. Exped.

A P P E N D I X (cc).

EL FASCHER, Darfour,

May 14th, 1876.

To

GENERAL STONE,

Chief of Staff,

CAIRO.

GENERAL.

You have already received the maps and reports which contain the results of the work of the expedition which I have had the honor to command for nearly a year.

These maps and reports complete the work in the province of Kordofan.

The expedition is now about to enter upon a somewhat different work in a quite different country.

The Government has now the means of judging of the value of the past services of the officers of this expedition, and of estimating the probable value of their future services.

On this occasion, I have the honor to ask that the following named officers of the expedition under my command, may be recommended for promotion—namely:

Adj.-Maj. Ahmed Hamdy of the Gen. Staff;

Lieut. Mohammed Mahir of the Gen. Staff;

(There is in the expedition also Sub-Lieut. Mohammed Mahir) and Lieut. Ahmed Ghalib of the 3rd Regt. of Infantry, 1st Division.

Adj.-Maj. Ahmed Hamdy is now an Adj.-Maj. of several years date, and is a particularly capable officer.

Lieut. Mohammed Mahir is a young officer whose intelligence, good sense and honorable conduct have made him more useful and respected than perhaps any other officer of the expedition.

Lieut. Ahmed Ghalib has done the duty of Commander of the Infantry detachment of the expedition most of the year past, in fact if not officially. He has been a faithful and intelligent officer.

I think that the interest of the service would be advanced in promoting all of the above-named Officers, and I take great pleasure in presenting their names.

I am,

General,

Very respectfully,

Your most obedient servant,

(signed) H. G. PROUT,

Maj. Eng., Comg. Expedition of Recon.

A P P E N D I X (dd).

EL FASCHER, 29th July, 1876.

To

GENERAL STONE,

Chief of Staff,

CAIRO.

GENERAL:

The following notes on the route followed by my expedition from El Obeiyad, Kordofan; to El Fascher, Darfour, are respectfully submitted to the Chief of Staff.

They are designed to accompany the map of that route which is sent by the same post; and to give such information as may be useful to persons organizing caravans or other trains to march over that route.

I am,

General,

Very respectfully,

Your obedient servant,

(signed) H. G. PROUT,

Maj. of Eng. Comg. Exp. of Recon.

NOTES

ON A CARAVAN-ROUTE FROM EL OBEIYAD, KORDOFAN, TO EL FASCHER, DARFOUR.

The route which I am about to describe is, in the main, the route necessarily followed by all heavy caravans which pass from the 1st of November to the 1st of July.—

Post-Route—The so-called post-route, which passes directly from Abou-Harraze, in Kordofan, to Foga, in Darfour (formerly to M'Shanga), is shorter than this route by about sixty-four kilometres, that is to say, about eighteen hours; but it is only during the season of the rains that water is found on this post-route at such intervals and in such quantities as to make it a practicable or even a safe route for a large body of people, or for a heavily laden caravan. It is I believe, the line chosen for the telegraph.*

In times past, this post-route and the neighbouring steppes were much frequented by the bedouins (Hamr Arabs), who carefully filled the *Adansonia* trees during the season of the rains, and thus insured water during the dry-season for much travel. Lately, however, since movements of troops have been taking place here, the bedouins are

(*) Since the date of this report the telegraph has been completed to *Foga*, so that Darfour is now in telegraphic communication with the whole civilized world. The line worked so perfectly already in July 1877 that messages from Cairo to Foga required only one repetition—The repeating station is at Berber. STONE.

said to have nearly abandoned the neighbourhood of the post-route, and to have neglected to fill the trees.

Adansonia trees.—In passing, a few words about these trees may not be out of place.

I think, it is a common idea that the reservoirs in the *Adansonias* are formed and filled by the accidents of nature. In truth, they are prepared by the people of the country, who carefully remove the decayed and spongy fibre from the interior of the trunk, and who laboriously transfer the water to the cisterns thus made, bucketful by bucketful, from neighbouring pools collected during the rains.

The importance of these *Adansonias* as reservoirs can be conceived when I state that trunks which contain *sixty-five cubic metres** of water are common; and trunks which might store *one hundred and forty cubic metres* † have actually been measured by me.

Would it not be well for the Government to organize a service for the maintenance of those trees on the post-route and telegraphic line, so that couriers, inspectors, linesmen and light convoys might always find a store of water?

Heavy Caravan-route.—1st Stage.—The first one hundred kilometres of the heavy caravan-route, that portion between El Obeiyad and Meguenis, is through the cultivated country of the village people of Northern Kordofan.

Here, a passing caravan will seldom be out of sight of villages, and consequently, can always have guides and information as to the route and the condition of the wells. Grain and meat can always be found in certain quantities, if needed, and there is sufficient pasturage, of a

* Say, in round numbers 15,000 gallons and more.—STONE.

† Say, 33,000 gallons.—STONE.

better or worse sort, for animals. The country is perfectly open and slightly rolling; the soil is light, but the sand not deep.

Wells in 1st stage. The wells which may be relied upon in the dry-season are distributed as follows:—

At *Nezaha*, thirty-three kilometres from El Obeiyad, in the neighbourhood of *Om Shemma*, are some scattered groups of wells, known as *Om Shemma* and *M'Leha*, which yield water for the surrounding villages, but could not be depended upon for many people at one time.

At about seventy-five kilometres from El Obeiyad, are the groups of wells called *Es-shey*, *Courra* and *Om Shewai*.

These wells are forty to forty-five metres deep. They yield water for a large area of villages all the summer, and can be depended upon for supplying a large party.

At about one hundred kilometres from El-Obeiyad, are the wells of *Megénis*—a group of many wells, fifteen to twenty metres deep, some of which are salt, but many of which are sweet enough to be used, and which supply many villages.

This is one of the most important water-stations on the route: yet, when I passed, in March 1876, I found the wells filling so slowly that it was impossible to take in from them, in one day, a three days' supply for seventy-five persons and a few animals. At the wells of *Shehahète*, fifteen kilometres to the Northeast of *Megénis*, is an abundant supply of good water.

2nd Stage.—From *Megénis* to *Gourradi*, three routes may be followed, according to the conditions of the caravan. One, a straight line of one hundred and fifteen kilometres, passes across the unin-

habited steppes, south of *Gebel Om Hushas*, and is without water in the dry-season. Another route, that which I followed, is northward from Megénis, forty-two kilometres to the wells of Tinneh, where abundant water may be found for three or four months after the rains cease, and where a little water is always to be found; thence, without water, eighty-three kilometres to Gourradi, making the total distance from Megénis to that point, of one hundred and twenty-five kilometres.

Still another route, to be followed by a party which could not carry water to make one dry camp, would be, (Megénis to Tinneh), from Tinneh, fifty-six kilometres, to Bir Souderi (shown on General map of Kordofan), where there is abundant water all through the year, and from Bir Soderi, forty kilometres, to Gourradi.

From Megénis to Gourradi, by this route, the distance is of one hundred and thirty-eight kilometres.

All these routes pass through a rolling steppe country, inhabited only at the base of the mountains, where are colonies of negroes from the southern mountain-country.

These steppes are but little wooded, but are heavily grassed, and give fine pasturage in the rainy-season. The country presents no difficulties to travel other than the want of water.

I do not think the water-supply could be improved between Megénis and Gourradi except by establishing cisterns in the neighbourhood of Bir Tinneh, where the water which drains from the mountains of Katoul sinks.

Even there, it would not be worth while to attempt to establish large reservoirs for agricultural purposes; but it might be well to make such cisterns as should furnish water to passing caravans from February to July.

At Gourradi, in a white-clay-plain almost destitute of herbage or vegetation, are ten or twelve wells, about ten metres deep, which give an abundance of excellent water.

The pasturage here for camels is scanty and far to seek, and is kept fed down by the animals of the caravans, which must rest here before starting across the Atmoor to Foga, or after arriving from that passage. The nearest villages are those of *Baccalai* and *Asserar el Bucker*.

3rd Stage.—From Gourradi to Foga, one hundred and thirty kilometres, is a steppe, absolutely without water except in the rainy-season: it is also quite uninhabited. In fact, it is what is called an Atmoor.

During the rains, the Hamr Arabs wander more or less over this region, with their flocks and herds: predatory bands of bedouins or of mountain negroes from one side or the other flit, occasionally, across the Atmoor: and from time to time, one meets here, in the acacia thickets, a small party gathering gum. Fixed inhabitants, however, the Atmoor has not.

Throughout, the steppe is rolling—the first forty or fifty kilometres after leaving Gourradi so rolling as to add greatly to the labour of the burden camels. The last third of the journey, before reaching Foga, the surface becomes completely flat: and the soil, which was, on the previous portion of the route, light red sand, becomes more intermixed with clay. The tickets, which I found throughout, here become dense forests.

The thickets and forests are composed of several of the smaller sorts of gum-producing acaccia, higliks and several other low trees. These forests are never high, but thick and thorny, disagreeable to traverse, and easy to get lost in.

Everywhere the country is well grassed.

There would seem to be no way of increasing the water-supply in this region—failing in which, it must remain simply a pasture ground in the rainy-season for the flocks of the nomads.

Foga—At Foga, is a basin covering several square kilometres, which receives the drainage of a large area, and which is a lake during, and sometime after, the rainy-season. At all times, abundant water is found in this basin at one or two metres depth. Consequently, it is the resort, during the dry-season, of many Hamr bedouins, who here water numerous herds of camels and beeves and flocks of sheep. This whole basin might be made a garden during half the year, while the surrounding land-ridges would produce the ordinary crops of dokhn. It is therefore a little strange that no villages of consequence have grown up in the neighbourhood. Probably the fact that Foga has long been a rendezvous and battleground for the various predatory peoples on all sides has prevented agricultural villages from being formed here. Within the last year, the capital of the Prefecture of M'Shenga has wisely been transferred to Foga; and now an important population of agricultural people should settle there.

Around Foga, are dense low forests, mostly acacias, of little value except for fuel.

4th Stage—From Foga, a much travelled route passes by M'Shenga to Gebel Hella or Broosh. This is longer than the route by Karnak, and will probably be little used, now that Foga is the capital of the Prefecture.

From Foga to Karnak, is one hundred and two kilometres without water.—The first twenty kilometres, are through thick forest, across a level and somewhat clayey bottom, to the mountains of Suroug,

where are several villages of negroes.— Those villagers drink, usually, from small cisterns in the rocks.

From Foga to Karnak, is across rolling country, with light, sandy soil, well grassed and thickly wooded.

The forests are of Acacias, Higliks and Godène, and Adansonias are numerous. Indeed, I saw here a grove of some hundreds of them in all stages of growth.

This entire distance is waterless and uninhabited.

At Karnak, is one immense well, seventy-five metres deep, four metres in largest diameter, cut in sandstone. This remarkable well, furnishes an abundant and perpetual supply of excellent water. The operation of raising water from such a depth, by the rude means of a bucket and rope is tedious and laborious.— Large pulleys, with large double buckets should be provided. At Karnak, are two villages of Takroories.

5th Stage.—Proceeding westward from Karnak, skirting the southern base of some picturesque sandstone cliffs and hills, we pass, at fifteen kilometres, the villages and wells of Booti; at 22 kilometres, the villages of Gebel Hella, and at forty-three kilometres, we come to the villages and wells of Broosh.

The region passed is hilly, quite peopled, and cultivated in dokhn. The wells are deep, but give an abundance of good water. The wells of Booti are forty-three metres deep, three in number, all carefully curbed with stone to the bottom.

At Gebel Hella, there are two wells, sixty-five metres deep. At Broosh, are three wells, twenty-eight metres deep. All those wells may be relied upon for a constant and abundant supply of good water. Everywhere here is found abundant pasturage for camels.

From Broosh to *Abiat*, sixty-seven kilometres, the country is open, a hilly sandstone country, which has evidently been much cultivated for many years past.

* * * * * * *

In this section, water is found at *Om Zeriba*, twenty kilometres from Broosh, one well, thirty-five metres deep. It affords considerable water: at *Om Kedada*, thirty-one kilometres from Broosh, there is one large well, thirty metres deep, with an abundance of good water; and at *Abiat*.—

At *Abiat*, there are twenty or thirty wells of about fifteen metres average, depth, each one of which yields but little water, and that not very good: still, taken together, they can be relied upon to water many people and animals.

In the hill, to the North of the route from Broosh to *Abiat*, are frequent villages which take water from the wells mentioned.

6th Stage.—From *Abiat* to *Ergood*, seventy-one kilometres, water for a caravan cannot be found in the dry months. A few people can drink at *Derra* (or *Derrat-el-Hamira*) in most months. This section is rolling, well covered with grass, and has many thickets.

No villages are found in the first two thirds of the route; but between *Derra* and *Ergood*, villages are numerous, all of which rely on the wells of *Ergood* for water.

Ergood.—At *Ergood*, in a large basin, full of beautiful barraze and other trees, are three groups of wells, where water is found in abundance at a few metres depth. Numerous villages are scattered in the sandy ridges and hills surrounding the basin. Little cultivation other than dokhn seems to be carried on, although gardens in the basin might produce a variety of vegetables.

7th Stage—From Ergood to El-Fascher, the distance is sixty-seven kilometres; first over dunes of light sand, then, across rolling grassy steppes, to the mountains of *Sarganat*. Leaving the mountains, a gravelly basin four or five kilometres wide, is passed, when we come to the sandy ridges of El-Fascher.

In this whole distance, a caravan can get no water. Near Ergood are a number of villages which take water from the wells of that place. In the mountains are several villages which get water from cisterns in the rocks, and, probably, from holes in the beds of water-courses.

From M'Shenga to Ergood, is a route, somewhat to the southward of that described above, which is much frequented, and which has been described in the reports of Col. Purdy.

El Fascher and its immediate surroundings have also been fully described in the reports of Col. Purdy.

SUMMARY OF DISTANCES FROM WATER TO WATER BY THE HEAVY
CARAVAN ROUTE ABOVE DESCRIBED.

STAGES.	Distance in kilom.	REMARKS.
El Obeiyad to Nezéha.....	33	Seven or eight wells, deep, considerable water; good.
Nezéha to Om Shemma....	22	Scattered groups of wells, deep, water but for small caravan.
Om Shemma to Es-She	20	Scattered groups, forty to forty-five metres deep; water for large caravan.
Es-Sheg to Megenis and to Shehahéte }	25 and 15	[N. W.] { Many wells, fifteen to twenty metres deep; water in abundance all the year.
Es-Sheg to Gourradi (direct)	115	Ten or twelve wells, ten metres deep, water always abundant and good. Pasturage scarce.
or from Megénis to Tinneh	42	Water abundant for three or four months during and after Khérif—Later, but very little.
and thence to Gourradi.....	83	-----
or from Megénis to Tinneh	42	-----
and thence to Bir Soderi...	56	Abundant water all the year at depth of eight metres
and thence to Guarradi.....	40	-----
Gourradi to Foga	132	Abundant water at one or two metres depth at all seasons—no limit to the supply.
Foga to Karnak.....	102	One well, seventy-five metres deep—much good water at all seasons. Slow drawing because of depth.
Karnak to Booti.....	15	Three wells, forty-three metres deep—Good and constant water.
Booti to Gebel Hella.....	7	Two wells sixty five metres deep—Constant water and considerable quantity.
Gebel Hella to Broosh.....	21	Four wells—Water good and abundant.
Broosh to Om Zeriba	20	One well, thirty-five metres deep. Considerable water.
Om Zeriba to Om Kedada ..	11	One well, thirty metres deep—Good and abundant water.
Om Kedada to Abiat	36	Twenty or thirty wells, fifteen metres deep, water somewhat brackish, but abundant.
Abiat to Ergood.....	71	Many wells at little depth. Water good, supply unlimited.
Ergood to El Fascher.....	67	-----

The above notes are respectfully submitted to the Chief of the General Staff, Gen. C. P. Stone.

(signed) H. G. PROUT,
Maj. of Engineers, Chief of Exp.

A P P E N D I X (*).

EL FASCHER, DARFOUR,
29th July 1876.

GENERAL:

I have the honor to inform you that I forward by the post, at the same time with this letter, a map of the route followed by the Expedition under my orders, from El-Obeiyad to El Fascher.

The astronomical determination of the position of El Obeiyad has already been discussed in Appendix A, to my General Report on Kordofan.

The position of El Fascher, as laid down on the accompanying map, was determined as follows:

For Latitude by Circum-Medium altitudes. North and South.

Lieut.-Col. Mason—49 observed Altitudes.....	13°	36'	25"
Maj. Prout—100 observed Altitudes.....	13°	36'	29"
Mean adopted.....	13°	36'	27"

For Longitudes, by Eclipses of Jupiter's satellites:

Lieut.-Col. Mason—10 observations	1h.	41m.	35s.
Maj. Prout7 observations	1h.	41m.	37s. 8
Mean adopted.....	1h.	41m.	36s. 4

East of Greenwich.

As the observations of Lieut.-Col. Mason were entirely independant from those of Maj. Prout, as to instruments and methods of reduction and dates of observations, I think that the results are remarkably close, and perfectly reliable.

On the route from El Obeiyad to El Fascher, no attempt was made to determine Longitude; but the Latitude was found at three intermediate points.

* In the final platting of the prismatic-compass line, the total error in Longitude was distributed over the whole line; and the errors in Latitude between the Astronomical Stations were distributed over the lines between those stations.

The coördinates have been projected with great care. The work in the field was all done by Maj. Prout, as well as the original platting of the line.—The pen-work on the final sheet was done by Lieutenants Mohammed Mahir and Halil Fauzy.

I am,

General,

Very respectfully,

Your obedient servant,

(*signed*) H. G. PROUT,

Major of Engineers,
Commanding Expedition of Reconnaissance.

To

GENERAL STONE,

Chief of Staff,
Cairo.

END.

PROUT'S REPORT.

WAR OFFICE
Bureau of the General Staff
Cairo, 26th August 1877.

CABINET OF THE CHIEF.

The report of Major Prout being in press, I have received, to-day, from him, in London, a letter dated August 16th 1877, enclosing readings of the Aneroid Barometer N° 2 (Elliott) used by him in his expeditions to Kordofan and Darfour, which should be printed with the report, as a check on the altitudes given by the use of that instrument.

They are as follows:

“ London, July 1877.

“ Barometer at mean-tide level, at noon=30". 235.

“ Thermometer=60°. 64 Fah.

“ Following day, at mean-tide level at 8 A. M.

“ Barometer=30". 20.

“ Thermometer=50°. 79 Fah.

“ Same days, tested under Air-Pump.

1st day.		2me day.	
“ Mercurial.	Aneroid.	Mercurial.	Aneroid.
30"	30". 14.	30"	30". 19.
29"	29". 09.	29"	29". 12.
28"	28". 13.	28"	28". 12.
27"	27". 17.	27"	27". 17.
26"	26". 24.	26"	26". 26.

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FINIS.

ERRATA

Page vii. 14th line. for *responsabilities* read *responsibilities*.

„ 91 21st „ „ *West* „ *south*

„ 135 8th „ „ *here* „ *there*

„ 149 title „ *Kohdefar* „ *Kordofan*.

