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PREHISTORIC SURVEY OF EGYPT AND WESTERN ASIA—VOLUME II

PALEOLITHIC MAN AND THE NILE VALLEY IN NUBIA AND UPPER EGYPT

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PREHISTORIC SURVEY OF EGYPT AND WESTERN ASIA—VOLUME II

PALEOLITHIC MAN AND THE NILE VALLEY IN NUBIA AND UPPER EGYPT

A STUDY OF THE REGION DURING PLIOCENE AND PLEISTOCENE TIMES

By K. S. SANDFORD *and* W. J. ARKELL

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GJ	The Geographical Journal
GM	The Geological Magazine
OIC	Oriental Institute Communications
OIP	Oriental Institute Publications
QJGS	The Quarterly Journal of the Geological Society
ZDGG	Zeitschrift der Deutschen geologischen Gesellschaft

INTRODUCTION

The Pleistocene period, during which Paleolithic Man hunted along the banks of the Nile and ranged over the surrounding hills and plateaus, was a time of copious rainfall in Egypt. The dry wadies of the desert were running streams, and the landscape was pleasantly diversified with forest and grassland, over which wandered troops of wild animals. Reaching far beyond its present bounds, the ancestral Nile flowed rapidly over a pebbly bed, augmented on its journey northward by a host of tributaries draining the surrounding country. The Nile of the present day is but a dwindled shadow of the original river. Constantly choking itself with fine silt where formerly it hurried down large pebbles, and winding languidly through deserts without receiving additions from any tributary for 1,200 miles from its mouth, it diminishes in volume as it approaches the sea, owing to loss by evaporation and absorption.

Where Paleolithic Man lived and hunted, he dropped, or in course of time discarded, his stone weapons and tools. These relics are almost indestructible; although thousands of years have passed since the rainfall ceased and the grassland and forest gave place to bare rock and drifting sand, while the bones of the men and of the animals they hunted have been dissolved by chemical agencies, the implements still remain. They are found in the Libyan Desert and the Sahara, scattered on the surface, or imbedded in fluviatile deposits in the dry wadies, where they became incorporated in the gravels of the rivers and streams.

To the eye trained in geological matters there are, in addition to the stone implements, many traces of the Pleistocene period which have not passed away. It has, in fact, left its mark indelibly upon the landscape of Egypt. Nearly everywhere the signs of a heavy rainfall are apparent: in the deep dissection of the plateaus; in the tearing of the cliffs by gullies, often filled with enormous bowlders; and here and there in the preservation of a dry waterfall with potholed and polished rock bed.

Of greatest interest, however, are the traces of the mighty Nile which then flowed high above its present level. For many miles the hills bounding the valley are terraced at remarkably constant heights. In the frequent cliffs the strata composing them can be seen to undulate and to vary in hardness, but nevertheless they are all planed off evenly at about 50 feet, 100 feet, 150 feet, or greater heights above the present valley floor. Often these abandoned Nile beds are still, like their smaller counterparts in the tributary wadies, covered by the gravels brought there by the river; and rolled among them may be found also the stone implements of Man.

Lastly, we find silt and mud, like that carried in suspension by the Nile at the present day, choking the mouths of wadies or forming dusty plains along the sides of the valley, up to 100 feet above the reach of present summer floods.

So much may be seen by the tourist without leaving his railway carriage. Many travelers, geologists, geographers, and archeologists have in the past described or remarked on some of these phenomena. Most of the observations have been isolated or incidental, and there has been no attempt to compile a coherent account of the occurrences, although surmises as to how they can have originated have been numerous.

The present survey was started with the object of piecing together for the first time the continuous history of the Lower Nile Valley and its inhabitants before the known predynastic period. Its aim has been to visit and study as much as possible of both banks of the river, revising and co-ordinating previous work and collecting new data and specimens—stone implements, rocks, shells, and bones.

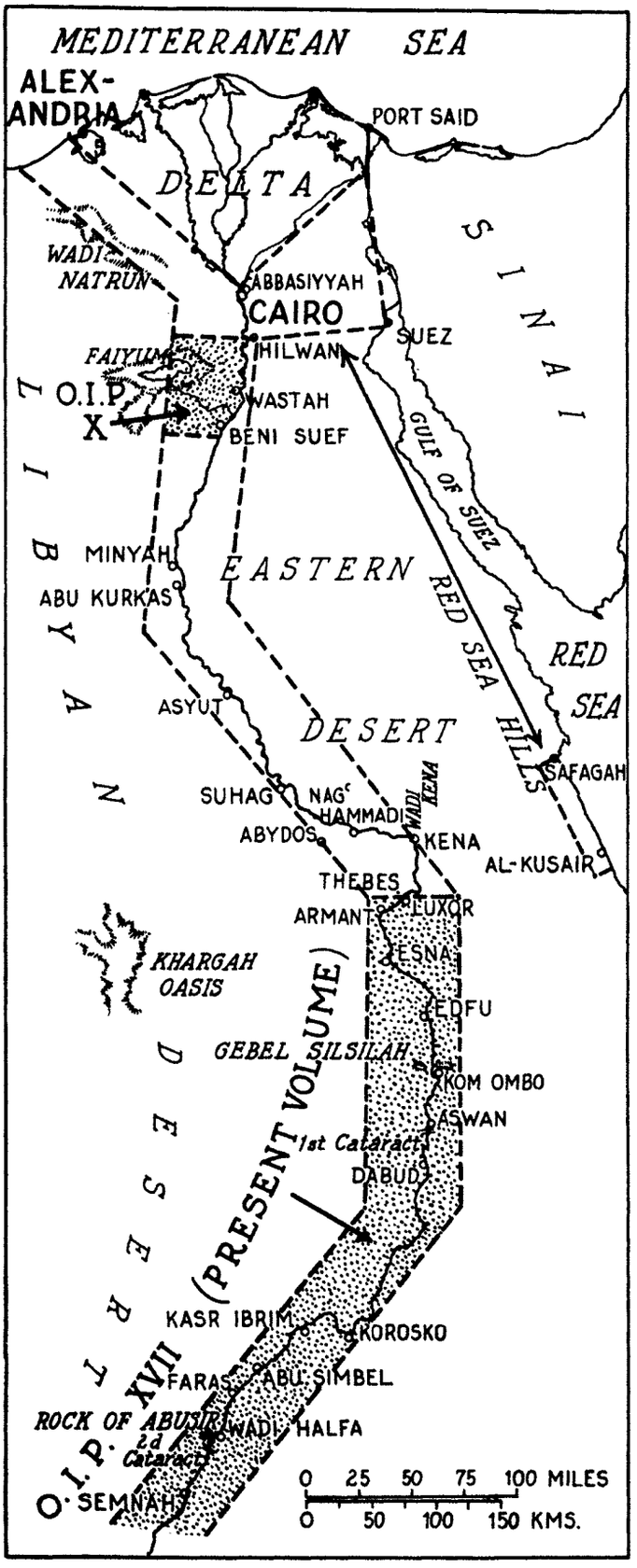


FIG. 1.—SKETCH MAP OF THE NILE VALLEY FROM SEMNAH TO THE MEDITERRANEAN, SHOWING APPROXIMATELY THE AREAS INVESTIGATED BY THE PREHISTORIC SURVEY

The organization, equipment, and methods of the expedition have been described briefly in the *First Report of the Prehistoric Survey Expedition* ("Oriental Institute Communications," No. 3), a popular account of the first season's work. During that season, 1926/27, we worked along both banks of the Nile between Luxor and Kom Ombo, made a preliminary study of the First Cataract region at Aswan, and crossed for a short time to the Red Sea from Luxor.

The second season, 1927/28, was spent in the region of the Faiyum, some 60 miles south of Cairo. Its results, being to a certain extent complete in themselves, were published as Volume X of the "Oriental Institute Publications" under the title *Paleolithic Man and the Nile-Faiyum Divide.*

The third season, 1928/29, we devoted to the Delta, completing the western side from the northern limit of our Faiyum work near Sakkarah to the Mediterranean west of Alexandria, including the Wadi Natrun. We made also a preliminary study of the eastern Delta between Cairo and Suez, the Wadi et-Tumilat, and the Suez Isthmus west of the canal.

In the fourth season, 1929/30, we returned to Upper Egypt, much better able to understand its problems by reason of the experience gained in the north. Further study round Luxor, revisionary visits to debatable spots passed during the first season's journey, and extension of the work by camel from Kom Ombo southward to link up with the Aswan area, did much to improve our knowledge of the stretch of river and its bounding deserts between Luxor and the First Cataract. First, however, we broke new ground by sailing from Aswan to Wadi Halfa, collecting data en route, and thence reached the southern limit of our survey at Semnah, 40 miles south of Wadi Halfa, working by camel along both banks.

It is the 350 miles of river embraced in the programs of the first and fourth seasons, namely, from Semnah to Luxor, that form the subject of this volume. Most of its chapters are the joint product of its two authors. Dr. Arkell alone, however, is responsible for chapter viii, "Rock Pictures," and has drawn the text figures and implements. To Dr. Sandford alone are due chapter ix, "Human Industries," and the final revision of certain parts of the area in 1931, after the first draft of this volume was completed.

In subsequent volumes we hope to present the results obtained in following the river downstream, so that the whole will form an outline survey of the Nile from the Second Cataract to the Mediterranean (cf. Fig. 1).

Our special thanks are due, as at every stage of our work in Egypt, to Dr. W. F. Hume and Mr. O. H. Little, of the Geological Survey, and Dr. John Ball, of the Desert Surveys of Egypt, who have given us every facility and encouragement; also to Dr. and Mrs. H. H. Nelson and the staff of the Oriental Institute's Epigraphic Survey at Chicago House, Luxor, who have provided us with an invaluable base in Upper Egypt and have welcomed our erratic comings with much appreciated kindness. We wish also to express our thanks for many other kindnesses and hospitalities shown us in Upper Egypt and Nubia: particularly must we thank Mr. and Mrs. Guy Brunton, who at the time of our first journey were living at el-Kab near el-Mahamid, and Mr. and Mrs. Singleton, then living at Esna. Our thanks are due to Mr. D. A. F. Watt, irrigation officer in charge of the Aswan Dam, for the use of a resthouse and launch and for much valuable information on the subject of levels and the reservoir; to Mr. H. Brice, agent of the National Bank at Aswan, for helping us on many occasions; also to the agent of the Sudan Government Railways and Steamers at Aswan for handling our mails while we were without an address in Nubia. To the governor and officials of Wadi Halfa Province, who facilitated our work in the region of the Second Cataract, and to Mr. G. W. Grabham and Mr. Addison in Khartum, we owe a special debt of gratitude.

I

PHYSIOGRAPHY OF THE NILE FROM SEMNAH TO LUXOR[1]

The point where our survey of the Lower Nile begins is roughly 1,000 miles from the Mediterranean and some 60 miles south of the Sudan frontier, at the village of Semnah, the southern outpost of Egypt during the Middle Kingdom.

It is a wild and picturesque region of igneous and metamorphic rocks, through which the river flows rapidly between barren shores, its surface broken by innumerable rocky islets. The sparse population, which cultivates the river banks between flood mark and low Nile, speaks of the reach as the Batn el-Hagar, or Belly of Stones, for, except in sheltered creeks, there is no flood plain of cultivated alluvium, but the rocks descend to the water's edge. To a considerable height above the river in winter the rounded black rocks reflect the sun, for they have been highly polished by the waters of the summer inundation rushing over them for untold ages. This and the varied colors of the hills and the golden dunes of drifted sand help to impart to the Batn el-Hagar a wild and characteristic beauty.

The country on the west bank is buried nearly to the tops of the hills in a mantle of blown sand, tongues of which reach down the *khors* or wadies as immaculate dunes descending into the water. The Nile acts as a barrier to this ever encroaching sand, which is blown along continuously from the Libyan Desert by the prevalent northwest wind but never reaches the east bank. The contrast between the deeply sanded country on the west of the river and the bare rock on the east is strongly marked throughout Nubia.

The type of scenery met with at the cataracts does not belong properly to the Nile Valley, but rather to the Red Sea Hills. It results directly from the exposure of the fundamental complex of Archean or pre-Cambrian igneous and metamorphic rocks, which there rises to the surface from beneath the mantle of later sediments that usually conceals it. At the cataracts, as in the chain of the Red Sea Hills, a veritable museum of petrology is to be found in every dry stream bed. The pebbles derived from the surrounding hills bring together almost every common variety of igneous rock: red and green porphyries, pink and gray granites and diorites, pegmatites with large pink feldspars, aplites, syenites, dolerites, mingled with white quartz, brightly colored volcanic agglomerates, glinting mica schist, and gneisses ranging in color from pale gray to vivid red. Intrusions of granite form rugged, rounded hills rising above the general level of the country and weathering into gigantic spheroids. The softer mica schists and slates disintegrate to form slopes covered with small, glittering, platy fragments; while often across the country, up the hillsides and along the crests, like a network of ruined walls, run dikes of quartz, pegmatite, and dolerite.

At Gebel Barka, west of Semnah, and on one or two other hills, the highest points in the district, a capping of hard conglomerate and quartzite overlies the planed-off surfaces of the igneous and metamorphic rocks. These relics show that the Nubian sandstone once covered all the Batn el-Hagar, but the Nile in the past has worn through it and exposed the ancient rocks beneath. The memory of the last stages of this erosion is perpetuated in abandoned cataract channels above flood level, which may be seen along both banks between Khor Musa and Semnah.

The Nubian conglomerate descends to river-level at the north end of the Second Cataract,

[1] See folding map at end of book.

where the "cataract" conditions disappear. Here a solid wall of Nubian sandstone rises above the river, forming the well known Rock of Abusir. On the east side of the river a wide plain marks the area where the igneous complex passes underground beneath the sandstone. In late Pleistocene times the Nile spread out over this plain and covered it with alluvial deposits with which we shall deal later.

From Wadi Halfa almost as far as the First Cataract at Aswan, a distance of 200 miles, the river flows without interruption through a region of Nubian sandstone with almost horizontal bedding disturbed only by minor faults and gentle corrugations. The banks usually rise in successive terraces or rock platforms to no great height above the river, while strips of cultivated land and palm trees become common, particularly on the east bank. The sky line beyond is broken only by deeply dissected sandstone plateaus, isolated flat-topped hills, or groups of sandstone cones. The principal wadies here, as elsewhere on the Nile, enter from the east, draining the Red Sea Hills.

At two places—namely, Abu Simbel and Korosko—a chain of higher ground (at Abu Simbel the edge of a plateau or cuesta, at Korosko a chain of hills) crosses the course of the river after converging toward it for some distance. On both occasions the river cuts through the obstruction and runs between vertical cliffs some 300 feet high (in those at Abu Simbel are carved the famous rock temples of Ramses II). At Abu Simbel the passage of the barrier is not accompanied by any important deviation of the river's course, but at Korosko it has been deflected to form two right-angled bends.

Apart from these two places, the scenery of the Nubian sandstone maintains a monotonous grandeur, a quality that reflects its geological characteristics. Although covering vast areas of the Libyan Desert and southern Sahara, from Edfu to the highlands of Erdi on the borders of equatorial Africa, the sandstone has yielded only the scantiest fossil remains. These suffice to show that the portions traversed by the Nile in Nubia and to the north of the First Cataract are of Upper Cretaceous (Senonian) age, although in Sinai and elsewhere a Lower Carboniferous and even Silurian fauna has been found in similar sandstones.

Cretaceous lamellibranchs (*Inoceramus*) found at Aswan and in borings near Edfu are of marine origin; but others (*Unio* and *Mutela*, the latter an essentially African genus), discovered by Dr. Hume farther south at Juwikul, lived in an estuarine or fresh-water habitat. The frequent remains of leaf beds and silicified trees also point to the proximity of land.

The vast quantities of quartz sand which comprise the greater part of the formation were probably derived from the breaking down of the underlying foundation of acid igneous rocks during the long period of subaërial denudation which preceded the transgression of the Cretaceous sea. The quartz grains vary greatly in size from place to place. The sandstones generally show current-bedding; and here and there, particularly in Khargah and Dakhlah oases, considerable beds of lagoon clays are interstratified, or even, at Wadi Halfa and elsewhere, thin seams of oölitic iron ore. Between Korosko and ed-Dirr we found that the sandstone contains a high proportion of white mica flakes, while in the cataract region pebbles of igneous rocks—agate, jasper, chalcedony, and chert—occur in the conglomerates at its base. All these occurrences, however, are the exception rather than the rule. Usually, wherever the banks are examined, they are found to consist of monotonous false-bedded quartz sandstone; and this must be considered the typical rock of Nubia.

Before Aswan is reached, an easterly tendency of the Nile brings it to the edge of the sandstone country, to describe a broad loop over the igneous rocks once more. The granite is first met at the Kalabshah gorge; but after a short distance a tongue of sandstone comes in again and continues for 12 miles, after which granite and metamorphic rocks form the river bed for 21 miles, culminating in the First Cataract at Aswan.

The cataract occupies only the northern end of the granite region; but in Paleolithic times it extended farther south, where there are still a number of islands at high Nile and the banks are rocky and broken. The aspect of the cataract has now been completely changed for the greater part of the year, owing to the building of the Aswan Dam across its upper end and the flooding of the region south of it to form a reservoir having a depth at the dam of 15 meters. So slight is the fall of the Nile above the cataract that in the winter and spring, when the reservoir is full, the river banks are flooded for 150 miles upstream and palm trees and mimosas protrude through the water as far south as Korosko. When the present heightening of the dam is completed, the flooding will extend to Wadi Halfa.

A short distance north of Aswan the igneous rocks sink beneath the ground for the last time on the Nile's course to the sea, and the Nubian sandstone closes in on both sides as far as Esna. Physiographically this reach is at first a direct continuation of Lower Nubia. Only one small but important area, the Kom Ombo plain (Fig. 2), calls for special mention.

Between Khannak and Darau, 10 miles south of Kom Ombo, the sandstone cliffs withdraw suddenly to east and west and inclose a broad plain covered with a considerable thickness of alluvial deposits. The Nile flows along the western edge of the plain, at a depth of about 40 feet below the general surface. On the north the basin is bounded abruptly by a fault scarp of Nubian sandstone running east-west, through which the river has cut a deep gorge with steep cliffs, narrower than the gorges at Abu Simbel and Korosko. To the east there is a second outflow channel, now abandoned and filled with alluvial silt like those at Aswan and utilized likewise for the railway. The two gorges are separated by Gebel Silsilah, a block of hard Nubian sandstone.

On the south (downthrown) side of the fault scarp, within the plain, low hills of Danian chalk and clays rise through the alluvium. These uppermost Cretaceous beds are found resting upon the Nubian sandstone high up on the plateau to the west, forming an escarpment through Gebel Borga and Gebel Garra, where their height shows that they have been faulted down at least 200 meters into the Kom Ombo plain, the origin of which is thereby made clear.

Into the east of the tectonic basin of Kom Ombo open the combined mouths of Wadi Shait and Wadi Kharit, in Plio-Pleistocene and Pleistocene times one of the most important drainage systems tributary to the Nile between the Atbara and Wadi Kena. Before the onset of desert conditions enormous quantities of igneous materials were carried down these wadies from the Red Sea Hills. Some of the gravel brought down in Pleistocene times still floors much of the plain, below the alluvium, and in places reaches a depth of at least 35 feet. At an earlier period, which we term Plio-Pleistocene, still larger volumes of gravel were swept across the present site of the Nile Valley and spread out in an extensive sheet upon the plateau to the west, at about 150 feet above the present river.

The thick stratum of Nile alluvium, full of shells and bones and flint implements, covering the greater part of the floor of the basin proves that in its last phase, in later Paleolithic times, the Kom Ombo plain was an extensive swamp or lake. With the history of this we shall deal in some detail in a later chapter. The exposed lake or swamp beds, formerly a dusty desert, are being rapidly converted into a green sea of flourishing sugar cane through the initiative of the Wadi Kom Ombo Company. Irrigation is carried on by means of water pumped up from the Nile and distributed through an elaborate system of canals.

From Edfu to Esna the scenery diverges somewhat from the true Nubian sandstone type, owing to the presence in the upper part of the formation of a considerable proportion of green and purple clays. These, being softer than the sandstone, have been more deeply dissected. On the east bank the country is cut up by a network of ravines, their sides strewn with bowlders of sandstone derived from bands interbedded with the clays. On the west bank the country for

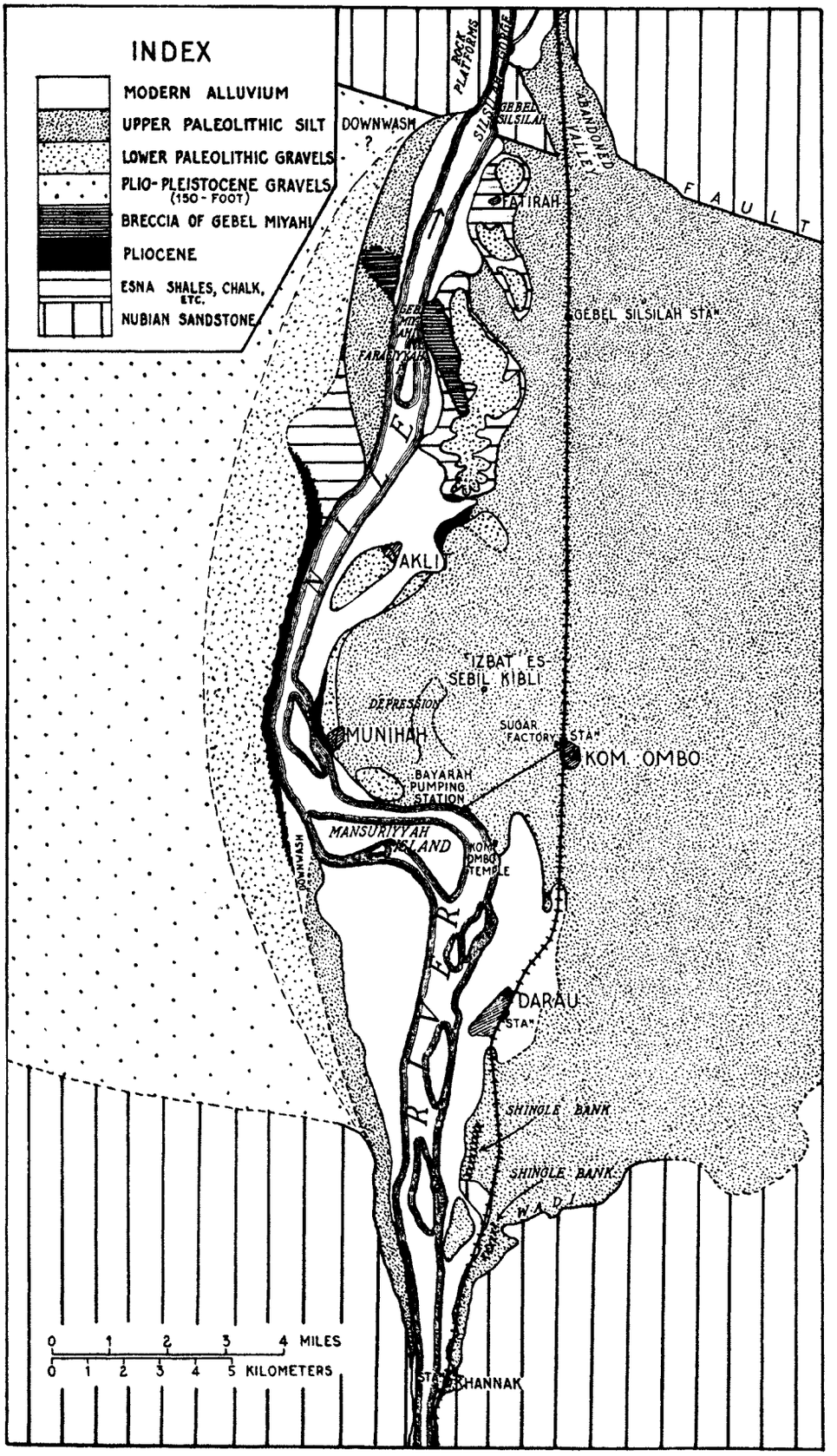


FIG. 2.—THE KOM OMBO PLAIN

some miles from the river is leveled by the 150-foot terrace, upon which rests the blanket of gravel from the Wadi Shait and the Wadi Kharit. Where the Nubian formation is exposed along the edge, it still shows near Edfu its characteristic tendency to weather into conical hills.[2]

A few miles farther north a fundamental change comes over the scenery. From the neighborhood of Aswan northward it is possible to see a distant blue escarpment running almost parallel with the river along the western horizon. An outlier known as Gebel Borga dominates the view from the Kom Ombo plain. Farther north between Edfu and Esna the main escarpment becomes visible from the valley, then closes in to become a prominent feature in the west and north. The escarpment is the edge of the high limestone plateau of the northern Libyan Desert. Near Esna a considerable thickness of shales with a Danian marine fauna succeeds the Nubian sandstone. Above the shales rises a vertical cliff of nummulitic limestones succeeded by tier upon tier of marine limestones with bands of flint, rising more than 1,800 feet above the sea and constituting the Lower Libyan formation of Schweinfurth, correlated with the Lower Eocene of Europe. The high plateau is continued on the east side of the river in two outlying massifs known as Gebel Rakhamiyyah and Gebel Nezzi, the cliffs of the former towering about 1,500 feet above the Nile.

As before, the river, instead of avoiding the high ground, cuts straight through it; and from here northward to Middle Egypt it continues to flow through the heart of the plateau between high limestone cliffs. Clearly the beginnings of the gorge must have been cut before any cliffs separated the surface of the limestone plateau from the Nubian sandstone—when the plateau, in fact, extended far to the south and east over Lower Nubia and possibly feathered out against the high ground about Korosko.

North of Esna the wadies contribute a new type of detritus, a white gravel of limestone and flint from the surrounding plateau, which completely changes the aspect of the Pleistocene deposits; and with the incoming of abundant flint the number of Paleolithic implements greatly increases.

Here then, at Esna, is to be drawn the most important physiographical boundary on the Lower Nile. South of this point the river has passed over Nubian sandstone, diversified by stretches of igneous and metamorphic rocks at the cataracts, throughout Nubia from the plains of the White Nile. To the north its course is flanked on either bank by a continuous and ever broadening flood plain, inclosed between the high cliffs of the limestone plateau, until it reaches the Delta and the sea.

[2] In 1927 we found in it bones and teeth of *Megalosaurus*, also plates from the carapace of a turtle.

II

THE PLIOCENE PERIOD

In a previous volume[1] we have already pictured the lower reaches of the Nile Valley in Pliocene times as a narrow gulf of the Mediterranean. In the region of the Faiyum we described the nature and fauna of the deposits formed in this gulf and gave reasons for supposing that the sea then stood about 180 meters above its present level. The deposits on the east bank of the Nile in Lower and Middle Egypt have been described by Blanckenhorn, who found marine Middle and Upper Pliocene fossils as far as Dahaibah near el-Fashn, about 100 miles south of Cairo.[2] In the next volume of this series an attempt will be made to connect them with the similar but unfossiliferous deposits of Upper Egypt, which were probably laid down in fresh water. These were described by one of us from Asyut to Luxor,[3] and in the following year were traced by both of us in continuous development from Luxor to Esna, a distance of 200 miles from Asyut.[4]

In view of this it seems fairly safe to assume that the marine Pliocene of Lower Egypt was deposited near the mouth of a long, narrow, fjordlike gulf in direct communication with the flooded river valley of Upper Egypt.

THE WATER LEVEL IN THE PLIOCENE GULF

During 1928 the Survey of Egypt published a layered map of the Theban necropolis and its environs on the scale of 1:10,000 (about 6⅓ inches to the mile) with contours at intervals of 10 meters. By sketching in upon this topographical map the boundaries of the Pliocene deposits it is easy to obtain a tolerably accurate idea of the level of the water in which they were laid down. The neighborhood of Thebes is fortunately as favorable a place as any in the Nile Valley for deducing this level, owing to the important topographic feature there formed by the deposits. They were delineated by H. J. L. Beadnell as long ago as 1897 under the non-committal title of "post-Miocene deposits,"[5] but no topographic map then existed as a basis. The accurate determinations possible upon the new map confirm our earlier measurements, made laboriously both here and at other points on both sides of the valley with closed aneroid traverses, verified by Abney level and Indian clinometer. The flat-topped or gently sloping platform of the Pliocene conglomerates rises everywhere just over the 180-meter contour. This, we have little doubt, represents the water level during a long pause at the end of, and probably during a large part of, later Pliocene times. The figure corresponds in a remarkable way with the results obtained about the Faiyum and on the sides of the Delta in Lower Egypt.[6]

THE SOUTHERLY BOUNDS OF THE GULF

The conception of a previously excavated valley system flooded by the sea to a height of 180 meters raises questions as to how far this Pliocene immersion extended toward the south and

[1] *OIP* X 11–23. [2] *ZDGG* LIII (1901) 373.

[3] Sandford, "The Pliocene and Pleistocene Deposits of Wadi Qena and of the Nile Valley between Luxor and Assiut (Qau)," *QJGS* LXXXV (1929) 493–548. This work was done on behalf of the British School of Archaeology in Egypt.

[4] *OIC* No. 3, p. 7.

[5] Unpublished ms. map, class 10, cat. 2, N. 11, in the Geological Museum, Cairo, kindly put at our disposal for consultation by the director, Mr. O. H. Little.

[6] See *OIP* X 22–23.

west. Did it flood the great depressions of the western desert, lapping round the foot of the Eocene scarp into Khargah and Dakhlah oases? How far up the Nile Valley did the gulf continue? Was Nubia ever submerged?

Answers to some of these questions are now possible thanks to the great advances in our knowledge of the physical geography and topography of the Libyan Desert made since the World War, chiefly through the researches of Dr. John Ball, former director of the Egyptian Desert Surveys. Dr. Ball's layered map of the Libyan Desert, published in 1927,[7] and the larger-scaled maps in the new atlas of Egypt produced by the order of King Fuad for the International Geographical Congress in 1928, which show the area inclosed by the 200-meter contour, give useful indications of the outermost bounds of the Pliocene sea.

The contour follows the foot of the Eocene cliffs west of the Nile Valley as far as the outlier of Gebel Garra, on the latitude of Aswan (see map at end). A few miles farther south the Eocene escarpment turns away westward; but the 200-meter contour, instead of turning with it, continues due south across the strike of the Nubian sandstone until it reaches the Nile Valley opposite the mouth of Wadi el-ʿAllaki, behind Dakkah temple. If these maps are correct, therefore, a ridge of Nubian sandstone rising above the 200-meter contour separates the Nile Valley from the low ground draining into the oases. Such a ridge, 25 miles wide at its narrowest point, would have constituted an effectual barrier against any westerly extension of a sheet of water having an altitude of 180 meters. On the other hand the region is not well known, the contour is in no sense precisely accurate, and a low pass or valley blocked with Pliocene débris may exist. The possibilities of connection between Khargah and the Nile Valley cannot be ignored.

On the east the 200-meter contour keeps close to the side of the Nile Valley, never straying more than 5 miles from the river except in the three baylike recesses at the mouths of Wadi el-ʿAllaki, Wadi Kharit with Wadi Shait (behind Kom Ombo), and Wadi Shoki with an area north of it (opposite Esna). Here, then, the bounds beyond which the waters of the Pliocene gulf cannot have extended are clear. There remains the actual valley of the Nile.

South of Sayalah near Wadi el-ʿAllaki at latitude 23° the Nile flows through clean Nubian sandstone desert almost entirely unincumbered by any more recent deposits; and for about 100 miles to the Sudan frontier the 200-meter contour is scarcely ever more than $1\frac{1}{2}$ miles, and for long stretches barely 1 mile, from the center of the river on both sides. The river runs through a narrow, threadlike valley hemmed in by high ground, and it is most improbable that any continuous sheet of water ever extended up this reach in Pliocene times. No traces of any deposits that might be attributable to such a flooding are to be found, and the valley shows every sign of having been cut in Plio-Pleistocene and Pleistocene times.

A strong indication of such a recent origin of the existing valley is the fact that it is almost everywhere bordered on both sides by rock terraces, which are invariably cut into the solid Nubian sandstone. It seems inconceivable that the cutting down of the river in Pleistocene times could have followed so exactly the meanders of an earlier period of degradation in Miocene or Pontic times and yet have left no trace of the deposits that filled them. More probable would seem to be the suggestion which we would here put forward, that during and before the Pontic Pluvial period,[8] when the ancestral Nile was cutting its deep gorge through the limestone cliffs of Egypt, it derived a large part of its water from rainfall over the Red Sea Hills and Nubia. This lowered the country over which the Nile south of Esna now flows, and drove back the Eocene escarpment to the west and north. The general lowering of the country could not have been accomplished by a single river, but only by innumerable streams collecting a

[7] With his "Problems of the Libyan Desert," I, *GJ* LXX (1927) 21–38.

[8] Cf. *OIP* X 10.

heavy rainfall. Such tributary systems are the Wadies el-ʿAllaki, Kharit, and Shait. The drainage from the south was probably accommodated in a relatively broad and shallow valley, in which the narrow post-Pliocene gorge was cut.

All things considered, we are of the opinion that any conception of a Pliocene gulf extending far south of the First Cataract is untenable, and that the erosion of the Pontic Pluvial period, which excavated the Nile Valley of Egypt, resulted in Nubia in a general lowering of the country and the removal of the Eocene and Cretaceous strata, rather than in the cutting of a deep valley.[9]

THE LACUSTRINE BEDS OF KURKUR OASIS

The Nile Valley below the 180-meter contour in the region of and above the First Cataract was carefully searched for traces of possible Pliocene deposits, but with negative results. The low plateau to the west has been found by Dr. Ball to be equally barren. He reported that "the desert between Aswan and Gebel Garra is for the most part a monotonous undulating plain of Nubian sandstone."[10]

In contrast to the negative evidence of the Nile Valley and its immediate vicinity, mention must be made of some interesting deposits of conglomerate and tufa in the Oasis of Kurkur. As described by Dr. Ball, "groups of small hills near the road some 11 kilometres before reaching the oasis consist of reddish yellow clays and sandstone, with a brown calcareous conglomerate. The last-named rock also forms the top of the extensive low banks further on, east of the road; it is a hard aggregate in which pebbles of limestone and quartzite of very various sizes are cemented together by a brownish yellow matrix."[11] Within the oasis thick tufa occurs, said by Dr. Ball to be "obviously a fresh-water deposit, totally unconformable to the underlying strata," and formed since the depression was cut to much its present depth in the plateau of Danian chalk strata.

The age of the deposits is indeterminate; for, in spite of the similarity of the tufa to that of the Pliocene in the Nile Valley near Abydos, the beds can have had no connection with the Nile gulf owing to the fact that they are situated at an altitude of about 300 meters above sea-level. They may be a relic of the Pliocene drainage system which flowed into the head of the gulf, but of this there seems to be no evidence. A similar drainage system probably persisted through Plio-Pleistocene and Pleistocene times.

THE MOST SOUTHERLY PLIOCENE DEPOSITS IN THE NILE VALLEY: THE SANDS AND CLAYS OF THE KOM OMBO PLAIN

The most southerly deposits which may be assigned to the Pliocene submergence of the Nile Valley lie in the Kom Ombo plain (Plate I, *A*).[12] Here the Nubian sandstone cliffs recede on either side and give place to a wide alluvial tract, through the center of which rise low hills of Danian chalk and clays, as described on page 3. Near the Wadi Kom Ombo Company's pumping station the river bends westward at almost a right angle for 3½ miles; and where it turns northward again it has cut into the desert of the west bank, which is laid bare in a line of cliffs 5 miles long. On the opposite or concave side of the bend there is also a short stretch of cliffs, near the village of Munihah (see Fig. 2).

The strata exposed in these cliffs are entirely different from the Nubian sandstone to the

[9] See also chap. iii, esp. p. 23.

[10] *Reconnaissance-Survey of Jebel Garra and the Oasis of Kurkur* (Cairo: Survey Dept., 1902) p. 29.

[11] *Ibid.* p. 32.

[12] Except for high mounds of rubble which locally incumber the Nubian sandstone on the east bank as far as Aswan. These may be the relics of débris-choked Pliocene wadies such as we have described in the Faiyum.

south or north, or indeed anywhere in those parts of the Nile Valley visited by us; they are of altogether peculiar appearance. They first attracted the attention of Schweinfurth in 1901;[13] later they were described by H. J. L. Beadnell, whose uncertainty as to their nature and age may be seen by the following quotation: "The [gravelly] deposits may possibly be unconformable to the clays below, and belong to the Pleistocene lacustrine period; on the other hand, the whole of the beds exposed may be of Nubian-Sandstone age."[14]

This uncertainty as to the Pleistocene or Nubian (Cretaceous) age of the deposits seemed most likely to be solved by as careful an inquiry as possible into their geological relations to the known Danian chalk and clays farther north, about the village of er-Raghamah. On the east bank low ground occupies the critical region immediately south of the chalk scarp, but the west bank affords a continuous section. Here, nearly opposite Aklit, we found a key section providing the information sought (Fig. 3).

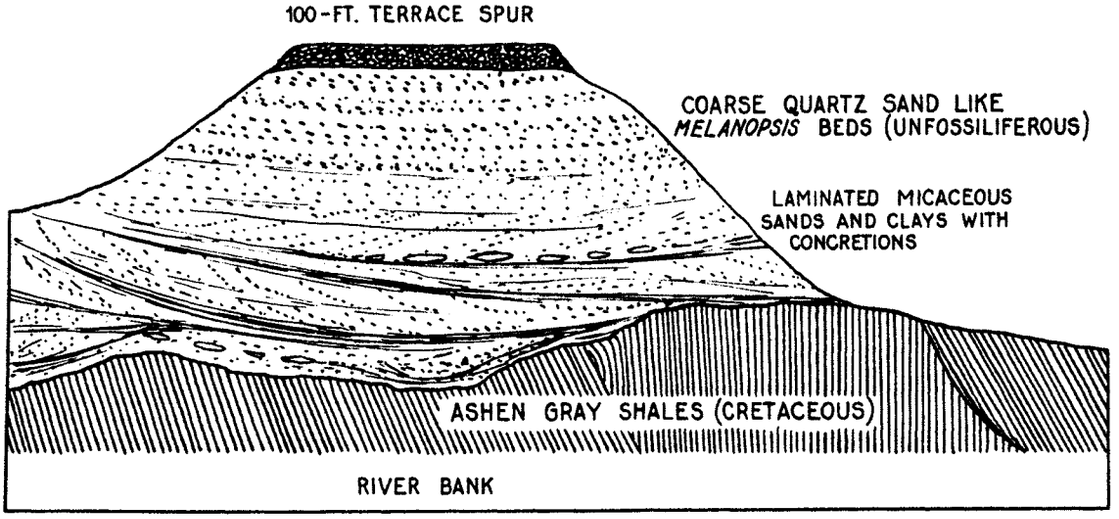


FIG. 3.—SECTION OF THE CLIFFS ON THE WEST BANK OF THE NILE OPPOSITE AKLIT

Beadnell has described[15] how, about opposite er-Raghamah, a conspicuous area of Cretaceous white limestone covering about a square kilometer crops out close to the river bank, the dip being some 5° to the north. According to Beadnell the thickness of the chalky beds is from 65 to 80 feet, and both above and below them are laminated clays—the upper the equivalent of the Esna shales; the lower the equivalent of the "ashen gray shales" of the oases, overlying the *Pecten farafrensis* marls. The lower clays or shales form the surface south of the chalk scarp for rather more than half a mile, to the beginning of the Nile cliffs. The first hill cut back by the river shows the section represented in Figure 3. The Danian shale is distorted and foliated at the foot of the cliff, and upon its unevenly eroded and hummocky surface—in places across the upturned ends of its bedding planes—lie the problematic beds which we assign to the Pliocene.

The series consists of erratically bedded loose mica sands, with bands of laminated clay from 6 inches to 1 foot thick. There are all gradations from sand to clay, also layers and concretions

[13] "Am westlichen Rande des Nilthals zwischen Farschut und Kom Ombo," *Petermanns Mitteilungen* XLVII (1901) 1–10.

[14] *QJGS* LXI (1905) 668. The "Pleistocene lacustrine" deposits of Beadnell and others who wrote at the beginning of the century we regard elsewhere in the Nile Valley as an intimate part of the Pliocene gulf series.

[15] *Loc. cit.*

of flat, hard, somewhat ferruginous sandstone like that in the Pliocene of Sidmant el-Gebel and Dahshur.[16] The sand beds are often lenticular, and the clay seams divide and arch over them. North of Munihah, on both banks, the erratic bedding is extremely pronounced, with appearances of contemporaneous erosion and deltaic deposition suggestive of the Estuarine Series of Yorkshire, England. At the bottom the sediment is fine and crowded with mica; toward the top it becomes coarser, passing up unevenly into coarse quartz sand and large-grained sandrock like that in the Pliocene at Esna and Abydos and elsewhere. This passes in turn into a peculiar white or rusty rock consisting of quartz grains in a white calcareous matrix, which may be stained gray, rusty, or pink—a type with highly characteristic appearance, indistinguishable from some of the *Melanopsis* beds[17] of Lower Egypt. The sands as a whole are full of multiform concretions in the shapes of sticks, roots, and nondescript objects.

The series is planed off at the top and overlain with extreme unconformity by the gravel of the Lower Paleolithic Nile channel. The terrace forms a conspicuous cap to the cliffs on the west bank at about 100 feet and less above river-level. On the east bank it descends to 50–60 feet at Munihah and continues to fall toward the east, cutting ever deeper into the subjacent

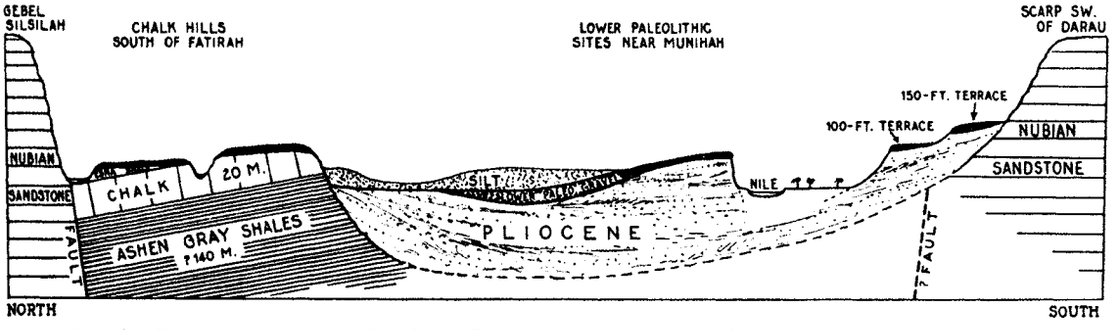


FIG. 4.—SECTION ACROSS THE KOM OMBO PLAIN ACCORDING TO THE VIEW REPRESENTED IN THE TEXT

deposits toward the center of the Pleistocene channel. The gravels, which yield Lower Paleolithic implements and must not be confused with the underlying deltaic deposits, will be dealt with in chapter iv. The mutual relations of the beds are shown in Figure 4.

The grounds on which we correlate these sands and clays of the Kom Ombo plain with the Pliocene submergence of the Nile Valley below Esna are, therefore, threefold: (1) close lithological identity; (2) geological relations (they are deposited unconformably upon Danian beds in a previously excavated basin or valley; they obviously postdate the Silsilah fault, which is post-Lower Eocene; they are unconformably overlain by the Lower Paleolithic gravels); (3) geographical position (they occupy a broad depression entirely below the 180-meter contour, their greatest altitude nowhere exceeding 130 meters).

THE LIMESTONE BRECCIAS BETWEEN KOM OMBO AND SILSILAH

At Gebel Miyahi (see Fig. 2), a conspicuous cliff on the east bank opposite the northern end of Farasiyyah Island, 4 kilometers north of er-Raghamah, Beadnell drew attention to a remarkable mass of breccia comprising gigantic blocks of Eocene limestone set in a matrix of Upper Cretaceous shale (Plate I, *B*).[18]

[16] *OIP* X 16.

[17] For the present we retain the *Melanopsis* beds in the Pliocene. Blanckenhorn (*Handbuch der regionalen Geologie*, VII. Bd., 9. Abt. [Heidelberg, 1921] p. 188) has suggested their inclusion in the Pleistocene.

[18] *QJGS* LXI (1905) 669.

The hill formed by the breccia is an elongate ridge trending southeast-northwest and terminating against the river in a cliff about 50 feet high and at least half a mile long. The tumbled mass of bowlders is continued on the west bank of the river near the ruined village of ʿIzbat el-Reseiris, behind which it seems to disappear under the Pleistocene gravels and downwash. As remarked by Beadnell,[19] "the Eocene limestone is much broken up, but the size and position of the blocks preclude the possibility of their having been transported. In all probability they represent the remains of a once far more extensive bed, which has been broken up and lowered by the removal of the soft, easily disintegrated clays below." This explanation satisfies every condition except the curious ridgelike distribution of the breccia.

Anyone coming fresh from a study of the pre- or early Pliocene valleys of the Faiyum, which were choked during the Pliocene submergence with conglomerate and slipped masses of higher Eocene limestones fallen from vanished cliffs on either side,[20] sees at first a ready explanation. But there are certain differences which preclude the drawing of too close a parallel; for at Gebel Miyahi the bowlders are not so tightly compacted as in the Faiyum, being set in a matrix of Esna shale, and they are totally unrounded, constituting essentially a breccia, not a conglomerate.

Thin seams of similar breccia are common in the Esna shale country immediately to the north, around Fatirah, where they form ridges running erratically across country, marked by lines of limestone blocks on the surface. West of Gebel Silsilah railway station, in the sides of a pair of wadies down one of which run the drainage canals from the sugar plantations, some of the ridges are clearly shown in section to be fault breccias. The country was evidently faulted before the removal of the Eocene limestones, angular blocks of which were dragged down the fault planes and became imbedded in the shale beneath, where they form true crush breccias. The breccia of Gebel Miyahi may be such a crush breccia on a huge scale; or it may be a choked valley formerly draining into the main gulf to the northwest and filled with scree material in Pliocene times, before the removal of the surrounding Eocene limestone.

The tumbled blocks of limestone forming the breccias seem to be the only Eocene beds within the Kom Ombo basin. Although they are evidence of the former extension of the Eocene, they do not provide grounds for mapping any such extension at the present day.

GEBEL SILSILAH TO ESNA

Careful search of the valley between Gebel Silsilah and a point a few miles south of Edfu failed to reveal any trace of Pliocene deposits. The Nile here flows through a narrow valley cut in Nubian sandstone. As in the reach between Darau and Aswan, there is no reason to suppose that the Pliocene gulf ever extended up it, or that at that period the modern valley was in existence.

Between es-Sibaʿiyyah and Esna railway stations massive conglomerates make their appearance, enveloping enormous slipped and tumbled masses of Eocene limestone far below their normal position. From this it is apparent that the edge of the Pliocene gulf is being crossed. The slip region is continued on the west side of the valley in some isolated low hills rising through the mantle of Pleistocene gravels. The hills consist of disturbed blocks of nummulitic limestone resting in disordered heaps on a base of Esna shale. A similar slip zone fringes the foot of the high Eocene cliffs to the north, and all in between is normal Pliocene.

Apparently the Pliocene gulf here leaves the Nile Valley and swings off to the west under a dense mantle of Plio-Pleistocene Nile gravel belonging to the 150-foot terrace.

If a start is made at the foot of the western Eocene escarpment near Esna, the Pliocene con-

[19] *Loc. cit.*

[20] Cf. *OIP* X 19, Fig. 6, and Plate I.

glomerate and red breccia may be followed along the foot southward, isolated from the Nile by the broad rolling gravel plains of the 150-foot terrace of the Nile. A high platform of the typical Pliocene conglomerate and breccia, horizontal or sloping slightly toward the distant river, unusually broad and undissected, though with an exceedingly rough surface of bowlders and cobbles, may be followed at least to the latitude of Edfu; and it seems to stretch indefinitely along the scarp.[21] Whether it passes round Gebel Borga on the west side remains uncertain, but it seems probable that it does. Dr. Hume, many years ago, noted conglomerate on the southwest spur.[22]

THE PLIOCENE DEPOSITS FROM ESNA TO LUXOR

From Esna northward to the sea the valley of the modern Nile coincides approximately with the Pliocene gulf. Hemmed in on both sides by the towering cliffs of the plateau, the Pleistocene river and its tributaries had no choice but to follow the ancient channels, cutting down anew through the deposits laid down in the gulf. As the Pleistocene river meandered to and fro in the valley, it excavated magnificent sections through the gulf deposits on both sides. The relics of the Pliocene strata form a second and lower system of cliffs and plateaus dissected by steep tributary wadies within the main valley. Some of the finest exposures in all Egypt are to be seen on the east bank, skirting the Eocene outlier of Gebel Rakhamiyyah. Steep cliffs, composed of layer upon layer of conglomerate, tower 350 feet above the desert edge and run in long spurs from the parent precipice of Eocene limestone toward the cultivation (Plate II).

The same stretch, between Shaghab and el-Mataʿnah, provides another spectacle of great interest. The Eocene limestone plateau of Gebel Rakhamiyyah is supported upon a base of Cretaceous Esna shales, which became saturated with water during the torrential rains of the Pontic Pluvial period, when the Nile Valley was first being excavated, and acted as a gigantic slide plain. The progressive excavation of the valley caused blocks of limestone up to half a mile or more in length to break away from the edge of the plateau and slide long distances outward and downward into the valley. The slipped masses, carrying some of the subjacent shales with them, turned over as they traveled until they dipped steeply inward; and, owing to the central and heaviest portions moving the most rapidly, they often acquired a crescentic shape.[23] By the end of the Pontic Pluvial period, therefore, the floor of the Nile Valley was covered with a series of crescentic waves of slips, serried one behind the other like gigantic billows on a choppy sea, their convex faces turned toward the center of the valley. The well known rock of Gebelein, which rises from the west bank of the Nile above Armant, is a detached mass which has traveled so far from the eastern cliffs that the Pleistocene and modern rivers have excavated their present valley between it and its parent cliff. Other masses lie planed off and partly hidden beneath the gravel in the vicinity.

Between, around, and over the landslips were banked the Pliocene conglomerates, incorporating in their base enormous angular or partly rounded bowlders and material crushed during the descent of the sliding rock masses. We obtained no evidence that any of the landslips had continued to move after the Pliocene deposits had been formed around them. On the contrary, it is everywhere plain that they were brought to a standstill before those deposits were laid down. The return to stability appears to have been due to the cessation of the deepening of the valley, when erosion gave place to drowning and deposition.

Although in some few places the Pleistocene river has cut back the Pliocene filling of the

[21] Actual evidence of Pliocene deposits west of the northern end of the Kom Ombo plain is provided by the presence of fragments of unmistakable Pliocene rock in the downwash in some of the wadies north of the outcrop of white chalk opposite er-Raghamah.

[22] Ms. diary and field map.

[23] The process was illustrated in *OIP* X, Fig. 2.

valley to the old limestone cliffs, in most places there remains a conspicuous selvage, its spurs terraced stepwise at the heights where the river paused in its downward course. In the tributary valleys, up which the waters of the gulf extended in miniature fiordlike arms, the filling is preserved locally. It also forms a noticeably flat-topped feature extending a quarter or a third of the way up the cliffs, 250–350 feet above the present cultivation, in the large bays where the Eocene walls retreat some miles from the cultivation, namely south of Luxor, east of Esna, and on the west bank between Armant and Thebes. The wide bay between Gebel Nezzi and the pyramidal hills at the east end of Gebel Rakhamiyyah, so familiar a feature of the southern landscape from Luxor, seems to have been confluent with the bay east of Esna. The ridge dividing them is so narrow and so broken that the water probably passed through it by a number of channels, converting Gebel Rakhamiyyah into an island. The country was thus under water from Wadi Shoki to Wadi Madamud.

A study of the Pliocene deposits throws much light on the conditions prevailing in the Nile Valley during the gulf stage. These deposits may be grouped roughly into three categories:

1. Coarse disintegration products of the surrounding plateau, washed in by tributary streams or fallen from the cliffs and forming underwater screes. To this category belong the most spectacular of the deposits, the masses of limestone and flint conglomerate and breccia, of which fine examples may be seen flanking the North Valley and the mouth of the Valley of the Kings' Tombs at Thebes (Plate III, *A*).

2. Fine-grained limestone and mud, laid down in still water under the shelter of cliffs or headlands and away from the influence of strong currents. To this category belong two classes of rock: white limestone and brown marl. The former is composed largely of small chips of Eocene and Cretaceous rocks cemented by lime; the latter, consisting of the finer products derived from the disintegration of the Esna shales, is extensively used as a *sebakh* or fertilizer for spreading on the fields.

3. Materials brought from the south by the main stream which fed the headwaters of the gulf above Kom Ombo. These consist of white and yellow quartz sand derived from the Nubian sandstone to the south and east of the limestone plateau. The sand, which is usually large-grained and pure, resembles some of that in the Pliocene deposits of the Kom Ombo basin, and it cannot have been derived from any local rock. Occasionally currents flowing down the gulf have carried it to the sides, and it may be seen exposed on the low desert edge. One such exposure may be seen close to the Anglo-American Nile Tourist Company's rest-house, between the Ramesseum and Chicago House. Perhaps the finest sections of all are in the wide bay east of Esna, in the sides of Wadi Shoki, where over 100 feet of this sand can be seen. Farther north, especially about Abydos and east of Balyana,[24] great thicknesses of similar sand occur unconformably in the Pliocene series.

The rocks belonging to these three categories usually interdigitate, mingle, and replace one another laterally; and, although in complete sections they are nearly always gravelly or conglomeratic toward the sides, no chronological sequence can be made out to hold good for all localities. The rock types remain essentially facies deposits, resulting directly from differing conditions of sedimentation which existed contemporaneously within the gulf. In fact, the sequence is a lateral one, from the coarse detrital deposits of the first category at the margins, through alternations of detritus and limestone, to marl; the quartz sand, as already remarked, is intruded from outside the area and may occur at any level.

Just as in Lower Egypt we found not only fragments of the surrounding rocks cemented together as Pliocene conglomerates, but also masses of the fossil shells derived from them, sorted

[24] See Sandford in *QJGS* LXXXV 510 and 513.

according to size by the currents,[25] so in Upper Egypt we find similar beds of marine fossils intercalated in the Pliocene succession. In Lower Egypt the principal fossils derived from the Upper and Middle Eocene beds are oysters. Care has to be exercised in distinguishing the contemporaneous Pliocene oyster, *Ostrea cucullata*, from the similar but more coarsely ribbed Eocene oyster, *O. clot-beyi*, which occurred sometimes with the other, sometimes separately.[26] An analogous but much more treacherous instance of derivation or "reworking" of fossils occurs in Upper Egypt, for here the derived fossils are almost exclusively the smaller and less easily identified *Foraminifera.*

The walls of the Nile Valley above Luxor display thick courses of limestone containing myriads of these minute organisms which lived in the Lower Eocene sea. When the valley was filled by the gulf, large quantities of them were washed into the water along with the other débris of erosion and spread out on the bottom among the finer-grained Pliocene sediments. A classic instance was first noticed some 30 years ago by Messrs. Barron and Beadnell in an ancient quarry on the west bank near Armant, where, below a series of conglomerates and marls, occur pure white limestones containing plentiful foraminifers and a few small gastropods and lamellibranchs (Plate III, *B*). Since no contemporaneous fossils of any kind had been found in the Pliocene rocks of Upper Egypt, and the presence of contemporaneous *Foraminifera* would have been incontestible proof of the marine origin of the beds containing them, Messrs. Barron and Beadnell submitted their collection to a specialist for determination. He reported[27] that there were six species, three of which were common in older rocks, particularly of Eocene and Cretaceous age. Of the remaining three, two—*Globigerina conglobata* Brady and *Gypsina vesicularis(?)* (Parker and Jones)—were apparently unknown before the Miocene. The sixth, *Operculina ammonoides* (Gron.), which was very common, did not appear before the Pliocene.

But of the *Operculina* Chapman wrote, "the septation . . . . is rather more crowded and narrower than usual"; and Blanckenhorn has since stated that to judge by Chapman's figures it should rather be identified with *Operculina discoidea* Schwager, an Eocene species.[28] Moreover, the *Globigerina conglobata* was recorded by Chapman himself from the Eocene of Sinai,[29] as was pointed out by Blanckenhorn. The almost impossible hypothesis of a deep, still, foraminiferal sea filling the Nile Valley in Pliocene times rests, therefore, upon the single fragment identified with a query as *Gypsina vesicularis(?)*, a species so far unknown before the Miocene.

There is no difficulty in dismissing this hypothesis. We believe it safe to conclude that the upper reaches of the gulf were filled with fresh water. The absence of any fossil bones or other land or fresh-water fauna or flora is remarkable,[30] especially as the Lower Pliocene deltaic deposits of the Nile in Wadi Natrun, between Cairo and Alexandria, have yielded a rich vertebrate fauna. The same sterility has been found to characterize the Pleistocene terraces, though a few bones have been discovered by Père Bovier-Lapierre in recent years in the unusually thick terrace gravels at ʿAbbasiyyah near Cairo. The facts are best explained by supposing that solution has effaced all trace of them from the thin gravels in Upper Egypt. This explanation does not account, however, for the absence of fresh-water shells from the thick Pliocene beds; they have probably been destroyed by chemical concentration in the finer-grained beds.[31] The earliest fresh-water shells found in a Pleistocene Nile deposit are those in the 100-foot terrace gravels along the outer margin of the Nile-Faiyum divide,[32] and they are of essentially African origin.

[25] *OIP* X 15.
[26] *Ibid.* n. 1.
[27] F. Chapman, *GM*, 1900, pp. 14–17.
[28] *ZDGG* LIII (1901) 376.
[29] *GM*, 1900, pp. 309–13.
[30] Derived Eocene *Foraminifera* are abundant.
[31] Except in travertines. Later collections of shells and leaves have not been identified, and our experience in the Nile Valley has shown *identifiable* remains to be rare in the Pliocene travertine. "Pockets" of good specimens may be expected to occur, but their relation to the main mass will need careful scrutiny.
[32] *OIP* X 33.

THE QUESTION OF MAN'S CONTEMPORANEITY WITH THE PLIOCENE GULF STAGE

The question of organic remains in the Pliocene deposits leads us to the all-important subject of Man's handiwork. Bones and plants may be dissolved and leave no trace behind; but the implements fashioned by Man from hard quartzite, chert, or flint are virtually indestructible. It was with the collection of these, if possible *in situ* in the deposits, that we were principally concerned.

In the course of our survey we collected many hundreds of Paleolithic implements of all industries, both in and on the river terraces and on the desert surface; and the detection of any in the Pliocene gravels, if any were present, was our constant object. At the same time our experience that the earliest Paleolithic industry was always to be found at a certain level above the Nile, in the gravel of the 100-foot terrace, which is often cut into the Pliocene deposits some 250 feet below their summit, made us especially careful to eliminate all possible sources of error. From abundant geological evidence it is clear that in the interval between the formation of the Pliocene deposits and the cutting of the 100-foot Nile terrace an enormous period of time elapsed. The successive Plio-Pleistocene terraces in Lower Egypt[33] may have required more time for their formation than the whole of the known era of Man represented by the history of the Nile from the time of the 100-foot terrace onward. We therefore rejected all implements not actually taken from the undisturbed deposit, together with all pseudo-implements that could have been formed by thermal flaking or abrasion against their neighbors. Of such there are multitudes. Prolonged search under these conditions, in several successive seasons, has failed to reveal a single implement that could be said without doubt to fulfil both requirements—that of being an undoubted human artifact and that of having been contemporaneously imbedded in the deposits of the Pliocene gulf.

Our evidence is only negative, and the more importance attaches therefore to past records of implements from the Pliocene of Egypt. The value of these is, however, in our opinion nullified by the internal evidence, in every published record, that neither of the sources of error above specified was eliminated. The most detailed account of supposed Eolithic implements from the Pliocene deposits about Thebes is also the most important because it carries the weight of no less a name than that of Georg Schweinfurth. In the second part of a long paper on Stone Age researches in Upper Egypt[34] Schweinfurth devoted many pages to the discussion and description of a large number of finds, supposed to have come from the Pliocene gravels, which he classified according to the subdivisions of the Eolithic epoch propounded by Rutot.[35] The Strepyan, Mesvinian, and Reutelian industries were recognized.

Typologically Schweinfurth divided the eoliths from Thebes as follows:

Reutelian and Mesvinian Industries

I. Eoliths made from natural flint nodules (Types 1–17)
II. Eoliths made from flakes of flint nodules (Types 18–51)

Strepyan Industry, Transitionary from Mesvinian to Chellean

III. Commencement of the predetermined forms (Types 52–58)

Thirty-five of these types were figured in five pages of drawings of sufficiently high quality to give a good idea of the subjects. The first page[36] shows a series of natural flint nodules, slight-

[33] *Ibid.* chap. iv.

[34] G. Schweinfurth, "Steinzeitliche Forschungen in Oberägypten," *Zeitschr. für Ethnologie* XXXV (1903) 798–822 and XXXVI (1904) 766–830 (pp. 825–30 give discussion by others).

[35] *Le Préhistorique dans l'Europe centrale.*

[36] Schweinfurth, *op. cit.* XXXVI 787.

ly chipped. Although those on the second and third pages[37] are more fragmentary and more chipped, we cannot find anything about a single one of the types figured as Reutelian that convinces us that their shaping or chipping is due to the intentional agency of Man or his forbears.[38] By systematic collecting in the conglomerates of North Valley, Thebes, the number of these fortuitous shapes could be augmented indefinitely; but the pursuit would be futile, for the shaping and chipping are due to the contact of the nodules against one another. Sometimes the flakes can be found still lying in position and can be fitted together.

Of the twelve types figured on Schweinfurth's fourth and fifth pages[39] as illustrating the Mesvinian and Strepyan industries, on the other hand, about half have undoubtedly been shaped by hand and would be universally accepted as implements. The types on which doubt might be thrown appear from the drawings to be Nos. 39, 42, 46, 47, 49, and 51. The rest are Lower or Middle Paleolithic, except Type 51 (group at right), probably late Mousterian, and Type 57, a crescent of doubtful age. Similar cores and flakes litter the desert surface by thousands in the neighborhood of Thebes and have been swept down every wadi, becoming mingled in the superficial gravels. They have also been found *in situ* in their proper terraces.

The inclusion of these Middle and Late Paleolithic implements as types illustrative of supposed pre-Chellean industries relieves us from supposing that any of the other shaped or hand-flaked types referred to by Schweinfurth really came out of the Pliocene deposits. Of the rest, neither those figured by Schweinfurth nor those described later by Rutot[40] convince us that Man existed in Egypt in Pliocene times. Schweinfurth's paper, in fact, as Professor C. G. Seligman has said, "is vitiated by his determination to see eoliths everywhere, much more advanced implements being regarded as Eolithic."[41] To "much more advanced implements" we would add nodules and broken stones that owe their form to nothing but the pressures and temperature changes of inanimate nature.

The question of the possible occurrence of flint implements in the Egyptian Pliocene was revived in 1921 in the important paper just quoted, where Professor Seligman put the following on record: "In the early part of this year (1921) . . . . Mr. Smith drew my attention to a number of specimens presented to the British Museum by Mr. Montague Porch, removed by himself from the cliff face of the north bank of the northern affluent of the Wadyēn, immediately below the old watch-house. Among these is a typical hand-axe (B.M. 1919, 12–27, 68) with greyish-white surface, while the photograph of the site which accompanies the specimens indicates that the level at which these were found is about one-third up the cliff face."[42]

From the sketch (made from a photograph) reproduced by Professor Seligman, and from the original in the British Museum, it is clear that if the Chellean hand ax belonged to the level at which it was found it must have lain low down in the Pliocene conglomerates and limestone. A careful investigation of the site and of the implements, however, has convinced us that another explanation is the true one. There is, at the spot on the cliff marked by a cross to indicate where the hand ax was found, an accessible ledge, to which we climbed. We found it cumbered with débris fallen from above and partially consolidated; and in the scree material we found another implement and several flakes, in the same partially patinated condition as Mr.

[37] *Ibid.* pp. 791 and 795.

[38] Except Type 29, which might be either Lower Paleolithic or a naturally flaked flint; it is difficult to be sure from the drawing.

[39] Schweinfurth, *op. cit.* pp. 801 and 808.

[40] A. Rutot, "La géologie de la vallée du Nil et les nouvelles découvertes éolithiques et paléolithiques qui y ont été faites," *Bull. de la Soc. belge de géol.* XIX (1905) 260–62.

[41] "The Older Palaeolithic Age in Egypt," *Journal of the Royal Anthrop. Inst.* LI (1921) 115–53; quotation from p. 116.

[42] *Ibid.* p. 135.

Porch's specimens. In addition, the wadi floor and the screes at the foot of the cliffs are full of implements, most of them Mousterian. Examination of the collection from this locality presented by Mr. Porch to the British Museum suggests that it comprises a mixture of implements from the screes and wadi floor with naturally chipped Pliocene nodules resembling the "Reutelian eoliths" of Schweinfurth.

As remarked already, we searched at this and other sites, both in the vicinity and at distant points, but were never rewarded by the finding of a single flake or core of human handiwork actually imbedded in the Pliocene gravels.

III

THE PLIO-PLEISTOCENE TERRACES

Experience in Upper and Lower Egypt has led to our grouping together certain rock platforms under the term Plio-Pleistocene. In northern Egypt there is no doubt as to its utility. In Upper Egypt we have found only the lowest member of the group, the 150-foot terrace. Its age here also is Plio-Pleistocene. On passing into Nubia higher terraces are encountered at altitudes comparable with those of Lower Egypt,[1] but there is no further local evidence than that they are pre-Pleistocene. Since undoubted Pliocene strata are lacking in Nubia, the earlier age limit of these platforms must remain unproved; but we shall show reason for supposing them to be allied to those of Lower Egypt in a common Plio-Pleistocene régime of the Nile. Whatever their precise age may be, they are of great importance in tracing the early history of the Nile, in defining the width of the valley, irrespective of areas drained by its tributaries, and in determining the relation of the cataracts to the Nile's development.

Before turning to such problems it may be well to describe briefly the series of terraces which we have mapped and measured. They may be divided conveniently into the High Group and the 150-foot terrace to which the former series descends. The 150-foot terrace, the last member of the Plio-Pleistocene sequence, is followed by the Lower Paleolithic 100-foot terrace, but is itself entirely barren of human implements; that is, it is immediately pre-Paleolithic in the Nile Valley.

THE HIGH GROUP

Nubia

Rock platforms from which the gravels have usually been swept away by later erosion have been identified at 300 and 200 feet above flood plain. Both show signs of rising a little higher toward the edges of the valley remote from the existing Nile stream, but in no instance does either rise more than a maximum of 50 feet above those heights; that is, the upper limits certainly do not surpass 350 feet and 250 feet respectively.

The platforms are regular features, seen in a number of localities to rise one above another, like gigantic steps, from 100 feet (Lower Paleolithic) to 150, 200, and 300 feet. From south to north the best districts for studying them are:

1. *The Abu Simbel gorge.*—This may be considered to include a stretch of river extending from a few miles north of Faras to a few miles north of Abu Simbel; the most important region, the gorge itself, lies within 10 miles south and north of the latter. The river approaches the gorge through a silt-covered plain bounded by 100-foot and 150-foot platforms, and the towering cliffs narrow to a funnel near the ruined hill town and fortress of Gebel Addah.[2] Thence northward the country is exceedingly wild and rugged. On both sides the bounding Nubian sandstone hills are significantly flat-topped, more rugged and higher country lying fairly near at hand on the east.

The general surface within a few miles of the river on the east side is so level as to suggest that, dissected though it may be into stately cones and pyramids, it is a river platform. Its

[1] The earliest connected account of the terraces of Nubia was given by A. Leith Adams, *QJGS* XX (1864) 6–19.

[2] The situation here is very similar to that of the Kom Ombo plain, where silts of the same (Late Paleolithic) age occupy a low plain immediately upstream from a gorge cut through the Nubian series and flanked by high terraces (the Silsilah gorge); see pages 3–5.

height is 300–350 feet above flood plain. The state of its dissection is well seen east and south of Abu Simbel in striking contrast to a clearly marked 150-foot platform which borders the river in long strips, broken only by occasional deep and narrow wadies. The two stages of denudation, the older pyramids and the younger (yet pre-Paleolithic) "castellated"[3] platform, afford a valuable index of relative age and of the action of the destructive processes involved.

On the west bank the uniformity of the plateau above the Abu Simbel temples is most marked, and remains unbroken for many miles. A reconnaissance over its wind-swept and sand-torn surfaces showed its width to be about 6 miles, beyond which lie higher sandstone hills. The plateau still bears patches of quartz gravels, with some flint and chert, and it is unquestionably an old river platform. Its height is 300 feet above flood plain (292 feet as measured by Abney level at the temples). The 150-foot platform is missing on the west side of the gorge, and it was the precipitous 300-foot cliffs that provided the temple architects with their opportunity.

At the northern end of the great gorge a lower platform, at 200–250 feet, appears below the 300-foot stage and thenceforth is locally prominent. Farther north isolated hills stand out in the low sand-covered plains, their summits conforming to this height. It is by such as these and the Abu Simbel cliffs that the immense periods occupied by the Nile's early history may be gauged.

2. *Kasr Ibrim to Tumas.*—Before the Nile enters the Korosko meander it has given yet further indication of its powers of erosion. Kasr Ibrim, the great frontier fortress which was garrisoned from Roman times until 1812,[4] crowns a precipice rising some 200–250 feet from the swirling waters of the Nile. The cliffs continue northward from the Tumas district almost to ed-Dirr, and their summit marks the edge of a plateau a few miles wide, beyond which rise irregular lines of hills. The plateau is an excellent example of an old river bench; careful measurements near its landward margin gave a general height of 250 feet above flood plain (e.g., opposite Tumas, Abney readings of 245 feet). On the west, part of an abandoned valley of 150- and 100-foot stages flanks the Nile from Kasr Ibrim to the Korosko bend.

3. *Ed-Dirr to the Korosko bend.*—No student of river history and geology can fail to appreciate the magnificent development of rock platforms that traverse the sides of the great meander. In spite of their perfection, however, they are almost impossible to photograph adequately, as the distances are so great; and no written account can do them justice. Only the fortunate traveler can enjoy them fully as the northbound Sudan government steamer bears him past ed-Dirr in the late afternoon. The sinking sun then lights up the bare platforms and the bright drift sand which lies on the slopes between them.

The most complete series is to be found on a prominent spur on the left bank about 7 miles upstream from Korosko. Clearly marked platforms, independent of all structure of the Nubian series in which they are cut, occur at 300, 250, 150, and 100 feet[5] (the last, Lower Paleolithic), each separated from the others by a steep cliff. Gravel still remains on the lower two terraces; the 100-foot platform is partly cut away, and Late Paleolithic silts are banked against its truncated edge to about 30 feet above flood plain.

[3] Cf. the walls of medieval fortresses with their parapets interrupted at intervals by narrow slits. Such is the appearance of the long sections of the 150-foot terrace, pierced by deep and narrow wadies which drain the hills remote from the Nile.

[4] This forbidding town-fortress, with the ruins of its beautiful Christian church, has a history of some two thousand years of turbulent frontier life. From the sixteenth century it was held by troops imported from Bosnia, and their descendants still live in the district.

[5] As a check on the accuracy of the Abney level and on the use of round-figure approximation for publication, it may be stated that the precise readings of the back (landward) margin of the three high terraces were 305, 245, and 152 feet respectively.

The view southward from the 300-foot platform is as instructive as it is superb. The jagged Nubian hills that border the higher platforms and the valley as a whole are clearly seen, and the contrast in topography is striking. Indeed, from this height even the higher platforms seem little denuded, despite their age, in comparison with the wild and bewildering confusion of the bounding hills. From this point also a wadi terrace of the 300-foot stage is clearly visible near by on the same side of the river; it is the only survival of this kind known to us among the high platforms in Nubia or Upper Egypt.

Fragments of similar Nile terraces are to be seen high up on the great cliffs that mark the right bank of the Korosko bend, the most prominent being the 300-foot platform, with inaccessible cliffs falling precipitously from it to the Nile. North of the Korosko bend the higher platforms are left behind, save for a few indications of the 250- and 200-foot levels. The rugged hills close in on the river at intervals; but their heights fall to the north until a general level, or peneplain, is reached.

Upper Egypt

The High Group of terraces is not recognizable in Upper Egypt south of Luxor; for the general level of the Nubian series is too low to come within their vertical range, whereas the towering heights of the Cretaceous and Eocene hills were protected from the river by the Pliocene lining of the valley. This, in turn, being soft, has suffered severely from Pleistocene erosion; and the high terraces, if ever present, have been destroyed. About 30 miles downstream from Luxor, however, almost at the summit of the Pliocene series, quartz pebbles derived from the Nubian sandstone farther south have been found upon the local conglomerate at a height of about 300 feet above flood plain. They are even more marked near Denderah. These, with other occurrences in the area to the north of that considered in the present volume, were sufficient to lead one of us to postulate the former existence of Plio-Pleistocene terraces higher than 150 feet above the river in this part of Egypt.[6] Although these are but scanty relics, they provide important support to the claim of a Plio-Pleistocene rather than an earlier age for the High Group of terraces in Nubia.

THE 150-FOOT TERRACE

Nubia

The platform is seen for a large part of the journey from Wadi Halfa to Aswan (Plate IV, *A*). It has been mentioned in the foregoing account, particularly with regard to its slight denudation compared with the fragmentary condition of the higher platform. It may generally be said to occur wherever the 100-foot or higher terraces are preserved, and there is therefore little need to describe its distribution in detail.[7] It is important as the youngest of the Plio-Pleistocene group, in which we find no trace whatsoever of Man's handiwork. Lower Paleolithic implements are sometimes strewn on its surface in profusion, but they have never been found in its gravels. They first appear *in situ* in the deposits of the 100-foot stage.

The terrace is lost as the region of the First Cataract is approached. The cause of its disappearance is to be found in the wide extent to which differential erosion has taken place between the basal conglomerate of the Nubian series and the resistant rocks of the underlying complex. The softer sedimentary beds have been swept away from a wide area, disclosing a remarkably regular sub-Nubian plain of erosion. The true rock walls of the Nile Valley, outside the present channel, have thus been lost. The 150-foot terrace lay partly in the modern

[6] Sandford in *QJGS* LXXXV (1929) 506 and 520.

[7] It stands out with unusual prominence in the narrow defile some few miles south of Kalabshah and gives rise to very fine river scenery, steep cliffs falling from it to the water's edge.

valley, where traces survive near Kalabshah, partly on the basal Nubian sands and conglomerate, which have been destroyed, and coincided locally with the sub-Nubian plain of erosion.

Of the former existence of the bounding walls in this region the Kalabshah gorge is sufficient evidence. The Nile, flowing over the Nubian sandstone, was held between its banks when it encountered the harder rocks in the process of deepening its bed. The walls were high and strong enough to keep the river to its course, and it had no alternative but to cut deeply through the rocks of the complex. Since that time it has been retained in the gorge so formed, and has never escaped. The blanket of Nubian sandstone has been rolled away by denudation. For a long period, no doubt, the Kalabshah gorge marked the site of a cataract; but this stage has now been passed, and the river passes swiftly but unbroken through an overdeepened channel (see also pp. 59–60).

Upper Egypt

About 10 miles north of the First Cataract the 150-foot terrace reappears on the surface of the Nubian sandstone between the Nile and Gebel Borga, and becomes the dominant feature of the west bank opposite Darau. As an unbroken gravel-strewn plateau it continues its northerly course on the west side of Gebel Silsilah and Edfu, marking the former main channel of the Nile. It was supplied with vast quantities of gravel by Wadi Shait and Wadi Kharit (across the site of the present Kom Ombo plain).[8] Two branches of the river also flowed over the Gebel Silsilah barrier, cutting deep trenches. Of these, one is now the only passage by which the Nile negotiates the rocky ridge; the other became choked with silt late in Paleolithic times.

North of Gebel Silsilah the platform may be seen at intervals along the east bank, usually stripped of its gravel, until the Nubian sandstone passes beneath younger and softer strata, which have suffered severely from subsequent denudation. On the west bank the gravel, about 25 feet thick, forms an undulating plain which is about 5 miles wide opposite Edfu. Local quartz gravels from the Libyan Desert reinforce its western side.

In its course northward from the latitude of Gebel Borga the terrace passes imperceptibly on to the eroded surface which may be seen near by between the top of the Nubian series and the Esna shale. Moreover, the uppermost part of the Nubian series consists of soft shales interbedded with more resistant layers of sandstone. At about the latitude of Esna the change from a hard to a soft underlying surface becomes apparent, and the terrace breaks up into gravel-capped hills and ridges. It disappears at the point where tongues of yet softer Pliocene strata fill hollows in the Esna shale. North of this point erosion has removed most of the Pliocene clays, and the terrace has suffered complete disintegration.

The deltalike end of the 150-foot terrace, spread over the remaining fragments of uppermost Nubian, Esna shale, and Pliocene sands and clay, is a prominent feature in the neighborhood of Esna and may be seen to advantage from the hills east of the town. Vast quantities of gravel, derived largely from the Red Sea Hills, characterize the 150-foot stage north of Darau and point to deposition rather than the erosion that marks the Nubian part of the river's course.

North of Esna the terrace survives in patches of considerable size on the west bank to a point not far north of Gebelein, where a series of ridges, steeply tilted masses of limestone which slipped from the precipitous flank of Gebel Rakhamiyyah in Early Pliocene times, has been cut off at about 150 feet above the river. The Nile now flows between Gebelein and its parent cliffs, while on the west side the ridges are hidden by the gravels.

[8] Independent evidence of the appearance of this material on the west bank between Darau and Gebel Borga has been sent to us by Mr. G. W. Murray, director of the Desert Surveys of Egypt.

AGE OF THE SECOND CATARACT

Although it is true that the platforms of the High Group in Nubia are generally bare of gravel, owing largely to subsequent denudation, the 150-foot stage still retains considerable thicknesses in some districts. The gravels are composed of pebbles of quartz, sandstone, and cherty material derived from the Nubian series, in strong contrast to the composition of the gravel north of the First Cataract. The absence of igneous or metamorphic material is a striking feature of the Plio-Pleistocene gravels at their first occurrence north of the Second Cataract, almost in juxtaposition to the complex itself. This is a matter of such importance that it must receive special attention.

Rock platforms and gravels are to be seen within the Second Cataract at 150 feet and at other levels above flood plain.[9] They were not necessarily formed by the river, however, since the Nubian series formerly extended over the whole of the igneous and metamorphic complex, planed off its surfaces, and formed a basal conglomerate of rocks derived immediately from it.[10] At any point at which the river has cut through the sub-Nubian peneplain and basal conglomerate a rock platform with gravel seems to exist; the appearance is the more deceptive where the surface is regular, not much above river-level, and the conglomerate has weathered into a loose shingle. These conditions are realized in the Batn el-Hagar in the Sarras-Murshid district at about 150 feet above the river. On the east side the bare platform is seen near the river; on the west it is covered with gravel consisting essentially of pebbles derived from the underlying rocks. It is only when the deposit is traced westward for some few miles (as toward Gebel Debba) that it passes laterally and vertically into typical Nubian sandstone and quartz sand, and the gravel plains disappear. After a careful examination of both banks of the Second Cataract north of Semnah, it may be said that no true river platforms exist in this region at 150 feet or higher; nor have we found any trace of a 100-foot or a 50-foot platform.

Since the complex, as now exposed, mounts hundreds of feet above the river in the mountains of the Batn el-Hagar, it is reasonable to expect that terrace gravels immediately north of the region should consist in large measure of material derived from it. At the northern end of the cataract stands the Rock of Abusir, a cliff of Nubian sandstone (Plate IV, *B*). Just behind the Rock itself is a fairly extensive bed of gravel a few feet in thickness, resting on a waterworn surface of the sandstone, almost exactly 200 feet above the river (198 feet where measured). It consists of well rolled pebbles of Nubian sandstone and of quartz pebbles derived therefrom, with no trace of any igneous or metamorphic rocks of the Batn el-Hagar. So close to the exposures of the older rocks and to the basement bed of the Nubian, with all its variety of pebbles and bowlders, this is astonishing. A few cherty or quartzite pebbles may be found; but not even the prominent red jasper pebbles[11] which occur in the Nubian itself over the region of the cataract, as on the summit of Gebel Barka, a great Nubian outlier within the Batn el-Hagar above Semnah, seem to be present here (see Fig. 7).

The composition of the gravel at the Rock of Abusir is not unique. A few miles farther north, on the west bank opposite Wadi Halfa, the 150-foot terrace flanks a prominent area of Late Paleolithic silt, which here rises to 100 feet. The 150-foot platform is covered with banks of

[9] By "flood plain" in an area of such turbulent water is meant the height attained by modern alluvium in backwaters and secluded reaches. Generally there is much less difficulty in determining this height than might be imagined.

[10] The same geological circumstances recur at Kalabshah and at the First Cataract, with the important difference that the ancient rocks there are at a lower elevation.

[11] We are indebted to Mr. G. W. Grabham for the information that these pebbles are brought down from the mountains of Abyssinia by the Blue Nile and other streams. They are prominent in the Late Paleolithic deposits north of Semnah through a considerable part of the Nile in Nubia. They do not seem to have been recorded previously from the Nubian sandstone.

white quartz gravel, and there is no trace of rocks derived from the pre-Nubian complex of the cataract, such as abound in the finer gravels among the immediately adjacent silts. The same contrast is seen repeatedly farther north, wherever the silts are in juxtaposition to the 150-foot terrace. At Dibeira West similar mixed gravels of the silt period lie unconformably against a low cliff capped with white quartz and rolled Nubian sandstone pebbles forming a gravel terrace at 115 feet. Finally, west of Faras, the 100-foot platform, almost stripped of its gravels, provides in poor measure Nubian and quartz pebbles, but no material which might have been derived from the cataract. The silts at its foot contain these rocks in abundance.

It is possible that these gravels devoid of rocks from the Batn el-Hagar were the products not of the Nile but of the local streams. Their situation shows, however, that they were certainly deposited by the river itself. There is thus evidence to suggest that in Plio-Pleistocene times the Nile did not flow through the Batn el-Hagar or touch the older rocks which lie beneath the Nubian sandstone; that, in fact, it probably did not do so till a late stage in the Pleistocene.

If, then, the river negotiated the Dongola bend at this time, its course lay east or west of the Batn el-Hagar. On the east the country over which the railway line runs from Wadi Halfa to Abu Hamed is high. But from the Rock of Abusir, the critical point, a broad plateau sweeps far to the south-southwest between the high and broken country of the Batn el-Hagar and the still higher sandstone hill-group of Gebel Sula (1,443 feet) which lies to the west. In this direction the eye travels over only low Nubian sandstone country scarcely exceeding the altitude of the Rock of Abusir and for the greater part rather below it. As far as the eye can see extends a broad depression which probably does not rise higher than 250 feet above the Nile. We are strongly inclined to suspect that the Nile flowed west of the Second Cataract until some stage of its Pleistocene history. The present tendency of the Nile, now imprisoned in the Batn el-Hagar, seems to be to lower its channel and to shift it westward again. Abandoned channels are common on its east bank and rare on the west, at least between Semnah and the Rock of Abusir.

The desert west of the Nile in the Dongola bend is not well known and for the greater part is still unmapped. On inquiry, Mr. G. W. Grabham, who has a quarter of a century's experience of the country, told us that in the present state of our knowledge there is no evidence to controvert the hypothesis here outlined. Verification turns on a survey of a wide and inhospitable district. A provisional map of part of it exists, however—a recent publication due chiefly to the efforts of Major Jennings Bramley, formerly stationed at Wadi Halfa, and Mr. H. C. Jackson, recently governor of that province. The critical area, or a part of it, was traversed by the former on the way to and from Selimah Oasis.[12] In answer to a letter written with special reference to this problem, he speaks of the wide extent of the 200- and 250-foot levels. He has no evidence to offer against the suggestion that the Nile formerly took a more westerly course at this or a higher level. It can be settled only by more survey and leveling, which pressure of other work unfortunately prevented our undertaking.

AGE OF THE NILE VALLEY IN NUBIA

The foregoing discussion leads back to the question of the age and size of the Nile Valley in Nubia, a question already touched upon in an earlier chapter (see p. 8).

Conjecture on a question of such far-reaching importance may be continued almost indefinitely, but we propose to limit unprofitable theory and to marshal fact and probability as follows:

[12] Since this was printed the route has been traversed by one of us (K. S. S.). Belief in the conclusions here given is greatly strengthened by the new observations.

1. No terrace higher than 300–350 feet is known in Nubia. Relics of the same stage are found in Upper Egypt (see p. 20) on top of the Pliocene gulf deposits. The only positive evidence, therefore, suggests that this and lower stages are Plio-Pleistocene, that is, that the actual valley in Nubia is post-Pliocene.

2. Reference has been made to the narrowness of the valley in Nubia and to the youthful appearance of even the highest terrace compared with the state of denudation of the bounding hills. Such features corroborate the view that the valley is comparatively young.

3. On the other hand, in Upper Egypt Pliocene strata fill a yet older and larger valley which was certainly of fluvial origin. It may be assumed to have been cut at latest in the Pontic Pluvial period (Lower Pliocene), at earliest in Miocene times, since it truncates Oligocene strata in Lower Egypt.

4. Oligocene rivers of which the estuarine deposits occur in the western desert of Egypt (west and southwest of the Faiyum) indicate land lying to their south and west since post- or late Eocene times.

5. It may be assumed that during the Oligocene and Miocene periods much of Nubia was still buried beneath Cretaceous and Eocene strata.

6. A cycle of erosion which removed this covering and caused it to retreat in general in a northerly direction has left no definite river valleys, but only a wide plain of subaërial denudation.

7. Into this plain the late or post-Pliocene valley system was cut in Nubia, the main affluents within our present area being the Nile, flowing from the west side of the Batn el-Hagar, Wadi el-ʿAllaki, Wadi Kharit, and Wadi Shait. It will be noticed that none of these great affluent systems flows from the west or northwest, in which direction the Cretaceous and Eocene escarpments have retreated, and whence more youthful valley systems converge on the Nile.

8. In none of those youthful western wadies is there a suggestion of drainage from the Sudan south or southwest of the Dongola bend, where long and probably very ancient wadies, such as Wadi Melik, are encountered.

9. A study of any good topographical map of Africa shows the Nile basin to be confined between the Red Sea and Abyssinian Hills on the east and the Congo-Tibesti watershed, the "backbone of Africa," on the west. On the south lies high ground across which the waters of Lake Albert have found their way into the basin, while tributaries drain the adjacent slopes. It is impossible to conceive of any outlet from the Nile basin except toward the north.

10. As evidence of the existence of such a northward-flowing river, the Shabluka gorge, about 60 miles north of Khartum, may be cited. Here the processes which caused the Kalabshah gorge (see pp. 59–60) operated on a far greater scale, causing the Nile to cut a magnificent ravine through a mass of igneous rock which it seems might have been avoided had the river not been imprisoned between banks of Nubian sandstone at an early stage of its history.[13]

11. We conclude that a Blue Nile–Atbara (Red Sea Hills) type of drainage, with other tributaries from the basin of the southern part of the Sudan, contributed to the Nubian Nile in Plio-Pleistocene times, since there was no other outlet. It should be emphasized that the river valley in Nubia and Egypt then gained its supply primarily from the Red Sea Hills and the western plains and escarpments, that it was augmented from the south but was by no means dependent upon this source as it is at the present day.

[13] We are indebted to Mr. G. W. Grabham for this information and its interpretation at the Shabluka gorge. While this volume was in proof, the existence of a lake of Upper Eocene or Lower Oligocene age in the Berber district was proved by the collection of fossiliferous cherts by Mr. Grabham and others. The fossils have been identified by Mr. L. R. Cox; see *Abs. Proc. Geol. Soc. London*, Dec. 16, 1932. See also further data by K. S. Sandford to be published in the *Geological Magazine* for June, 1933.

IV

THE LOWER PALEOLITHIC STAGE OF THE PLEISTOCENE

Within the area discussed in this volume gravel terraces and associated rock platforms assignable to a Lower Paleolithic age fall into two groups, a 100-foot and a 50-foot terrace. In only one small locality in Nubia (Dihmit; see pp. 29–30) has an intermediate stage of 75 feet been noted. Both stages maintain uniform heights above the modern flood plain throughout the area and far to the north of it, and thus indicate remarkable stability in Lower Paleolithic times. It has been our good fortune not only to trace and map these and other terraces, but to find in their gravels at sufficiently close intervals representative assemblages of human implements. This, especially in Nubia and the northern Sudan, is a distinct advance on previous knowledge.

In general the ages of the two terraces may be given as:

100-foot terrace	Chellean
50-foot terrace	Acheulean

In more precise terms, the higher terrace contains the oldest implements of which we have any knowledge in this part of Africa, as well as more developed Chellean forms. Coarse flakes also occur which will call for special attention (see p. 74). The lower terrace contains in its gravels all these older forms, as derived specimens from the higher terrace, and also Acheulean implements, together with other types not strictly Acheulean but probably contemporary with that industry. The lower terrace does not contain Middle Paleolithic (Mousterian) cores and flakes, but these are found upon it in "workshop" or flaking sites. The 50-foot terrace is therefore to be considered as post-Chellean and pre-Mousterian. Owing to the absence of implements from the gravels of the 150-foot terrace, the 100-foot stage possesses particular value from a chronological point of view.

The isolated occurrence of a 75-foot platform, already mentioned, is of little value, since its gravels have been almost entirely swept away and no implements were found associated with it.

In view of their widespread occurrence, it is unnecessary to describe every locality in which the 100-foot and 50-foot terraces occur singly or together. It is hoped that the following supplies a reasonable amount of field detail without laboring matters of purely local importance.

THE 100-FOOT TERRACE

Nubia

In the neighborhood of Wadi Halfa Late Paleolithic silts rise to a height of 100 feet above the modern alluvium and therefore obscure the older terrace feature. Abandoned channels at 100 feet within the Batn el-Hagar, as already mentioned, cannot safely be attributed to the Chellean stage and are, in fact, probably Late Paleolithic (see chap. vi).

North of Wadi Halfa, however, the level attained by the silts decreases, and the true 100-foot terrace emerges, usually as a rock platform stripped of its gravel. It may first be seen as a distinct feature about 10 miles north of Wadi Halfa; the river is then bordered by it on one side or the other for many miles. When Faras is reached, on the Sudan frontier, the west

bank is strongly delineated by the 100-foot platform, and the silts are banked against its edge. As already stated, the platform bears small quantities of gravel in which material derived from the Second Cataract appears to be lacking. A broad plain of river erosion stretches westward toward the Nubian hills, crowned by the stately Gebel esh-Sheikh. On this open desert about 20 years ago Professor F. Ll. Griffith found some quartz implements of Lower Paleolithic type. These can now be associated with a known river stage, although they were not found *in situ* in its gravel.

Northward the 150- and 100-foot platforms flank the river until yet higher terraces close in upon it from both sides near Abu Simbel. Beyond the gorge the lower platforms, 150-, 100-, and 50-foot, reappear and dominate the scene as far as Tushkah, north of which (as at Kasr Ibrim) higher terraces again flank the east side of the river. On the west side the low ground is continued as an abandoned channel; and the 100-foot platform, covered locally by hillocks of as much as 15 feet of gravel, is predominant in the Tumas district (Plate V, *A*). Here we found in the gravels rough Chellean coups-de-poing of hard Nubian sandstone. This is the most southerly point at which this type of implement is yet known to occur *in situ* in gravel of the 100-foot stage.[1] The terrace, broken at intervals by later erosion, may be traced onward along the left bank of the Nile to the Korosko bend, which it skirts. Here also, at the foot of the series of platforms already described (pp. 19–20), we found rough sandstone implements in thin gravel of the 100-foot stage.

In 100- to 50-foot times the Nile followed a more direct path across the curve north of Korosko than that which it now takes. It has deepened its bed by cutting down on the right side of its old channel; and it seems probable that the great vertical cliffs, some 300 feet high on this side, which are but little weathered, have been cut during this post-100-foot movement.

North of the Korosko district, through Sayalah and Wadi el-ʿArab, the Lower Paleolithic terraces (100- and 50-foot stages) dominate the river scenery on one or both banks. They may be recognized as far as Kalabshah, north of which they are fragmentary and finally fade away as the cliffs become uniformly low. A wide and low plain of Nubian sandstone stretches to the west and north, in which direction it is interrupted by the reappearance of the sub-Nubian complex of the First Cataract (as at Kalabshah). On the east bank hills rising above the general plain at a distance of a few miles from the river give rise to a steep lateral drainage, some of the wadies containing old deposits which we need not consider here (Dihmit gravels; see pp. 29–30).

Within the First Cataract the 100-foot gravels reappear and play an important part in damming that branch of the cataract which is now utilized by the railway from Aswan to Shellal (see Fig. 13). The gravel extends in a sinuous ridge from side to side of the valley and is noticeable for the considerable size of its pebbles, most of them well rolled or polished, derived from the destruction of Nubian sandstone. Constituents derived from the rocks of the sub-Nubian complex of the cataract are conspicuously scarce, thus suggesting that these rocks were relatively little exposed at the time of the 100-foot terrace. The gravel contrasts strongly with the Late Paleolithic silts which overlap its lower slopes but do not attain a height of more than about 60 feet above the flood plain, either above or below the pebbly barrier. There is no evidence that it was breached in this silt phase, and it plays an important part at the present day as a natural barrage in any consideration of heightening the Aswan Dam. The water of the reservoir already laps a considerable distance up the valley.

In view of the height of the gravel barrier (96 feet above flood plain at Shellal), the size and

[1] The important Ashkit gravels, near Wadi Halfa, contain many Chellean implements but belong to the 50-foot stage (see pp. 30–31).

composition of its pebbles, the position it occupies in the valley and with relation to the silts, and its close resemblance in every way to gravel of the 100-foot stage throughout Nubia, we have no hesitation in identifying it as belonging to that stage.

Upper Egypt

The country immediately north of the First Cataract is very similar to that south of it, the essential difference which the tourist sees in the winter months being an artificial one produced by the Aswan Dam. North of Aswan the low Nubian sandstone and marl cliffs continue for about 50 miles, approximating here and there to the 100-foot platform, but providing no striking feature.

On the east side there follows the plain of Kom Ombo, described in chapter i (cf. Fig. 2). A reconnaissance round its eastern border, across the great wadies which drain into it from the distant Red Sea Hills, reveals a few hills scattered with coarse pebble beds at about 100 feet above Nile flood plain (to be distinguished from the Kom Ombo plain level, which is up to about 60 feet above the river). These, from the contrast they provide with the gravels introduced by the eastern wadies, may be attributed to the Nile itself. Similar gravels occur to about 100 feet on the hills near the Nile north of Aklit, while others project through the silt of the plain itself (see p. 33 and Fig. 5).

West of the Nile the gravels of the 150-foot terrace form the sky line, with traces of a 100-foot terrace across the Nileward spurs. Opposite the Kom Ombo plain the lower terrace is seen to a considerable width; but northward it narrows to the Silsilah gorge (Plate V, *B*), where a deeply incised 100-foot rock platform flanks the present rocky channel (94–100 feet at point of measurement). The 150-foot terrace continues unbroken on a northerly course west of the Silsilah barrier, but platforms of this stage mark the passage of one arm of the river over the hills themselves. This branch persisted in later times, through the 100-foot and all later stages till the modern ravine was cut.

In 100-foot times yet another branch of the great river, probably augmented by the eastern wadies Kharit and Shait, passed east of Gebel Silsilah itself and started the erosion of the valley, now choked with Late Paleolithic silts, up which the state railway makes its way.

Gebel Silsilah and its gorges presented the Nile with most of the difficulties that it had encountered at the First Cataract. It overcame them in much the same way, in 100-foot times, by the unequal erosion of two channels, one of which has since been abandoned. The cataract stage at Silsilah has been succeeded by a single deep channel. Once the barrier of Gebel Silsilah had been negotiated, the Nile had no further difficulties to overcome in 100-foot times. It had but 60 miles or so of soft Cretaceous rocks to traverse before it gained the Pliocene gulf, and no obstacle then lay between it and the sea at any stage of its post-Pliocene history.

The river negotiated these 60 miles in the manner typical of it in Nubia, by cutting a channel on the eastern side of the 150-foot gravel plains,[2] between them and the solid rock. As a result, few traces of the 150-foot platform remain east of the Nile in this part of its course, whereas platform and gravel dominate the west side.

We have traveled over these platforms on both sides of the river by camel and automobile, but have nothing of particular importance to report of the 100-foot stage till es-Sibaʿiyyah Station, north of Edfu, is reached, where there are sections worthy of special attention. A little north of the station is a prominent bluff, round which the railway line bends. It consists of soft Esna shales and limestone which are being extensively quarried. They are covered by 12 feet of typical Nile gravel, a loose conglomerate of quartz and other material from the

[2] Which prevented the river from entering the Pliocene gulf west of Edfu.

Nubian series with igneous and metamorphic rocks brought from the Red Sea Hills to the Nile by the great wadies. The eroded platform on which the gravel rests is about 50 feet above flood plain. The deposit may be traced eastward in a gentle slope for about 2 miles. It has then attained a height of about 100 feet. It ceases abruptly, with a featheredge against the rising surface of the underlying rock. The view toward the Nile from this point shows clearly that in the traverse from the quarries a considerable part of the river bed of the 100-foot stage has been crossed. Levels of less than 50 feet mark a deeper part of the old channel. No later terraces are noted in the depression, but the Late Paleolithic silts have overlapped into it.

The edge of the 100-foot beds may be traced from a distance by observing the contrast in color between the gravel, yellow with quartz pebbles, and the brown solid rock sloping up from beneath it into the hills above. At the margin Lower Paleolithic implements occur in profusion, some in the gravel and slightly waterworn, others just above and on the old river bank, unabraded because they have lain where they were made and have never been incorporated in gravel. Finished and incomplete coups-de-poing, hammerstones, and coarse flakes (see p. 73) lie scattered on the bare surface and in the gravel, the sole relics of early communities living by the river's edge. The implements lie virtually as they were dropped, since subsequent erosion and run-off of rain from the gentle slopes has been taken by rills and wadies.

Among the implements rough Chellean types predominate; but the more primitive forms, similar to those identified as Chalossian[3] by Père Bovier-Lapierre in his implement-bearing gravels at ʿAbbasiyyah near Cairo,[4] are intimately mixed with them, both above and below the edge of the gravel (see Plates XIII–XIX).

It is clear, therefore, that the Chellean industries spread through Egypt during a prolonged river stage. At ʿAbbasiyyah the primitive implements occur in a lower and older bed than the Chellean; here they are mixed and associated. The terrace stage (100-foot) appears to be the same at both places. This, then, is an important fixed point of human chronology in Paleolithic Egypt.

The late Professor A. H. Sayce, writing of the wadies which drain the circle of Nubian hills east of el-Kab, about 7 miles south of es-Sibaʿiyyah, says: "In a breccia near the upper end of one of these wadis I discovered a number of artificially worked flints of the so-called Chellean type, which I handed over to De Morgan."[5] The breccia, no doubt, is local wadi débris or conglomerate. We found Lower Paleolithic implements to be fairly common on the surface of these hills at el-Kab and northward.

The 100-foot platform, with or without gravel, may be traced northward to Esna, where it entered the Pliocene gulf. With a change of lithology in the underlying rocks from hard Nubian sandstone to softer Esna shales and limestone, and now to the yet softer marly clays of the Pliocene, the whole aspect of the Pleistocene deposits is altered. The narrow river gorge, flanked by rock platforms, disappears. The central members of the Pliocene gulf series have themselves been swept away, and the lateral conglomerates and breccia have been touched by the Pleistocene river at only a few points. The wide bays, once filled with Pliocene deposits, formed by the recession of the great Cretaceous and Eocene limestone cliffs, are filled with local gravels left by countless streams which once flowed from this high hinterland of the Nile Valley.

[3] This term was applied by E. Passemard in France. See his "Le Chalossien," *Bulletin de la Soc. préhistorique franç.*, May, 1924, and "Une nouvelle industrie du Paléolithique inférieur plus ancienne que le Chelléen: le Chalossien," Association franç. pour l'avancement des sciences, *Conférences: Compte rendu de la 49e session, Grenoble 1925* (Paris, 1926) pp. 478–81, with other references there given. "Pre-Chellean," "early Chellean," or "primitive Chellean" seem more satisfactory terms; hence "Chalossian" will not be used here.

[4] Paul Bovier-Lapierre, "Le Paléolithique stratifié des environs du Caire," *L'Anthropologie* XXXV (1925) 37–46, and "Les gisements paléolithiques de la plaine de l'Abbassieh," *Bull. de l'Inst. d'Égypte* VIII (1926) 257–75.

[5] *Reminiscences* (London, 1923) p. 297.

Since the Nile stages are missing, it is on these local deposits that we must rely; and they serve well, since they were governed ultimately by the height of the Nile. Thus a regular succession of lateral terraces, stretching for miles into the desert, occurs at 100 and 50 feet above the existing wadi floors, which at their Nileward end conform (within a few feet) to the present level of the flood plain. Paleolithic implements are perhaps more abundant in these local deposits than they are in the Nile gravels, and we can trace the history of the main river in terms of the reaction of the local streams to its changing régime.

The true Nile terraces are seen only at intervals, where they have meandered into the region of local deposits, truncating the wadies and banking themselves against older or contemporary local gravels. The contrast in color is again marked, the white limestone and flint gravel of local origin showing clearly against the darker Nile gravel. Every such inroad of the Nile can be mapped, stage by stage, by this means.

The bay between Luxor and Shaghab on the east side can be clearly seen from the train between Luxor and Aswan. Behind a sea of terraces in imposing array the edge of the Pliocene platform (see Plate II) forms a wall above which tower the magnificent triple peaks of Gebel Rakhamiyyah. About midway between Armant and Luxor, where the desert comes down to the east bank of the Nile, there is a ridge of gravel about 50 feet high beside the canal. Old alluvium and coarse, highly polished Nile gravels are seen in the canal bank, covered unconformably by local gravel. They are probably a part of the river channel of the 100-foot stage, and recall similar sections at es-Siba'iyyah and Kom Ombo.

On the west side the great bay between Medinet Habu and Gebelein is similarly filled; and here meanders of true Nile gravel are to be found on the Nileward slopes, extending about 5 miles into the desert. Careful search will frequently reveal the older types of Lower Paleolithic implements in the local gravels, while they abound on the higher desert, scattered over the surface. The age of the higher local terraces is confirmed by the presence of Middle Paleolithic flaking sites upon their surfaces. From these the discarded flakes may sometimes be fitted together round the core from which they were struck off. It is then undeniable that they have lain undisturbed since the remote date when they were made.

THE 75-FOOT TERRACE OF DIHMIT IN NUBIA

On the west bank of the Nile, opposite Dihmit, about 30 miles south of Aswan, is a well marked rock platform, swept bare of gravel, its landward margin at about 75 feet above flood plain.[6] The platform slopes considerably toward the river, but is truncated by a cliff of some 30 feet, its structural independence of the solid rock being clearly displayed. Old cliffs rise from the landward margin of the platform, and its condition in every way suggests active and prolonged abrasion by a powerful river. It may be noted at intervals as far north as Dabud. This is the only instance of a pause between 100- and 50-foot levels which has come to our notice within the area covered in this volume. It is of special interest with regard to a platform of similar height which we have noted in the Delta and on the Red Sea coast, the details of which have not yet been published.

On the opposite side of the river, in the Wadi Dihmit, is a wadi terrace perhaps associated with the 75-foot platform. Some 15 feet of gravel are seen, a coarse deposit of igneous and metamorphic rocks in the form of shingle and small bowlders mixed with large masses of local Nubian sandstone. The usual association is here reversed, since the wadi has brought the nonsedimentary rocks from the ancient complex while the adjacent deposits attributable to the

[6] Since the flood plain is hidden by the water held by the Aswan Dam, the surface of the water is used as a datum, and flood plain height is computed from the height of water of the day and map measurement of consequent depth of water at the locality. Height of water for any day can be obtained from the records kept at the dam.

Nile are of Nubian sandstone origin. In a side valley the gravel terrace, also loose banks of well rolled material, could be traced to about 80 feet above flood plain (near the mouth of the wadi). At this height it became plain that the gravels were the redeposited ruins of a higher stage (presumably 100-foot), of a branch of the Nile, flowing for a few miles on the east side of its present course and meeting Wadi Dihmit at this point. Rough quartz flakes and disks, probably of Middle Paleolithic age, occur on the surface.

THE 50-FOOT TERRACE

NUBIA

The Nile at its 50-foot stage can be credited with few great achievements. It followed its course of 100-foot level within narrow limits, and where the higher platform occurs the lower may be seen very frequently as a narrow step running below it. There is little doubt that it was a stage of considerable duration, but its platforms and gravel have suffered severely from inroads which the Nile has made upon them by a later erosion and undercutting. This should be borne in mind in comparing it with older deposits, for the younger platform, at its own expense, protected the older by acting as a buffer between it and the Nile.

In the wilderness of the Batn el-Hagar the stage has not been recognized. If it is present near Wadi Halfa, it is buried, like the 100-foot terrace, beneath the Late Paleolithic silts. A few miles down the river, however, near Ashkit, it makes its first[7] and one of its most important appearances on the east bank. A small wadi debouches from the sandstone hills that encircle Wadi Halfa on its northern side, and end in cliffs rising steeply from the Nile. The wadi reaches the river a few hundred yards north of the cliffs. A casual walk in the wadi revealed a number of Lower Paleolithic implements, mostly made of local ironstone; and careful search produced them in quantity, with Middle Paleolithic forms in addition, and showed that all the types found in the wadi abound on the hills above.

It is an astonishing fact that this is the most southerly point at which such implements have yet been found in the Nile Valley. It is, moreover, the only place at which they are yet known to occur in the vast area of the Sudan. Many eyes have searched carefully for them for years in various parts of the country, and their non-appearance must indicate rarity. Yet surely they must occur here and there in this enormous tract, and one can only feel confident that in due time they will be found.[8] Middle Paleolithic implements occur in the silts in the lower reaches of the Second Cataract (see p. 38), but we found no older forms there. We are left at the moment with this remarkable profusion on the borders of a land, much of it barren, the size of Europe—a southern outpost, perhaps, of northern "civilization," as the same district has been at intervals in ancient and modern history.

Implements of Lower Paleolithic type reappear in great profusion south of the Sudan in the region of the Great Lakes, the headwaters of the White Nile, in Uganda and Kenya, while forms suggestive of Middle Paleolithic culture occur not only there but in Abyssinia and Somaliland.

The field relations of the Ashkit implements are of the simplest description. Well rolled Chellean coups-de-poing and other implements occur with slightly rolled Acheulean forms *in situ* in the old wadi gravels. These have been deeply eroded by more recent torrents to form a prominent ridge in this embayment of the hills. Middle Paleolithic flaking sites are

[7] Gravels mounting to about 50 feet may be seen near Abu Hamed, at the southern end of the Dongola bend. They are Nile gravels, no doubt; but they have not been studied.

[8] Since this was written Professor and Mrs. F. Ll. Griffith have found implements of Late Paleolithic appearance on the surface at Merowe, Dongola; a few have been found at the oasis of Lagia Amran; and they occur farther south in the Nile Valley.

scattered over the ridge, indicating its antiquity as a fixed deposit. The gravels sweep out on to a well marked rock platform, and the association of implements is maintained. The geological aspect is therefore of the commonest type displayed by any river and its tributaries, and such as is seen in countless places along the Nile. The height of the platform, which is continued north and south of the mouth of the wadi along the Nile border, is 48 feet above flood plain at the point of measurement, a figure indicating the 50-foot terrace. Overlapping the platform and its gravels lies the Late Paleolithic silt, with its own assemblage of implements, here mixed with fine pebble sand or gravel partly derived from the rocks of the Second Cataract. The pebbles bear a high polish, and the younger deposit is quite distinct from the older.

Northward from Ashkit the 50-foot platform is frequently seen, as already stated, as an undercliff of the 100-foot platform, especially on the east bank. On the west (as in the Dibeira and Tushkah districts) it is often concealed beneath the younger silts or masked by drifting sand.

Between Tushkah and Kasr Ibrim an important feature, noticeable but less marked farther south, is well displayed, namely, that the wide floors of all the great wadies which debouch from the Eastern Desert conform to the height of the 50-foot Nile platform (Plate VI, *A*). Although it is true that narrow torrent gorges are cut deeper, piercing the platform to present flood level, it appears that the main erosion of these important tributaries ceased after the period of the 50-foot platform. This suggests strongly that the rainfall which had rendered earlier erosion possible was greatly reduced in this southern district at this time, a theme upon which more will be said later (see p. 36).

In the lower part of the Korosko bend, as already mentioned, a lateral shift to the right bank, probably instituted at the time of the 50-foot terrace, led to the abandonment of the old channel and to the cutting of precipitous cliffs.

The platform is frequently seen through the Sayalah and el-ᶜAllaki districts, usually bare of gravel, sometimes finely displayed as a sharp feature cutting across all the irregularities, dips and faults, of the solid rock. Gravels which may in part belong to this stage occur at and near the mouth of the great Wadi el-ᶜAllaki, the tributaries of which, now dry, formerly drained a very wide area of the Nubian Desert, stretching across the Sudan frontier into the northeasterly part of the Korosko–Abu Hamed desert and draining an extensive sector of the Red Sea Hills. That being so, it is not surprising that the region of its mouth should be a wide and depressed area, since drainage from the coastal ranges may be considerable, even at the present day. In this respect it differs from some of the wadies farther south to which reference has already been made. Even if allowance is made for this wide collecting ground, however, the mouth of the Wadi el-ᶜAllaki illustrates the tendency of the northern wadies, great or small, to be wider and nearer to present flood plain than those of the southern region.

There is reason to suspect that rainfall continued longer in the north than in the south; or, to state it conversely, the cessation of major erosion of tributaries at the 50-foot level becomes a marked feature south of Wadi el-ᶜAllaki. The traveler from the north does not appreciate it as a factor much before that point is reached.

The platform is continued at intervals north of el-ᶜAllaki and is last seen in Nubia as a well marked feature in the Dihmit district. It is not recognizable in the complex of the First Cataract.

Upper Egypt

The platform is not well marked between Aswan and the Kom Ombo plain, in contrast to its widespread preservation north of the plain as far at least as Esna. The existence of a channel

below the plain itself, however, is a matter that calls for special attention. In a number of localities, notably between the Nile and the town of Kom Ombo and between this and the hills north of Aklit, coarse deposits of cobblestones and gravel make their appearance from beneath the mantle of Late Paleolithic silts. The outcrops between the town and Gebel Fatirah (north of Aklit) mount so high that they are probably best considered as relics of the river channel of 100-foot times; for, as already stated (p. 27), remains of such a stage survive on the hill just named. It may fairly be assumed, in fact, that the Nile in 100-foot times followed a course very similar to its present one, but somewhat to the east; it will be remembered that the eastern marginal gravels occur on the low hills which rise from the silt east of Kom Ombo. Moreover, we may assume that at that time the river received large supplies of water and gravel from the Wadies Kharit and Shait. The western side of this channel is still well marked by the 100-foot terrace west of the Nile's present course.

We gain the impression, then, that an old Nile channel, of which at least the margins belong to the 100-foot stage, lies beneath the silts of the Kom Ombo plain, and that it should prove to be deepest, and the silts thickest, along a line not far removed from that taken by the state railway. The channel probably branches somewhere south of Gebel Silsilah, since we know that at the 100-foot stage the river flowed through the valley now occupied by the railway as well as through the existing gorge.

We shall now show that the gravels of the 50-foot stage are contained as an inner lining in this ancient channel.

First, the edge of the 50-foot terrace is seen on the west side of the Nile beneath the 100-foot ledge.

Secondly, on the east side of the river, from the pumping station of the Wadi Kom Ombo Company (near the temple of ancient Ombos) to the mouth of the Silsilah gorge, low gravel hills border the flood plain. These generally conform to a height of about 50 feet or a little less, but they are seen to slope fairly steeply toward the east and to dip beneath the Kom Ombo silts. This is particularly clearly marked in the most southerly exposures (a little north of the pumping station), where the western limb of the cross-section of the old channel can be clearly seen. Rain falling on the coarse pebble beds and running down their easterly slope has washed away some of the overlying silt, thus further exposing the channel almost to present flood plain level. Wind has probably been even more effective in this process of denudation, since the dusty surface of the great plain is easily raised in dense and choking clouds by comparatively slight breezes. The Nile has cut through the western limb of the old channel, where it was less impeded by the thickest accumulation of silt, and produced its present course.[9] The section illustrated in Figure 5 is thus obtained.

The question of the age of the gravels is in no doubt, since we found *in situ* in them a large number of Chellean implements, all waterworn in varying degree, and a lesser number of slightly worn Chellean-Acheulean or Acheulean types—in all a valuable collection (see Plates XXI–XXIII).[10] Here, as elsewhere, abundant unrolled Middle Paleolithic flakes and cores lay on the surface of the gravels. These have been covered by the silt without being disturbed and are now being laid bare by its denudation.[11]

[9] It should be remembered that here and northward nearly to ʿEdwah the gravels rest unconformably on exceptionally soft sand, believed to be of Pliocene age (see pp. 8–11), which would be more readily undermined and removed by the river than would the great body of silt occupying the old channel. This, simply Nile mud, would form a highly resistant body when saturated with water.

[10] M. E. Vignard found "une superbe limande acheuléenne" (*Bull. de l'Inst. franç. d'arch. orientale* XXII [1923] 4) at the same place.

[11] A Middle Paleolithic deposit also is concealed in the channel, or at least at its mouth. It contains rolled implements (see p. 44).

A little farther north, near Nagᶜ ed-Dib, a further indication of the course of the old channel is seen: seams of gravel (Plate VI, *B*) about 3 feet thick are intercalated with about 10 feet of ancient Nile alluvium, and Chellean implements are present. This section is closely comparable with a channel section in northern Egypt.[12] Farther north again, on the "island" of Aklit, an outlier of the old gravels is enveloped by modern alluvium. A cobble-and-bowlder deposit rises to nearly 60 feet, intercalated mud is reduced almost to nothing, and the concen-

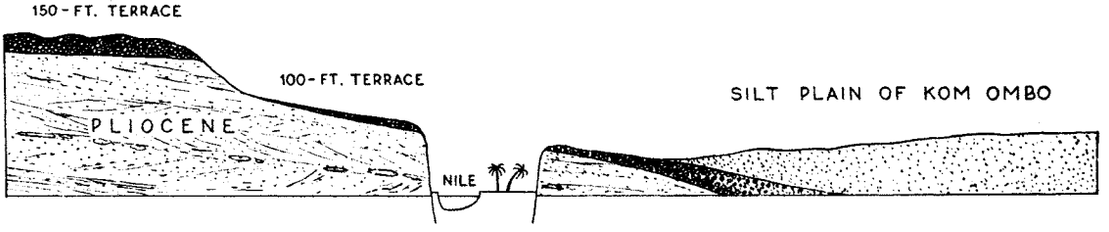


FIG. 5.—SECTION FROM THE KOM OMBO PLAIN WESTWARD ACROSS THE NILE

tration of beautiful Chellean implements, all waterworn, is at its richest. A few specimens of later type also were found. It is evident that this section lies well up the western limb of the old channel.

Outflow from the Kom Ombo plain, with more recent river activity, has destroyed much of the gravel north of Aklit; but between Gebel Fatirah and Sebil the eastern limb of the channel, or of part of it, comes to the surface. Coarse gravel, with rolled Chellean implements,

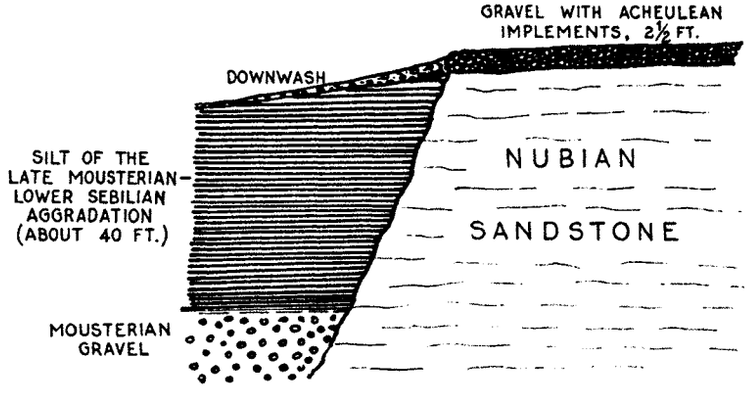


FIG. 6.—SECTION IN THE RAILWAY VALLEY SOUTH OF EL-KAB, SHOWING SILTS BANKED AGAINST THE 50-FOOT TERRACE

protrudes through the silt plain and everywhere shows a slope toward the Nile. In Lower Paleolithic times, therefore, at least a part of the river negotiated the Cretaceous hills by a course to their west, as at the present day.

Finally, the gravels of the 50-foot stage are seen about 4 miles south of Gebel Silsilah, immediately south of Fatirah village. Flat-topped hills run parallel to the Nile and about half a mile east of it for 2 or 3 miles. They form the southern rim of the Kom Ombo plain at this point, having a steep slope or cliff on this side (due to overflow erosion from the plain toward the gorge) and a gentle slope toward the Nile. A few feet of coarse gravel ćap this well marked platform at 46–50 feet above flood plain, resting on disturbed Esna shales. A little south of the village the outflow from the plain has led to the cutting of a deep wadi through the cliffs,

[12] Described in *OIP* X 32–34.

in which good sections are exposed, while north of the village is a broad gully. This marks the northern end of the old channel, or part of it, which thus reappears from beneath the silt opposite the Silsilah gorge. Another branch passed through the railway valley, unless, as seems improbable, this carried only the waters from the Wadies Kharit and Shait. The gravels of the second valley are still hidden (for the greater part) beneath the silt.

North of Gebel Silsilah, through the gorge, the 50-foot platform is a regular feature, an undercliff to the 100-foot stage as in Nubia, everywhere independent of hard or soft beds or of structure in the rocks it traverses. Its gravel is usually missing, but waterworn surfaces are common, and, especially near es-Sirag, the larger pebbles and bowlders of the old gravel are to be found in pockets and potholes. Here and there it is overlapped by the later silt.

An important section (Fig. 6) is to be seen in the railway cutting a little south of the late Mr. Somers Clarke's house at el-Kab. Here $2\frac{1}{2}$ feet of coarse gravel of Nile origin (i.e., not a locally derived deposit) lie on a well marked platform of Nubian shales at a little under 50 feet. The gravel yielded unpatinated flakes and implements of Acheulean type (see Plates XXVI–XXVII). Coarse gravels (probably of Middle Paleolithic age) are banked against the foot of the section and are covered by Late Paleolithic silts which rest unconformably against the edge of the 50-foot gravels. North of el-Kab the platform is seen at intervals, but no features of note present themselves.

On passing into the region of the Pliocene gulf north of Esna the 50-foot stage is represented in the same way as the 100-foot stage, the occurrences of which have already been described in that area (see pp. 28–29). It is strikingly developed in the great bays both east and west of the Nile between Armant and Luxor, and Acheulean implements are occasionally found *in situ* in the local gravels.

V

THE MIDDLE PALEOLITHIC STAGE

CHANGES OF INDUSTRY, RIVER, AND CLIMATE

The stratigraphical relation of Middle Paleolithic or Mousterian implements to the deposits of the Nile is one of more than usual interest, since it involves more complex processes than we have encountered in the older stages. It may be said with truth that the Mousterian period marked the birth of the modern Nile and the creation of its neighboring deserts, and its close is the datum from which purely archeological investigation should start. The reason for the last statement lies in that which precedes it, the growth of deserts. This overwhelming change drove wandering Man to settle in the Nile Valley and in other favored spots, cramped his hunting, and finally forced him to live on the fauna of the valley and its immediate environs and to depend largely on fresh-water shells for food. The period of kitchen middens is thus heralded, and with it settlements which the excavator might hope to investigate with greater success than the geologist.

The later stages of these changes carry us into the post-Mousterian epoch, which will be considered in due course; but it is not too early to stress here the extreme importance to the archeologist of the changes we are about to consider. Before passing to a description of the field evidence, we will state for the sake of clarity the major conclusion to which it leads.

Mousterian levels and change in culture.—These may be summarized as follows:

Upper Egypt	1	30-foot terrace
	2	10-foot terrace
	3	Basal part of silt
Nubia	3	Basal part of silt

In other words, the terrace stages of the Mousterian are virtually limited to the region of the Pliocene gulf; in the Nubian zone as far as the Second Cataract they are missing or hidden under the upper parts of the younger silt phase.

A study of the implements leads to the conclusion that nearly the whole of the Mousterian industry is to be found *in situ* in Upper Egypt, whereas the basal part of the silts gives only its later developments. In Nubia, however, the flaking sites on the neighboring hills show that the older parts of the industry are represented in the district, even if not seen *in situ*. The surface discoveries in Nubia, though lacking precise stratigraphical position, gain importance in view of similarity of form of implements to those found *in situ* in Upper Egypt, where, in view of the abundance of the geologically dated material, surface specimens are of relatively little value.

The technique of the implements found in Nubia is precisely the same as that of the Upper Egyptian implements, in spite of the fact that Nubia affords as materials only hard sandstone and ironstone, quartz, quartzite, and other igneous and metamorphic rocks. The Mousterian of the terraces of Upper Egypt, beautiful in form and technique, ideal in simplicity if wasteful of material, consists generally of large cores and flakes with bold though effective primary flaking and fine retouch. Development tended along the line of reduction in size (not governed by any lack of material) and increase in the delicacy of primary and secondary flaking.

This change is very clearly marked on passing from the terraces to the base of the silt. It is continued, as will be shown, in the succeeding industries until the ancestry of the core finally employed would scarcely be recognized.

We shall endeavor to make these changes in technique clearer in the following pages. The impression that becomes dominant in studying them and their relation to the stratigraphical evidence is a sense of unlimited time. Compared with the development of industries from primitive Chellean to superb Acheulean, the Mousterian river movements seem to span almost as long an interval. The cutting of deep channels in living rock from 30 feet to present alluvium level or lower, and the building up of the lower part of the silt phase, must have taken a very long time indeed.

Changes of river and of climate.—Another fundamental change overtook the Nile in Mousterian times. From a great river capable of excavating a deep valley and of hurrying along a vast load of pebbles and cobbles, it descended to its present form, although keeping the same gradient. The change is marked by the two low terraces of Upper Egypt, both smaller than their predecessors of Lower Paleolithic times. Since they carry wadi gravels (the equivalent Nile gravels are almost entirely lacking), they indicate the amount of local run-off, which they show had been appreciably reduced. The 10-foot gravels especially are torrent beds rather than regular deposits. They suggest the type of rainfall in the existing thorn scrub semi-desert of the northern Sudan or the Red Sea Hills. The entire lack of wind-etched material in the Mousterian or earlier deposits of Upper Egypt indicates, however, that the rainfall, though reduced, had not altogether ceased. There is, indeed, no evidence for absolute desert at so early a period.[1]

When we turn to the younger Mousterian beds of Nubia, we find a very drastic change from the earlier stages. In the first place, the Second Cataract was now in full use as the Nile's route round the northern end of the Dongola bend. Variable, but on the whole rather small, gravels, the ingredients highly polished, were poured out over the lower reaches of the cataract about Wadi Halfa and carried at least as far north as Tushkah. Compared with the adjacent older deposits, though these may have been more locally derived, the younger deposits are of insignificant size and quantity. But the contemporary local deposits are similarly reduced, and the general impression gained from the lowermost beds of the silt phase is one of reduced local supply and of an appreciable amount of material carried well northward from the Second Cataract.

We would emphasize that there is a great body of evidence to indicate the following facts, which have been determined solely by field work:

1. The failure of *local* run-off was appreciable between the northern Sudan and the el-ᶜAllaki district in 50-foot times, and it was an established fact by their close (i.e., by the end of Acheulean times).

2. A similar failure, with a premonitory reduction in bulk of material in 50-foot times, overtook the northern part of the Nubian zone and Upper Egypt in the earlier part of Mousterian times and was complete before the end of the period. We suggest that the climatic belt of reduction of rainfall spread from south to north, as far as the Nile Valley was concerned.

3. Though the local supply was failing, the Nile remained markedly active, far more so than it is now, till an advanced period of the Mousterian. A considerable amount of true bed-erosion was achieved.

4. By the time the Mousterian culture had become locally evolved to such an extent that it

[1] The vermiform markings on some limestone pebbles in this and all other gravel deposits, conglomerates, or breccias may be attributed to existing desert conditions in Upper Egypt. The markings tend to be limited to pebbles on or near exposed surfaces.

is called by another name (older Sebilian) the gravel phase was all but past, and the Nile from the Second Cataract northward was overwhelmed by vast quantities of silt.

5. The silt came through the Second Cataract, filling up many of the old channels, and may safely be presumed at this stage of the argument to have been derived from farther south, where climatic changes of enormous importance had taken place or were now going on. The supply there may have been partly aeolian, partly, perhaps, contributed from the basins of the White and the Blue Niles.

We shall return to these later phases subsequently. It will be well now to pass from this brief generalization, from which it is hoped a working knowledge of the new conditions will have been gained, and to review the field observations. These will be given in order of age of deposit (or implements), causing some deviation from the geographical treatment adopted in the foregoing chapters; so far as possible, however, the same treatment will be maintained.

THE 30-FOOT TERRACE

The 30-foot terrace is but little seen in the area covered by the present volume, but it is widely developed in the district north of Luxor. It may be identified among the wadi stages of the bays east and west of Armant, where it becomes locally the dominant terrace. Coarse flakes and cores and an occasional hand ax (cf. Plate XXVIII) are associated with it and are found redeposited in the 10-foot gravel there adjacent to the older terrace. Although they do occur sporadically, such flakes and cores are not common in Nubia. The terrace is not known south of Esna, where it has been eroded away or covered up by the silts.

THE 10-FOOT TERRACE

The 10-foot terrace is ubiquitous in the region of the Pliocene gulf in Upper Egypt, and a more advanced type of implement than that associated with the 30-foot stage abounds in its gravels. It is unnecessary to give a detailed account of its occurrence in this district. It may be studied conveniently between Medinet Habu, the Coptic church near by (Plate VII, *A*), and the Valley of the Queens' Tombs (Plate VII, *B*), and also at the northern end of the Theban necropolis in Wadiyein and North Valley. Implements abound *in situ* (Plate VII, *B*) in the gravels and are particularly abundant in the exposures at the southern end of the necropolis and in the northern end of the Armant bay (see Plates XXIX–XXXIX).

A critical section may be observed between Medinet Habu and the Coptic church (Plate VII, *A*), where the later silts overlap the gravels unconformably to a height of 18 feet above flood plain. The silts are crowded with shells of *Corbicula*, and implements occur sporadically.[2] It will be noted that the silts were deposited by the Nile, while the gravels are of local origin. A considerable aggradation is thus indicated. The 10-foot Nile terrace itself has been destroyed or hidden. The section illustrates what may be seen at intervals from Luxor to the Second Cataract, namely, the southward thickening of the silts.

In Nubia the industry of the 10-foot terrace, though not found in bedded deposits as a definite horizon, appears mixed with younger types in the base of the silts. Also it may be found, unmixed with other material, in flaking sites situated on the hills bordering the Nile. Such sites have been located at a number of places in Nubia, notably on the 150-foot platform above the village of Abu Simbel (east bank), on the 100-foot platform at Faras, on the 50-foot (Acheulean) gravels near Ashkit, and on the hills behind them.

[2] We are indebted to Mrs. James H. Breasted for the discovery of this important section, the only one of its kind close to Thebes and Luxor.

DEPOSITS OF YOUNGER MOUSTERIAN AND OLDER SEBILIAN AGE

The great silt phase may be divided into two parts:

1. Aggradation phase, later Mousterian and early Sebilian.
2. Degradation phase, later Sebilian.

The former may be included in this chapter. It comprises the basal parts of the silt, usually an intercalated series of fine gravels and silt, which may be regarded as Mousterian, and the main mass of silt,[3] which is Lower Sebilian. The term "Sebilian" was introduced by M. Vignard as a result of his study of the Kom Ombo plain.[4] It may be defined briefly as a Nile Valley industry which developed in its early stages from the Mousterian during some part of the time occupied by the Upper Paleolithic industries in Europe. In its early phase it is virtually indistinguishable from the late types of Mousterian. At its close it is barely distinguishable from the Tardenoisian, and outside influences have probably become involved. In the early part of this volume it has passed under the title of Late Paleolithic, "Late" being used to avoid confusion with the distinct industries of the European "Upper" Paleolithic; but a general contemporaneity may be postulated.

The degradation phase will be described in the next chapter. Of the aggradation phase the following is a general survey from south to north, described by means of special areas. Broadly speaking, it may be said that the silt occurs throughout the area, its upper margin descending from 100 feet at Wadi Halfa to 18 feet at Luxor. It is locally absent, owing to removal by rain and wind.

NUBIA

Wadi Halfa.—The silt occupies a broad area on the east bank from below the town to the lower reaches of the Second Cataract (see Fig. 7), where highly polished gravel of rather small pebbles sweeps over higher parts of the cataract long since abandoned. Late Mousterian and older Sebilian flakes and cores abound in the gravel and are almost without exception waterworn. In the plain, northeast of the foot of Khor Musa, the gravels pass under and over silt which seems to be of approximately the same age. Fresh-water shells are abundant in the silt, and fossil bones occur.[5]

On the plain east of Wadi Halfa there are some exposures in the lower parts of the silt. In one of these, a pit between the town refuse-incinerator and the railway, a large unworn Mousterian flake was found firmly imbedded in compacted mud. It is noticeable that there are practically no shells in this lower part of the silt; but higher up, where the fine gravels with rolled Sebilian implements begin, toward the sides of the valley, they become increasingly numerous.

On the west bank the silts are preserved to a height of 100 feet above flood plain between the Rock of Abusir and a point opposite Wadi Halfa. They are protected from northerly and westerly winds by the 150-foot platform and in part by the 100-foot platform, which they overlap, and they are banked against the edge of the lower platform to their greatest known thickness. In their upper part only Sebilian implements of older type occur, and their surface is sprinkled with flakes and cores of the younger Sebilian. The two are easily distinguished, apart from

[3] Limy concretions, about the size of a sparrow's egg, are characteristic inclusions of the silt from Wadi Halfa to Luxor.

[4] Vignard, *op. cit.* 1–76; see also review by Boule in *L'Anthropologie* XXXIV (1924) 568–71.

[5] The following species of mollusks were obtained: *Cleopatra bulimoides* (so common locally that the ground is appreciably whitened by the shells), *Viviparus unicolor*, *Corbicula artini*, *Unio willcocksi*, *Aetheria elliptica* (see Plate XLIII). Early references to the silts will be found in a paper by A. Leith Adams, *QJGS* XX (1864) 6–19, and to the mammals in another by R. Lydekker, *ibid.* XLIII (1887) 161–63, in which he describes a "Pliocene" horse and other species collected here and near Kalabshah during the Anglo-Egyptian Sudan campaigns. From this latter account, and from others to which reference is made in the paper, it emerges that the remains were obtained from the Pleistocene silts; hence the suggested Pliocene age of the horse can hardly be admitted. The fauna includes *Equus* sp., a gigantic hippopotamus, a deer, and an antelope. Compare the fauna of the Kom Ombo plain, page 52.

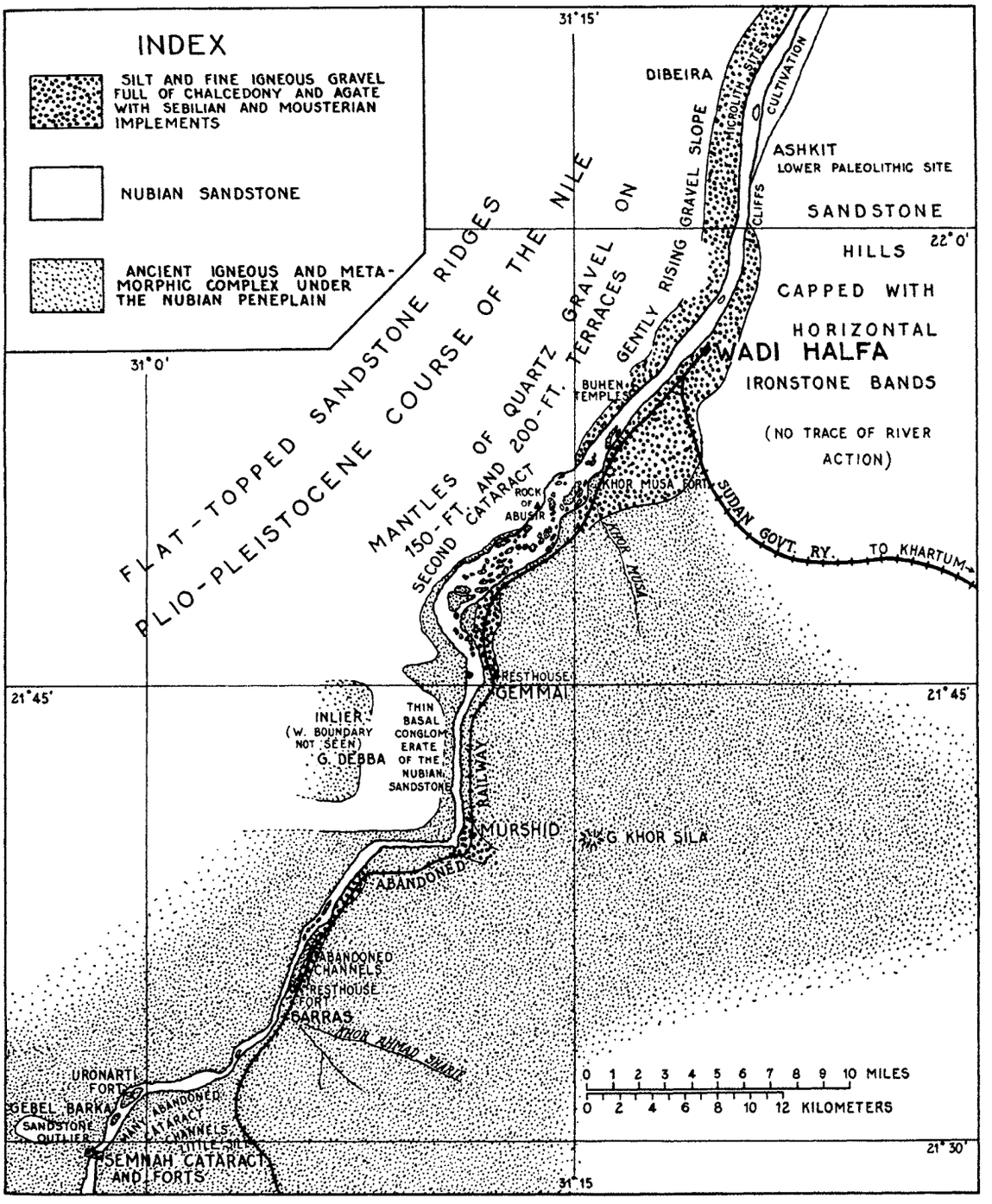


FIG. 7.—THE DISTRICT OF WADI HALFA AND THE SECOND CATARACT

typological differences, by the waterworn condition of the former and the fresh and sharp edges of the latter. The surface sites of younger type may be traced down the flanks of the silt toward the Nile until they lie on lower layers from which implements of Mousterian appearance are weathered out. The degradation phase is thus marked by surface sites; but accurate measurements are not possible here owing to the general, though slow, lowering of the surface by wind.

The silts in the embayment southeast of Wadi Halfa suffer severely from wind erosion, and surface concentration of implements is marked.[6] Nevertheless, although the older forms and waterworn Mousterian material are much in evidence, there are but few later Sebilian types.

Dibeira.—Mention must be made here of the exposures at Dibeira West, on the left bank of the Nile, although they are better considered in connection with the degradation phase (see pp. 48–49). The feature of importance in the present context is the contrast between the quartz gravels of a terrace which ends in a cliff at about 115 feet above flood plain and the gravels which lie at its foot at 98 feet. The latter are composed essentially of material derived from the Batn el-Hagar. The Second Cataract was therefore in full use at the height of the aggradation phase, and there was a strong current. We have already shown that it was pouring out gravel at the beginning of the phase (gravel near Khor Musa, south of Wadi Halfa).

From its maximum height of 98 feet the gravel slopes gently toward the Nile, and the coarseness of its pebbles is sufficient evidence of the activity of the river. Among them are rolled Mousterian implements of late type and shells of *Corbicula*. Older Sebilian implements were not noticed; but it may be presumed that they occurred in silts which have since been removed. They appear in the remarkable beaches of the degradation phase which run across the lower slopes (see Fig. 10).

Abu Simbel district.—At the mouth of the great gorge, and on the east bank a few miles south of Gebel Addah, the silt is weathered by wind erosion into hillocks as much as 30 feet high.[7] Later Sebilian flakes and small cores, relics of surface sites, are scattered over the surface, pointing to the completion of the aggradation and abandoning of the silt plains by the river by the time the Sebilian industry had advanced to this point of its culture. Farther from the river the silts become more sandy and more resistant to wind, and the hillocks fade away. The sand was contributed from the neighboring cliffs of Nubian sandstone. To this point the country has been submerged by silt to the 100-foot level, or a little less, and, except for the general absence of modern wadies cutting through this pall, little direct evidence of climatic conditions can be obtained.

North of the Abu Simbel gorge the upper limit of the silt falls markedly, and wind erosion has cleared it away from long stretches of the Nile's banks, revealing the 100- and 50-foot platforms. Almost every wadi, however, is choked at its mouth by silt, which may be traced for considerable distances up the tributaries also. As now seen, the silt forms plugs at the mouths of the wadies wherever they protect it from the prevailing northerly or westerly winds. Close inspection in such places shows that the silt is undisturbed, not redeposited, and an insignificant watercourse cuts it, indicating the total amount of water erosion since the maximum of the aggradation phase. No more striking or conclusive evidence of the failure of local rainfall could be obtained; hundreds of plugged wadies and smaller *khors* between the two cataracts tell the same story (see Plate VIII).

[6] The small limy concretions, many of them spherical, also become concentrated on the surface of the silt here and farther north.

[7] Some of these have been shown to be sites of remarkable burials, and they are reported by Messrs. Emery and Kirwan, who excavated them, to be entirely artificial; see *The Times* (London), January 11, 1932. We are also indebted to Mr. Emery for further information on the subject. It has not been demonstrated that *all* the hillocks, of whatever shape, are artificial; this seems to be most improbable.

Tushkah.—One of the most important sections of the aggradation series is to be seen in a shallow wadi immediately north of Tushkah, and the same succession may be noted in other wadies south and west of the village (see Plate IX, *A*). The first section is about half a mile from the river. It is noteworthy for the presence of a layer of well rolled gravel intercalated between a lower and an upper silt (Fig. 8). In and below the gravel a number of unusually beautiful Mousterian flakes were found. They belong to a period which can be but little later than that of the highest culture of the 10-foot terrace of Upper Egypt. They are made of extremely hard siliceous Nubian sandstone. All are more or less rolled, and they seem to be associated with the lower and coarser part of the gravel, which has a total thickness of about 2 feet and at this point is 33 feet above flood plain. Cores were entirely absent, but they were found subsequently upon higher ground, on the surface of the Nubian sandstone, where they were worked. Their absence at this point in the gravels is probably due to mechanical under-water sorting.

In the same gravel, but in its upper part, was a marked horizon of smaller flakes, rectangular, but about twice as long as broad, of late Mousterian type, much waterworn. Again cores were

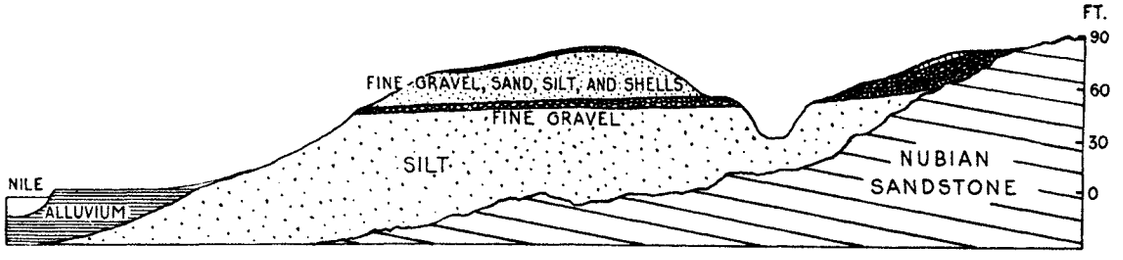


FIG. 8.—SECTION ACROSS THE LATE MOUSTERIAN-EARLY SEBILIAN DEPOSITS ON THE WEST BANK NEAR TUSHKAH

absent. On top of the gravel, in coarse sand and in the lower part of the overlying silt, were Lower Sebilian cores and flakes, waterworn. These and the rectangular flakes were made of brown flint.

Lastly, rolled and unrolled small flakes and cores were found on, and perhaps in, the upper silt. Most of them were made of agate or chalcedony and were of rather later Sebilian type. Others were of quartz or ironstone, more rarely of fresh igneous or metamorphic rocks, including a beautiful green epidote. The position of this class is not entirely certain; but the rolled implements were notably of older type, probably later forms of the older Sebilian, and the unrolled flakes, small and delicately made, are probably surface specimens of the period of degradation.

On tracing the deposits away from the Nile (westward) it was found that the gravel thickened and replaced the silts, but it remained fine and ascended gently. With it the Mousterian horizon also mounted higher and higher until, at the margin, only gravel remained and the Mousterian was mixed with the older Sebilian in a featheredge of gravel resting on the Nubian sandstone. The height at this point was about 70 feet above flood plain.

The same series was traced a few miles farther south also, the featheredge there being at about 80 feet. The discrepancy is accounted for partly, no doubt, by error of measurement, though this is small, and partly by the absence of silt in the first featheredge, owing to erosion, whereas it survived in the second.[8]

The abundance of flint pebbles is a notable feature of the gravels. A myth has grown up among archeologists that flint must have been imported into Nubia from Upper Egypt. But

[8] It contained a fresh-water fauna of *Unio willcocksi* and *Corbicula*.

the presence of flint pebbles here disposes of such a theory and draws attention to the geological map, which shows how nearly the flint-bearing Lower Eocene rocks approach the Nile Valley in this district, though they were last seen near Edfu.[9]

Korosko.—The wide valley which leads from the village into the Eastern Desert is filled with silt. No better example could be found of the results of the aggrading process by which the tributary valleys were flooded. Since that time an insignificant channel has been freed by water running down the great valley. The silt between the high bounding walls forms a definite topographic feature with a clearly marked upper limit. The British military cemetery, of the days of the Gordon relief campaign, is situated on this feature, a mile or more up the valley.

About 3 miles downstream from Korosko, on the same side of the river, a wadi reaches the Nile between precipitous flanks of Nubian sandstone. Seen from the river it appears to be completely choked with silt. Close inspection reveals a torrent bed little more than 15 yards wide at its mouth, which represents the total amount of post-silt excavation by local run-off. Moreover, there is evidence here of the run-off having failed already in the aggradation phase. The silt stands at a maximum height of 70 feet (or a trifle less) above flood plain. It has flooded the wadi from the Nile inward, maintaining complete horizontality, and there is no cone of local detritus, or scree, or local stream fan, opposing it or interbedded with it. The fine sections cut by rare torrents in the narrow channel referred to show the following details:

1. The silt contains marked bands of coarse material shot in from the wadi sporadically by heavy rains, but they do not approach torrent beds in size; they indicate a state of affairs akin to the present, of cloud-bursts at rare intervals.

2. The silt itself varies from pure mud to sandy mud. Bedding is regular, and concretions of limy material suggesting in form sticks and twigs occur in places remote from the inflowing current from the Nile.

3. The silt lies on an extremely coarse and very hard conglomerate made up of local rocks, indicating a pre-silt abundance of detritus in the wadi. In the narrow torrent bed it is unconformable with the conglomerate, but irregular pockets of gravel fill hollows in the underlying surface. The surface of the solid rock below the conglomerate is well worn by water, surface and conglomerate rising to about the same height as that attained by the silt. On the opposite side of the wadi, remote from Korosko, the conglomerate rises from beneath the silt in a long ridge.

4. Clearly, then, the silt belongs to a period of aggradation when at least the shorter wadies of the eastern desert normally brought no water to the Nile. But it succeeded a period of heavy local rainfall.

No significant implements were found. The age of the silt is now sufficiently well known, but it would be especially interesting to discover precisely the age of the conglomerate. The latter descends below the level of the 50-foot terrace and, since it floors the whole wadi, may be assumed to be post-Acheulean. It marks the excavation of the tributary to the level of modern flood plain (its base is seen in the present torrent bed), but not deeper. It appears to be long anterior to the main aggradation period (late Mousterian–older Sebilian). In time and in level,

[9] It should be recorded that many of the flint pebbles here are battered as on the seashore and are indistinguishable from those of the Oligocene gravels of Middle and Lower Egypt. A flake collected by us in the Second Cataract region bears impressions of two small gastropods. Mr. L. R. Cox of the British Museum (Natural History) identifies them as *Melanoides* (*Tarebia*) cf. *acuta* (Sowerby), a species which occurs in the Lower Oligocene of England. A closely related species has been described from the Upper Eocene of Libya. It would therefore seem that at least some of the flint in Nubia, though perhaps derived via Oligocene gravels, is of later date than the bulk of the Egyptian flint or chert (which is of Lower Eocene age). See p. 24, n. 13.

therefore, it seems to fall in the interval between the 30-foot stage and the close of the 10-foot Mousterian stage in Upper Egypt.

North of Korosko.—In this area the silt is seen at the mouths of many of the wadies (Plate VIII) and in low ridges near the Nile, but no exposure calls for special attention.[10] Its upper margin is appreciably lower than in the southern part of Nubia, scarcely attaining 50 feet above flood plain. In these exposed reaches of the river this may be due partly to wind erosion; but associated gravels are also missing, and one gains a strong impression that its level falls. North of Girf Husain it is scarcely seen above the water ponded back by the Aswan Dam, which also floods the *khors* and small wadies. At the First Cataract it is again in evidence as an aggradation stage, and its upper margin is well defined.

First Cataract.—It may be stated briefly that at the First Cataract three channels exist. That which the river now follows contains no trace of silt. That occupied by the railway from Aswan to Shellal is blocked by a ridge of 100-foot gravel (see p. 26); but silt has filled both upstream and downstream parts of the valley and lapped against the ridge, attaining a height of 60 feet above flood plain. The third valley, followed by the road from the dam to Aswan, is completely choked with silt interbedded with disintegrated granite in the form of felspathic quartz grit.

Upper Egypt

Beyond the occurrence of silt here and there, no evidence of the phase of aggradation calls for special notice between the First Cataract and the Kom Ombo plain.

Kom Ombo plain.—Reference has already been made to the valuable work of M. E. Vignard in this district.[11] His researches enabled him to establish the following:

1. An ancient period of "filling up of the basin with gravels" (first period of high water level) = 150- and 100-foot terraces.
2. A Mousterian period of vertical erosion (gravels at the base of the silt).
3. A post-Mousterian and Lower Sebilian period of high water, when the basin was filled with silt and the maximum level attained.
4. A Middle and Upper Sebilian period of vertical erosion, with increasing desiccation.

M. Vignard credits the Silsilah barrier with the control of these movements and suggests that it was broken down in the two periods of down-cutting: at the first, with cataclysmic results; at the second, by overflow at the maximum of the silt phase causing rapid removal of a barrier at the site of the gorge now in use.

M. Vignard's observations and our own are identical, but our interpretation differs by reason of the discovery that the processes are not local but widespread. It will be readily understood that M. Vignard's first (ancient) period of high water level is that marked by the widespread terraces of the 150-foot and Lower Paleolithic ages (see pp. 21, 27) embracing the great gravel plain west of the Nile, opposite Kom Ombo. We have shown that they are continued as rock platforms over the Silsilah barrier and north of it. The chaos of rocks which he notes from Silsilah (Kagug) to Edfu is not a sign of any cataclysm due to a bursting of the barrier, but results from local erosion by wind and water subsequent to the formation of the rock platforms.

The first phase of low water level and the second of high water (Mousterian to Lower Sebili-

[10] On the west bank, near Khattabab, bones of *Hippopotamus* were added to the usual molluscan fauna and implements.

[11] See pp. 32, 38. His memoir (*Bull. de l'Inst. franç. d'archéol. or.* XXII 1–76) contains a few minor inaccuracies from the purely geological point of view and in certain respects has a somewhat local outlook, except that its concluding paragraphs appear to strive after an unduly wide application. Such criticism, however, is outweighed by admiration for M. Vignard's successful research, which, carried out under difficulties, marks a new era in the prehistoric archeology of Egypt.

an) which he establishes were not merely local events. In this chapter it is shown that they may be detected from Wadi Halfa to Luxor. The second period of erosion is likewise a major event in the history of the Nile, though first proved by M. Vignard in the Kom Ombo plain.

In the Kom Ombo district the silt occupies an area of considerably more than 50 square miles,[12] mounting with variable thickness to some 60 feet above the present flood plain. The credit for fixing the age of its top and bottom belongs to M. Vignard. First, in 1920, he found Mousterian implements and cores *in situ* during excavations for irrigation works a little downstream from the great pumping station at Bayarah, at a depth of 13 meters (i.e., about 40 feet), that is, at about the present summer level of the river. Reference to Figures 2 and 4–5 will show that here lies the upstream end of the old channel of the Nile, already proved to pass under the silt of the Kom Ombo plain (see pp. 32–33)—a channel on the flanks of which occur Mousterian sites overlapped by the silt.

Further evidence of aggradation is hardly necessary, but the following sections which we noted in 1931 may be quoted:

1. A little south of Nagᶜ ed-Dib a well marked terrace of coarse gravel standing at 25–30 feet above flood plain cuts into the higher (Acheulean) gravels. Although the section is obscured by scree, the gravel seems to lie on the eroded surface of the Pliocene sands and to pass under the silt toward the northeast. Rolled Chellean and (rare) Acheulean implements occur in the gravel, with a few Mousterian implements which are but slightly waterworn. No Sebilian implements were found in the gravel.

2. A similar gravel, at 20 feet, was seen *under* the silt in an unobscured section a little north of Aklit; but no implements were found.

3. A little east of Munihah Mousterian implements coated with tufa were found below the silt. Since the sections show the sub-silt Mousterian gravel, it follows that the Nile had already cut a channel, to which it returned in the later degradation phase, in the soft Pliocene sands west of its Lower Paleolithic course. It is probable that the Lower Paleolithic channel remained in use in Mousterian times and that the Nile cut a subsidiary channel on its western flank, thus striking a direct course to the Silsilah gorge.

It appears from M. Vignard's memoir that he found no Lower Sebilian implements in the great mass of the silt, which seems to be barren, but he proved conclusively that they occur in its highest levels. In the period represented by the accumulation of the great thickness of alluvium the industry had evolved from a definite Mousterian culture to a specialized form clearly descended from the Mousterian and retaining most of its characters. This we have since traced from the Second Cataract to the Delta.

The absence of implements from the mass of the silt in the Kom Ombo plain is readily understood on purely ecological grounds: habitation was impossible until the mud flats were abandoned by the river and became swamps. Along the draining channels and round the swampy lakes and ponds Man and riverside mammals established themselves as soon as they were able—namely, after a fall of river-level. By the time this was appreciable, cultural development had advanced beyond the Lower Sebilian, which marks the first colonization of the mud flats, to Middle Sebilian. The subsequent stages of the fall of the river, with its effects on the Kom Ombo plain, will be considered in chapter vi.

North of Gebel Silsilah the silt is seen to overlap the 50-foot terrace, as already described (p. 34); but it reaches no higher. The following sections complete the evidence of the Mousterian to Lower Sebilian aggradation:

[12] The greater part of this area is already irrigated by the pumps of the Wadi Kom Ombo Company.

Edfu district.—The silts are well developed on the west bank from the lower end of the Silsilah gorge nearly to Edfu, where they are broken for a short distance by cliffs. They lie at the foot of older terraces, especially the 150-foot stage, and downwash from the older gravels has led to some interlamination of silt and gravel. A considerable current below the gorge is also shown by the lithological change in the beds, which rise to a maximum of 60 feet above flood plain. The following section, recorded about 8 miles south of Edfu, is typical:

Bed		Feet
7	Laminated coarse sand and gravel downwash	8
6	Dark brown earthy mud with "root" marks	8
5	Soft yellow sandstone	4
4	Dark brown earthy mud	3
3	Soft yellow sandstone and gray marl with concretions	3
2	Laminated coarse sand and gravel downwash	3
1	Gray marl with concretions	4
	Total	33

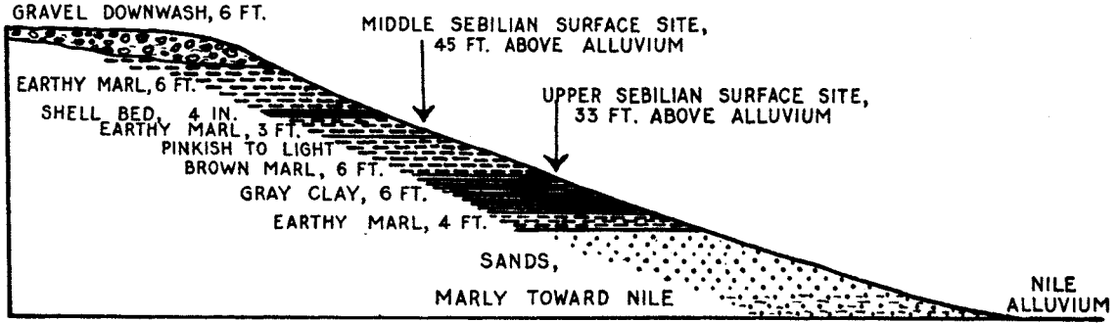


FIG. 9.—SECTION OF SILTS WITH LATER SURFACE SITES, ON THE WEST BANK ABOUT 7 MILES SOUTH OF EDFU

Such changes occur locally throughout the silt, and there is often false bedding on a large scale. Less than a mile away northward the following section (Fig. 9) could be traced on the surface, locally swept clear of dust:

Bed		Feet
8	Gravel downwash from 150-foot terrace	6
7	Earthy marl	6
6	Hard clay with special fauna: *Planorbis alexandrinus* Ehr., *Bulinus truncatus* (Audouin), and *Valvata nilotica* Jickeli (all abundant)	½
5	Earthy marl	3
4	Pinkish to light brown marl	6
3	Gray clay with small spherical concretions	6
2	Earthy marl	4
1	Sands, passing toward Nile into brown and gray sandy marl with concretions as above and normal fauna of *Unio willcocksi*, *Corbicula consobrina-artini*, and *Cleopatra bulimoides*	25
	Total	about 56

About a mile farther north Mousterian implements were found in the lowest member of the series, about 10 feet above flood plain (where Bed 1 in the foregoing section begins).

It should be clearly understood that the section represents a phase of continuous building up, that is, the aggradation phase, in the basal part of which the Mousterian, of late form, is thus seen to occur. Lower Sebilian implements were not found *in situ*. We may add that the

degradation phase also is marked here by sites occurring on the face of the slope, independent of bedding but regulated by height. An upper flaking site at 45 feet contained material of Middle Sebilian type; a lower, at 33 feet, provided the most delicate microliths associated with the Upper Sebilian. Other sites of Middle Sebilian type were found in the immediate vicinity of the Mousterian implements and at about 40 feet.

The following vertebrate remains were found in the silt about 15 feet above the Mousterian level: *Hippopotamus, Equus* sp. (cf. the Nubian specimen, p. 38), *Bos* sp., crocodile (dermal plates), and siluroid fish.

On the east bank, from the hills opposite Edfu emerges the great Wadi ᶜAbbad, which is filled with silt. About a mile from its junction with the cultivated land some well sections were seen in 1931. The first showed 8 feet of silt resting on a coarse and well rolled wadi gravel about 4 feet thick (base not seen). The second, about 100 yards nearer the Nile, showed the gravel reduced to small lenticles and stringers interbedded in silt. The gravels probably represent the last phase of the Mousterian river in the wadi, after which the silt flooded into it from the Nile without interruption.

Hierakonpolis–el-Kab–Esna.—On the west bank the silt is continued from the Edfu sites, first along a part of the river course which it has choked, causing the river to abandon it, and then beside the present stream. A few miles south of the ruins of Hierakonpolis the silt expands and fills an embayment of some few square miles. The surface is white with fresh-water shells (mostly *Corbiculae*) which have weathered out of the upper layers. The ruins of Hierakonpolis, predynastic and later, rest on it at about 20 feet and less. The surface is sprinkled with later Sebilian flakes and cores, and the silt itself is seen to about 50 feet above flood plain. It follows, therefore, that the whole of Sebilian times had passed away and the silts had been eroded to their present contour before the period represented here by the earliest of the predynastic remains.

North of this locality the silt may be traced for many miles, but becomes increasingly fragmentary. It covers a considerable area on the west side about midway between Edfu and Esna, where the valley is at its narrowest, to a height of about 20 feet. It will be remembered that it occurred at about the same height near Medinet Habu. Since good exposures of its landward margin are available as far north as Hierakonpolis, where they reach 50 feet, it follows that there is a considerable fall in level, relatively to modern flood plain, from Wadi Halfa to this point. Isolated patches of silt occurring farther north, at increasingly lower levels, suggest that the fall is continued in the downstream direction. Some of these, between Gebelein and Medinet Habu, are important (see p. 47).

On the east bank a section in a railway cutting near el-Kab has been described on page 34.[13] Another important section may be seen in the valley which reaches the Nile from the eastern hills at el-Kab. The mouth is occupied by silt, but down the center coarse gravels are exposed by the modern torrent bed, which has cut 15 feet into them. In the continuous sections thus afforded we found in the main gravels unpatinated implements of older Mousterian form.

The top two or three feet of gravel, in strong contrast to those below, consist of small and well rounded pebbles and contain a few flakes of older Sebilian type. This finer upper portion is therefore the wadi equivalent of the silts that flank it, and there is undoubtedly a long time interval between lower (Mousterian) and upper gravels. The diminution in coarseness of the material brought in by the wadi is also of great interest. Too much stress should not be laid

[13] In the silt at el-Kab we obtained several specimens of *Unio* (*Caelatura*) *nilotica* (Cailliaud). The species is recorded by Miss Gardner as subfossil in the Faiyum (*Mémoires présentés à l'Institut d'Égypte* XVIII [Le Caire, 1932] 48), but it does not seem to have been previously recorded from the Paleolithic silts of Upper Egypt. It is very local, and we never found it in association with *U. willcocksi*, the common form.

on the type of the Sebilian implements, since the upper gravel probably belongs to the degradation phase (cf. pp. 49–51). On the surface of the upper gravel and on the wide wadi floor predynastic implements occur.

North of el-Kab the silt is seen in a number of small embayments (as at es-Sibaʿiyyah Station, p. 28), rising to a height of about 25 feet. These show precisely the same features as those already described, and do not call for special attention. Similar exposures may be seen near the mouth of Wadi Shoki (immediately south of Esna), but at the mouth only, not up its course. Between this point and Esna patches of silt may be seen near the edge of the desert resting on a conglomerate of local limestone rubble and well rounded pebbles (presumably the Mousterian horizon). The silt itself contains later types of Sebilian implements which have dropped from the surface down cracks and often remain in a vertical position. They thus indicate that they are not truly *in situ*.

Gebelein–Armant.—North of Esna the exposures on the east bank occupy low ground and bays, the silt usually resting on local conglomerates which may sometimes be proved to be of Mousterian age. The general upper limit, even in situations favorable to preservation, does not exceed 25 feet above flood plain. The last exposure is seen a few miles south of Luxor.

Special attention was given to the west bank in 1931, after the completion of the first draft of this volume. A patch of silt some few acres in extent was noted about 3 miles north-northwest of Gebelein. It fills an embayment of Mousterian gravels of local origin, upon which it is seen to lie, and owes its preservation to its secluded position. It is the last major occurrence, in point of size, as the silt is traced northward. In common with smaller patches farther north, it rises barely 20 feet above the modern alluvium.

An important discovery was also made near the edge of the desert about 6 miles south of the Egypt Exploration Society's house (Sir Robert Mond's house) at Armant. Here a lenticle of wind-blown sand was found intercalated in the silt. So far as is known, this is the only record of a defined mass of aeolian sand in the silt of Nubia or Egypt. Its bearing on the question of contemporary climate is considerable.

The section was as follows:

	Feet
Silt	3
False-bedded wind-borne sand in dome-shaped lenticle or dune	0–4
Silt	3

The upper and lower silts are continuous outside the limits of the lenticle.

It is a matter of some interest that at the present day sand still sweeps off the high Eocene scarp, traverses the low ground in a series of crescentic barchans and ill defined dunes, and enters the cultivated alluvium at this locality.

North of the Egypt Exploration Society's house patches of silt are marked features along the road to Medinet Habu. The summit level of this last clearly marked exposure on the west bank has fallen below 20 feet. The fall in level already described seems, then, to be maintained.

VI

THE LATE PALEOLITHIC STAGE

The lower or older part of the industry known as the Sebilian has just been described from a geological point of view. The present chapter deals with the phase of degradation, or destruction of the high silts and lowering of river-level, during the remainder of Sebilian times. In the southern part of our area the process still continues. The later changes are reserved for another chapter, to which the whole of the evidence collected at Semnah is deferred to form a connecting link between historic and prehistoric times.

Enough has been said in chapter v to demonstrate the grand scale on which the silts were formerly developed and to show that later stages of the Sebilian industry marked the period of the fluviatile destruction of a large part of the ancient alluvium. It has been shown that the later Sebilian implements occur on the surface from the top of the denuded masses of silt down to the present flood plain. It remains to fix this more precisely in relation to falling river-levels. This may be done by a number of critical sections.

Throughout Nubia it is apparent that the stages of degradation will be found only with reference to the Nile itself; in contrast with our experience of Lower Paleolithic gravels, the local deposits and wadies are useless. We have already shown, in fact, that there were no tributary deposits at this time, since the local drainage had been reduced to occasional torrents in the valleys, the mouths of which had been choked with Nile alluvium.

In spite of this, we found no evidence in the silts of Nubia of the existence of sand drifts or dunes, such as now creep into the Nile from the western shore. That the surface run-off had failed is clear; but the present desert of drifting sand on the west bank was not yet in existence, and it seems reasonable to suppose that the surface was still held by scrub or grass, as in parts of the northern Sudan at the present day, nourished by rains which rarely produced surface run-off. We would draw a distinction between failure of run-off, that is, failure of the earlier type of rainfall, and the condition of absolute desert, which had not yet been attained. Sand was already blowing, however, at least in some parts of Upper Egypt.

The degradation phase in Nubia (omitting Semnah) may be illustrated by a single section, that at Dibeira West, which might be corroborated, were it necessary, by others (e.g., Tushkah, Plate IX, *A*).

NUBIA

Dibeira West (Fig. 10).—The higher part of the section has already been described (p. 40). A gentle slope of gravel, containing rolled Mousterian implements, falls from the margin at 98 feet to a level of about 68 feet, where it is broken by a prominent ridge about 5 feet high. The ridge runs parallel to the Nile, with its top at 73 feet, for a considerable distance (traced over about a mile) and displays the features of a beach. Rolled implements of older Sebilian type, which were lacking in the gravel slopes above, make their appearance in its shingle, together with rolled Mousterian material. No fresh implements of older Sebilian type occur, and the material in the "beach" is so rolled as to suggest that it had passed through considerable vicissitudes before it came to rest here. The 68- to 73-foot level may be regarded as of late older-Sebilian or more recent age, that is, perhaps Middle Sebilian, but pre-Upper Sebilian.

Below the marginal gravel ridge the slope is continued, the pebbles becoming very coarse here and there, until, at a height of 40 feet above flood plain, it passes under a light gray silt. Along the margin of the latter for a considerable distance microlithic implements occur in very large numbers. They are limited to this margin and are evidently *in situ* in flaking sites on, in, and just above the featheredge of the silt; they are, in fact, the relics of a riverside industrial activity. In type they belong to the youngest group of Sebilian culture, and they indicate the river-level of their time.

Important as the Dibeira West section is, there are gaps in the sequence. These may be filled by the study of other districts, especially the Kom Ombo plain and Edfu.

UPPER EGYPT

Darau-Edfu.—The attention of an observant traveler on the railway between Aswan and Luxor is drawn to a prominent ridge of gravel between the railroad and the Nile at the southern end of the Kom Ombo plain, close to Darau. It serves to introduce the degradation phase in Upper Egypt, since it contains abundant flakes and cores, much waterworn, of Lower and

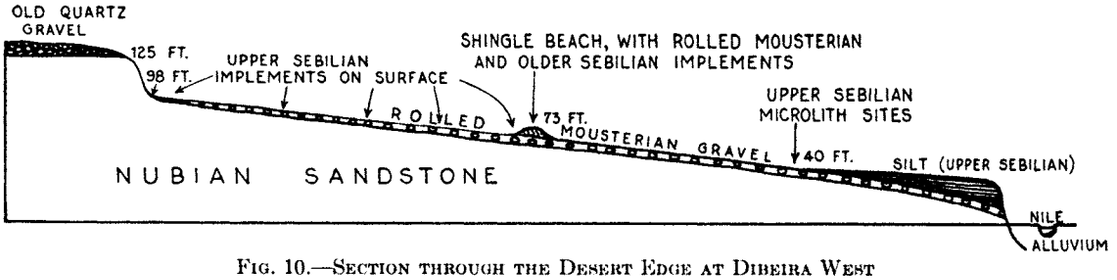


FIG. 10.—SECTION THROUGH THE DESERT EDGE AT DIBEIRA WEST

Middle Sebilian types. A closer inspection shows that a great shingle bar curves away from the cliffs on the east bank near Khannak and marks the strongest part of the westward curve by which the Nile skirts the Kom Ombo plain. The bar attains a height of 26 feet above cultivation. It is then broken by the railroad and an isolated headland of Nubian sandstone, beyond which it rises to its maximum height of 40 feet above cultivation south of Darau (see Fig. 2).

Behind it, on the landward side, the level of the silt is much reduced, but rises gradually farther back to the full height of 60 feet. The intervening hollow is probably due largely to wind erosion. Eddies and gusts of wind are thrown back by the cliffs of Nubian sandstone which run close behind the southern part of the bar.

Two processes seem to have been involved:

1. Reduction in the level of the silt, with concentration of its coarser elements.

2. A re-working of these elements by the Nile, as well as the introduction of its normal load from the south, *pari passu* with the reduction of the silt. The bank became isolated by (*a*) the further fall of Nile level, leaving it high and dry, and (*b*) the destruction, still in progress, of the silt on the landward side.

At first sight the bar might be interpreted as a beach piled up at the southern end of the Kom Ombo lake by the northerly winds; but against this must be set the following considerations:

1. Its level is 20 feet below the highest level attained by the lake silts. Therefore, if the shingle bank represents a beach, it can only be a beach formed during a pause in the contraction of the lake—that is, in some part of the degradation phase. Moreover, it contains much-

rolled Lower and Middle Sebilian implements, which would not have been available until after the completion of the aggradation phase.

2. There is no corresponding beach at the maximum level reached by the silt. The margin of the silt was carefully traced along the edge of the Nubian sandstone, and no comparable shingle bank was discovered.

3. The absence of a shingle beach at the period of highest water level shows that the Kom Ombo basin was not a lake like that in the Faiyum, but a marsh or network of pools and mud flats comparable perhaps with parts of the Sudd region at the present day.

From these considerations it would seem that the shingle bank was a marginal accumulation or "lateral beach" of the falling Nile on the convex side of a wide and wind-swept bend. On such a bend the river would drop its load through loss of velocity, and the waves lapping against the bank of older silts would form a true beach, perhaps partly above water, but mostly under water, indistinguishable later on from the beach of a lake.

Further evidence of a fall in Nile level is forthcoming in the immediate vicinity, in a small wadi cut in the mass of the silt opposite Khannak Station. The wadi is so short that the levels preserved in it may be attributed directly to Nile influence and given in terms of height above flood plain. Each level is marked by a small step covered with fine pebble sand, independent of any layers in the body of the silt itself. The heights are 51, 46, 36, 32, 28, 26, and 24 feet respectively.[1] The top level, 51 feet, is virtually the present maximum height to which the silt is preserved. No implements were found.

In view of the level of the Nile in post-Middle Sebilian times, as shown by the Darau bar, the heights of the riverside flaking sites on the west bank near Edfu (pp. 45–46) are of particular interest. They have already been given as

Middle Sebilian	45 feet
Upper Sebilian	33 feet

On the evidence of the sites, therefore, the Nile was below the 45-foot level in Middle Sebilian times; but the Darau bar shows such implements rolled and incorporated in a Nile deposit at this height. The Edfu site thus seems to be within the range of the river's vertical erosion in Middle Sebilian times, and the following data will show that considerably lower levels were attained before the advent of Upper Sebilian times:

1. At the northern end of the "island" of Aklit (p. 4) there is a wide expanse of fine gravel resting on silt at 20 feet above flood plain. The gravel, though thin, contains rolled Lower and Middle Sebilian implements, but none of Upper Sebilian form.[2]

2. At es-Sirag ballast is dug on a large scale for use on the railroad. It consists of highly polished pebbles of rather small size and contains certainly Lower, and perhaps Middle, Sebilian flakes in similar rolled and polished condition. On the Nileward side sand and fine gravel predominate and mount in a ridge to 23 feet above flood plain. On the landward side silt lies behind this barrier. This is the Darau bar over again.[3]

3. Across the mouth of Wadi ʿAbbad, opposite Edfu, a similar bar is a marked feature, likewise at 20 feet, with the great silt plain behind it.

It seems, then, that the 20-foot level is a definite stage in the period of degradation, and that it was pre-Upper Sebilian.

[1] The height above wadi may be obtained by deducting 16 feet from each of the foregoing, this being the height of the wadi floor above flood plain.

[2] A little south of Fatirah, on the long slope—covered with varying thicknesses of silt—from the gravels of the Lower Paleolithic stage to the Nile, a prominent cobble beach runs at 20 feet. No implements were found, but it may be associated with this stage of degradation.

[3] A rolled and polished tooth of *Ibex* was found at es-Sirag.

The 33-foot site south of Edfu corroborates the further fall before Upper Sebilian times; and the occurrence of its implements (of types not yet found *in situ* and rolled in a Nile deposit) on the surface (Plate IX, *B*) of the silts almost to present flood plain indicates that the present level had been attained before the close of Sebilian times. The Nile deposits of this age, at least in Upper Egypt, seem either to have been destroyed or to be hidden below the modern alluvium.

Kom Ombo plain.—Such is the evidence of the Nile itself. There remains the Kom Ombo plain, which the streams of running water, continually attempting to accommodate themselves to the sinking Nile, drained with increasing thoroughness.

Here we must once more refer briefly to M. Vignard's work, which we had the good fortune to study in detail on the ground before the advancing belt of irrigated land submerged many of his best localities and destroyed them.

Briefly, he found Lower and Middle Sebilian mixed at the highest levels, the latter purer at lower levels, then passing to Upper Sebilian, which is purest at the lowest levels. This alone indicates the stages of degradation clearly enough. We may complete the survey by reproducing one of M. Vignard's figures and quoting his own words: "Les premiers Sébiliens étaient cantonnés aux quelques points les plus élevés émergeant des eaux du marécage; leurs descendants du II[e] niveau s'établirent légèrement en contre-bas des endroits antérieurement habités

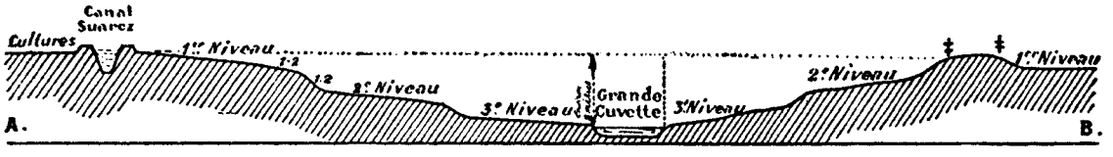


FIG. 11.—TYPE SECTION OF THE KOM OMBO SILTS (FIG. 1 OF M. VIGNARD'S MEMOIR)

sur la pente des anciennes rives d'abord, puis plus tard sur de petites bandes de terre qui émergèrent au retrait des eaux."[4]

The points marked ‡ on our Figure 11 (M. Vignard's Fig. 1[5]), inhabited during the early part of the emergence but not later, yielded bones, but no shells. Over the whole zone occupied at the second stage, but especially in the second part of that stage, M. Vignard found refuse heaps or kitchen middens of fresh-water *Unio* shells in a state of perfect preservation, mixed with flint chips, bones, cinders, and fragments of hard rock. Such shells, with *Corbicula consobrina*, which was likewise collected and eaten, occur in the silts with valves united, in position of growth, at levels which were still covered by water.[6]

Finally, speaking of the Upper, Third, or Microlithic Sebilian, M. Vignard says: "Cette période vit l'apogée et la fin de la civilisation sébilienne dans nos contrées. L'assèchement du désert arabique entre dans une phase très active, le débit des fleuves de l'Est diminue de plus en plus; ils tarissent peut-être parfois, concentrant, surtout vers la fin, l'occupation humaine auprès des cuvettes où viennent se réunir les dernières eaux."[7]

The kitchen middens of this stage are much less important than those of the Middle Sebilian, and in M. Vignard's opinion suggest a much shorter human occupation. This bears out the evidence obtained from the Nile deposits. They contain similar objects. There is evidence that bone was used in the Upper Sebilian at least, if not before; but there is no sign of artistic work on any of the objects.

[4] Vignard, *op. cit.* p. 13.

[5] Reproduced with his kind permission and with the consent of the Institut français d'archéologie orientale.

[6] This does not imply that the Nile was still at a high level.

[7] *Ibid.* p. 29.

As an indication of the length of time that elapsed between the Upper Sebilian and the earliest of the predynastic periods, it may be noted that no trace whatever of pottery has been found in any Sebilian horizon. The fauna which M. Vignard found with the implements and in the kitchen middens also bears witness to the length of the time interval. It includes two extinct species, *Bos primigenius* and *Bubalus* nov. sp. We are much indebted to M. Vignard for the following provisional list, drawn up by M. Gaillard of Lyons: *Hyaena crocuta, Equus asinus, Hippopotamus amphibius, Bos primigenius, Bos africanus, Bubalus* (buffalo) nov. sp., *Bubalis boselaphus* (antelope), *Gazella isabella,* and two fish, a siluroid (synodontoid) and *Nodularia coelatura.*

CONCLUSIONS

At Dibeira West Middle Sebilian time had begun, it may have ended, with the 68- to 73-foot "beach"; it had certainly closed before the 40-foot level was reached by the Nile, for this is undoubtedly the riverside habitation- and river-level (perhaps flood level) of Upper Sebilian times.

At Darau the 40-foot level is Middle Sebilian, pre-Upper Sebilian. The lowest known Middle Sebilian flaking site is at 45 feet (south of Edfu). This seems to limit the Middle Sebilian.

In lower, 20-foot levels (ᶜEdwah to Wadi ᶜAbbad) rolled Upper Sebilian implements still fail to appear in the gravels. There thus appears to be a considerable break in the human sequence.

The lowest known Upper Sebilian site is at 33 feet, but the river was apparently then below 20 feet. This, with the striking relation of Upper Sebilian sites to river silts at Dibeira West, suggests a temporarily greater rate of river-fall than obtains at present.

The outstanding fact is the absence of Upper Sebilian implements from the 40- to 20-foot bars between Darau and Wadi ᶜAbbad.

VII

PREHISTORIC AND HISTORIC CHANGES IN NILE LEVEL—THE FINAL MOVEMENTS LEADING TO THE PRESENT ERA

In the last chapter we have seen the river falling and cutting its way down through the silts piled up in the preceding phase of aggradation. As it fell, the flint industries of the people living along its banks passed through the later phases of their Sebilian evolution, becoming more and more diminutive until they reached the microlithic stage which may be compared with the Capsian of other parts of North Africa.

In the Faiyum depression in northern Egypt we traced the same succession of phases in implement evolution and diminution through a similarly falling series of water-levels marking pauses of a shrinking lake. The Faiyum lake was filled and controlled by the Nile, and its history therefore served as an index to the history of Nile levels of the time. But in the Nile Valley all those chapters of Late Paleolithic history are buried beneath a thick covering of alluvium, which accumulated during a subsequent phase of aggradation.

That the aggradation is still continuing throughout Egypt, at least as far as the First Cataract, is proved by the fact that the temples and monuments built on the alluvium by the dynastic Egyptians are already partly buried. Each year the summer inundation adds its quota to the pile of sediment already accumulated and so increases by the thickness of one layer the height to which the fields rise round the old monuments. The greatest rise has taken place in the Delta, where all traces of cities which flourished as late as Ptolemaic times have been covered; but the same effects are apparent in lesser degree in Upper Egypt, where the ever rising Nile threatens to destroy the buildings of Karnak by seeping into the stone and undermining the foundations.

Attempts have been made by archeologists to estimate the rate of accumulation of the silt in historic times by measuring the extent to which monuments of known date have been buried. By this means Sir Flinders Petrie has arrived at an average figure of $4\frac{1}{2}$ inches per century;[1] but it would seem that too much importance can be attached to such results, since local conditions cause great variability.

We shall have more to say on Lower Egypt in a subsequent volume. For the present purpose all that concerns us is that the last phase of the Nile's movements below the First Cataract has been one of aggradation, with the result that the final Paleolithic and later stages have been buried beneath the rising alluvium.

In Nubia this last movement never took place; and probably all except the lowest few feet of the Late Paleolithic stages of sinking Nile, with the marginal deposits formed during the pauses in its descent, are still open to the sky. Forty feet above present cultivation at Dibeira West we found microliths of final Sebilian workmanship strewn along a once inhabited river bank which had obviously never since been covered up. At Edfu similar sites were found at 33 feet, associated with piles of shells from mollusks used by the Sebilians as food, resting on older silts (of the preceding aggradation phase) which rise behind them. In the Kom Ombo plain the classic instance was first worked out by Vignard (cf. pp. 51–52). There the high

[1] This figure Sir Flinders has recently verified for us in conversation and correspondence.

plain of silts up to 60 feet, built up during the aggradation phase, is channeled and furrowed by water subsequently draining off the plain into a falling Nile.

That the downward cutting of the Nile continued after Paleolithic times is demonstrated by the arrangement of the successive habitation sites of predynastic and dynastic dates excavated during the archeological survey of Nubia. Professor Reisner has said, quite independently of any considerations of the Paleolithic history of the river, that in Lower Nubia "the shifting of the cultivation from higher to lower terraces between the Predynastic Period and the Old Kingdom must have been due to a fall in high Nile level."[2] At the present day the river flows through a rocky valley, with a thin blanket of alluvium covering the sides.

Thus it seems to be established that while in Egypt, probably up to (or almost to) the First Cataract, the Nile has since the beginning of Sebilian times first cut down its bed to an unknown depth and then built it up again, in Nubia the process of degradation has gone on continuously until the present day.

EROSION AT THE CATARACTS

The two cataracts which we have had opportunities of examining, the First and Second, both come in the purview of this volume, and with them a somewhat isolated barrier at Semnah which some regard as a separate cataract, others as nothing more than a part of the Second Cataract. In addition narrow gorges or abandoned valleys at Kalabshah, Silsilah, and el-Kab call for mention here.

The Semnah cataract.—Since the expedition of Lepsius through Nubia in 1842–45 it has been known that at Semnah, under one of a pair of dynastic forts that guard the cataract, there exist 12th–13th dynasty records of high-Nile levels about 26 feet above the highest inundations of the present day (Plate X). The data discovered by Lepsius were examined from a geological point of view in 1850 by Horner.[3] He surmised that either a ledge or barrier at Semnah had been gradually worn away by the river, or that before the records were made some dam or perhaps a large landslip had blocked the river somewhere below Semnah, the obstruction having since been washed away. Sir William Willcocks suggested that Amenemhet III may have built a dam at Semnah.

Whatever the explanation, the high-Nile records continued to be quoted in numerous historical and archeological works, with various interpretations, until in 1902 Dr. John Ball, of the Egyptian Government Survey, paid a special visit to Semnah in order to investigate the locality. In his report[4] Dr. Ball described the cataract at Semnah in detail, confirmed the accuracy of Lepsius' reading of the inscriptions and of his measurements, and concluded that the narrow rock barrier constituting the cataract had been lowered 26 feet by the erosive action of the river. He pointed out that the gneissic rock barrier which stretches across the river is only some 200 meters in width, with an area of 100,000 square meters, and that the amount of rock removed since the reign of Amenemhet III would have been about 200 cubic meters (weighing approximately 500 tons) per year. In view of the fact that, apart from pebbles and bowlders, some 60 million tons of silt are carried over the barrier by the Nile every year, and that the foliation planes of the gneiss are parallel to the direction of the current and therefore most favorable to the formation of channels, he concluded that the removal of 500 tons of rock per year "is not only not impossible, but highly probable."[5] He found no trace of any dam or other obstruction either at Semnah or at any likely place downstream.

[2] *Excavations at Kerma* I (in "Harvard African Studies" V [1923]) 5.

[3] *QJGS* VI (1850) 384–85.

[4] *QJGS* LIX (1903) 65–79.

[5] It should be remembered that the silt is subject to continual erosion by the varying volume of the Nile's water, not merely to seasonal or marginal scouring by flood waters.

On our visit to Semnah in February, 1930, at the instigation of the Director of the Institute we confined our attentions to an attempt to elucidate the earlier history of the cataract and the river in the neighborhood before the cutting of the Nile records. This was the one aspect of the problem not touched on by Dr. Ball and his predecessors, and at the same time it most directly concerned our work in the more normal stretches of the river below the Batn el-Hagar.

Accepting Dr. Ball's interpretation of the Nile marks, it was to be inferred that, if the river had lowered the Semnah barrier 26 feet in the last 4,000 years, it had probably effected proportionately great erosion of its bed in other parts of the Batn el-Hagar. There may have been other comparable barriers which have been entirely removed or reduced to a group of islands, which will be the ultimate fate of the existing barrier at geologically no very distant date. In this region, in fact, it is reasonable to suppose that the general lowering of the river profile is brought about principally in a series of steps by the formation and removal of barriers and obstructions, the positions of which are determined by the varying hardness of the rocks.

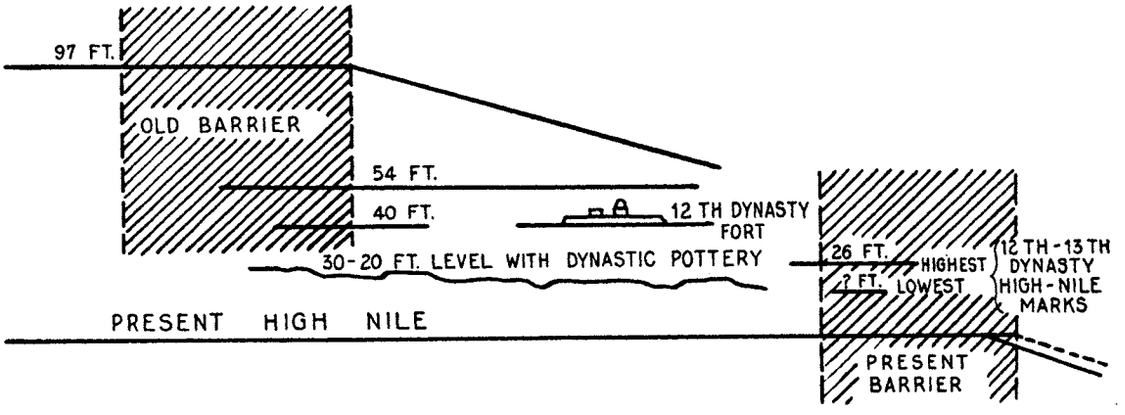


FIG. 12.—STAGES IN THE FALL OF THE NILE ACROSS THE ROCK BARRIER AT THE SEMNAH CATARACT

One such ancient barrier may be traced about half a mile upstream from that between the forts at Semnah. Although it now gives rise to only minor rapids, there are clear indications that it is the wreck of an obstruction which in its day was quite as formidable as the existing one. Along the west bank the two are partly connected by three high gravel terraces and a marked platform below. At their downstream end, before reaching the present cataract, the gravel terraces are cut off by a side wadi; but in an upstream direction they can be plainly seen to pass into the old cataract funnel, through which they are continued as smooth rock platforms.

The heights of these gravel terraces, particularly that of the lowest, and the corresponding notches or platforms in the abandoned cataract proved to be of considerable interest. In such a region care must be taken in the selection of an accurate datum for cultivation or flood-plain level, from which our readings are taken in the more normal reaches. A convenient patch of cultivated ground, evidently flooded during the inundation, was found, however, on the west bank opposite the "pool" above the cataract. From this our measurements were taken by Abney level up and down, repeated.

The height of the highest notch or platform running through the ancient rock barrier (Fig. 12) was found to be 97 feet above cultivation, at which level near the mouth the first gravel terrace starts, to sink rapidly downstream to some 60 feet before being cut off by the side wadi.

The second platform is at 54 feet. This is covered with about 2 feet of fine gravel, which passes out of the miniature gorge as a gravel terrace until, like the higher terrace, it is truncated by the side wadi. But, unlike the higher terrace, it does not fall appreciably in a downstream direction, showing that by then the water had begun to be held up by the new barrier at Semnah.

The third platform is clearly defined only near the mouth of the old barrier, where it forms a marked feature at 40 feet. After emerging it is lost for a space, to reappear at the same height as an isolated remnant of gravel terrace crowned by a 12th dynasty[6] fort (Plate XI, *A*), presumably an outwork of the great twin fortresses which guard the lower or Semnah sill.

The fort is protected on all but the north (downstream) side by a strong stone glacis, and its mud brick walls are built on a pavement of mud "tiles" at the level of the glacis. Lower ground passes on round the inclosure on the three glacis-protected sides, and the suggestion may be made that the stone-flagged slopes were for a protection against floods. The north side is broken.

The level ground below the fort, thick with comminuted pottery, is clearly an ancient habitation site. The level of its lower part is 21 feet; of its highest, where finely bedded black silt remains, 30 feet. Pottery is distributed over the whole of this area, thickest near the ruins. The lower part has been irrigated by artificial means in modern times (probably before the Dervish Wars). It will be noticed that the levels covered by the pottery (21–30 feet) embrace the 12th–13th dynasty records on the cataract (26 feet above present high-Nile level at the sill), and they are no doubt the cultivation levels of that period. The situation and appearance of the pottery make this very clear in the field. The levels afford useful corroborative evidence of the Nile records, and the 97- and 54-foot platforms show the facility with which the destruction of a similar barrier was achieved, thereby throwing the whole force of the water upon the new obstacle.

On the east side of the river, in turn, both 97- and 54-foot levels can be traced above the present sill, the latter as a marked upper limit to a silt-filled embayment. Trails of gravel, with concretionary pellets such as occur in the silts, connect the two levels.

Only in one spot near Semnah, on the downstream side of the present cataract, were gravels found which seemed likely to prove useful. These, with silt, occupy a small plateau on the east bank about halfway between Kummah (opposite Semnah) and Uronarti, above a magnificent sheet of swirling, tumbling water. The highest regular portion of the silt-and-gravel is 32 feet above flood level. This recalls the 21- to 30-foot levels above the sill, but the deposit contains no rolled pottery. Instead, pottery of the same type, windworn on the exposed surface but not waterworn, a stone pick, and a flaked lump of pitchstone were found on the surface. The association of these articles with the 12th dynasty is indefinite, but in any event the absence of rolled pottery at a level so closely associated with those above the sill suggests that this level was already abandoned by the river. The gravel occupies an old branch of the cataract now entirely abandoned.

The foregoing observations serve at least two purposes:

1. They provide purely geological evidence in support of the levels actually recorded in 12th–13th dynasty times.

2. They show that a sill of the type seen at Semnah can affect river-levels in the immediate vicinity only, ponding back water to a certain extent, but being entirely without effect on levels below the sill. In no circumstances can any such minor obstruction in the raging interior of the Batn el-Hagar influence levels in Nubia or Egypt.

[6] We are indebted to Commander N. E. Wheeler, of the Harvard-Boston expedition, for this information. A *kubbah*, a local saint's tomb, rises picturesquely from the ruins.

The Semnah sill since 12th dynasty times, therefore, has repeated the performance of the former barrier just above it.

Aswan.—Four years after the appearance of Dr. Ball's observations at Semnah, they were followed by a masterly memoir on the First Cataract at Aswan, mapped during the winter of 1899/1900.[7] This memoir was the first detailed account of the geology of the region. It showed, among many other things of the highest interest to the geologist, that beyond question the Nile had formerly flowed through the dry valleys now occupied by the railway and the road from Aswan to Shellal and the dam (Fig. 13). Dr. Ball pointed out that these valleys are choked with Nile silt and gravel to a height of 29 meters (96 feet) above the level of present-day inundations.

In speculating as to the cause that led to the Nile's abandoning these channels and deepening its present course through the cataract region to the west, he was driven to the conclusion that earth movements alone could supply the necessary explanation. This belief seemed to be confirmed by his finding a fault across the mouths of the abandoned valleys with a throw equivalent to the fall in the level of the river, namely, about 100 feet. At the same time he ascribed the actual *lowering* of the present course almost entirely to erosion. As an important factor in this the effects of potholing were emphasized. Although no measurements could be taken, Dr. Ball expressed it as his belief that the river may be lowering its bed through the length of the First Cataract at the same rate as it has lowered the rock barrier at Semnah, namely, 2 millimeters per annum, or 20 meters in 10,000 years.

The unparalleled late date (Quaternary) of the faulting postulated by Dr. Ball[8] is a serious obstacle to accepting the hypothesis, for true faults of such recent date are very rare indeed in Egypt. A close examination of the Pleistocene deposits which block the two abandoned valleys seems to establish that no such hypothesis is necessary. The deposits consist of two separate elements of very different ages, both formed normally by the Nile in two now well known phases of its history.

The highest Pleistocene material, which is that referred to by Dr. Ball as rising to 96 feet above cultivation, is a coarse gravel forming the water parting in the widest of the three valleys, that followed by the railway from Aswan to Shellal. Although we were unsuccessful in finding any implements that could be said to belong to this gravel, we consider that it may be referred without hesitation to the 100-foot stage of the Nile, because the pebbles are large and well rounded and consist entirely of quartz, quartzite, and ironstone derived from the Nubian sandstone (see p. 26). All that survives of this 100-foot gravel stage in the railway valley is a transverse saddle forming the highest part of the divide, through which the railway passes by a shallow cutting (see Fig. 13). From the height and the lie of the gravel, it is clear that no branch of the Nile has passed through the railway valley since 100-foot times, and that all drainage subsequent to 100-foot times has been off the divide on either side, tending continually to reduce the size of the surviving relic of gravel.

The high silt of the Mousterian–Lower Sebilian aggradation phase can be traced to the usual height of about 60 feet from both ends of the railway valley; but it laps against the flanks of the gravel divide at that height, and, although the junction is obscured by a thick mantle of gravel and finer material washed down from higher levels, it is clear that the silt does not reach within 30 feet of the summit. Further, the surface of the gravel is littered with abundant patinated, unrolled implements of Sebilian industries, which were dropped there during and perhaps immediately preceding the high-silt phase, when the water lapped up both ends of the valley to 60 feet.

[7] J. Ball, *A Description of the First or Aswan Cataract of the Nile* (Cairo, 1907).

[8] *Op. cit.* p. 105.

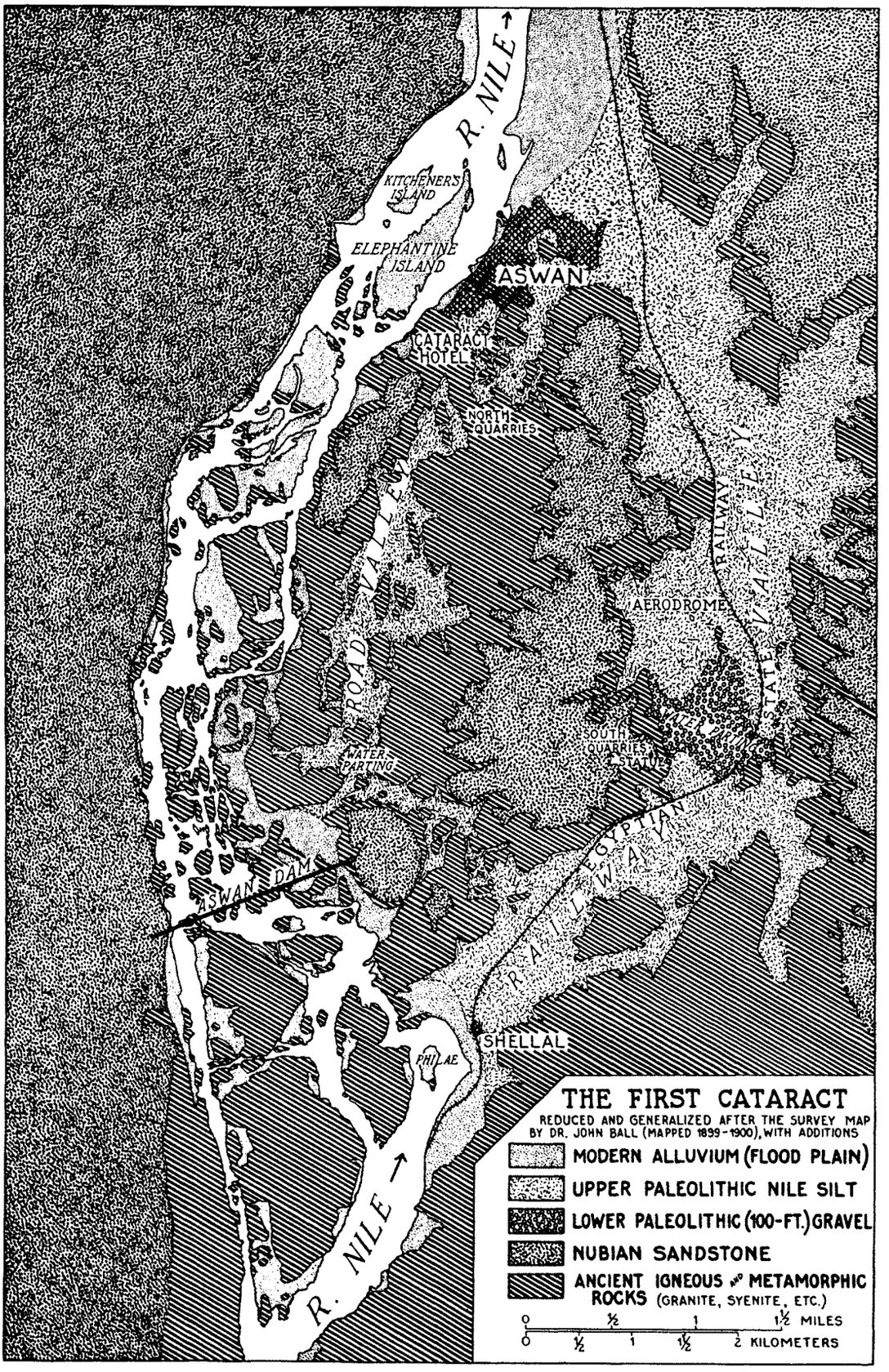


FIG. 13.—THE FIRST CATARACT AND ITS ABANDONED CHANNELS AT ASWAN

The second abandoned channel, the central one, by which the road leads from Aswan to the dam, tells a different story. It is less an abandoned river valley than a dry cataract channel, studded with islands and projecting spurs of granite. It contains no deposit of coarse gravel corresponding with that in the railway valley; but relics of silt with *Corbicula* shells occur here and there up to the watershed, the level of which indicates that at the 60-foot aggradation maximum a minor branch of the Nile passed through it. In a pit on the southern side of the watershed, close to the houses below the dam, where a 10-foot face of the silt has been worked for *sebakh*, the ancient granite floor has been laid bare. It is rounded and polished, with a brilliantly varnished surface recalling the rocks in the present cataract.

The disproof of the faulting hypothesis, we would submit, lies in this fact that the two abandoned channels fell into disuse not at the same time, but at widely separated times. The eastern valley was finally abandoned immediately after the 100-foot stage; the central valley not until after the river had sunk to an unknown level, risen again to the 60-foot level, and then begun to sink for the second time.

The Survey map (Fig. 13) suffices to show what is apparent to an observer on the spot, that after the abandonment of the eastern valley the central valley alone would have been inadequate to conduct the whole volume of the Nile. We may, therefore, infer that the Nile was divided between the central valley and the western valley which it now occupies. This inference is of interest because, although we searched both banks of the modern cataract channel from the dam to the Cataract Hotel, we found no deposits of silt at notably high elevations above modern flood levels. If any existed, they have been swept away during the subsequent history of the cataract.

It is probable, however, in view of its relatively great width, that, ever since the retreat from the eastern valley at the end of 100-foot times, the western valley has carried the main stream of the Nile. If this is true, the current was probably too strong for the deposition of large quantities of silt. More would have tended to accumulate in the narrower central channel, which we may picture as little more than a quiet backwater, perhaps temporarily abandoned toward the end of the first period of degradation and reflooded when the water rose again to the 60-foot level. So far as our observations go, therefore, they do not lead us to conclude that any great abnormality characterized the history of the river in the region of the First Cataract.

Kalabshah.—The Kalabshah gorge (cf. pp. 3, 21), about 40 miles south of Aswan, reproduces in miniature certain parts of the First Cataract. The covering of Nubian sandstone has for a short distance been stripped away, leaving the river to find its way through rugged buttresses of the much harder granitic rocks beneath. The result is a narrow and deep channel fringed with islands, promontories, side channels, and creeks, while all trace of high level cultivation disappears. The river has long since overcome the worst of the obstruction, however, and no rocky barrier now exists such as would entitle the Kalabshah gorge to be called a cataract. In the early part of this century a boring was made beneath the river bed in the Kalabshah gorge with a view to the possibility of erecting a dam there instead of at Aswan; but Dr. Ball records that instead of bed rock being reached at a shallow depth, as was expected, gravels were penetrated to a thickness of more than 20 meters.[9]

At first one might be inclined to accept this solitary instance as evidence of the depth to which the general cutting down of the river bed was carried in Mousterian times, before the aggradation set in which carried the level up to 60–100 feet above present flood plain. That we cannot take the depth of gravel in the miniature "cataract region" of Kalabshah as typical of the river as a whole, however, was shown by soundings taken in connection with the dam at

[9] *QJGS* LIX 75.

Aswan. Channels of great depth were proved to be still in existence, one of them over 42 meters (140 feet) deep, so that its bottom is at about the level of the ground at Minyah, 650 kilometers downstream.[10]

Clearly, when the river was first cutting its course through the granite at Kalabshah while cataract conditions still obtained, similar deep channels may have been scoured out, later to become filled with gravel. It was probably such a gravel-filled channel that was penetrated by the boring, which consequently gives us no clue to the general depth of bed rock in Nubia.[11]

Silsilah.—The Silsilah gorge (see p. 3 and Fig. 2) differs from the other gorges and cataracts by being cut entirely in Nubian sandstone, the underlying granitic rocks coming nowhere to the surface (Plate XI, *A*). Mr. Beadnell has described it as follows:

> The Kom-Ombo plain has two outlets through the bounding sandstone-range to the north; they are about a kilometre (=two-thirds of a mile) apart, and at the present day the river occupies the westernmost of the two, cutting through the hills known as Jebel Silsila. Schweinfurth described the river here as running through a narrow channel (395 metres=1296 feet wide) of great depth. . . .[12] He considered that there was certainly a cataract here at the time of the Kom-Ombo lake, although if the stated identity[13] of level of the lacustrine beds on either side be correct, the sandstone-block intervening between the two passes of the present day was probably an island in the midst of a long continuous lake.[14] Nowadays the river washes the sandstone-escarpment on both banks for a distance of a kilometre.[15]

For a much longer distance downstream the merest strip of cultivation intervenes between the river and the sandstone cliffs, and throughout the gorge the current seems to have been always too strong for the deposition of gravels or silts except in the smallest quantities. The absence of conspicuous quantities of silt in the gorge had led naturally to the conclusion that Gebel Silsilah was the northern bounding wall of a great lake which occupied the Kom Ombo plain and flowed out over a barrier or barriers now swept away. Schweinfurth's suggestion of a cataract[16] and Vignard's picture of the "bursting through of the barrier"[17] which led to the draining of the lake followed as natural consequences.

In the mouths of the wadies, however, silt mounds remain, as throughout Nubia, while as soon as the valley opens out once more, high silts can be traced for long distances in the neighborhood of Edfu. We obtained measurements at Edfu which prove that the silt attains 50–60 feet above cultivation, which is the same height as the highest part of the silt plain of Kom Ombo. Beadnell's picture of a continuous lakelike sheet of water passing through the Silsilah gorges is therefore entirely vindicated, except that we now know that not only this reach but the whole river from Luxor to at least the Wadi Halfa cataract was flooded, so that the old conception of a lake has perforce to be modified.

Now it should be noted that high silts such as those which choke the Kom Ombo basin also fill the abandoned channel by which the railway passes through Gebel Silsilah. The formation of the channel must, therefore, have taken place before the period of high water in the Kom Ombo plain. Consequently, it cannot have acted as a cataract or barrier at that period. Moreover, if there was already one free passage here, there cannot have been at the same time a cataract or barrier in process of being eroded away or burst through over the site of the other channel; for any obstruction there would merely have diverted the water into the free passage.

The most reasonable supposition seems to be that the two gorges were cut at the same time,

[10] Ball, *A Description of the First or Aswan Cataract*, p. 107.

[11] The cutting of deep and narrow channels through obstructions in the courses of wide rivers is a process well known to hydraulic engineers and geologists. Such overdeepened parts of the river bed may be cut even below sea-level.

[12] *Petermanns Mitteilungen* XLVII 9.

[13] Sir William Willcocks, *Egyptian Irrigation*, 2d ed. (London, 1899) p. 7.

[14] I.e., in older Sebilian times.

[15] *QJGS* LXI 670–71.

[16] Schweinfurth, *op. cit.* p. 9.

[17] Vignard, *op. cit.* p. 2.

namely, during the first or Lower Paleolithic–Mousterian period of degradation. There is nothing to suggest that the excavation of the gorges did not take place *pari passu* with the general lowering of the river bed, although, owing to the sudden incidence of harder rock north of the Silsilah fault, cataract conditions comparable with those at Kalabshah probably prevailed here throughout the first period of degradation.

The ultimate abandonment of the eastern channel during the second or Sebilian period of degradation was undoubtedly due to the selection by the river of the channel which had become least blocked with silt during the period of high water. This in turn would have been determined by the general westerly tendency of the river, as demonstrated by its undercutting the western bank across the Kom Ombo plain. The concentration of the current on the west side, which resulted in the cutting of the fresh channel at the extreme western margin of the silt between Munihah and Silsilah, would have tended to keep the west gorge clear of silt while the east gorge became choked. Thus we find no more need to invoke abnormal agencies, such as faulting or the bursting of barriers, at Silsilah than at Aswan.

The direct cause of the gorges at Silsilah is the outcropping of an unusually hard mass of sandstone. This occurrence was utilized by Egyptian temple architects, who obtained much of their building stone from the famous Silsilah quarries. The gradual widening of the gorge and renewal of the normal valley at the north end are due to the sandstone dipping below river-level and being replaced by higher beds of much softer materials. The abrupt termination of the gorge at the south end overlooking the Kom Ombo plain is due to the hard sandstone having been faulted down below river-level in Tertiary times (pre-Pliocene and post-Eocene).

El-Kab.—An abandoned channel of very minor dimensions which must receive notice in the present connection exists at el-Kab near el-Mahamid. Here again the dry valley is on the east side of the Nile and has been utilized by the railway to negotiate one of the few points where the rocks fall in cliffs directly to the river.

Although much shorter than the others, the el-Kab dry valley is choked with pre-Sebilian silts full of *Corbicula* and *Unio* shells. It shows also a fine section of the 50-foot terrace (see p. 33). Hence it was formed in precisely the same way as the gorges at Silsilah (through which also the 50-foot, 100-foot, and 150-foot terraces pass).

A railway cutting at el-Kab, northeast of the late Mr. Somers Clarke's house, shows an interesting section through a mass of current-bedded sandy, silty deposits containing shells. These deposits lie at the mouth of the abandoned valley, from which they dip. They are best interpreted as a bar due to the current from the side channel being checked at its mouth and dropping its load on encountering the stronger current in the main stream.

THE FORMATION OF THE ABANDONED CHANNELS, WITH OBSERVATIONS ON THE LATERAL MIGRATIONS OF THE NILE

It is noticeable that wherever the Nile bed consists of rocks of unusual hardness, namely, in the cataracts, the existing stream is split into a number of minor channels separated by rocky islands of all sizes, from mere bowlders to considerable masses such as those of Philae and Elephantine. It is at these very places that abandoned channels choked with silt are found. The channels at Aswan (see pp. 57–59) coincide with the outcrop of the hard rocks forming the First Cataract (Plate XII, *A*). In the Second Cataract there are numerous abandoned channels, from a few hundred yards to several miles in length, at Gerhmai, Sarras, Semnah, etc. Finally, it is significant that the outcrop of hard rock at Gebel Silsilah coincides with the only other remaining abandoned channel of any importance (see Plate XI, *B*).[18]

[18] The occurrence of the miniature abandoned channel at el-Kab seems to be fortuitous.

To connect the abandoned channels with the outcropping of the hard rocks that give rise to the cataracts and gorges is unavoidable. An observer standing on the summit of the high hill behind the Cataract Hotel or by the ruined watchtower between the river and the road valley, or crossing the divide between the road valley and the railway valley on his way to the "recumbent colossus" in the South Quarries, sees a superb panorama which, properly interpreted, gives the clue to the history of the dry valleys. In the face of the vast expanses of desert opened to view by his ascent he loses his sense of scale. The same sensation must be felt, but to a much greater extent, by an aviator. The whole Nile Valley shrinks to a mere thread stretched across the desert from horizon to horizon. The three channels at Aswan become insignificant loops interrupting but for a moment the continuity of the whole. The ridges separating the three valleys shrink to mere islands in a vastly greater cataract. Such a loss of the sense of scale is essential in order to gain a true picture of the cataract regions as Chellean, Acheulean, and Mousterian Man saw them. A relatively enormous river, capable of cutting the rock platform and carrying the gravels which we have traced in the preceding chapters over so many miles of country, rushed in those days through the cataract regions, branching and rebranching in consequence of its encounter with the resistant rocks. The lateral spread of the river into several forks resulted directly from its inability to deepen a single channel sufficiently to take the whole stream. This inability is evidenced by the survival of cataract conditions to the present day, long after active erosion has ceased over the rest of the river's course and given place to quiescence or even aggradation.

Such a picture of the Lower Paleolithic cataracts is no mere flight of fancy. The quality of the granite is inimical to the preservation of rock platforms or gravel terraces such as are conspicuous in the Nubian sandstone or Pliocene regions. At Aswan the 100-foot gravel relic blocking the railway valley is all that survives. But happily at Silsilah the sides of the gorges are well terraced, and rock platforms cut in the sandstone at about 50 feet, 100 feet, and 150 feet above the modern river can be traced through both the modern and the abandoned valleys. This is ample proof that the two valleys were formed at the same time. It is reasonable to suppose that the three valleys at Aswan and the numerous abandoned channels beside the Second Cataract were formed in the same way, and that evidence would be preserved had the nature of the rock been favorable.

It is noticeable in reviewing these abandoned channels of the Nile that they all lie east of the present river, as though there had been some general tendency on the part of the river to migrate westward. Before Pleistocene times, however, the reverse tendency manifested itself; for the widest spreads of Plio-Pleistocene gravels are invariably west of the modern river. The most striking examples are the vast expanse of Plio-Pleistocene gravel to the west between Kom Ombo and Esna, and the corresponding sheets rising tier upon tier into the distance opposite Wadi Halfa. In Middle and Lower Egypt the same distribution of the Plio-Pleistocene terraces, always on the west side, has been noted from the Delta to south of the Faiyum; and there are indications that it holds for many miles farther south. Such a general agreement can scarcely be attributed to chance.

VIII

ROCK PICTURES

Within the last ten years there have been important discoveries of animal pictures carved upon rocks of the Libyan Desert at distant points, from the Nile to the Sahara and from the Egyptian oases to Kordofan. The desert journeys of Prince Kemal el-Din Hussein and Dr. John Ball, of Hassenein Bey, and of Douglas Newbold and W. B. K. Shaw have produced finds of rocks covered with engravings of men and cattle, dogs, ostriches, giraffes, elephants, and other animals. All this material has been examined and analyzed in the last few years by Newbold[1] and the Abbé Breuil[2] with a view to evolving some chronological sequence, and highly interesting results have been obtained.

The principal sites that have been studied are Uweinat, in the extreme southwest corner of Egypt in the latitude of Abu Simbel, and a large group of localities farther south—Zolat el-Hammad, Umm Tasawir, etc.—in Dongola and northern Kordofan. No direct dating evidence has been found, such as flint implements or habitation sites in obvious association with the drawings; but a sequence dating has been determined, and the dovetailing of this into the absolute scale has been achieved approximately in a number of indirect ways.

In the two works published in 1928 Messrs. Newbold and Breuil attempt rough classifications of the rock pictures of the Libyan Desert. Newbold suggests four main groups,[3] as follows:

D. *Roman, medieval, and modern (since the introduction of the camel, about 500 B.C. or later).* This group includes hundreds of crude drawings of camels on bowlders in the Abu Sofian area in the northwest corner of Kordofan, together with large numbers of more or less conventionalized human beings, some purely geometrical. There are also some "giraffes, ostriches, cattle, antelopes, horses (or donkeys?), and other indeterminate animals."[4] Some dromedaries and a few dogs in Uweinat are assigned here by Breuil.[5]

C. *Middle Libyan (Egyptian Middle Kingdom and Empire).*

B. *Early Libyan (Egyptian Old Kingdom, predynastic, and [possibly] Neolithic).* Groups C and B cannot always be differentiated. To them belong almost all of the pecked drawings of oxen, together with elephants, giraffes, ostriches, oryx, dogs, and men found by Newbold and Shaw at Zolat el-Hammad, Umm Tasawir, and Nakhailah in southern Dongola and northern Kordofan. The majority of the drawings at Uweinat—in fact, the residue left after excluding the most ancient and the most recent—is assigned to the same long period by Breuil.[6] This extensive residue he subdivides into a group of older and better drawings (in part equivalent to Newbold's B group), nearly always pecked, and a set of more recent line drawings (equivalent to Newbold's C group) showing much less artistic feeling and often a tendency to geometrical simplification.

In both these groups of drawings at Uweinat men are represented with bows, lances, hatchets, and shields of various types. The animals are predominantly cattle; but there are also

[1] D. Newbold in *Sudan Notes and Records*, Vol. VII (1924) No. 1, pp. 80–81, and *Antiquity* II (1928) 261–91.

[2] H. Breuil, "Les gravures rupestres du Djebel Ouenat," *Revue scientifique* LXVI (1928) 105–17.

[3] Newbold, *op. cit.* (1928) p. 289.

[4] *Ibid.* p. 267.

[5] *Op. cit.* p. 106.

[6] *Ibid.* p. 106.

some sheep, horses, antelopes, and other animals. It is noticeable, and important as dating evidence, that in the earlier group of drawings the cattle represented are chiefly the long-horned *Bos africanus* of protodynastic and Old Kingdom times in Egypt, while the clothes portrayed are like those of the predynastic Libyans as shown on objects from Egypt. The later drawings show both *Bos africanus* and the short-horned *B. brachyceros*, which superseded the former in the Nile Valley during the Middle Kingdom.[7]

In correlating the drawings of Uweinat with those at the other desert localities, Breuil states that only two of the drawings at Zolat el-Hammad recall the earlier group at Uweinat, all the rest there and at Umm Tasawir comparing more closely with the later group (Middle Kingdom and Empire).[8]

A. *Bushman (late Paleolithic or early Neolithic)*. Some very realistic giraffes and ostriches found by Hassenein Bey in Uweinat are attributed by Breuil to Upper Paleolithic hunters and are stated by him to be unmistakably in the style of the realistic Bushman school of South Africa.[9] According to Hassenein Bey, "the carving is from a quarter to half an inch in depth, and the edges of the lines are weathered until in some parts they can be scraped off easily with the finger."[10] No drawings comparable with this earliest Uweinat group have been found at the other known sites.

The result of all these discoveries is to focus attention on the long known but much neglected rock drawings of the Nile Valley, and some observations made in the course of our survey seem to be worth putting on record. In two places we copied rock drawings, some of which, perhaps the oldest yet recorded from the Nile Valley, are strongly reminiscent of Group A at Uweinat.

KNOWN GRAFFITI IN THE NILE VALLEY

South of the Second, or Halfa, Cataract the map is spattered with the words "rock pictures" in Gothic type. The pictures in the region of the Abu Hamed bend have been described (with photographs) by H. C. Jackson.[11] Many, containing various forms of crosses, can be dated as Meroitic. Others are associated with a hieroglyphic inscription dating from the reign of Shabataka, king of Egypt and Ethiopia B.C. 700–688. Numerous other Meroitic and later rock carvings and paintings from farther south, between the Atbara and the Blue Nile, have been published by Whitehead and Addison.[12] Of probably much the same age, certainly not older than the second half of the first millennium B.C., are the red or white paintings of animals and horsemen in Kordofan described by MacMichael in 1909.[13]

Besides these comparatively late drawings, all of which fall into Newbold's Group D above, there are many others, usually crudely pecked or scratched, representing *Bos africanus* and *B. brachyceros*, which are obviously attributable to Groups B and C, that is, to the dynastic and predynastic periods. The largest group seen by us was beside the road about a mile north of the Sarras fort, between Wadi Halfa and Semnah. Here the carvings are inscribed all over a large isolated ridge of black slaty rock, becoming increasingly numerous toward the top, where they are crowded in a dense mass. In the main they represent the long-horned ox, *Bos africanus* (Figs. 14–15); but there are also a few elephants and ostriches, besides some human figures and camels done in a puerile style. They are all in crude "pecked" and scratched tech-

[7] Cf. Breuil, *op. cit.* p. 109, and Newbold, *op. cit.* p. 286.

[8] Breuil, *op. cit.* p. 108. [9] *Ibid.* p. 106.

[10] A. M. Hassenein Bey, *The Lost Oases* (London, 1925) p. 205; cf. plate facing his p. 204.

[11] *Sudan Notes and Records*, Vol. IX (1926) No. 2, pp. 22–24 and Plates I–II.

[12] G. O. Whitehead and F. Addison, "Meroitic Remains," *ibid.* pp. 51–58, with plates.

[13] H. A. MacMichael, "Rock Pictures in North Kordofan," *Jour. Royal Anthrop. Inst.* XXXIX (1909) 562–68.

niques; the cattle drawings resemble very closely those in the photographs taken by Shaw at Zolat el-Hammad[14] (referred by Newbold to Groups B and C). The men and camels were in all probability added later; but the white marks of the pecks on the black rocks retain their freshness longer than do those inscribed on sandstone, so that there is little or no difference in pati-

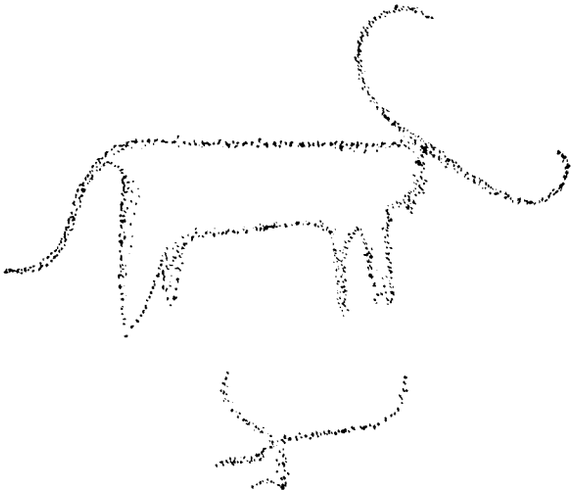


FIG. 14.—PECKED DRAWINGS OF *Bos africanus* ON NUBIAN SANDSTONE, SAYALAH, NUBIA

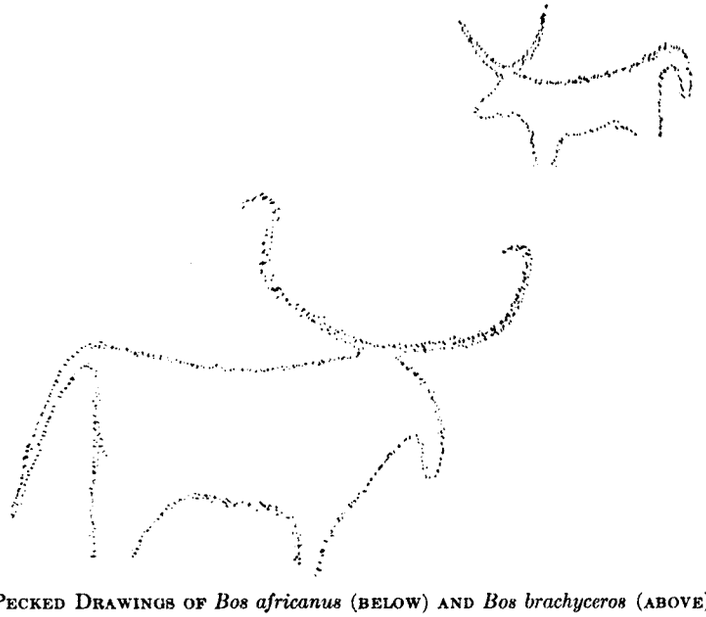


FIG. 15.—PECKED DRAWINGS OF *Bos africanus* (BELOW) AND *Bos brachyceros* (ABOVE), SAYALAH

nation. Commander N. E. Wheeler, of the Harvard-Boston expedition, has kindly given us permission to publish the fact that near Semnah he found a group of eight drawings of *B. africanus* with a Middle Kingdom hieroglyphic inscription cut across (over) four of them.

A group of carvings of *Bos africanus*, and possibly of *B. brachyceros* also, occurs upon a rock south of Girf Husain in Nubia.[15] The drawings seem to be in two styles, incised drawings and

[14] *Antiquity* II (1928), Pls. I and II (facing pp. 261 and 288).

[15] C. M. Firth, *Archaeological Survey of Nubia. Report for 1908–1909* (Cairo, 1912) II, Pl. 18 *a*.

crude outline pecks, suggesting Newbold's Group C; Firth regards them as of Nubian C (i.e., Middle Kingdom) age.[16]

Perhaps the largest group of all consists of those found at six sites described by Schweinfurth, in the Wadi Abu Agag on the east bank a few miles north of Aswan.[17] The animals represented here are, as usual, chiefly *Bos africanus*, together with dogs, camels, various antelopes, gazelle, members of the horse family, etc. There are a very few ostriches and only one animal which could, but doubtfully, be regarded as a giraffe. Schweinfurth divides the pictures into four classes, each characterized by a distinctive technique, and assigns them to five periods. While he considers on various grounds that the majority belong to Middle Kingdom and Empire times, and identifies some work as Greco-Roman and early Arabic, the earliest representations are supposed to be predynastic. A seventh site was found by Professor Adolf Miethe in 1908, on sandstone cliffs and fallen blocks at the mouth of the second wadi south of the monastery of St. Simeon, on the west side of the Aswan cataract. This group was dated by Schweinfurth, by the greyhounds represented in it, to the Old or Middle Kingdom.

North of el-Kab, a short distance back from the east bank, we visited, under the guidance of Mr. and Mrs. Guy Brunton, a large group of drawings in many ways comparable with that at Aswan. The majority of this group are incised upon the vertical sides of an isolated rock of sandstone which rises abruptly from a broad wadi opening into the "bay" between el-Kab and el-Mahamid. Many different styles and periods are evidently represented. We understand that the entire group has been copied by Professor Sayce with a view to publication.

At Gebel Hetemat, between Edfu and Silsilah, some groups of graffiti of relatively modern (dynastic or more recent) appearance have been copied by Legrain and published.[18]

Another group which might repay study, but which, so far as we have been able to ascertain, has not yet been published, is to be seen below the fortress of Kasr Ibrim in Nubia. The drawings are situated upon a steep cliff overlooking the river south of the fort beside an inscription of Seti I. There are some others east of the rock temple at ed-Dirr.[19]

NEW SITES IN NUBIA

At two other places in Nubia we came across rock carvings, some of which may belong to a period altogether earlier than those of the published examples mentioned above and may probably be correlated with Newbold's Group A. We were not equipped, however, with the requisite appliances for photographing graffiti cut high on inaccessible rocks. One of us (W. J. A.) therefore made notes and free-hand drawings, as accurately as possible, of selected groups, while the other photographed those within reach. Later, at Chicago House, drawings were copied on enlargements prepared by Mr. Morrison from the photographs, after which the photographic foundations were bleached away. We believe, therefore, that the accompanying figures attain a reasonable degree of accuracy.

The larger collection of carvings lies on the west bank of the Nile in the Wadi el-ʿArab district about 30 miles north of Korosko, at Nagʿ Umm Shikk near Sayalah, on latitude 22° 56′. Here is a veritable picture gallery upon the sandstone bowlders and cliffs overlooking the river.

The long-horned *Bos africanus* and the short-horned *B. brachyceros*, executed by the usual

[16] *Ibid.* I 16; cf. on his p. 80 description of an unillustrated drawing of boats and animals near Fagirdib, north of Girf Husain.

[17] G. Schweinfurth, "Über alte Tierbilder und Felsinschriften bei Assuan," *Zeitschr. für Ethnologie* XLIV (1912) 627–58.

[18] In J. de Morgan, *Recherches sur les origines de l'Égypte. L'âge de la pierre et les métaux* (Paris, 1896) p. 162, Fig. 487.

[19] These groups are mentioned in Baedeker's *Egypt and the Sudan*, 8th ed. (Leipzig, 1929) pp. 429–30. They include boats and giraffes. Professor Sayce and Cecil Firth have died in the interval between the writing and the publication of these notes.

crude pecks in outline only, may at once be recognized (see Figs. 14–15). The pecks by which the oxen are delineated still look yellow and comparatively fresh, as do also a number of drawings of barks obviously of the dynastic period. Barks and cattle are drawn down to the present water's edge.

The best executed drawings are confined to the higher rocks forming the upper part of the cliff. They comprise long friezes of giraffes of all sizes in various attitudes (Figs. 16–18). There are also some elephants and a single inaccurately depicted ostrich with up-stretched wings (at left end of Fig. 17; cf. p. 68). The patination of some of these drawings has advanced so far that they have acquired the same tone as the surface of the rock on which they are cut. The barks and oxen look recent by contrast. Indeed, one of the barks was carved across a group of giraffes which had become almost effaced.

Most carefully drawn are the largest giraffes, some of which measure from 1 to 2 feet in length. They are the most realistic also, because of the faithful portrayal of the thick necks

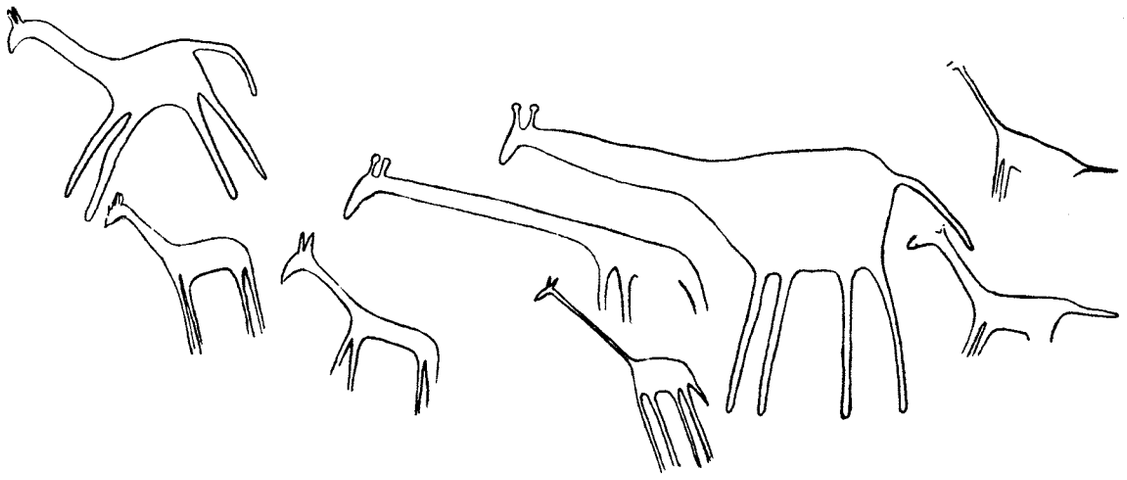


FIG. 16.—GROUP OF GIRAFFES CARVED ON SANDSTONE, SAYALAH

and shoulders. These are entirely in negative relief, the outline comparatively smooth and the inside battered out *en creux*. The numerous smaller giraffes which surround them seem to be caricatures of the larger ones, for they have exaggeratedly long thin necks, for the most part held in a more erect position, and extremely spindly legs, in one instance with definite indications of feet. They are also in a slightly different technique, the outline not being so smooth. That they were drawn later than the larger giraffes is certain, not only on these grounds, but also by reason of the grouping of the whole; for the larger drawings occupy the best positions on the rocks. All the drawings are so much weathered that it is difficult to feel satisfied as to how much of the difference is due to relative degrees of weathering and how much to original differences of technique and depth of incision; but, whatever the cause, the largest animals are now less clearly delineated than the majority of the others. A few of the small giraffes are the most obscure of all; but these have the short, depressed necks and large heads of the larger pictures, which they resemble more than they do the other small ones.

The best work from an artistic rather than a technical point of view is to be found in the spirited representation of a gamboling young giraffe at the left-hand end of the main group (see Fig. 16) and in a frieze picturing a procession of two elephants followed by three giraffes (see Fig. 18). The sense of movement in these figures is most striking. The standard of attitude is far in advance of the standard of anatomical accuracy, though the large and well de-

fined feet of the elephants are noteworthy. The technique and approximate degree of weathering in these figures are the same as in those of the long-necked small giraffes, one of which is likewise portrayed in a walking attitude (the central one of the three at the upper right in Fig. 17).

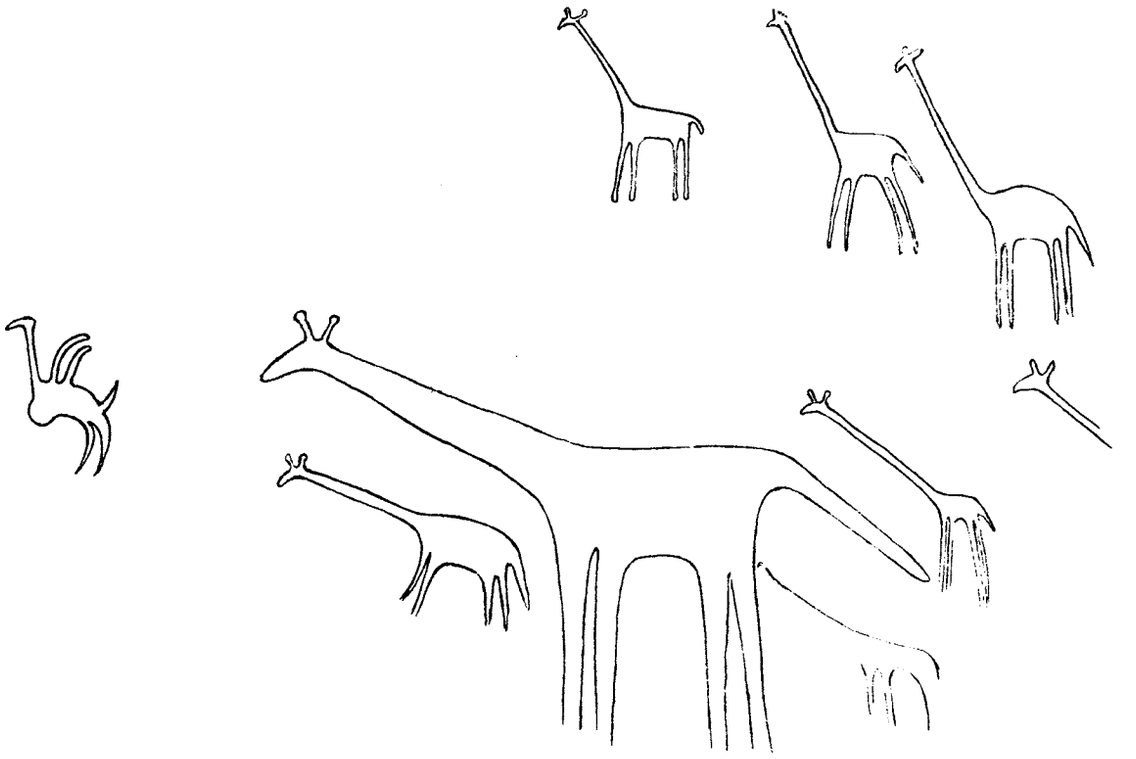


FIG. 17.—GROUP OF GIRAFFES CARVED ON SANDSTONE, SAYALAH

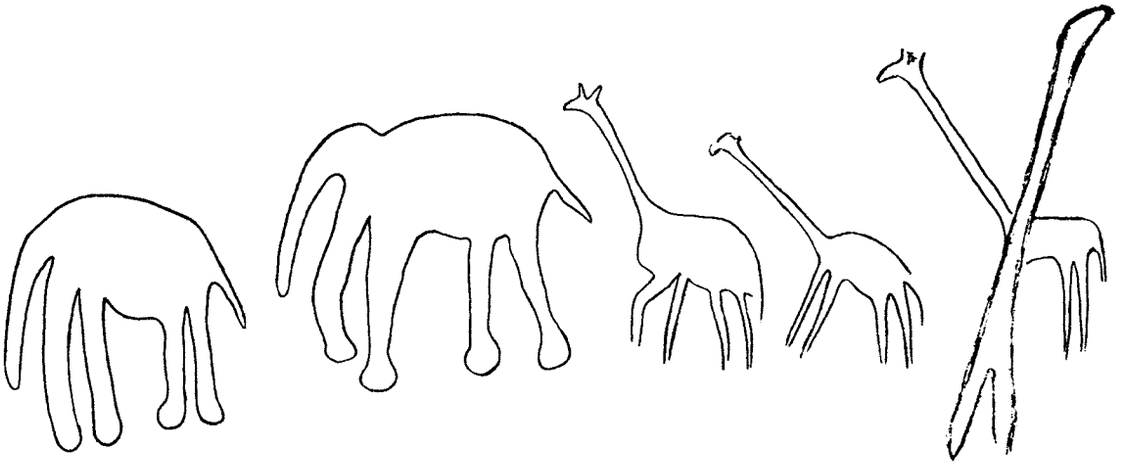


FIG. 18.—FRIEZE CARVED ON SANDSTONE, SAYALAH

In a class apart is a single man holding a long staff in one hand and with what appears to be an animal thrown across his shoulders, the whole inclosed in a square frame. This figure seems to be as deeply weathered as the oldest drawings, but this may be due to the fact that the isolated block of sandstone on which it is carved has offered less resistance to weathering.

Though all trace of the technique is obliterated, the figure has a distinctly dynastic appearance.

A second highly interesting series of drawings was brought to our notice by Dr. Breasted, who visited them some years ago. They lie about 5 miles north-northwest of the Abu Simbel rock temples, upon a high plateau 300 feet above the Nile. The carvings appear on a flat joint plane of Nubian sandstone in the side of an arched rock known by the natives as a *birbah* ("temple ruin"), but in reality probably a freak product of natural weathering in Pleistocene or Recent times (Plate XII, *B*).

The drawings comprise two groups. The lower and larger group (Fig. 19) consisted originally of some early, roughly pecked giraffes and an obscure elephant. One of the giraffes has been partly defaced by the superposition of one of a pair of ostriches strongly drawn in negative relief with deep, smooth, sharp outline. Below is another, smaller ostrich in the same style but not so well drawn. To this an extra pair of legs seems to have been added later in an attempt to convert it into a giraffe. These ostriches are in a far more accomplished style than any of the other rock drawings we have seen, which suggests that they were cut by some practiced artisan employed on the temples. Last of all were added some very crudely pecked figures of imaginative design, the pecks of which still appear quite fresh, like those of the oxen at Wadi el-ᶜArab. The curious animal of Figure 20 is somewhat suggestive of a hyena represented at Site VII on the west side of the Aswan cataract.[20] Schweinfurth considers that the latter's neck most resembles that of the tropical African species *Hyaena crocuta* Zimm. It compares also, however, with some figures in a group at Gebel Hetemat, copied by Legrain,[21] which seem to be debased derivatives of the giraffe.

The upper group (Fig. 21) is less distinct, probably on account of its greater exposure to the weather. It shows two roughly pecked giraffes, larger than those below, and the head and neck of a third, which appears to have been cut across by the simple outline of a bark. In the right-hand drawing the artist utilized two vertical root markings on the sandstone for the neck and front line of the giraffe.

On reviewing all the evidence, it is possible to establish a rough sequence in the drawings at these two sites.

The latest (apart from a camel at Wadi el-ᶜArab and possibly the nameless shapes at Abu Simbel) are undoubtedly the oxen (both *Bos brachyceros* and *B. africanus*), the barks at both localities, and, in a class by themselves, the ostriches at Abu Simbel. Older than these, because they are cut across by pictures of barks at both localities, are the majority of the giraffes, among them the spirited figures of Wadi el-ᶜArab, and the elephants. The only indication of their age seems to be the similarity of the curious ostrich with wings erect (in the large group in Fig. 17) to one near the quartz hill at Aswan[22] which is associated with a 12th dynasty inscription. On the other hand, it is unique at Wadi el-ᶜArab and may be later than any of the giraffes. The barks and oxen may most reasonably be dated to about the Middle Kingdom by comparison with those at other localities. Since they cut across the smaller giraffes, the latter are certainly older, though there is no indication whether the time interval should be measured in days or in centuries.

The oldest drawings are certainly those of the largest giraffes at Wadi el-ᶜArab. It is significant that these bear the closest resemblance to those of Group A at Uweinat. But again it is impossible to say how great a time interval separates the larger giraffes from the smaller ones and the elephants.

[20] Schweinfurth, *op. cit.* p. 654, Fig. 21.

[21] See J. de Morgan, *loc. cit.*

[22] Schweinfurth, *op. cit.* p. 657, Fig. 25.

With regard to the age of his Group A drawings in Uweinat, the Abbé Breuil is emphatic that they are to be correlated with the Bushman school and may therefore be of Upper Paleolithic date. It is held that the Bushmen migrated southward across the African continent from their original home on the shores of the Mediterranean, where the Paleolithic Grimaldi race found in the caves of Mentone shows negroid affinity. Such a dating affords perhaps the only answer to the question that leaps to the mind of every observer on first seeing these drawings—the

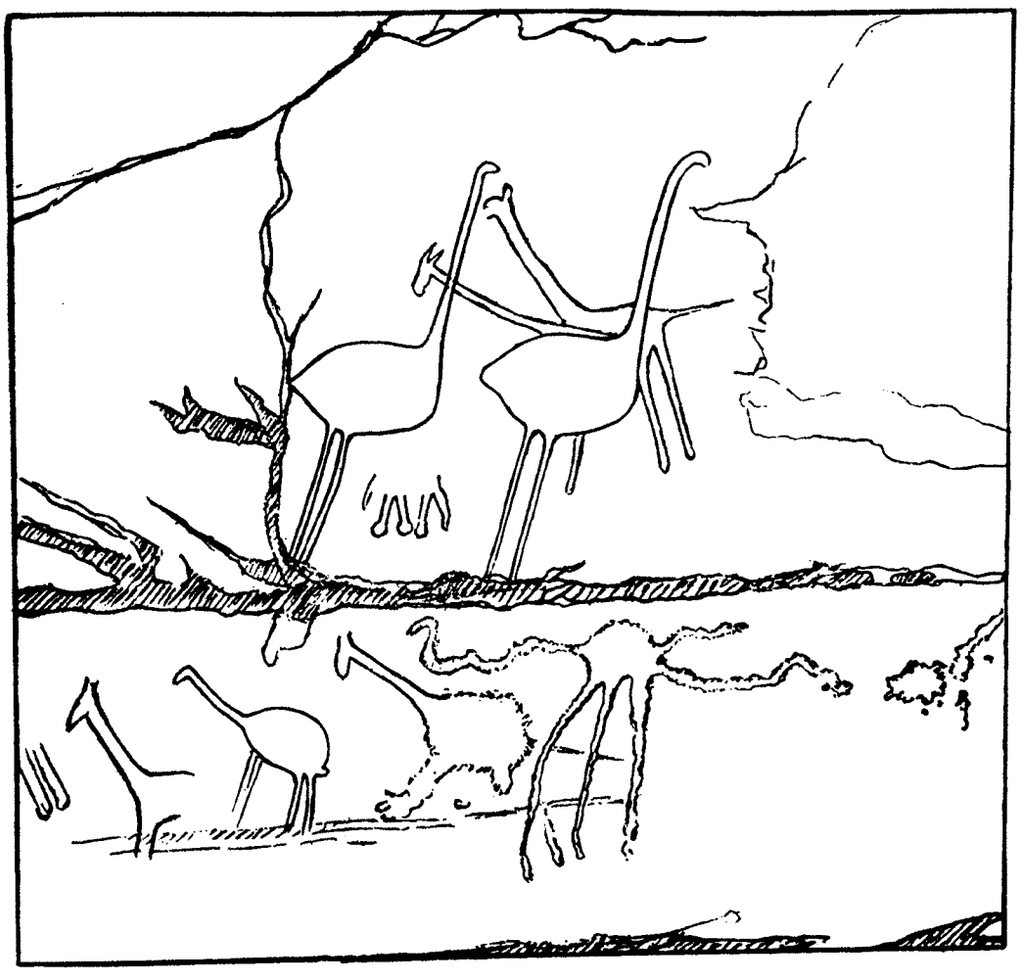


FIG. 19.—GROUP OF DRAWINGS ON ARCHED SANDSTONE ROCK WEST OF ABU SIMBEL

question so tersely put by Hassenein Bey in his diary: "There are no giraffes in this part of the country now; nor do they live in any similar desert country anywhere. Also there are no camels among the carvings on the rocks, and one cannot penetrate to this oasis now except with camels. Did the men who made these pictures know the giraffe and not the camel?"[23]

The finding of similar drawings within the Nile Valley becomes of special interest in view of the knowledge which we now possess of the physical conditions obtaining there in Paleolithic times. It is important to note that at Wadi el-ʿArab the drawings are carved actually within the recent Nile Valley upon the cliff overlooking the river, and not more than 30–40 feet above it, though they are not found down to the water's edge as are the cattle and barks of Groups B

[23] *The Lost Oases*, p. 205.

and C. This would seem to indicate that at the time they were drawn the river stood higher than when the more recent drawings were made. On the other hand, their position proves that they must be later than the fall of the river from the high levels attained in the late Mousterian and early Sebilian periods, when the rocks upon which the drawings are made would have been under water.

FIG. 20.—DRAWING AT ABU SIMBEL

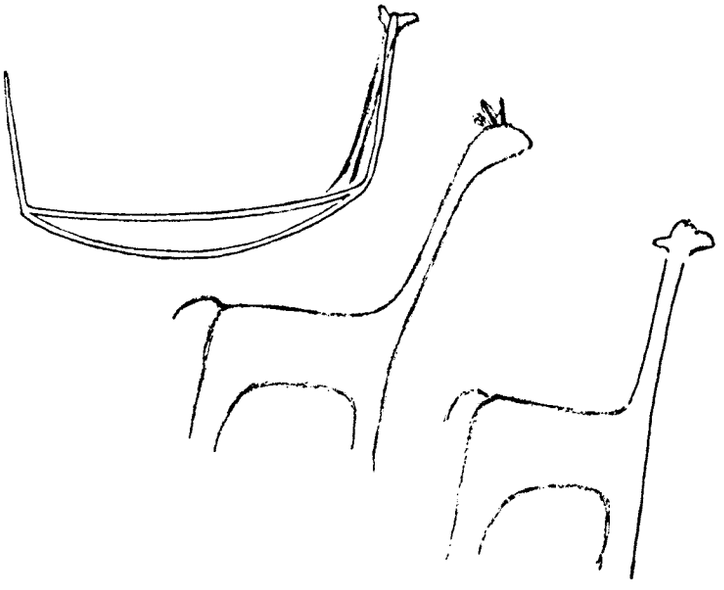


FIG. 21.—UPPER GROUP OF DRAWINGS, ABU SIMBEL

If we examine the matter in rather more detail, we find that the Nile stood 100 feet above its present level at Wadi Halfa and 60 feet at Aswan in Lower Sebilian times, while in Upper Sebilian times there was a pause of considerable length at 40 feet at Halfa (Dibeira West), but below 20 feet near Edfu.[24] Since Wadi el-ʿArab is considerably nearer the former than the latter, the level was probably nearer the 40 feet of Wadi Halfa than the approximate flood-plain level at Edfu. We thus arrive at a date which is of necessity not as early as Lower Sebilian, and by the balance of probability is Upper Sebilian.

[24] See chaps. v–vi.

IX

HUMAN INDUSTRIES

In this chapter representative series of implements will be described and discussed with special reference to the examples chosen for illustration. It is to be understood that all the figured specimens have been found *in situ* in deposits, unless otherwise described, and that a large body of material similarly located remains in the collections. With such wealth of material, specimens found on the surface, lacking geological evidence of age, need play little part. Full publication of the whole of the material found *in situ* would require a volume to itself. In this book emphasis is laid on the task of fixing the ages of types by geological means, rather than on purely typological description.

With regard to selection of specimens for illustration the following policy has been adopted:

1. Implements have been chosen from collections made at rich sites, rather than from sporadic discoveries. In this way an attempt has been made to conform to the archeologist's group-system.

2. Where possible, material from the newly discovered implementiferous deposits of Nubia and of the northern border of the Sudan has been chosen. Most of the implements from these localities are made of rough brown-black sandstone or ironstone, and many are in consequence almost impossible to illustrate. Types from other sites have then been chosen.

3. An attempt has been made to illustrate Paleolithic Man's skill with materials other than the common flint of Upper Egypt, such as was used, for example, for the Lower Paleolithic implements of the Kom Ombo district.

4. In dealing with Lower and Middle Paleolithic implements size has been a consideration. Some implements and cores could not be reproduced without reduction; instead, others equally typical of the class of workmanship but of more reasonable dimensions have been chosen. All illustrations are thus of *actual size*.[1]

5. The question of size does not enter into the matter of selection of the Late and post-Mousterian implements. To deal with them a technique of line drawing on photographs has been employed. The implements and cores have been chosen from newly discovered sites rather than from the Kom Ombo plain where M. Vignard made his large collection. The copious illustrations in his monograph form a type series that needs no repetition.

Our aim is to provide the maximum of observations in the field as soon as possible, that they may be useful to others, and not to immerse the users of this book in a welter of typological detail. The collections once made and safely housed are always available for study and for further analysis when the time and pressing need for field work are gone.

Grateful thanks are due to Mr. Henry Balfour, F.R.S., for reading the text of this chapter and for helpful criticism and suggestions, full use of which has been made.

THE LOWER PALEOLITHIC STAGE

Implements of the 100-Foot Terrace

Artifacts appear first in the 100-foot terrace; all searches for them in earlier deposits have so far proved vain. A mixture of Lower Paleolithic types, both rolled and unrolled, oc-

[1] Implements made of good quality chert of the Theban Hills are described as "flint," which that chert resembles, to avoid confusion with others made of impure chert.

curs in and at the margin of the 100-foot terrace at es-Sibaʿiyyah. This suggests that the period from the abandoning of the higher level of 150 feet to the sinking of the Nile below the 100-foot terrace was a very long one. The most primitive type of implement is a coup-de-poing made by blows from alternate sides, a strongly marked zigzag edge resulting. The blows were delivered usually on three edges, forming a markedly triangular implement (No. 1).[2] Similar treatment on two edges produced a slightly more refined type (No. 2). The three-sided form is strongly represented at es-Sibaʿiyyah, and some specimens are half as large again as No. 1. The butt was left untouched, though projecting pieces may have been knocked off. The implement seems to have been designed to give a smashing, rather than a cleaving or cutting, blow. The fabrication of these and other coups-de-poing from pebbles should be noted.

This most primitive form has received the name "Chalossian"[3] from supposed European analogies; but there is no need to bind it to European types, and that term will not be used here. "Primitive Chellean" or "pre-Chellean" serves equally well. Nos. 2 and 3 illustrate some slight improvement in technique, the same object having been attained by flaking from two edges only; again the butt was left untouched. In none was there any serious attempt to improve or retouch the point or sides. In No. 3 the dorsal surfaces of the implement are formed by two or three flake scars, and the point gives place to a broad, chisel-shaped edge, which was evidently desired, not obtained accidentally.

In Nos. 4, 8, and 9 some development of the bifaced coup-de-poing can be traced. No. 4 is of the same coarse workmanship as Nos. 2 and 3, but the enormously heavy butt has been discarded. Moreover, the general mass of the flaked portion has been reduced to finer limits, and the specimen shows that its maker had attained a considerable knowledge of his material and the technique of working it. In No. 8 the removal of the butt was plainly intentional and effected at some pains. Attempt at aesthetic symmetry of outline was not yet made, as in later styles, but the extremely vigorous blows were giving place to more purposeful and more carefully directed flaking. A straighter edge was beginning to replace the exaggerated zigzag. No. 9, made from a small bowlder, shows a striking contrast in the size of the flakes removed and in the mainly straight edges, spoiled by only one blow. No retouching of the point is yet noticeable. No. 8 seems to belong to the same class of implement as Nos. 1–3. Nos. 8 and 9 one may regard as essentially Chellean pieces, No. 9 probably representing a well developed stage in which mastery of blow and material has progressed far.

No. 7 introduces a high standard of work. Again a large pebble was used, and most of the crust was removed. The initial shaping flakes were still large, remarkably so for so small an implement; but in spite of this a good sharp point and a commendably smooth edge were achieved. The placing of the blows was extremely accurate, and the zigzag is much reduced. In this sequence of coups-de-poing, Nos. 1–4, 8, 7, and 9, all from the same terrace margin, a considerable evolution of skill may be traced; and Nos. 7 and 9 certainly take us well into Chellean time.

Outstanding among this assemblage are Nos. 5 and 6. No. 5 seems to be a core. If so, it is the smallest example from the site. The majority of the cores collected could not be figured here without reduction, and the flakes struck from them are of corresponding size. The cores suggest the vigor of early Chellean work, and the coarse zigzag is prominent in even this small specimen. The flakes, in which the site was not rich, are well exemplified by No. 6, which is very thick and bears a strong median ridge resulting from the removal of two previous flakes.

[2] The implements are illustrated in numerical order on Plates XIII–XLII.

[3] See p. 28. The occurrence of these triangular implements below more highly finished Chellean forms, in the same vertical sections of the 100-foot terrace gravels at ʿAbbasiyyah near Cairo, indicates that they are of greater age and not merely unfinished or rejected trial pieces.

The feature of special importance is the striking-platform, which is not prepared or faceted in any way and makes a strongly obtuse angle with the ventral side of the flake. The extremely prominent bulb can be seen in the illustration. The obtuse angle in No. 6 is 109°, and in half a dozen examples in the collection ranges between 109° and 120°. Measurements from cores also suggest that the range lies between 100° and 120°.

Although the value of such angular measurements may not be an irrefutable guide, considerable importance has been attached to them in the study of a Lower Paleolithic flake industry in Europe, now known, from Mr. S. Hazzeldine-Warren's researches at the mouth of the Thames, as the Clactonian. In these, according to Mr. Chandler,[4] the angles of two series, an older and a younger, average 109° and 122° respectively, but may be as high as 145°. In their general characters the Egyptian and the English Clactonian flakes have much in common, and this is reflected even more strongly in the cores. Caution demands that one should be slow in adopting the names of industries to identify analogous material in widely separated regions, but in this instance there seems to be some justification for so doing.[5] The similarity and the level at which the implements occur *in situ* having been pointed out, more extensive collections can be made. It will then be possible to form a definite conclusion. For the present perhaps the term "Egyptian Clactonian" may be used to describe flakes and cores, as "Egyptian Mousterian" has been similarly employed for some years, although the association with European types may be established later.[6]

Before leaving the 100-foot terrace, attention should be given to the remarkable implement No. 10. It was found on, not in, the gravels. It is virtually unrolled. A somewhat similar implement was found some years ago *in situ* in the 50-foot gravels north of Kena (outside the limits of this volume). Apparently its provenience is either at the top of the 100-foot stage or in the lower (older) levels of the 50-foot terrace. Types leading up to this magnificent product may be traced among the larger Chellean coups-de-poing of surface sites, but the specimen figured seems to outstrip them all in the boldness of its initial flaking and the care that was taken to perfect a long and slender point. Considerable trouble was taken over the butt also, but it was the point on which attention was chiefly focused. No attempt was made to remove an erratic zigzag in the middle of the edge; yet great pains were taken to retouch parts of the edge. The implement seems to recall Chellean work of Europe, with some suggestion of Acheulean secondary flaking; I would assign it to this transitional stage in Egypt.

Implements of 100- and 50-Foot Gravels

Implements have been found, as already described (p. 32), particularly near Munihah and Aklit, in the gravels of the Lower Paleolithic channel which underlies the Kom Ombo plain. At both places the gravels stand less than 60 feet above the flood plain and appear to form an inner lining, of Acheulean age, to the original channel of the 100-foot terrace. Our collections from these sites include a number of large Chellean coups-de-poing made by dressing large pebbles of various tough metamorphic rocks brought from the east by the Wadies Shait and Kharit. In spite of the fact that these pieces are very interesting, it is impossible to illustrate them here; instead, later and less waterworn, and in general smaller, specimens are chosen (Nos. 11–13), since they indicate better the general line of evolution. It must be borne in

[4] *Proc. Prehist. Soc. East Anglia* VI (1929) 79–116, and *Proc. Geol. Assoc.* XLII (1931) 175–77.

[5] M. l'abbé Breuil has identified the Clactonian over much of Europe, and states that he himself has found it in the gravels of the river Vaal, South Africa. He is convinced of its occurrence in Egypt also. One may thus use the word with the highest authority. See *Bull. Soc. préhist. franç.*, No. 4 (1930).

[6] These are terms of convenience and are intended here merely to signify respectively "a flake industry of Lower Paleolithic age, with unfaceted striking-platform," and "a flake industry of Middle Paleolithic age, with striking-platform usually (though not yet always) faceted."

mind that all three are made of material less tractable than flint, and yet they are in every way as effective. It must be admitted that Paleolithic Man had by now gained a real mastery of his craft. The outlines of all three are symmetrical and smooth, even if the effect of water wear is discounted. Despite difficulty of material a regular edge has been maintained, except in No. 12, an exceedingly obstinate rock to work into shape; yet care was taken to flake the butt. No such attempt was made in Nos. 11 and 13, probably on account of the facility with which the rock cleaves; in No. 13, for example, the ventral surface is a natural fracture. All three, despite the many difficulties to be overcome, show a marked advance in technique and symmetry over anything found in the 100-foot terrace.

Implements of the 50-Foot Terrace

In the 50-foot terrace more highly finished implements occur, made not only of flint but, in the Sudan, of intractable ironstone. With them occur small but thick flakes and occasional miniature coups-de-poing. On account of their small size no special technique need be claimed for the latter, but one side tends to be markedly flatter than the other. They are not, on the other hand, made from flakes.

Two small groups have been chosen for illustration, one from the northern border of the Sudan, the other from el-Kab. Nos. 14–16, from Ashkit, a little north of Wadi Halfa, are made of ironstone that would seem almost impossible to shape to any plan. Paleolithic Man reduced it to a form indistinguishable from that of his flint implements. His now complete mastery of himself, his tools, and his material could not be better illustrated than in the little coup-de-poing No. 14. The slender point was obtained, with a slight waist; and the rest of the implement, which might well have been left untouched, was studiously reduced to a conventional and symmetrical form both in section and in plan. Even a fairly straight edge was achieved. No. 15 retains the same symmetry; but the implement was modeled on a natural fracture, with far less pleasing, though equally efficient, results.

In No. 16, a disk, the maker set himself an almost impossible task; for the fragment of ironstone, though hard, is of coarser texture than that employed in the other two. Nevertheless the outline is extremely good, the section nearly biconvex, and the edge of surprising regularity. Although there is no evidence in this specimen, one is inclined to hazard the suggestion that some of such disks were modeled from coups-de-poing broken in manufacture or use. The butt of No. 14, for example, if broken at the slight notch at the base of its pointed part, could have been converted into a disk by a few blows.

No. 18, from the 50-foot gravels of el-Kab, is the same type of implement. It is made of flint of rather poor quality, but plainly was intended to be a disk and was not converted from some other purpose. From el-Kab also comes the coarse little flake No. 17, the only example from the site. The striking-platform makes an angle of 135° with the surface of the flake, and there is no sign of preliminary preparation or faceting.

The most interesting specimen from el-Kab is the miniature coup-de-poing No. 19. Such small implements are known from Chellean sites; but the beautiful symmetry, straight edge, and retouched point mark this as of Acheulean rather than Chellean type. There seems no need to claim more for it. The *arête* on the dorsal surface is almost exactly median, not displaced to one side; the opposite surface is flaked, not a flake fracture. The implement was obviously conceived and fabricated from a pebble. There is no need to invoke any associations with Micoque types.

The small implements from the 50-foot terrace figured here present a striking contrast to those of the older gravels. In the same terrace gravels north of Luxor well developed Acheulean types occur. In Nubia the Chellean tradition may have lingered longer or developed more

slowly. Above all it must be remembered that ironstone, not flint, was being used. The forms of the 50-foot terrace are not represented in the higher gravels. On reviewing the whole of the material and evidence within and outside of the district, we do not hesitate to attribute an Acheulean age to the 50-foot terrace.

Implements of the 30-Foot Terrace

In the 30-foot terrace, poorly represented in the area, derived Acheulean implements have been found, but no prolific site has been discovered. Of the forms that really belong to the stage nothing of outstanding merit or type calls for attention. North of our area coarse flakes and cores of early Mousterian aspect[7] have been found in this terrace.

Two isolated implements from our area will serve to illustrate the types found. No. 20, from el-Mataʿnah, recalls remarks made about No. 19, for it is a flake which was converted into a point after being detached. It gives no indication of detachment from a prepared core. Its age, judged from technique, is doubtful.[8] No. 21, from the Armant "bay," is a beautiful example of Acheulean skill in its outline, precise bilateral symmetry, and severely straight edge. The "fish-scale" flaking over the whole of both surfaces is remarkable, and the retouch of the edge is extremely well regulated. In a word, it is a fine example of the Acheulean development of art in flint-working in Egypt. As this was an isolated specimen in the 30-foot gravels, it is difficult to determine whether it was truly *in situ* here, that is, whether Acheulean technique continued so long, or whether the implement was derived from the 50-foot terrace near by. In view of its slightly abraded condition, the former seems the more probable; and this interpretation is borne out by Nos. 22 and 23.

THE MIDDLE PALEOLITHIC STAGE

Implements from the 30-foot terrace have just been described.

Implements of the 10-Foot Terrace

This is by far the most prolific terrace of Upper Egypt, its gravels locally being crowded with Mousterian implements. Older types, derived from higher levels, naturally occur, but call for no further comment here. The broken point or part of a coup-de-poing, No. 22, and the beautiful specimen No. 23 hardly seem to fall into this older group, for neither is appreciably waterworn. No. 23 is unrolled, and the technique is of a very high order. Although reminiscent of the Acheulean *limande*, it is almost as thin at the butt as at the point, yet lacks the careful attention to the butt that one associates with good Acheulean work. Fragments of cortex remain, and the butt as a whole would offend the Acheulean eye for form and symmetry (cf. butt of No. 21). The primary flaking is very bold, not relieved by "fish-scale" flaking as in many Acheulean pieces in Egypt. Moreover, the retouching of the sides only, by minute flakes, some at a high angle, is not typically Acheulean. On the whole, then, this implement may be described as of Acheulean form, but not of Acheulean technique in detail or of Acheulean age. It recalls so strongly certain Acheulean influences which survived in association with Mousterian implements in Europe that one cannot ignore the comparison. In Egypt there does not seem to have been an interdigitation of industries; but there is, in this implement and a few others like it, a suggestion of imitative carry-over, rather than of survival, from Acheulean well into Mousterian times.[9]

Passing now to the more Mousterian forms, we may first notice the rough disk No. 24. The contrast in technique between it and Nos. 16 and 18 is striking, though a result equally effec-

[7] I.e., early Mousterian of Egypt (see footnote, p. 74)—thick and heavy flakes with faceted striking-platforms.

[8] Cf. descriptions of Nos. 24–26.

[9] I.e., Mousterian of Egypt.

tive seems to have been attained by the removal of about four main flakes and a number of edge chippings[10] instead of perhaps fifty carefully delivered blows. The Mousterian sense of utility and simplicity and the "barbarian" lack of aestheticism such as the Acheulean flint-worker had certainly possessed are thus illustrated. But, as will appear, this crudeness was replaced, or else accompanied, by an entirely different spirit, rivaling in its expression much that the Lower Paleolithic industries could produce.

Nos. 25 and 26 are large flakes similar in workmanship to No. 24; but for No. 25 the detaching blow was far more forceful, delivered on an unfaceted platform with a flaking angle of 110° and a very large bulb of percussion. In No. 26 the platform is unprepared, and the flaking angle is 103°. These three implements might well have come from the 30-foot terrace, and may indeed be of that age; but two were firmly imbedded in the 10-foot gravels, and the third (No. 26) was found, unpatinated, on their surface. They demonstrate the survival of a flake industry in the district, as does No. 17 from the 50-foot terrace.

The contrast between the foregoing and the rest of the Mousterian suite illustrated here is strongly marked, though all are chosen from the same district, between the Armant "bay" and Wadiyein (at the mouth of the Valley of the Kings' Tombs, Thebes), including the Valley of the Queens' Tombs near the temple of Medinet Habu. Near by, another wadi, passing at the foot of an ancient Coptic church, laid bare gravels rich in implements. As far as possible two parallel series, cores and flakes, have been selected for illustration: cores Nos. 27, 29–32, and 35–36; flakes Nos. 28 (from a core such as No. 27 or No. 29 or, on smaller scale, No. 36), 33 (from a core such as No. 31 or No. 32), and 34 (from a core such as No. 30).

No. 27 is an example of numerous and varied simple cores, for which was chosen a long flint nodule broken across intentionally or by nature. A striking-platform was prepared by two or three blows. A further blow or two served to remove the cortex, and the required flake was then struck off. As a rule the core was not used further, at any rate to provide more flakes.

In No. 29 tabular flint was chosen. The whole of one side was carefully cleared of cortex, and a striking-platform was prepared by several light blows. This makes an angle of 50° with the surface from which the flake was removed; that is, the flake would possess a flaking angle of 130°. These features are reflected in flake No. 28, which is representative of a long series of varying lengths and widths.[11] No. 30 shows similarly careful preparation, but on the economical basis of a striking-platform broad enough to provide two flakes side by side. The preparation of the core suggests that broad, thick, short flakes such as No. 34 were required.

Nos. 31 and 32 introduce perhaps the best known and most typical Mousterian implement of Upper Egypt, from which slender leaf-shaped flakes of great beauty were produced (e.g., No. 33). In these flakes and cores artistic skill seems to find by simple form-lines as high an expression as it does in Acheulean technique. The cores are most carefully prepared on one or both sides, and their points appear to have been used subsequently for boring or chipping (cf. No. 31). If there had not been some such ulterior motive, it seems unlikely that the practical-minded Mousterian craftsman would have troubled to flake *both* sides to remove a flake from only one. The other side is most frequently far too highly arched for it to render a useful flake; there seems to have been no such intention. Some of the cores may undoubtedly be regarded as implements in themselves. When only a flake was required, a simple core such as No. 36 was prepared. This may or may not have served some further purpose, but plainly the flake was the initial object in view.

[10] Some of these are the result of use or damage from natural causes; the rest plainly were intentional.

[11] Cf. No. 37 also.

Lastly the small core No. 35 calls for attention. A flake has been detached from each end. The type was of special importance in the Mousterian beach of the Faiyum.[12] This is the only example known to us from Upper Egypt that has been found *in situ* in the 10-foot terrace gravels, though it occurs sparingly on the desert surfaces. It heralds the type of core almost invariably made in the closing stages of the Mousterian of Upper Egypt and Nubia, when pebbles were usually employed. In the specimen illustrated a short piece of tabular flint has been used. The presence of this core provides a suitable introduction to the succeeding deposits, but it must be regarded as uncommon in the 10-foot terrace gravels.

Implements of Younger Mousterian and Older Sebilian Age

The geological sequence is continued from the 10-foot terrace to the silts of the aggradation phase in Nubia and Upper Egypt. In the fine gravels that frequently form the base of the silts, or in their basal parts if gravels are missing, Mousterian implements of finely developed leaf shape occur. M. Vignard reported Mousterian implements at considerable depth in the silts of the Kom Ombo plain, and we have found them similarly situated at intervals from the Second Cataract to Edfu. Invariably these flakes are of the highly evolved type. Frequently, in the south, they are made of hard rocks other than flint; hence their illustration is a difficult matter. No. 38, from fine gravels of the silt phase at the mouth of the Second Cataract, south of Khor Musa, and No. 39 illustrate the type fairly well. At its best it resembles the late Mousterian type found in the beach and gravels of the Nile-Faiyum divide.[13]

Flakes of this type do not occur in the 10-foot terrace of Upper Egypt. There the most developed types seem to be No. 33 or, if a long and slender flake was required, No. 37.[14] Nos. 38[15] and 39[16] are but two illustrations of a type common in the older part of the silts and apparently strictly limited to it. The double-ended core, made from a pebble, also developed here, not in the 10-foot terrace. The occurrence of these forms of flakes and cores, not seen in older beds, closely associates the base of the silts with the Mousterian gravels of the Nile and the collateral 112-foot Mousterian beach within the Faiyum.

In a large collection there is a gradation from the Mousterian type No. 39 to forms such as No. 42, from the silt east of Wadi Halfa, and No. 43, from the same locality as No. 38. Here the steps in this transition must be severely reduced to intermediate forms such as No. 40, from the "beach" at Dibeira West, and No. 41, from the silt on the west bank of the Nile opposite Wadi Halfa.[17] There seems no reason to dissociate No. 40 from the late Mousterian; No. 41 marks a considerable falling-off in size and technique. Nos. 42 and 43 lack nothing in technique, but are markedly dissimilar from Nos. 39 and 40 in style, though plainly descended from them. It is at this indefinite position that M. Vignard introduces his Sebilian, and to it Nos. 42 and 43 would be assigned. No. 41 also is closely paralleled by some of M. Vignard's implements.[18]

With the Lower Sebilian it is a question, then, of employing that term or of abandoning it in favor of yet another qualification of Mousterian. From all points of view the former seems by far the better course. M. Vignard's work was the first systematic attempt to analyze the

[12] See *OIP* X 48 and Fig. 17. The crescents there mentioned have not yet been found *in situ* in Upper Egypt.

[13] Cf. *OIP* X, Fig. 18, No. 2, and Fig. 19.

[14] From the 10-foot gravels of the Valley of the Queens' Tombs. Nos. 28 and 37 are large and small members of a long series of flakes of this description.

[15] From lower gravels (below silt) at mouth of Second Cataract south of Khor Musa.

[16] From Dibeira West, surface of silt below Middle Sebilian "beach."

[17] No. 41 is made of siliceous hornfels; No. 39, of fine-grained green porphyrite; and Nos. 37, 38, 40, and 42–46, of flint.

[18] Cf. *Bull. de l'Inst. franç. d'arch. orientale* XXII (1923) Pl. IV 4–10.

later Paleolithic industries on a scientific basis; and the value of his work to later investigators is, or should be, acknowledged with keen appreciation. The adoption of his term is convenient and but a small tribute to his difficult task successfully accomplished. If we adopt the standard of his memoir for distinguishing typologically implements of Middle from Lower, we must place No. 44 in the former. This is also in strict conformity with the geological evidence, for it comes from the degradation gravels near el-Kab, analogous to the beaches and bars of the area from Darau to Wadi ᶜAbbad.

Similarly the small cores Nos. 45 and 46 come from upper (degradation) gravels at the mouth of the Second Cataract south of Khor Musa, and typologically No. 45 recalls nuclei of M. Vignard's second level.[19] No. 46 on the other hand, though from the same stratum, is a clear descendant of Mousterian design. The Lower and Middle Sebilian are thus part of a gradation: certain common forms join them; but certain Lower Sebilian types are not continued in the Middle, and new forms take their place. A study of M. Vignard's plates and text shows how many of the newer forms are founded on the older, the main difference lying in the growth of detailed retouch. A "nibbling" retouch such as this tends to bite into original simple forms, and new forms are evolved and standardized. Among the typical changes thus brought about at an early date was the removal of the remains of the striking-platform and bulb of percussion from the flake (see Nos. 42, 47, and 49). With the brief series consisting of Nos. 38–46 the geological succession must be illustrated; but the Middle Sebilian is met again, not in a geological deposit (i.e., the degradation gravels) but in flaking sites. Here typology and, to a certain extent, levels are the only criteria of age.

Nos. 47 and 49 illustrate some of the features, notably removal of the striking-platform, already mentioned. With Nos. 48 and 50 they come from a flaking site (Site B) 45 feet above the flood plain on the west bank about 7 miles south of Edfu (see Fig. 9). No. 47 was probably broken later. No. 50 shows the "backing" of a blade by flaking.

THE LATE PALEOLITHIC STAGE

In discussing the geological dating of industries in earlier chapters the term "Late Paleolithic" was adopted; to indicate the probable scale of time the Sebilian as a whole has been placed in this category. Typologically the changes come neither with aggradation nor with the beginning of degradation (Middle Sebilian) but at a later point in that degradation, geologically defined only at Dibeira West (see pp. 48–49). Apart from this site the Upper Sebilian is known as yet from surface flaking floors only. The material from Dibeira West shows little dissimilarity from that of a newly discovered site near Edfu, and the whole may be described jointly. It presents in general a marked contrast to the Middle Sebilian, and in some respects it is unfortunate that it was not given a distinctive name by M. Vignard. It is an industry of little but microliths.[20] The cores from which they were struck are of two forms. One, illustrated by Nos. 56 and 62 from the Edfu sites, is a miniature double-ended type which can be traced through the Lower and Middle Sebilian. The other is an essentially neanthropic type. The latter is produced by removing both ends of a small elongated pebble and then stripping off a large number of thin, narrow, parallel-sided flakes (cf. Nos. 71–74 and the minute core No. 75). The two forms seem to have been combined in cores of the type of No. 68, a double-ended core allied to No. 62, from which, however, the narrow flakes were struck off.

Many of the small flakes illustrated here are probably workshop débris of these cores (cf.

[19] Cf. *op. cit.* Pl. VI 1–2.

[20] Nos. 51–56 are from Site A and Nos. 57–72 from Site C, both on the west bank of the Nile south of Edfu. Site C is 33 feet above flood plain (see Fig. 9), and Site A is not far from it. Site B, Middle Sebilian, is at 45 feet. Nos. 73–102 are from the geologically dated site at Dibeira West, north of Wadi Halfa.

Nos. 51–54, 57–70, and 85–102); but many of them were turned to special purposes, some obviously serving as small borers or points, for they are broken or show signs of wear. Others were carefully retouched (cf. Nos. 51, 63, and 66) after removal from the core. The familiar "Aurignacian retouch" of Europe is not seen, and burins seem to be absent, as M. Vignard noted at Kom Ombo. No. 67 immediately catches the eye. Inspection shows, however, that although a blow was delivered from the upper end of the flake it was but a previous attempt to detach the flake from its core, and that the recessed furrow across the specimen is not a burin but the hinged fracture that resulted. Retouching of edges and production of geometric forms are very common and are profusely illustrated by M. Vignard.[21] Two crescents have been included, Nos. 55 and 95. The former is clumsy and occurs equally in Middle and Upper Sebilian; the latter is made of transparent agate, and the "backing" is so minute that it can hardly be studied in the original without a lens.

At Dibeira West arcs of circles also, with flat flake surfaces on the side not illustrated, were carefully produced by minute retouching, as in Nos. 81, 83, and 84. No. 82 shows flakes parallel to the edge, some of them apparently removed after detachment of the piece of agate from its core. The last group that calls for attention in this new Sudanese site is the series Nos. 76–80, minute implements of which the lower surface is a plain flake and the upper is arched and flaked from the edges. No. 79 has a high apex. The retouch is almost unparalleled in its minute size and remarkable accuracy (cf. the converging flakes on No. 78).

Plainly this series of Upper Sebilian type has little in common with the Middle Sebilian. M. Vignard's monograph[22] shows Middle Sebilian types developed almost to meet Upper Sebilian standards; but nevertheless one feels that, whatever advances had been made, some new and outside influences certainly entered the culture series in Upper Sebilian times. M. Vignard's work shows the industry to have developed, finally, almost Mesolithic characters; but the outside influence, so retarded in its arrival in Upper Egypt, one tends to associate with some form of the Capsian. This suggestion will gain weight if it transpires that the oldest of the Nubian graffiti can be linked with rock drawings of Bushman influence or origin (see p. 70). Aurignacian implements seem to be entirely absent from the region described in this volume, and the infiltration of peoples making those Upper Sebilian implements not found in older sites or cutting the graffiti, or both, seems in any case to have been a late event. This part of the Nile Valley remained the stronghold of Mousterian technique probably long after it had been forgotten or absorbed elsewhere.

The principal kinds of shells found in the Sebilian kitchen middens of Upper Egypt, comprising the characteristic molluscan fauna of the Middle–Upper Paleolithic silts, are illustrated in Plate XLIII. They are:

1–4. *Unio willcocksi* Bullen Newton (synonym: *Unio vignardi* Pallary). Nos. 1–2, left valves, Edfu; No. 3, right valve, Silsilah; No. 4, right valve, Edfu. Chorotypes. This species is extremely abundant from Edfu to Wadi Halfa, and has sometimes been wrongly recorded as *Unio schweinfurthi* Martens (see *OIP* X 56, n. 1). It is strange that it does not occur in the Faiyum.

5. *Cleopatra bulimoides* (Olivier). A small gastropod sometimes so abundant in the silts that its shells whiten the ground (e.g., at Edfu and other places on the west bank in Upper Egypt, and also east of Wadi Halfa).

[21] *Op. cit.*

[22] *Op. cit.* All students of the subject are strongly advised to consult this, for our notes make no attempt whatsoever to rival or replace it.

6–7. *Corbicula consobrina* (Cailliaud). Recently living shells from a modern canal in Upper Egypt, inserted for comparison with Nos. 9–30. The Paleolithic shells never reached such a large size as these.

8. *Corbicula consobrina–artini.* From same locality as Nos. 6–7. Recent.

9. *Corbicula artini* Pallary. From Paleolithic silts 20–25 feet above flood plain west of Medinet Habu temple, Thebes. High form (height 110% of length) transitional to *C. vara* Gardner.

10–30. *Corbicula consobrina–artini.* From Paleolithic silts, Upper Egypt. Nos. 10–13 and 15–18 from Kom Ombo plain (Sebil, from Vignard's "I^{er} niveau"); Nos. 14 and 19–22 from Edfu; Nos. 23–30 from el-Kab. Series figured to show the forms most typical of the Paleolithic silts of Upper Egypt, with thick shell as in *C. artini* and length-height radio often intermediate between the two so-called species.

X

SUMMARY

This volume deals with about 350 miles of the Nile Valley and is the result of two seasons' field work. The season of 1926/27 was spent between Luxor and Aswan; that of 1929/30, between Aswan and Semnah (40 miles south of Wadi Halfa), with revisionary work between Darau and Edfu. Some final revision between Luxor and Edfu was carried out in 1930/31.

GEOLOGY

Physiography

From Semnah to Wadi Halfa the river makes its way through a massif of igneous and metamorphic rocks, along a region of cataracts, rapids, and wild scenery. It then passes onto Nubian sandstone, horizontal or gently corrugated, over which it flows northward for a distance of about 250 miles until the sandstone dips under later, Upper Cretaceous, rocks near Esna. Within this distance the ancient rocks already seen in the Second Cataract, south of Wadi Halfa, reappear from beneath the Nubian sandstone at two points in the river's course, Kalabshah and the First Cataract (immediately south of Aswan). North of Aswan, in the Kom Ombo plain and at Gebel Silsilah, faults passing transversely across the valley interrupt the normal surface of the Nubian sandstone and bring Upper Cretaceous and later beds into contact with the river. The faulting also brought the resistant mass of Gebel Silsilah (Nubian sandstone) into being, but the river has negotiated it by a steep-sided gorge, just as it has penetrated the inlier of Kalabshah.

North of Esna soft Cretaceous rocks—Esna shales and limestones—predominate and, a little farther north, are still capped by massive Lower Eocene limestones, which form the cliffs of Thebes and great outliers such as Gebel Rakhamiyyah on the east side of the Nile between Luxor and Esna. The fact that the Nile penetrates this high scarp shows that the river, or an ancient drainage of the same type, formerly flowed over the overlapping edges of Cretaceous and Lower Eocene rocks at some remote and unknown locality in the south. Denudation has brought out lithological differences between the strata, producing a scarp which has been driven northward. The main river, the Nile, has been able to maintain its northward course and deepen it, and so passes between cliffs 1,000 feet and more above its bed where it enters the Lower Eocene rocks near Luxor. It was unable to change its course, once intrenched in the limestones; and it probably became so established in Pontic times, after late Miocene continental uplift. The sides of the deep valley are scarred by the remains of gigantic slipped masses. No similar movement has taken place since early Pliocene times.

Pliocene

In the ensuing Pliocene period the ancient Mediterranean transgressed upon the land and flooded the Pontic Nile Valley to a height of at least 180 meters above present sea-level, converting it into a long and narrow gulf. The Nile, its tributaries, and the run-off from the plateau and the limestone cliffs continued to pour detritus into the flooded valley, until by Upper Pliocene times it was virtually filled to water level. Breccias and conglomerates formed

near the sides, passing into finer deposits near the center line; from the south the Nile contributed quartz sand derived from the Nubian sandstone.

The gulf and its deposits can be seen plainly as far south as Esna. The task of tracing its southern boundary has occupied our attention, and it has now been followed as far south as Kom Ombo and west of Edfu. Its deposits are generally concealed under later gravels, between which and the eastern rocky wall of the valley the Nile is confined from Kom Ombo northward as far as Esna. The modern river thus enters the old gulf from the southeast corner rather than from the southern end.

No Pliocene deposits have been found south of Aswan, and in the valley which the river now occupies farther south the oldest river platforms that have been preserved are believed to be of post-Pliocene age. In Pliocene times the river either occupied the higher levels of the present valley, now much dissected, or had an independent course of which all trace has disappeared. The Nile basin south of Aswan must certainly have drained northward, particularly from the eastern mountains and highlands of Abyssinia, though the Victoria Nile may be a much later addition to the White Nile basin.

Plio-Pleistocene

It appears, however, that the ancient massif from the Second Cataract to Semnah and farther south remained concealed beneath Nubian sandstone until comparatively late in Pleistocene times. The earliest river terrace of which traces survive, the 300-foot terrace, probably of post-Pliocene age, shows no sign of material which could have come from the massif immediately on the south. Lower Plio-Pleistocene terraces at 200 feet and 150 feet are in this respect the same. It is suggested that the river may have made its way from Dongola to Wadi Halfa on a course a few miles west of the present outcrop of ancient rocks.

Plio-Pleistocene river platforms and terraces may be followed from Wadi Halfa northward at 300 feet, 200 feet, and 150 feet for the greater part of the distance to Aswan. Here and farther north the higher two terraces are absent, owing to lithological changes of the solid rock; but the 150-foot stage is strongly represented by a wide stream of gravel, locally 20 feet or more thick, along the west bank of the Nile from near Darau to Esna. Most of its gravel was provided by two great wadies draining the Red Sea Hills—Wadi Shait and Wadi Kharit. Hence the gravel was carried across the site of the Kom Ombo plain. The gravel passes northward on the west side of Gebel Silsilah; but two branches of the river crossed the ridge at that time, and one of them initiated the present channel. North of Esna the soft deposits of the Pliocene gulf, abandoned by the subsiding sea, were vigorously eroded by the Plio-Pleistocene river; and nearly all traces of terraces that may have been formed have long since been destroyed by later erosion.

Pleistocene: Lower Paleolithic

In the gravels of the next river terrace human implements make their first appearance. Long-continued searches of the Pliocene gulf deposits and Plio-Pleistocene terraces have failed to produce any flaked stone which might be accepted as an artifact. In the 100-foot terrace, however, early and later Chellean types are found together. Their total absence from the 150-foot gravels suggests that a prolonged interval must have elapsed between these two river stages and that the level of the 100-foot terrace was long maintained by the Nile.

The 100-foot stage may be traced at frequent intervals from Wadi Halfa to Luxor at the same height above flood plain. There is no sign that the Second Cataract as such was in existence during this or the succeeding 50-foot (Acheulean) stage. The discovery of Lower Paleolithic implements *in situ* in gravels within the northern boundary of the Sudan and through Nubia fills a gap in the knowledge of their distribution. At es-Sibaʿiyyah on the east bank

near el-Kab a section of the river bed of 100-foot terrace age is exposed from the center to the marginal gravels, in which an important assemblage of implements was found.

At one locality, Dihmit, an intermediate terrace of 75 feet occurs; but, apart from this, the next stage widely preserved is at 50 feet. Implements indicating its later, or Acheulean, age were found at a number of places, including Ashkit (within the northern border of the Sudan), el-Kab, and the vicinity of Kom Ombo. At the last place one side of a channel analogous to that of es-Sibaʿiyyah, but partly of the 100-foot and partly of the 50-foot stage, is exposed; its central part is hidden beneath later silts. During these two terrace periods two valleys through Gebel Silsilah were kept open and were deepened on the sites of the original 150-foot channels.

Middle Paleolithic

With the advent of Middle Paleolithic times came drastic changes. The river entered the Second Cataract, apparently for the first time. Two terraces, at 30 feet and 10 feet, though poorly preserved in Upper Egypt, serve to indicate the continuation of normal terrace formation for a while. The former is known to be of early Mousterian age, while the gravels of the latter abound with beautiful implements of the "typical" Mousterian of Upper Egypt.

Farther south either these gravels were never formed, or they have been destroyed or hidden beneath later deposits the bases of which are approximately at present river-level. Elsewhere Mousterian flakes are found in the basal part of the later deposits, which consist mainly of micaceous silt almost indistinguishable from that brought down by the Nile today. Beds of fine gravel, the pebbles bearing a highly polished surface, also occur. In the upper part the Mousterian flakes give place to an industry which is plainly its direct descendant, and for which the name Lower Sebilian is retained here.

The silts thicken from north to south, from about 18 feet at Luxor to 100 feet at the mouth of the Second Cataract. Thus they conceal progressively earlier and higher river terraces from north to south, up to the 100-foot terrace near Wadi Halfa. The river during the silt phase filled broad marshlike bays along its course, as at Wadi Halfa, Abu Simbel, Kom Ombo, and in many smaller areas; these suddlike regions, when habitable, were occupied by human beings.

Late Paleolithic

After the accumulation of silt had reached its maximum, the river-level fell and the marshes were drained. Habitation sites are at once noticeable in situations such as the Kom Ombo plain and along the narrower parts of the river in both Nubia and Upper Egypt. The technique of the earliest or Middle Sebilian sites still shows unmistakable traces of a Mousterian ancestry.

By Middle Sebilian times the river seems to have cut its bed to a level about 40 feet above present flood plain in Upper Egypt (e.g., at Kom Ombo); but it probably stood rather higher in Nubia (e.g., 68–73 or 70 feet at Dibeira West). Upper Sebilian implements are found in direct association with contemporary marginal deposits at 40 feet at Dibeira West. They are not so found in Upper Egypt, although bars and "beaches" occur at 40 and 20 feet and contain rolled Middle Sebilian implements. The lowest flaking site of Upper Sebilian age yet recorded is at 33 feet (south of Edfu), but the river was certainly below 20 feet at that time. Thus there appears to be a considerable interval of time between the main Middle and Upper Sebilian occupations, although there is no reason to suppose that the country was depopulated. From this geological starting-point further investigation would be of special interest.

Prehistoric and Historic

Of the river's later movements in Upper Sebilian times little is known. The valley was cut to about its present depth in Nubia; and a deeper channel, since filled, seems to have been cut

north of Esna, while bed erosion has continued in the south. Erosion has been concentrated at the cataracts and "narrows." At Gebel Silsilah one valley was left choked with silt, the other was deepened; so also at Aswan, where a third valley has remained blocked by a bar of gravel since 100-foot times. At the Second Cataract many channels have been cut and abandoned, and may now be seen filled with ancient silt. Farther south, at Semnah, a sill of hard gneissic rock seems to have been lowered 26 feet since the 12th dynasty. It has been possible to prove this by purely geological evidence based on surviving terraces and their gravels, with rolled potsherds as zonal indexes instead of shells or flint implements.

Finally, we put on record some interesting rock pictures encountered in Nubia and, we believe, not previously described. We do not pretend to offer a complete survey of the graffiti of the region, many of which have already been recorded in scattered memoirs, although many more remain to be observed and copied. The subject is in need of a comprehensive survey for the Nile Valley akin to those made by Breuil and Newbold for the western deserts. This is the more desirable since we have observed certain graffiti that recall the oldest class of Newbold's classification, which, according to Breuil, suggests Bushman (or migrating Aurignacian) affinities. These oldest engravings occur, moreover, *above* the probable Upper Sebilian water level in Nubia (Wadi el-ʿArab). This concludes the application of geology to human problems within the area.

CLIMATE

There is every reason to suppose that the part of the Nile basin draining into the area dealt with in this volume received a considerable rainfall in Pontic and later Pliocene times. Judged by the Pliocene deposits, it was abnormally heavy. There is no sign within our area of any desert period before Pleistocene times, and the Plio-Pleistocene terraces indicate a liberal water supply from the south, east (especially), and west. The eastern hills throughout were the main source of surface water.

At the close of Lower Paleolithic times a change is noticeable in the Nubian tributary streams. Their floors conform to the level of the 50-foot (Acheulean) terrace, only narrow torrent gorges passing below it. There seems to have been a marked reduction of run-off, even on the east bank, at the close of Acheulean times. North of Wadi el-ʿAllaki this contrast fades away, and there is no suggestion of a failing water supply in Upper Egypt in early Mousterian (30-foot terrace) times. The deposits of the succeeding 10-foot terrace, however, suggest sporadic torrents rather than evenly distributed rainfall. There is no sign of wind erosion or of desert climate.

In the following silt phase the local rainfall failed completely in Nubia, and the silt still lies in and chokes hundreds of small wadies above and below the 50-foot terrace. The silt of those on the east side and of the larger wadies has been cut through by narrow gullies, often only a few yards wide, which have been the only channels of escape for local water since the peak of the silty aggradation. It may be assumed that Nubia had lost its rainfall by Lower Sebilian times, and that it has never since regained it. The advent of absolute desert with its blanket of sand appears to have been a much later event, since dunes of blown sand have not been found incorporated in the silt south of Esna though they now cover a large part of it on the west bank.

In Upper Egypt the features of silt accumulation are similar to those in Nubia, but the local rainfall survived in some small measure. The vast mass of silt in the Kom Ombo plain was left virtually intact, however, and the wadi valleys from the eastern hills have been established across it to the Nile. In view of the large areas of silt surviving in exposed places, it must be assumed that the rainfall had virtually ceased in Upper Egypt by Upper Sebilian times. This

is reflected also in the absence of Sebilian implements from the desert surfaces far from the Nile. Lower and Middle Paleolithic implements, but not Sebilian, may be found anywhere between the Nile and the Red Sea. Concerning the western desert, opinions differ. Although Lower and Middle Paleolithic implements have been known for many years to litter the surface between the Nile and Khargah Oasis, their distribution in the remoter parts remains to be investigated. Beadnell expressed the opinion many years ago that they did not occur;[1] Ball, more recently, has stated that he thinks they may be expected anywhere in the Libyan Desert.[2]

The western plains and plateaus of Nubia and Upper Egypt probably remained in a semi-desert state for a very long time, and to the end of the geologically dated record there is only one known occurrence of an incorporated sand dune—in the silt on the west bank between Gebelein and Armant. The situation there is particularly favorable for such an early accumulation, and it must be remembered that blowing sand does not necessarily signify absolute desert. It suggests, however, at least a semi-desert climate at the time of silt accumulation. On a hard limestone plateau the border between semi-desert and desert is a narrow one.

On the whole, then, it appears that run-off began to fail in Nubia at the close of Acheulean, in Upper Egypt during Mousterian, times; that it failed entirely in Nubia by the close of the Sebilian aggradation, and in Upper Egypt but little later; and that sand accumulated locally near the river in small dunes in the north before it did so in the south. The sand was derived, however, from the western plains, and it is possible that from an early date their climate differed from that of the Nile.

HUMAN INDUSTRIES

In the 100-foot terrace primitive or early Chellean, Chellean, and Chellean-Acheulean implements have been found, but not in older beds. Many are made from pebbles. A coarse flake industry occurring somewhat sparsely, recalls the Clactonian industry found at a similar, pre-Acheulean horizon in England and Europe. The use of the term in Egypt may be justified.

In the 50-foot terrace Chellean-Acheulean and Acheulean implements occur, with small, rather crude, flakes.

The 30-foot terrace is known elsewhere to contain early examples of the Mousterian method of detaching flakes from roughly prepared blocks of flint.

The Mousterian technique reached an exceedingly high standard at the time of the 10-foot terrace, and the beautiful workmanship seen in the implements here figured represents the "typical" Mousterian of Upper Egypt at its best.

During the following period of silt accumulation the previous high standard was not maintained. For a while flakes with equal beauty of form and technique were made; but imperceptibly they became thicker, lost their fine edges and retouch, and changed their shape from that of a broad-based leaf to a rough rectangle or a simple point. Similar changes took place in the cores, small pebbles being used almost invariably instead of larger masses. To these changing stages the term "Sebilian" has been applied, and the Lower and Middle Sebilian may be regarded as essentially of Mousterian derivation. Since the word serves its purpose and records the admirable researches of its author, M. Vignard, there seems no reason to abandon it.

Distinct from the Lower or Middle Sebilian is the Upper Sebilian, which has essentially neanthropic character of workmanship and suggests the introduction into this part of the Nile Valley of Capsian or Capsian-like influences from North Africa or elsewhere. The ap-

[1] *GM*, 1903, p. 58.

[2] *GJ* LXX (1927) 220.

parent hiatus between Middle and Upper Sebilian industries, reflected in their geological positions, suggests that some event of considerable human importance took place at this time. At present there is insufficient evidence to judge what it was, but we suspect that the growth of deserts here and elsewhere had set in motion those migrations which continue at the present day among the desert population.

INDEX

[Egyptian place-names include some, such as Cairo, Alexandria, and Luxor, which are thoroughly at home in the English language. In compound names more or less phonetic spellings of certain elements have likewise become relatively fixed in popular English usage. To facilitate pronunciation by the reader such spellings are here retained for the following terms:

Spelling Adopted	Written in Arabic as	Meaning
beit	*bait*	house
beni	*banī*	sons
deir	*dair*	monastery
gebel	*gabal*[1]	mountain
gezirah (construct, *-ret*)	*gazīrah* (construct, *-rat*)	island
kom	*kūm*	heap
medinah (construct, *-net*)	*madīnah* (construct, *-nat*)	city
tell	*tall*	mound

On the same basis the Arabic article is here transliterated not as *al-* but as *el-*, with assimilation before dentals, sibilants, *n*, and *r*. An *e* is used for Arabic *a* in a few other cases analogous to the foregoing, e.g., in the names Deirut and Denderah. Elsewhere its use is called for to harmonize with preceding *e*'s, e.g., in the diphthong *ei* in the terms Gebelein and esh-Sheikh. An *e* takes the place of Arabic *i* in such names as Edfu, ᶜEdwah, and Esna. An *o* is used not only for Arabic *ū* in Kom and in elements harmonized therewith (e.g., Kom Ombo) but also for Arabic *au* in such names as er-Rodah.

For the greater part, however, the geographic names or elements found in this volume are relatively unfamiliar to English or American readers. The written Arabic forms of such terms have in all possible cases been exactly transliterated in our Index. In the text proper the same spellings are used, but diacritical markings are omitted. Cross-references to spellings used in the Prehistoric Survey's previous reports are also included in the Index. The original Arabic forms have been obtained primarily from the map of Egypt 1:50,000 by the Survey Department of the Egyptian government, supplemented by Baedeker's *Egypt and the Sudan*, 8th ed. (Leipzig, 1929).[2]

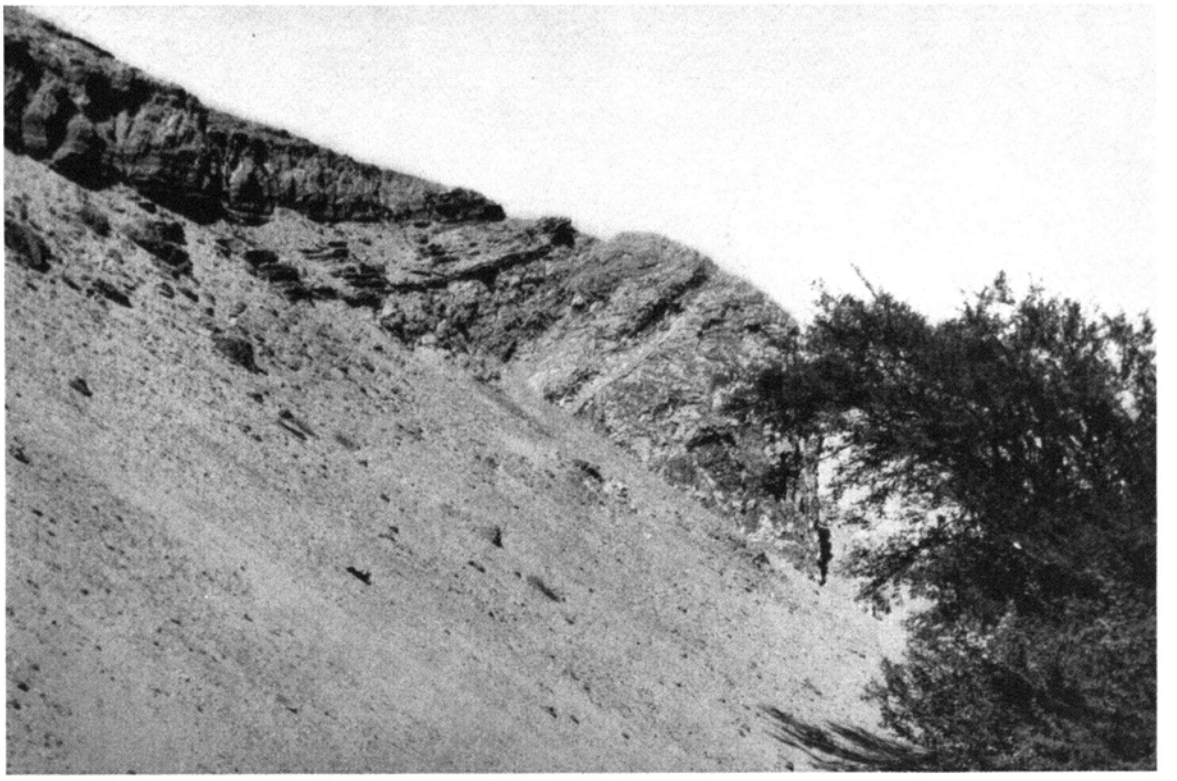
The system followed for exact transliteration is that worked out for the archives of the Oriental Institute by Dr. A. A. Brux and published under the title "Arabic-English Transliteration for Library Purposes" in the *American Journal of Semitic Languages and Literatures*, October, 1930, Part 2. Previous systems are discussed, and the reasons behind the Oriental Institute's system given, in Dr. Brux's paper. The problem of geographic names in particular is treated at its end.—EDITOR.]

[1] Since in Egypt *j* is sounded as *g*, we use the latter symbol throughout our Egyptian place-names.

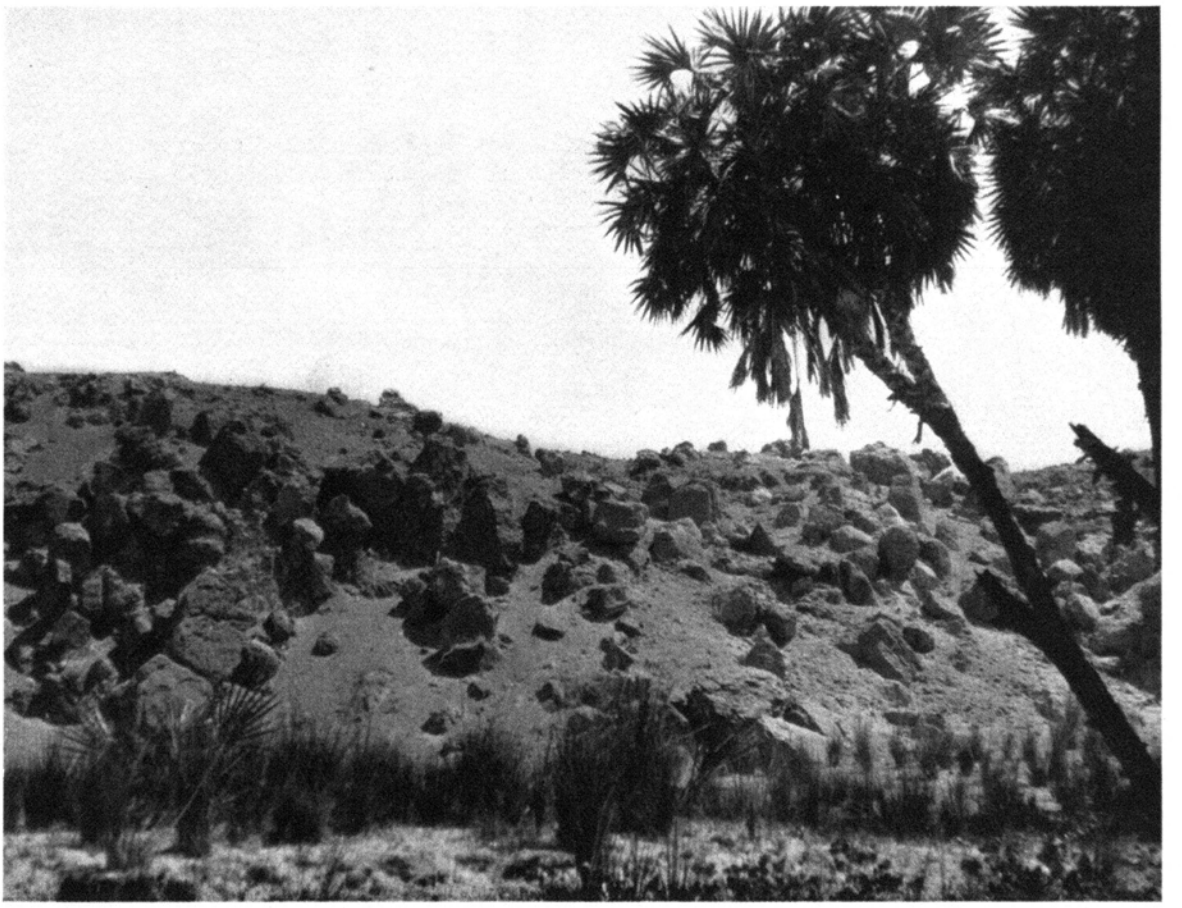
[2] Edited by Georg Steindorff. Arabic transliterations apparently by Dr. Curt Prüfer; see its p. xxviii.

[PRINTED IN U.S.A.]

PLATE I



A



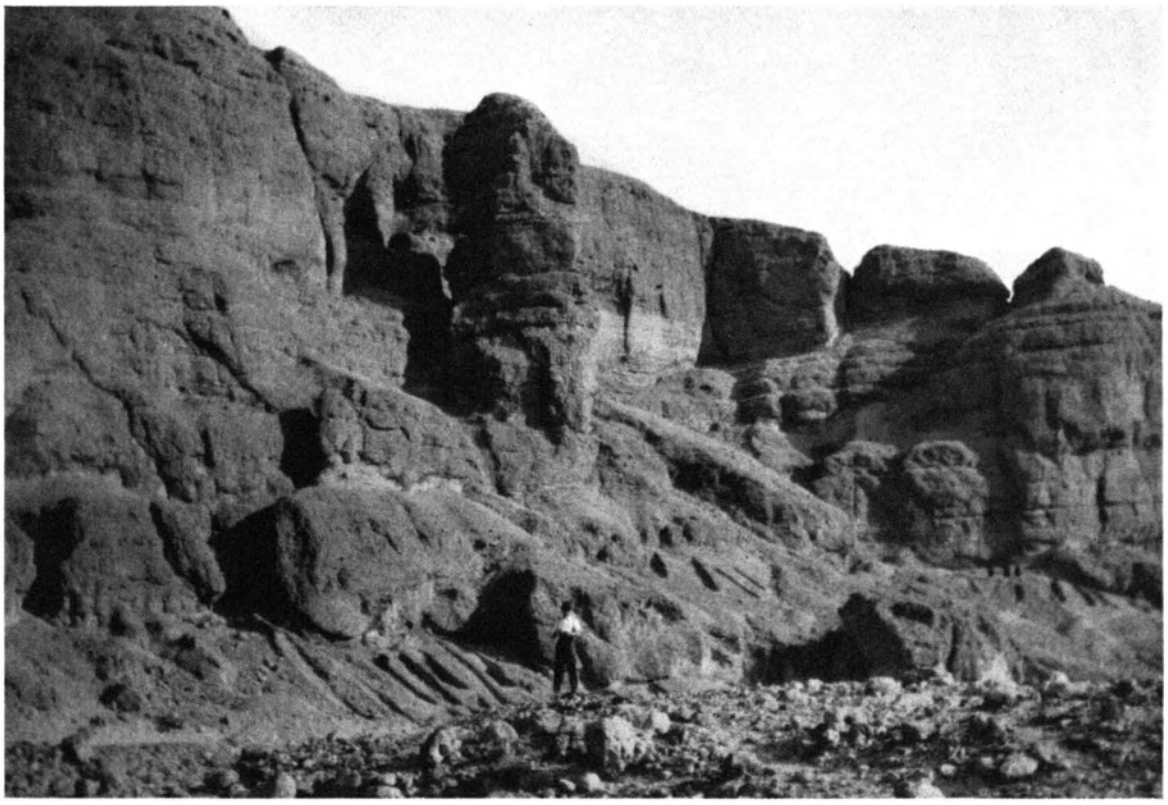
B

A.—Cliffs on the west bank of the Nile opposite Aklit, Kom Ombo plain. Current-bedded Pliocene strata lie unconformably on an uneven floor of highly inclined Upper Cretaceous shales. *B*.—Gebel Miyahi. Gigantic blocks of Eocene limestone set in a matrix of Upper Cretaceous shale.

PLATE II

Pliocene Gulf Deposits at Shaghab. The Upper Limit of Deposition, Forming the Conspicuous Pliocene Platform, Is Clearly Shown

PLATE III



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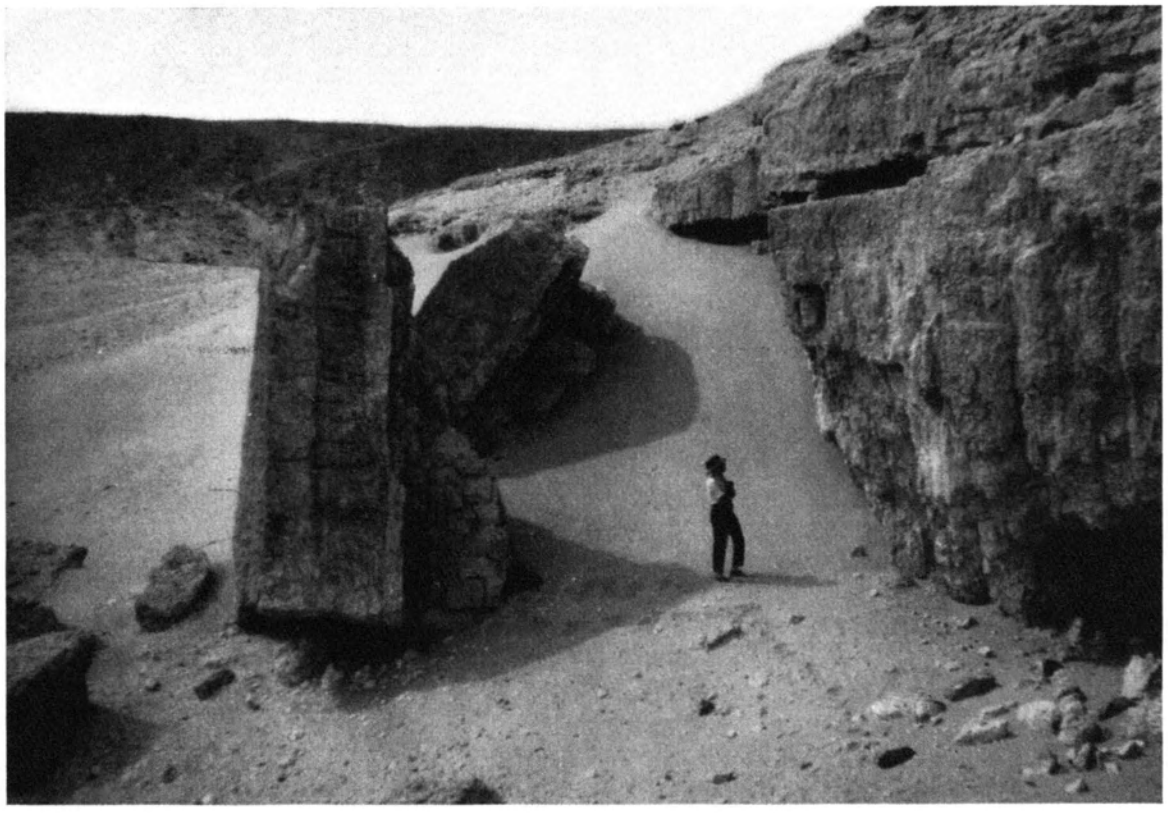
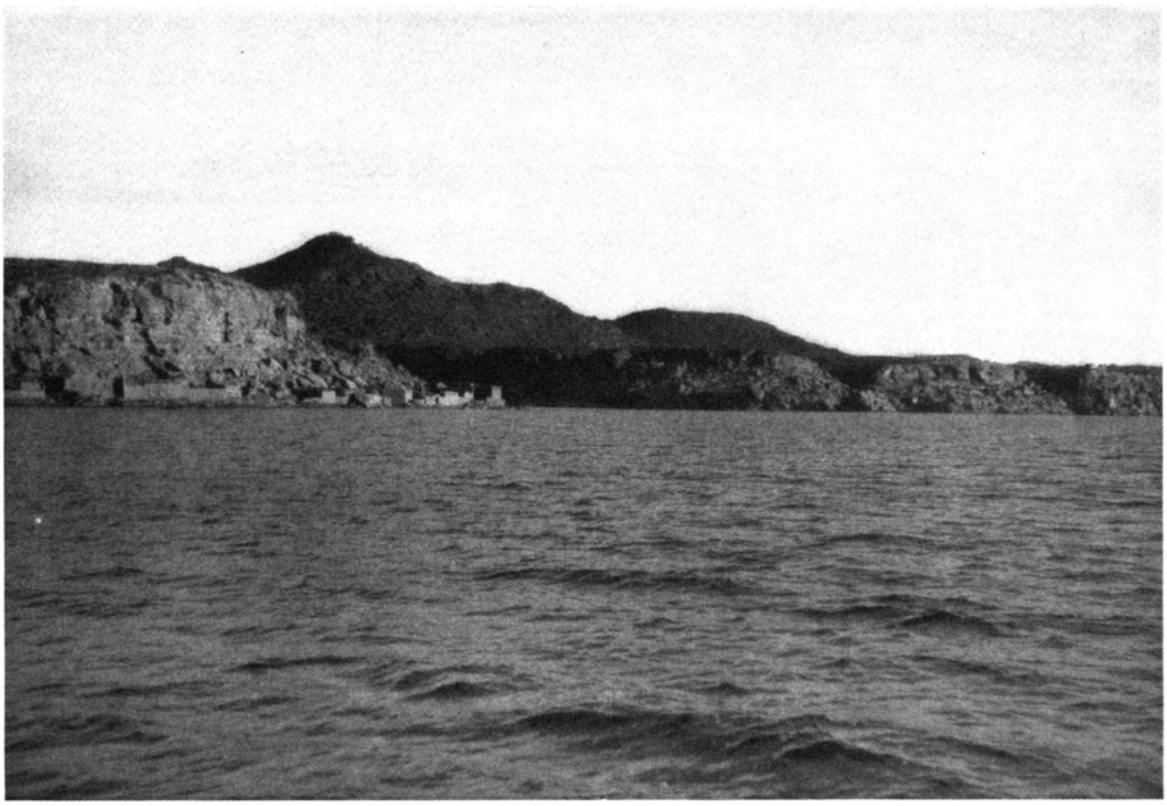


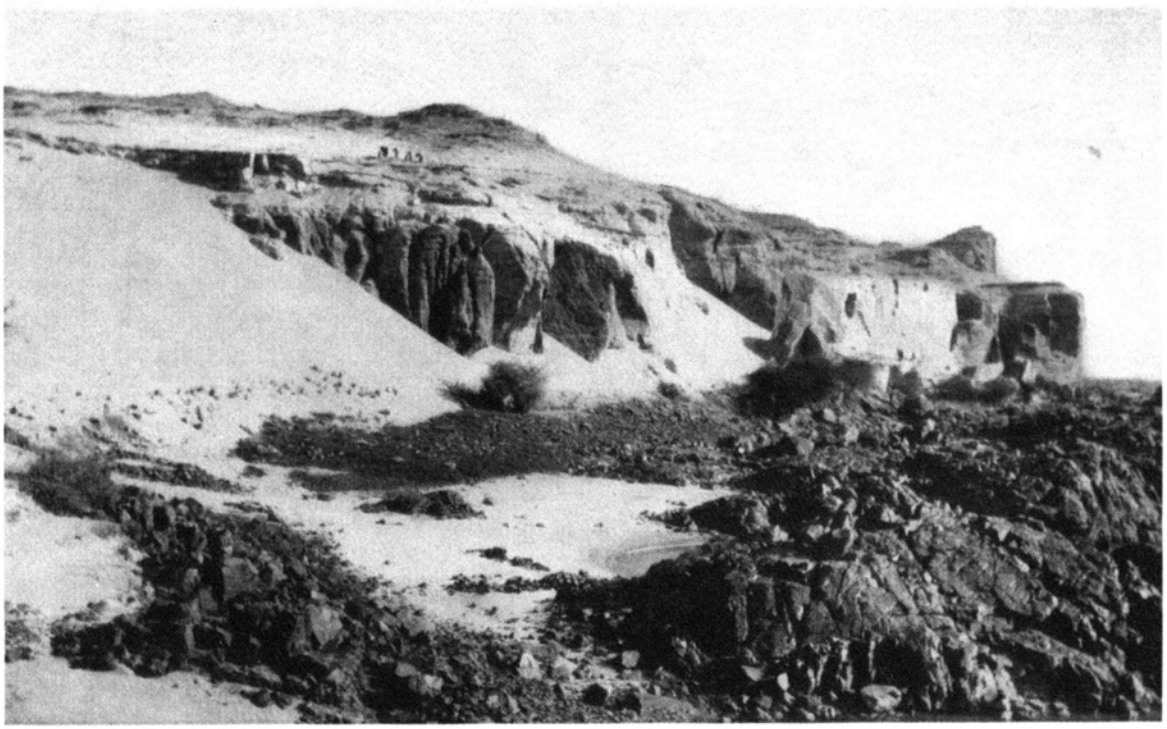
B

A.—Cliffs formed of Pliocene gulf deposits. Valley of the Kings' Tombs, Thebes. *B*.—Quarry in Pliocene marls, limy and pebbly beds, with derived Eocene nummulites, in desert west of Armant at foot of the Theban hills.

PLATE IV



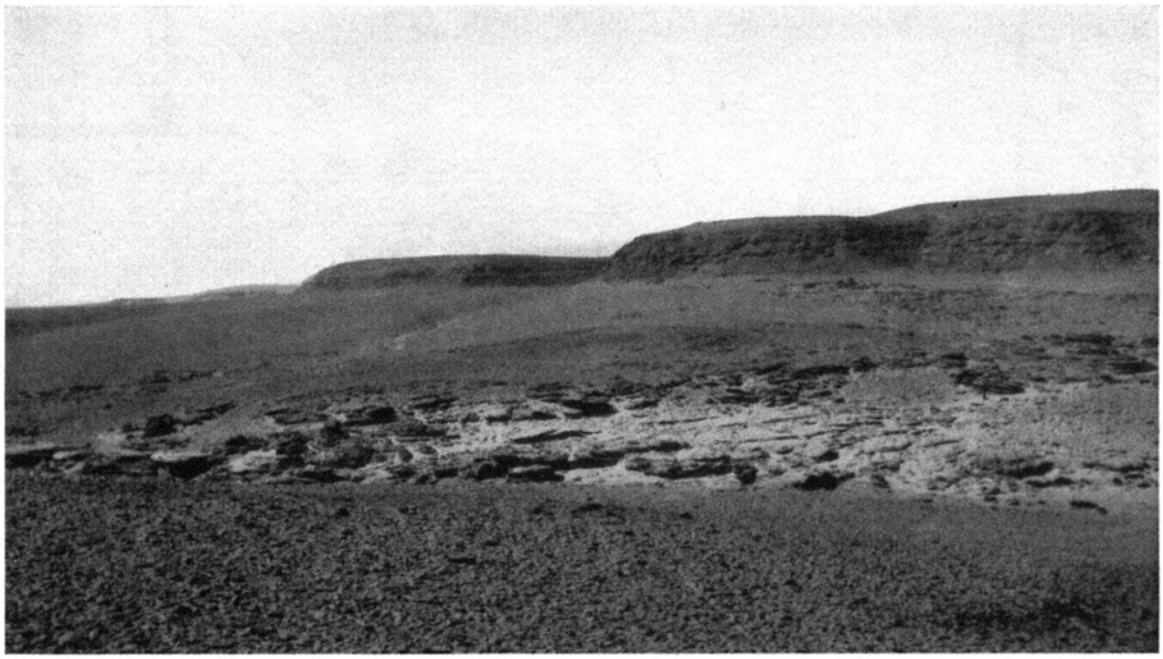
A



B

A.—The 150-foot Plio-Pleistocene terrace on the east bank of the Nile near Nag‹ es-Singab (about 23°25′ N. Lat.), Nubia. *B*.—The Rock of Abusir, on west bank of Nile near Wadi Halfa. The cliff is formed of Nubian sandstone, which rests unconformably on the igneous and metamorphic complex seen in the foreground. The Nubian sandstone has been planed at a height of 200 feet above the Nile, and fluviatile gravels lie upon the eroded surface.

PLATE V



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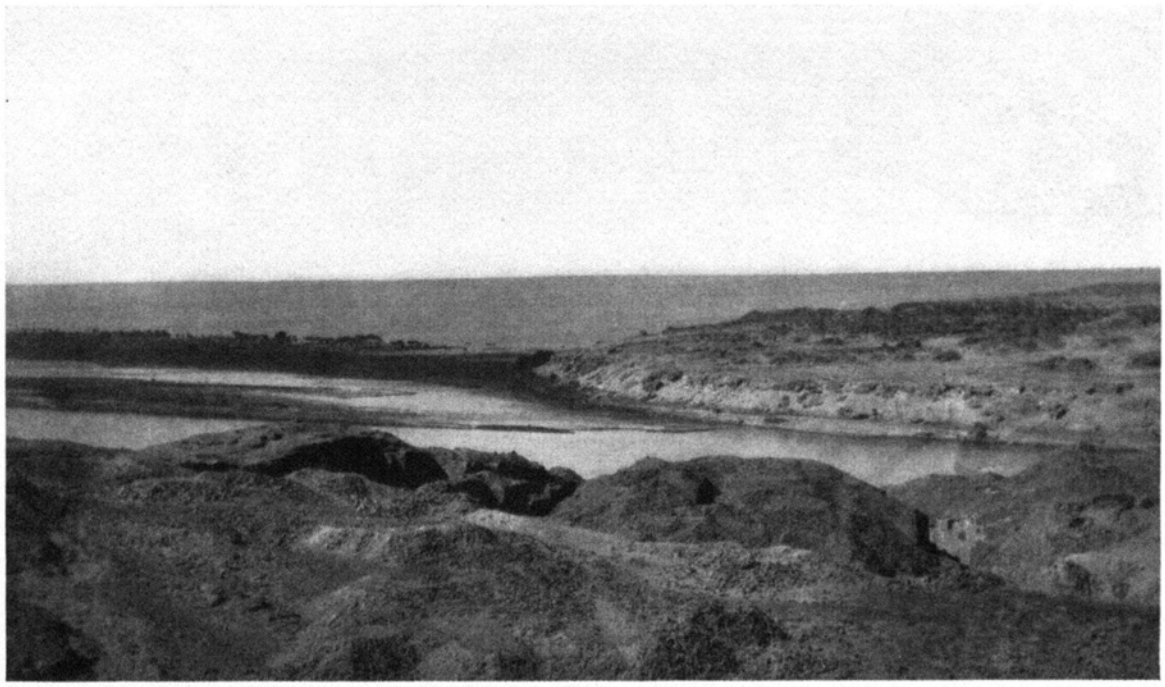
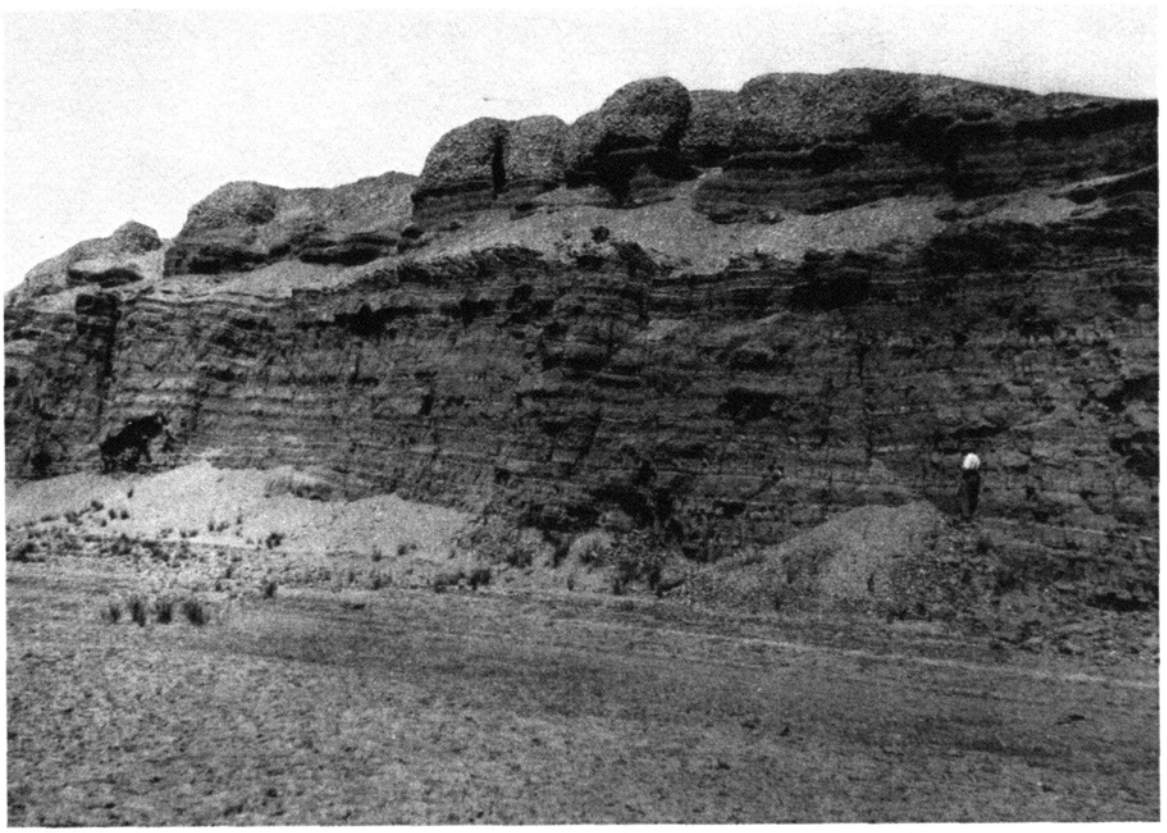


B

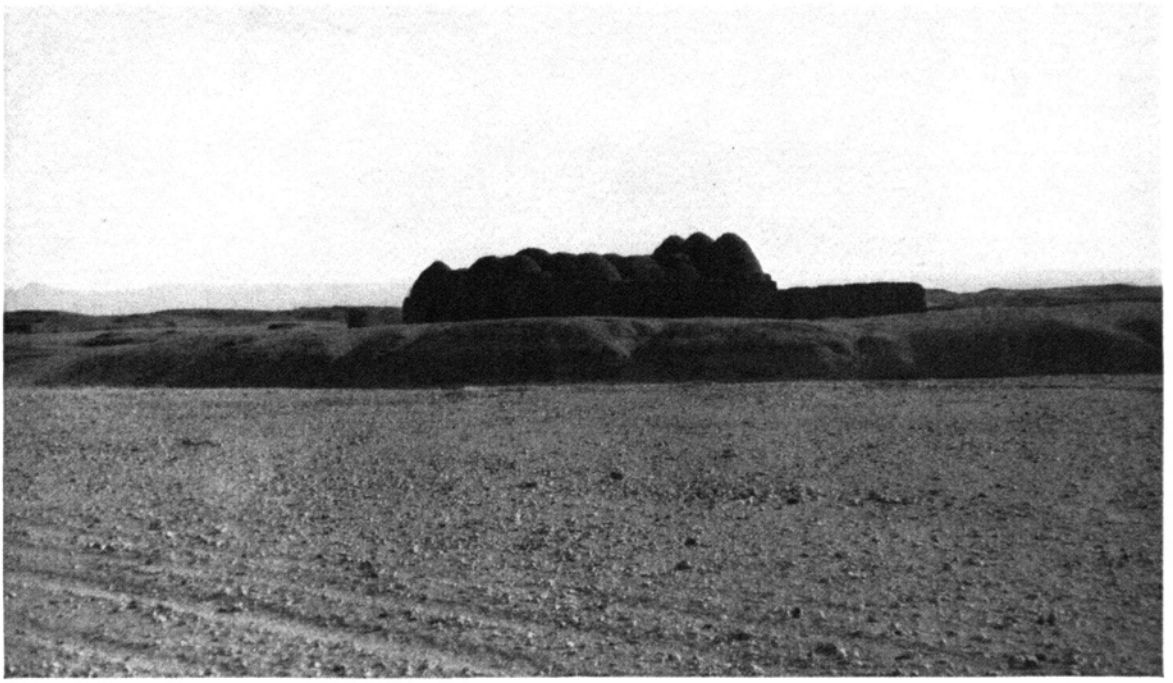
A.—The 100-foot erosion platform, with gravels of Chellean age resting at the foot of the bounding cliff of Nubian sandstone. West bank of Nile, Tumas district, Nubia. *B*.—The Nile passing into the Gebel Silsilah narrows from the Kom Ombo plain. The horizon is formed by the 150-foot gravels west of the Nile, upstream from Gebel Silsilah. The rocks in the foreground and right middle distance show traces of a 100-foot platform of river abrasion.

A



B

A.—The 50-foot erosion platform of the Nile (on line with tops of trees), with wadies entering from the Eastern Desert mainly at this altitude. The summit of the cliffs is determined by the 200-foot Plio-Pleistocene terrace. East bank of the Nile a few miles south of Kasr Ibrim, Nubia. *B*.—Gravels of the west side of the Lower Paleolithic Nile channel at Nag ed-Dib, Kom Ombo plain, forming capping to the cliff. The gravels rest on sands probably of Pliocene age.



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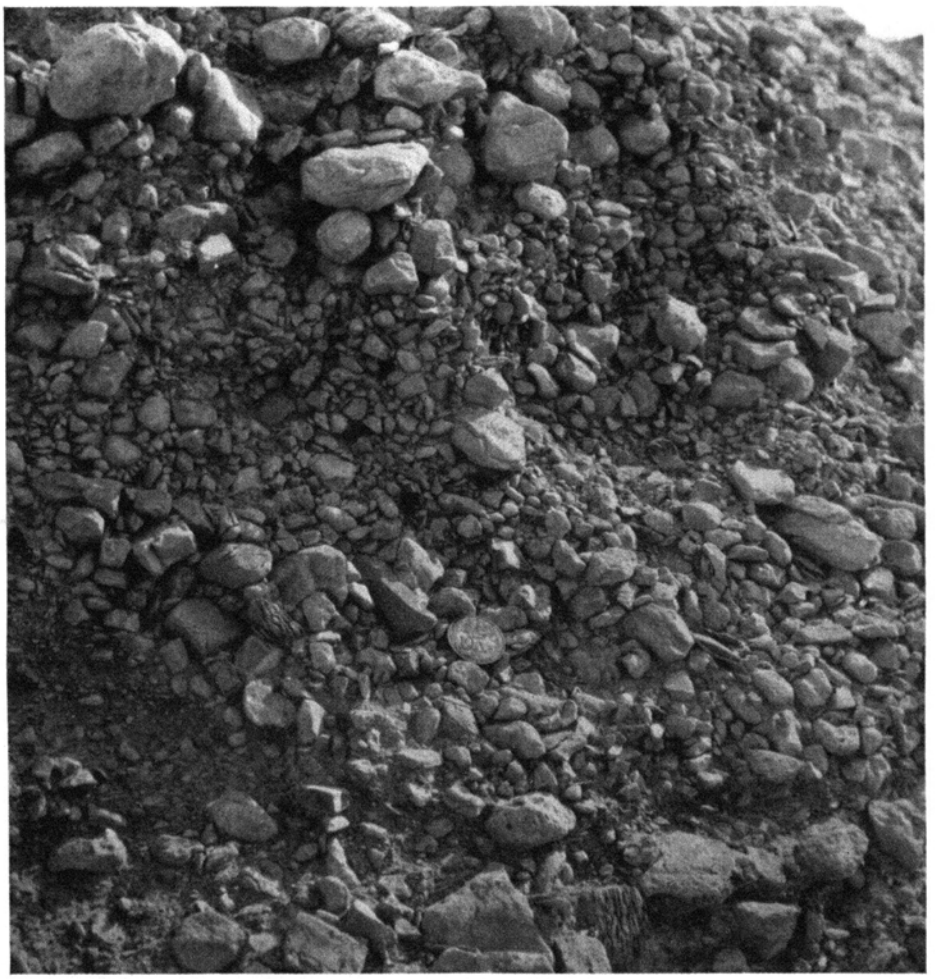


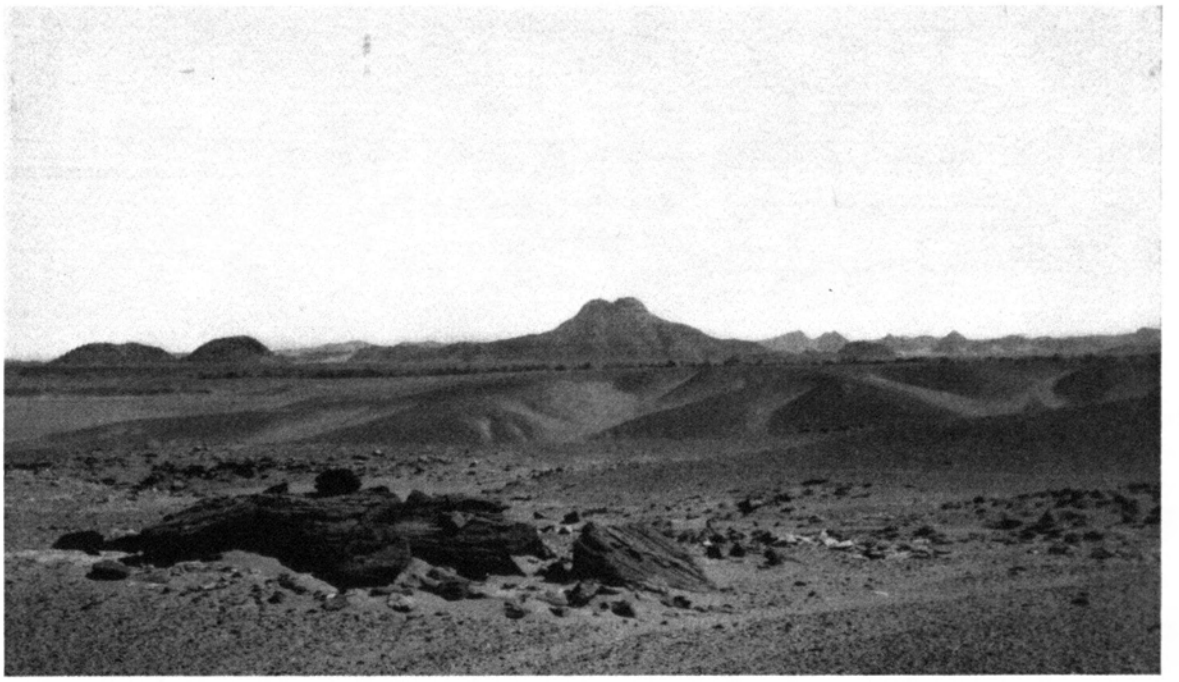
B

A.—The 10-foot Mousterian gravels at the Coptic church near Medinet Habu, Thebes. *B*.—Type of deposit composing the 10-foot wadi gravels in Upper Egypt. A Mousterian flake is seen *in situ* immediately on the left of the coin. The section is at the mouth of the Valley of the Queens' Tombs, Thebes.

PLATE VIII

Mouth of a Wadi Choked with Late Paleolithic Silt. East Bank of Nile a Few Miles below Korosko

PLATE IX



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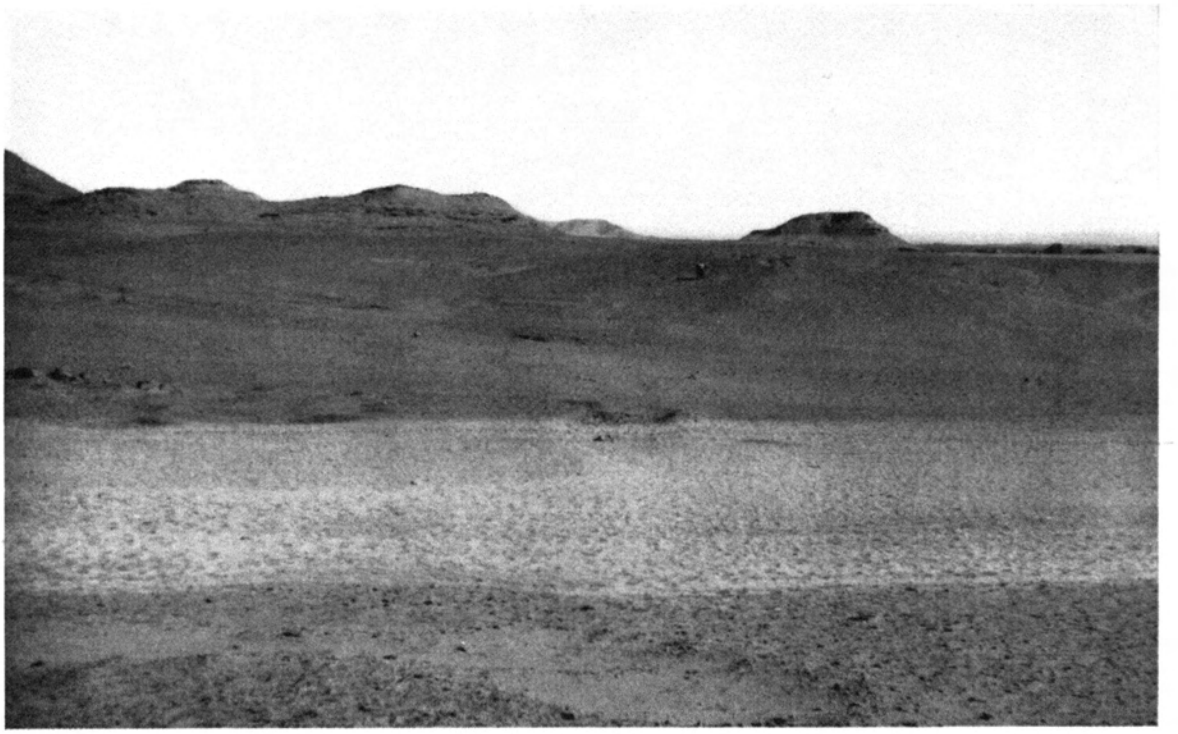


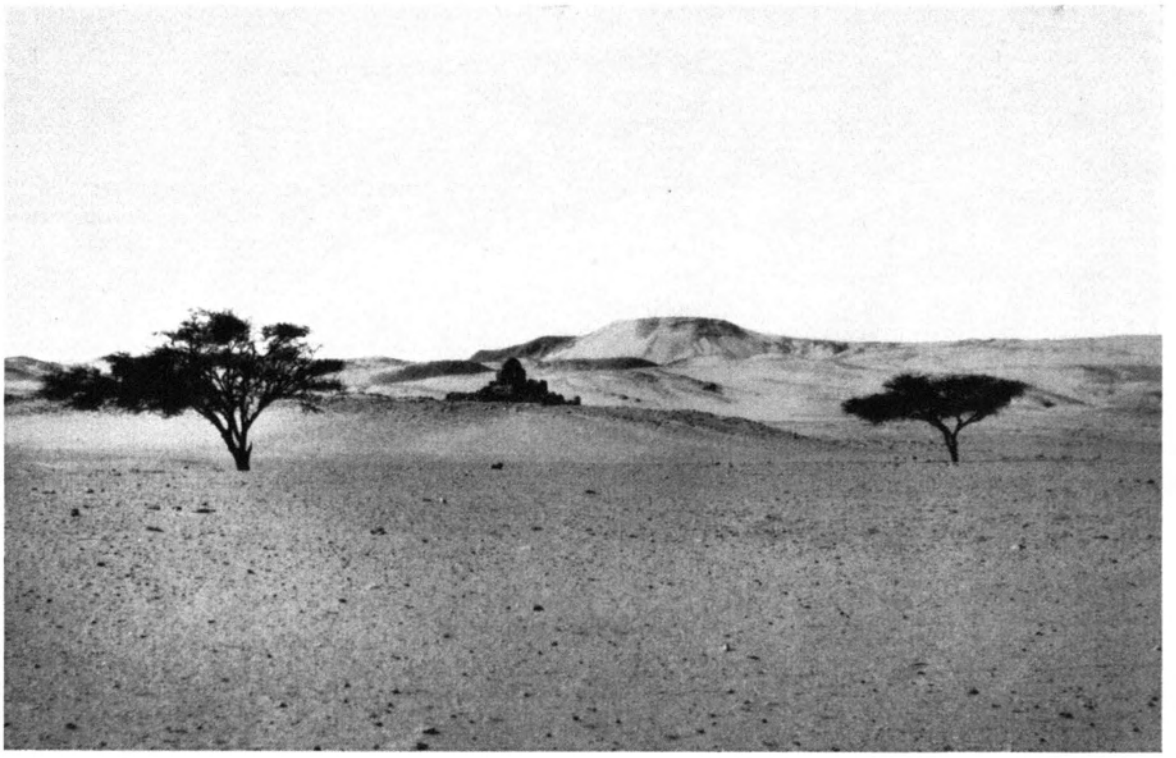
B

A.—Late Paleolithic (Sebilian) silts on west bank of Nile (indicated by line of palms in middle distance). View looking eastward near Tushkah. *B*.—Sebilian silts on west bank of Nile about 7 miles south of Edfu. Upon the silts near here were found Late Sebilian surface sites.

PLATE X

THE SEMNAH CATARACT AT ITS NARROWEST POINT, AS SEEN FROM THE SOUTH. THE ROCKS ON WHICH ANCIENT NILE LEVELS ARE RECORDED ARE IMMEDIATELY BELOW THE RUINS OF KUMMAH (AT EXTREME RIGHT)

PLATE XI

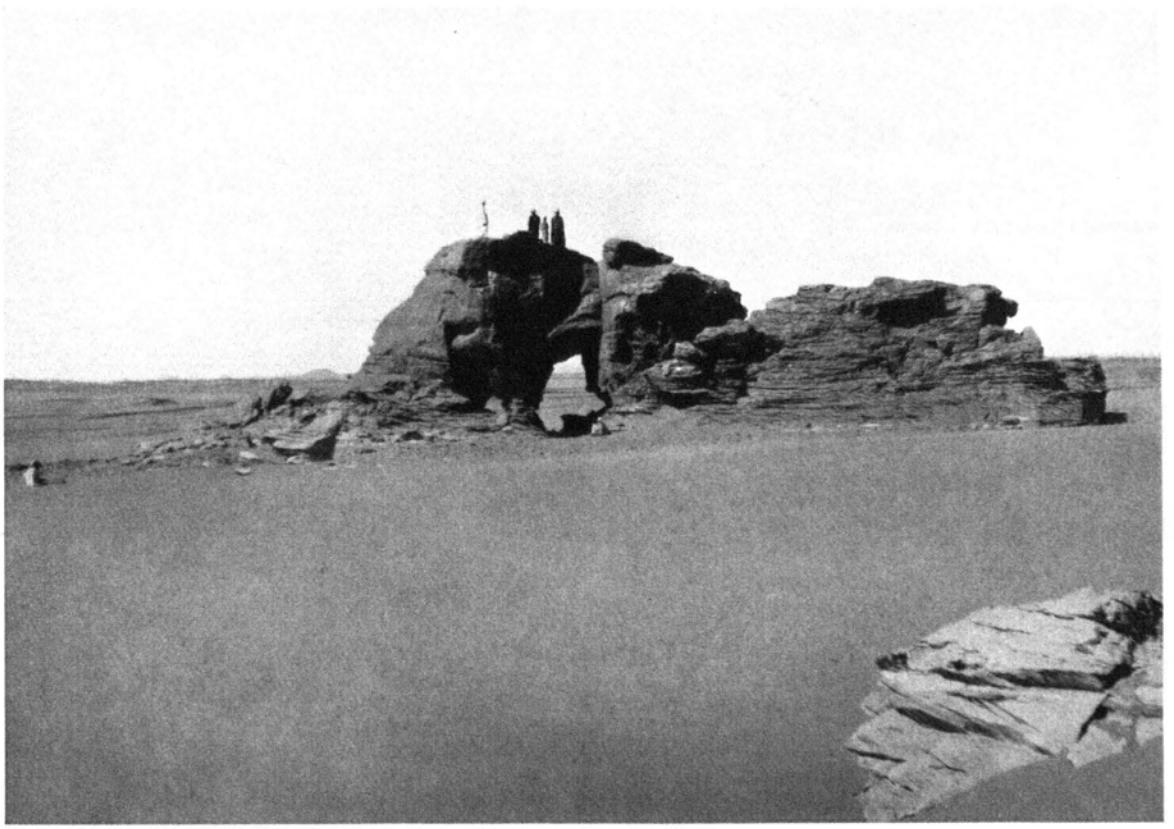


A

B

A.—A *kubbah* built among Middle Kingdom ruins on the west bank, immediately south of the Semnah fort. The acacia trees are growing upon a surface covered with fluviatile deposits and rolled fragments of pottery. The mountain in the background consists of Nubian sandstone, which formerly extended over the whole region.—*B*. Northern end of Kom Ombo plain, showing an old branch of the Nile's course through the Nubian sandstone of Gebel Silsilah, now choked with Sebilian silt.

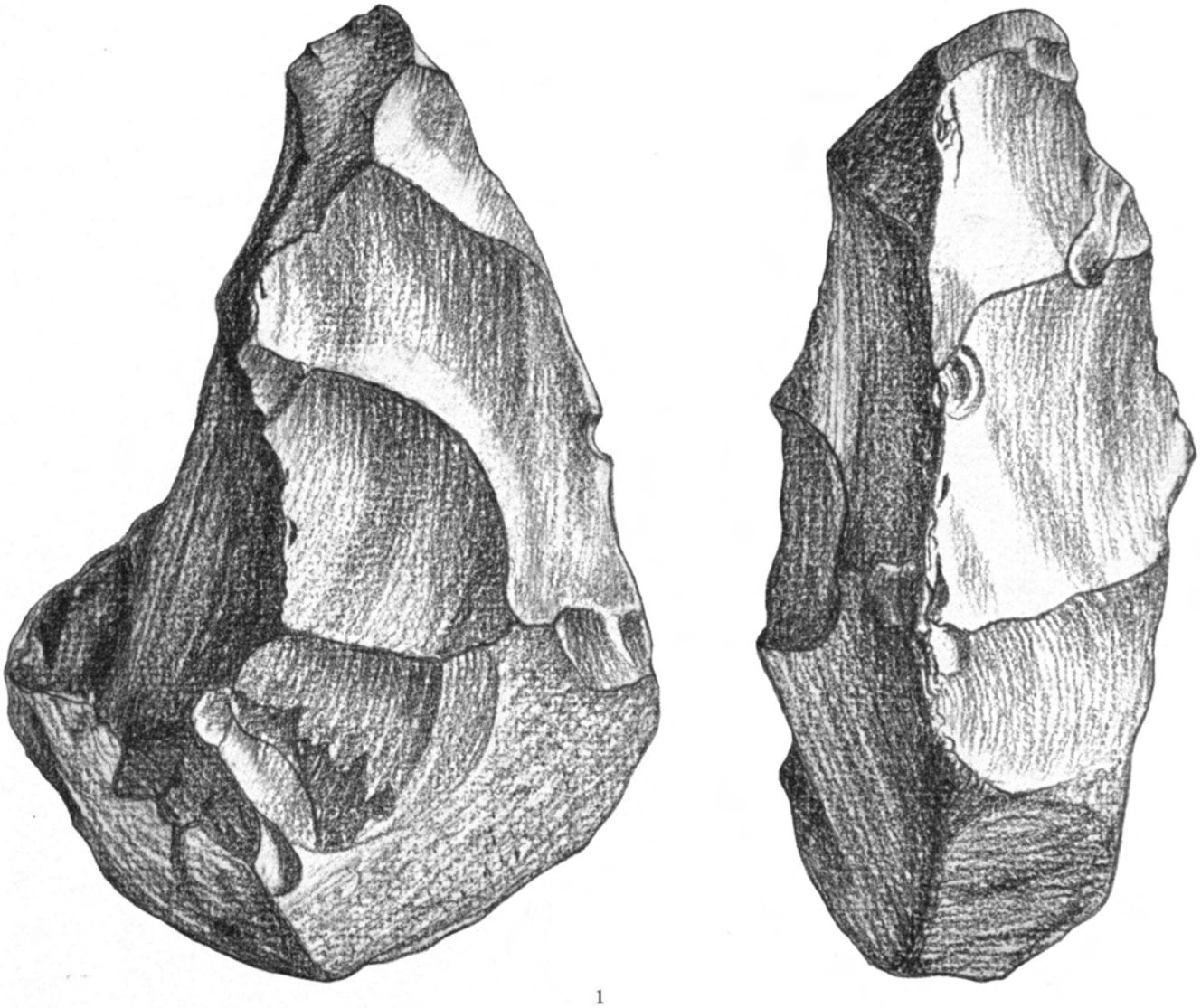
A



B

A.—The First Cataract, seen from Elephantine Island near Aswan. Nubian sandstone is exposed in the cliffs, granite and associated rocks in the river bed. *B*.—The "*birbah*" bearing graffiti, really a natural arch, a few miles west of the temple of Abu Simbel.

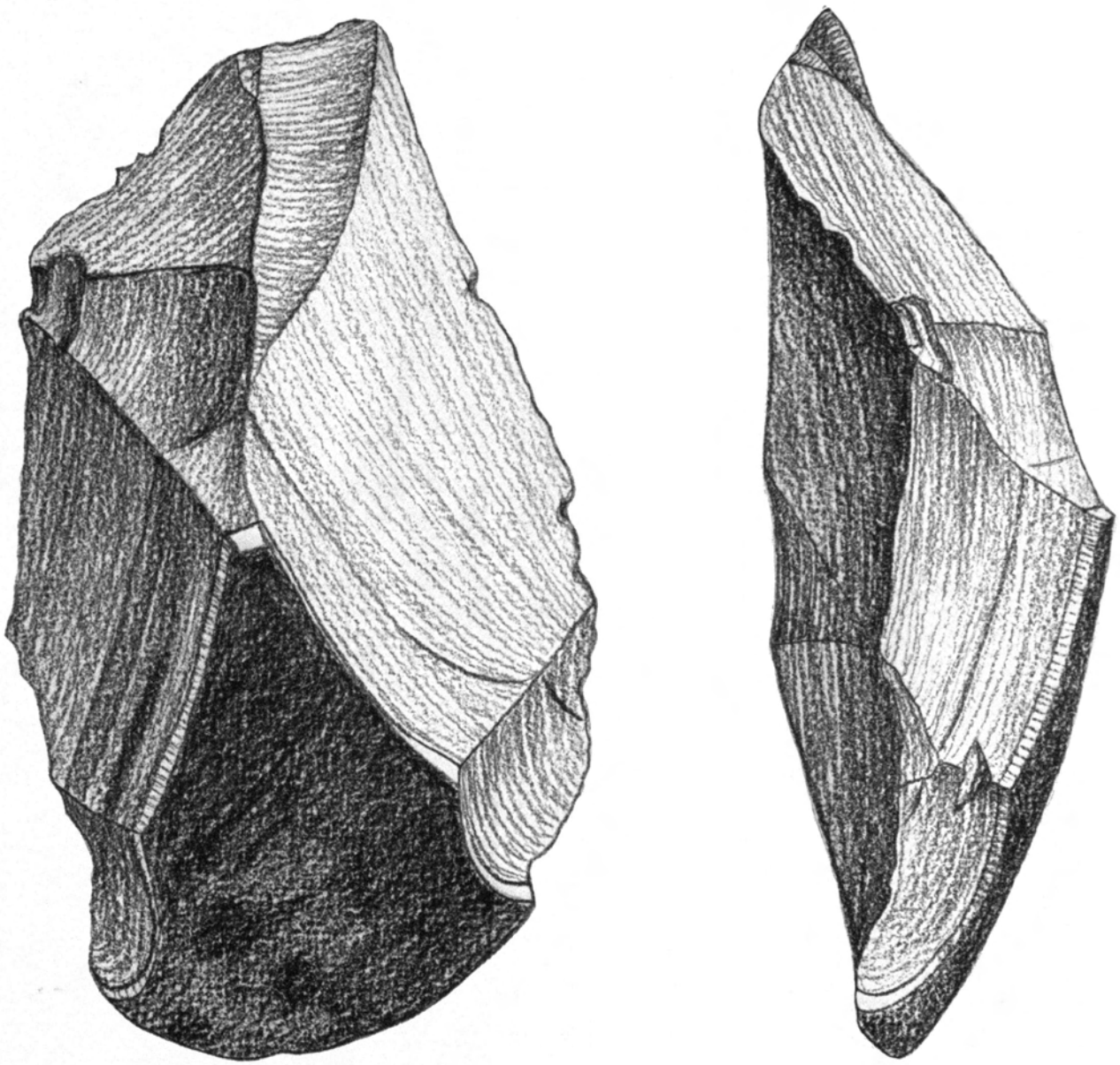
PLATE XIII



1

1.—Primitive Chellean coup-de-poing of brown chert, slightly waterworn, from marginal gravels of 100-foot terrace, es-Sibaʿiyyah, Upper Egypt.

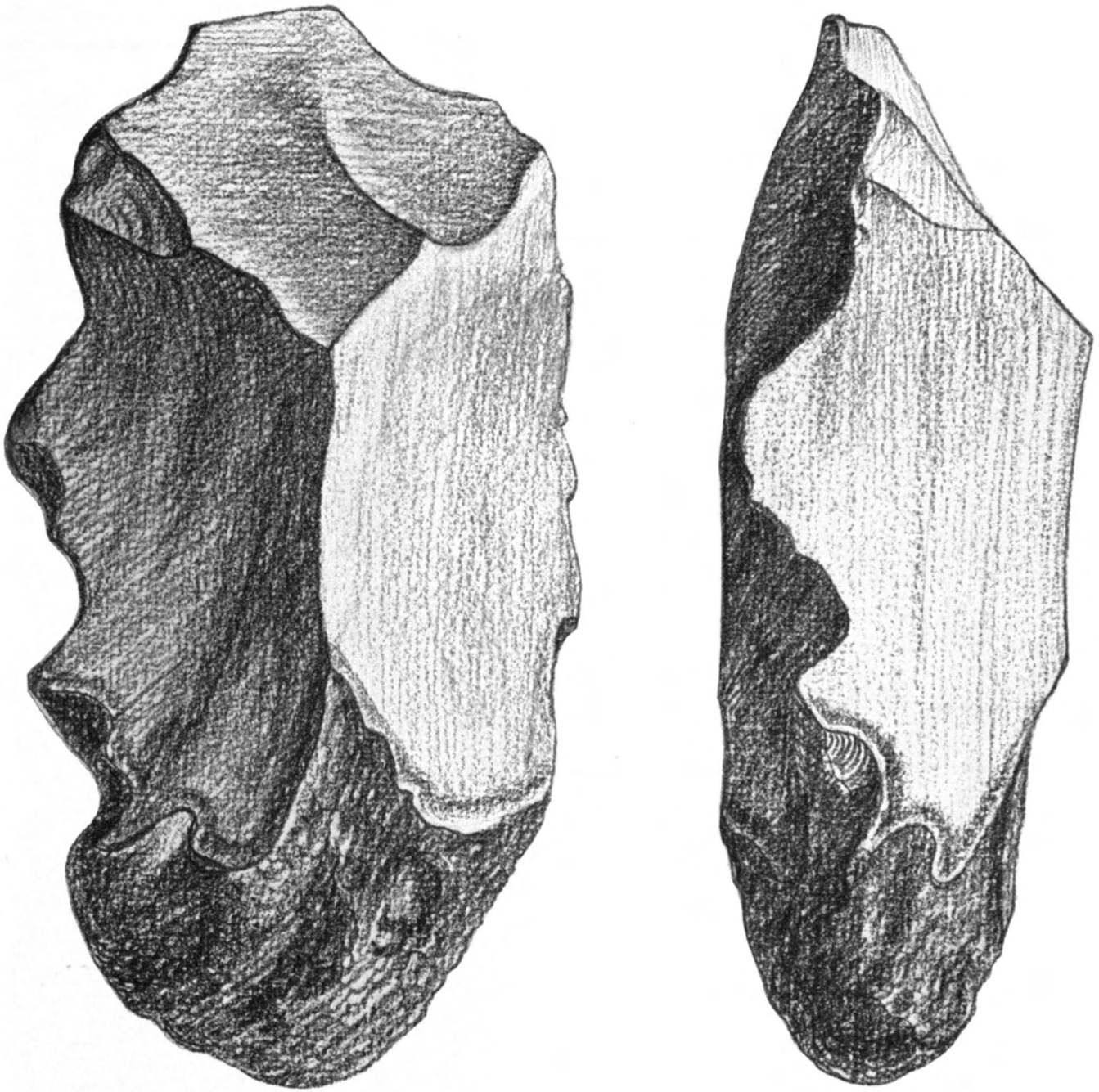
PLATE XIV



2

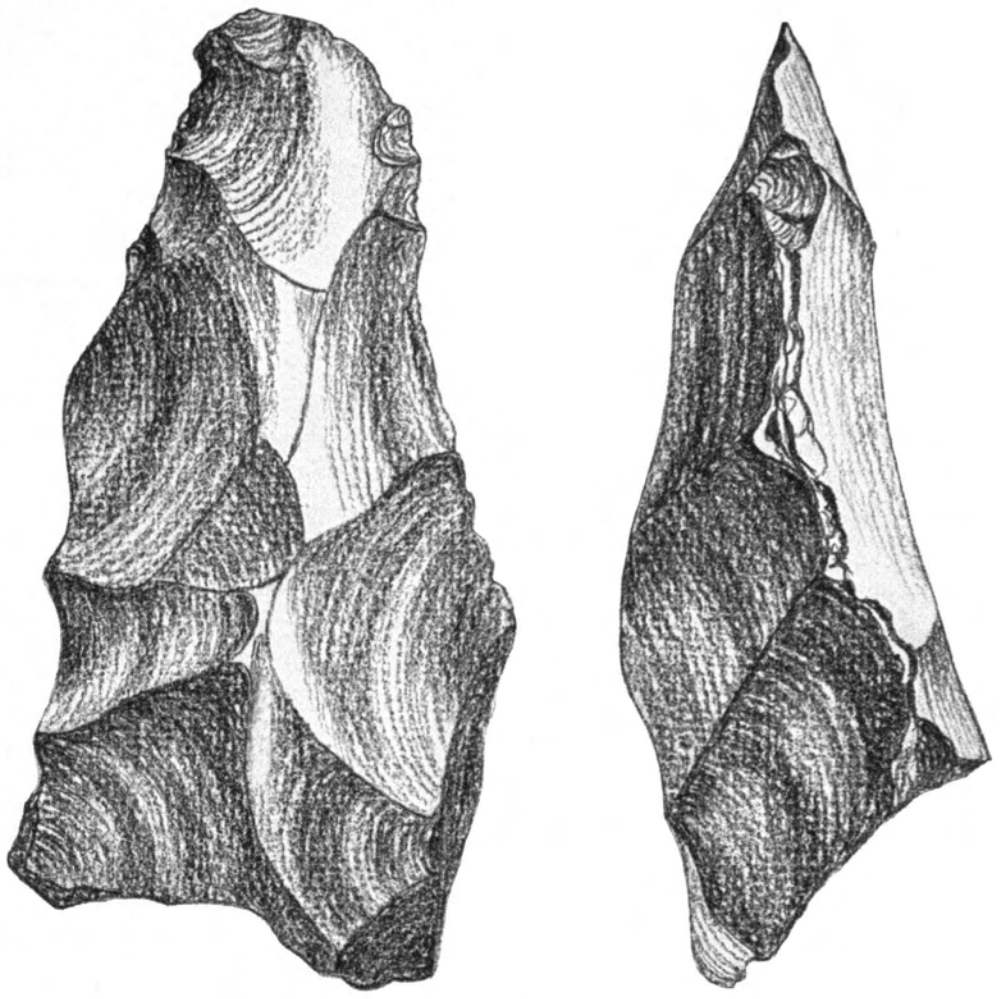
2.—Primitive Chellean coup-de-poing made from a cherty concretion of the Lower Eocene "melon beds," from marginal gravels of 100-foot terrace, es-Sibaʿiyyah, Upper Egypt.

PLATE XV



3

3.—Primitive Chellean coup-de-poing made from a cherty concretion of the Lower Eocene "melon beds," from marginal gravels of 100-foot terrace, es-Sibaʿiyyah, Upper Egypt.



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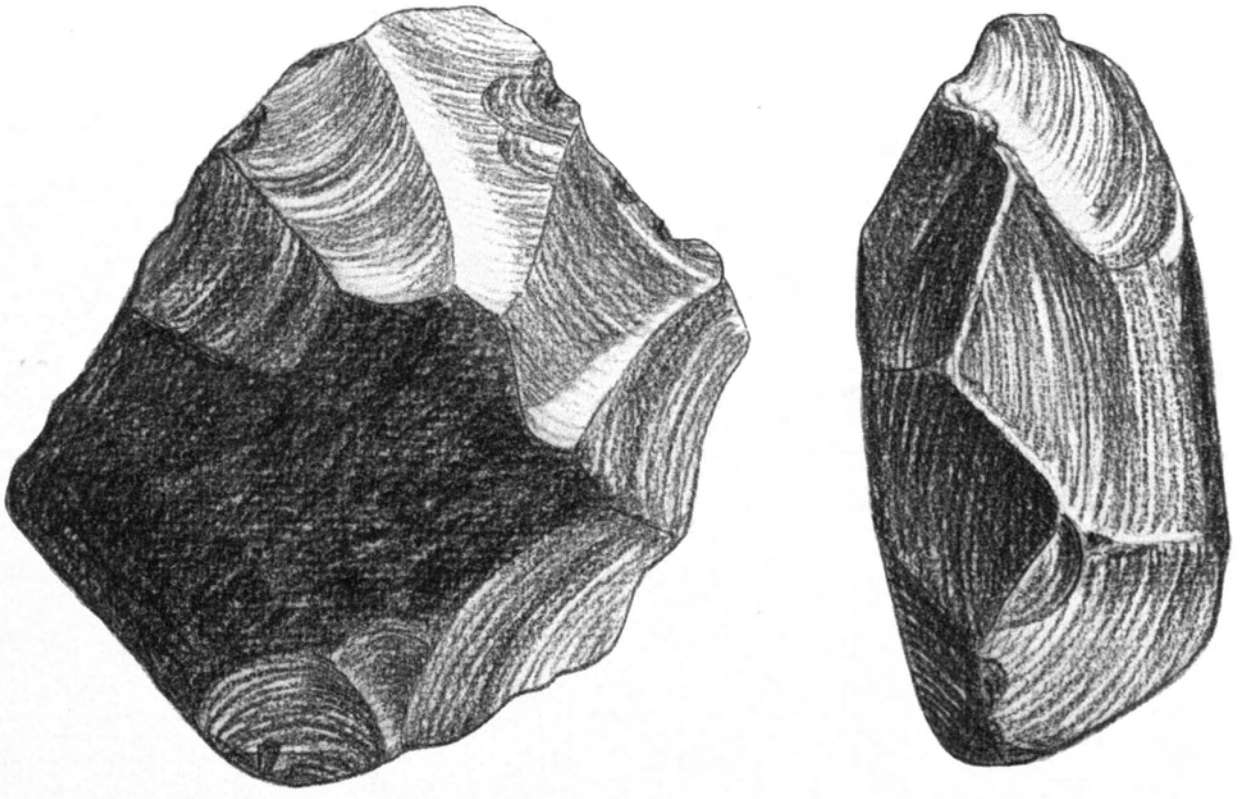
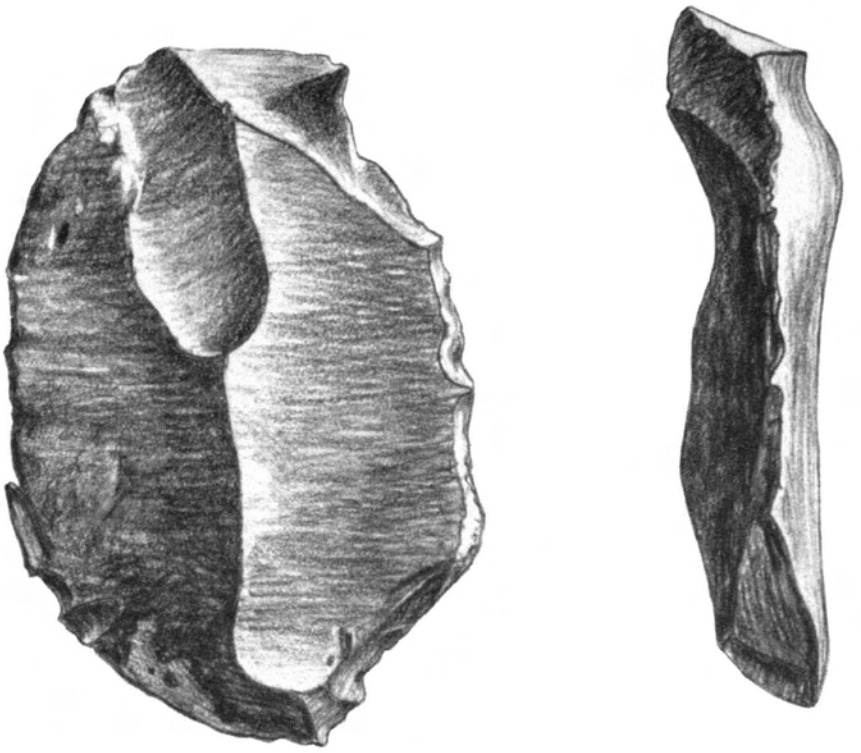


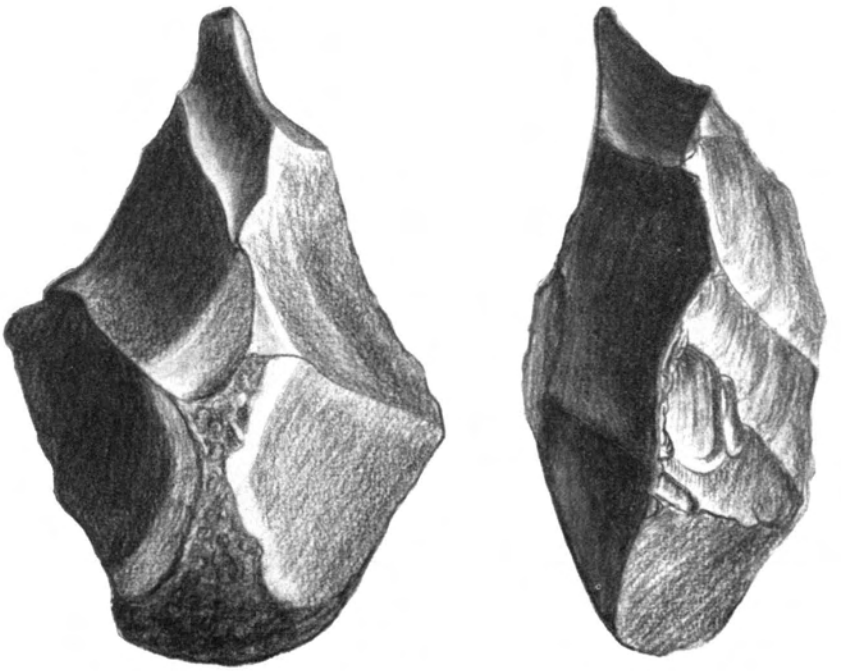
5

4–5.—Chellean coup-de-poing and waterworn core(?), both of brown chert, from marginal gravels of 100-foot terrace, es-Sibaʿiyyah, Upper Egypt.

PLATE XVII



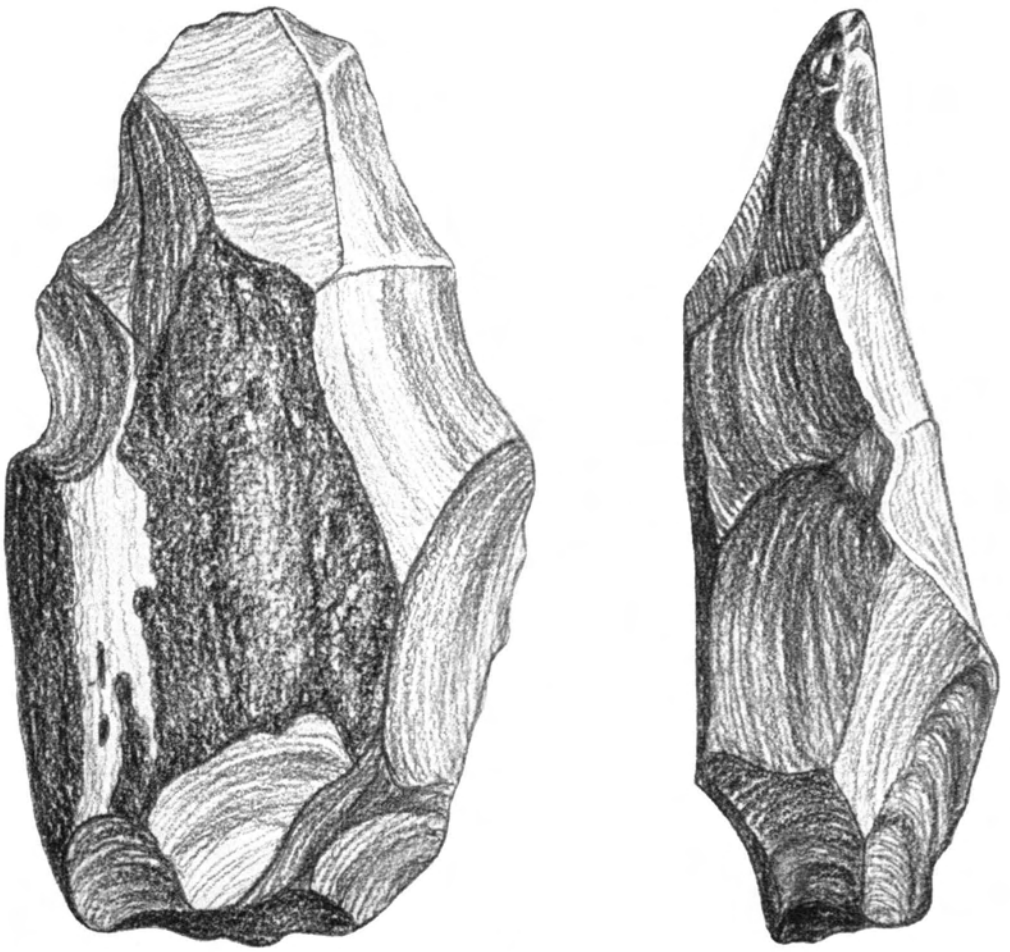
6



7

6–7.—Coarse flake of chert and Chellean coup-de-poing of mottled "flint," from marginal gravels of 100-foot terrace, es-Sibaʿiyyah, Upper Egypt.

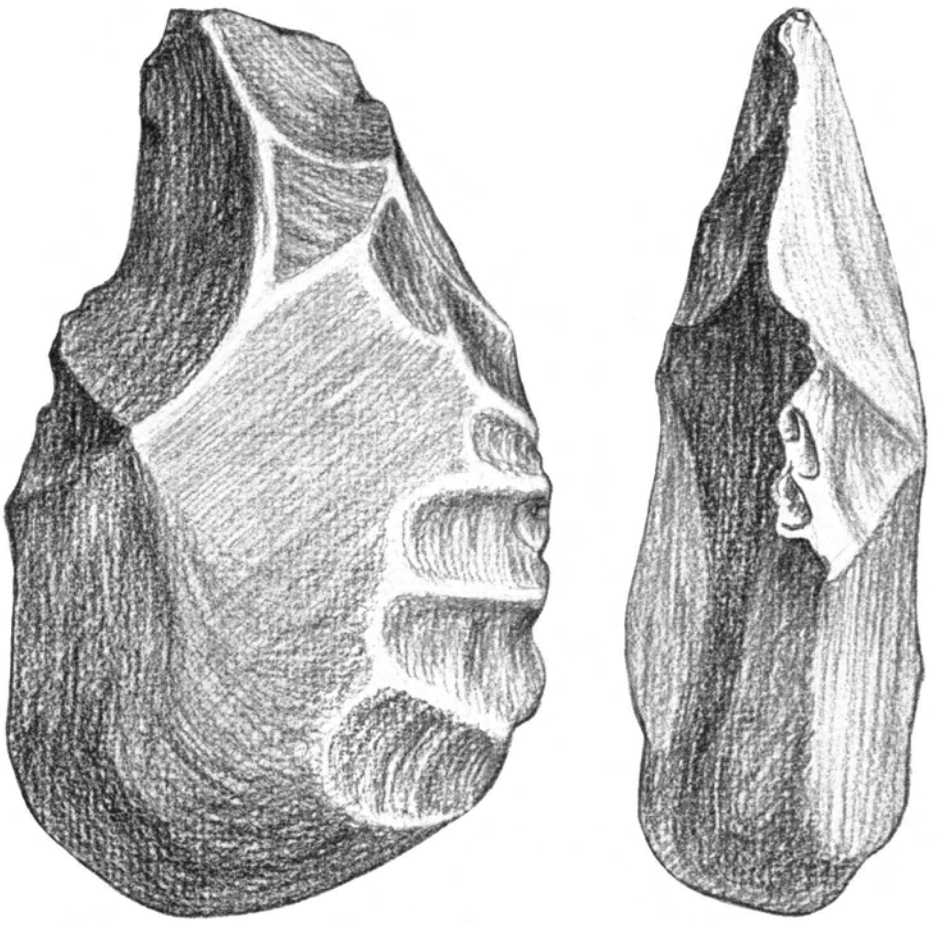
PLATE XVIII



8

8.—Chellean coup-de-poing of brown chert, with brown and white crust, from marginal gravels of 100-foot terrace, es-Sibaʿiyyah, Upper Egypt.

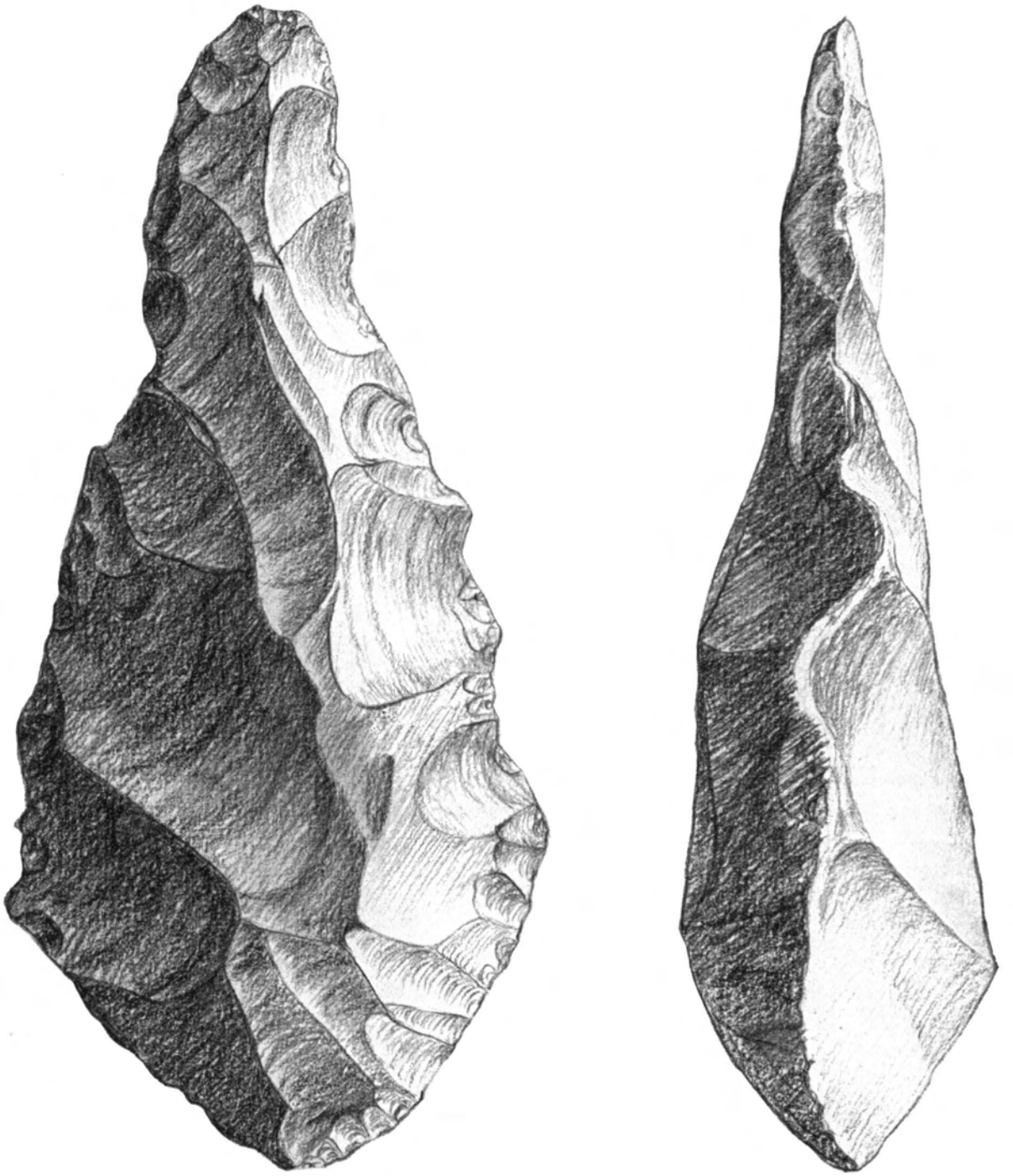
PLATE XIX



9

9.—Chellean coup-de-poing of brown chert, waterworn, from marginal gravels of 100-foot terrace, es-Siba'iyyah, Upper Egypt.

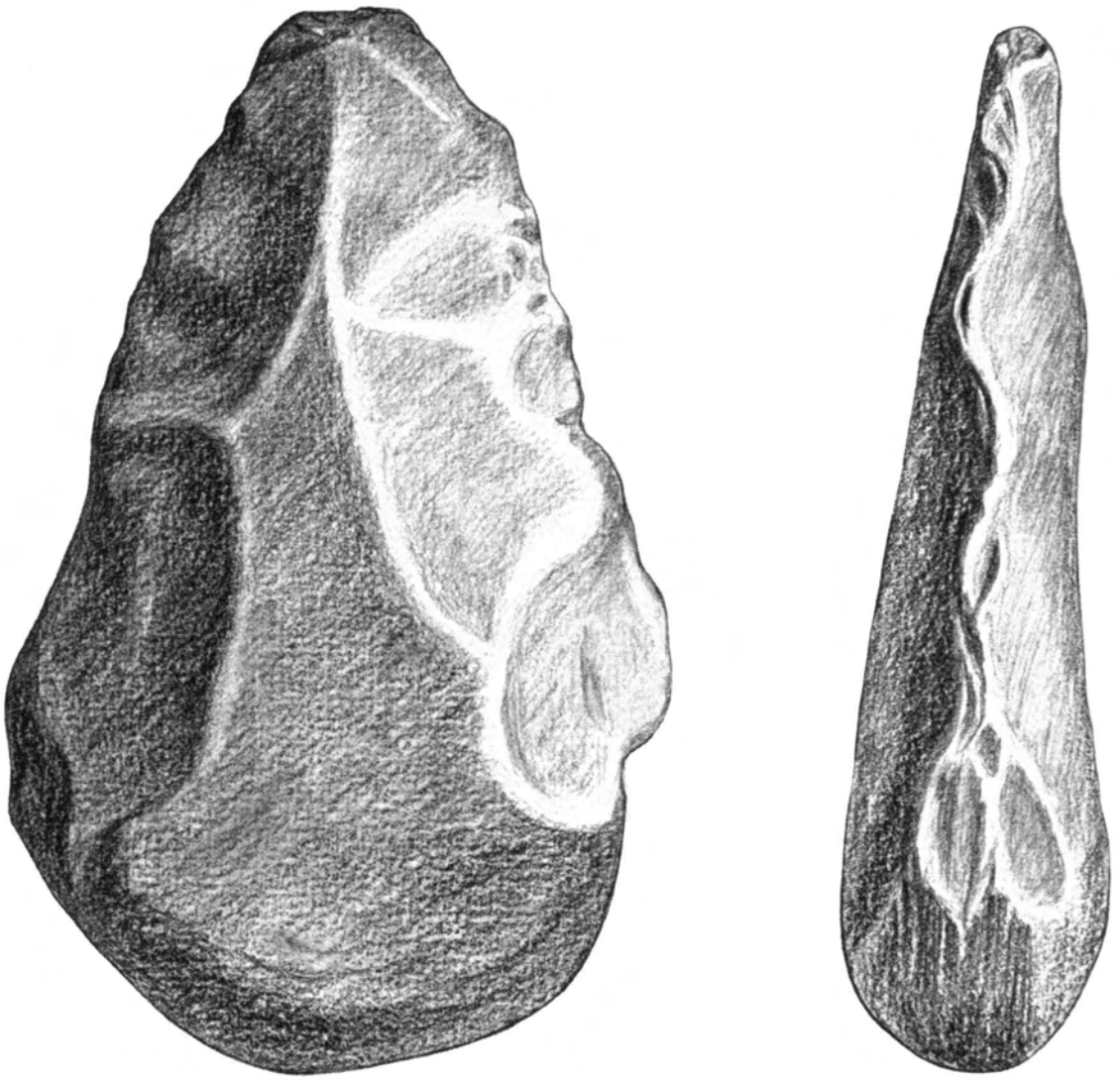
PLATE XX



10

10.—Coup-de-poing of brown chert, from surface of 100-foot terrace east of Esna, Upper Egypt

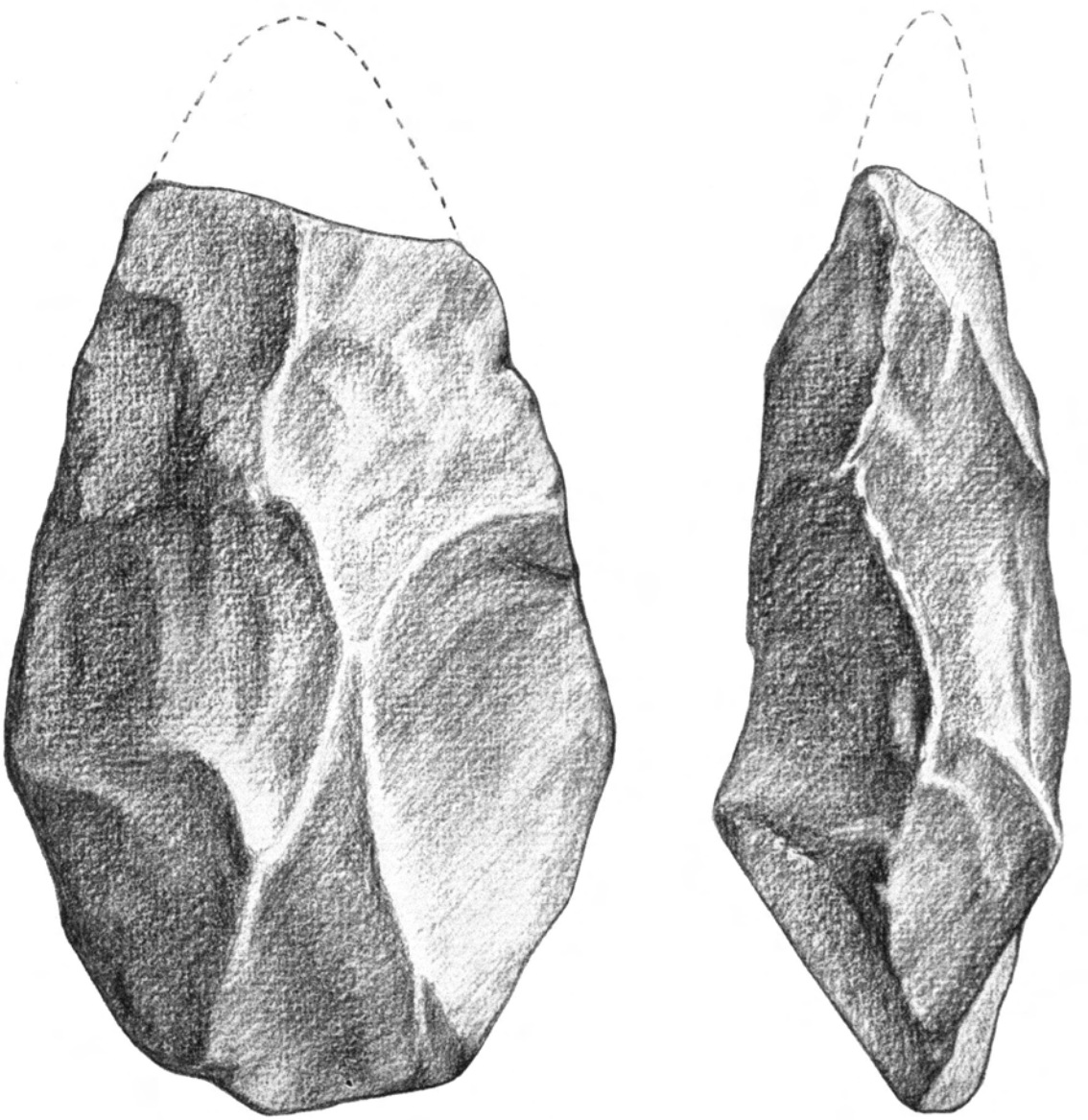
PLATE XXI



11

11.—Coup-de-poing, much waterworn, made from bowlder of schistose rock derived from Red Sea Hills; from 100- to 50-foot gravels near Aklit north of Kom Ombo, Upper Egypt.

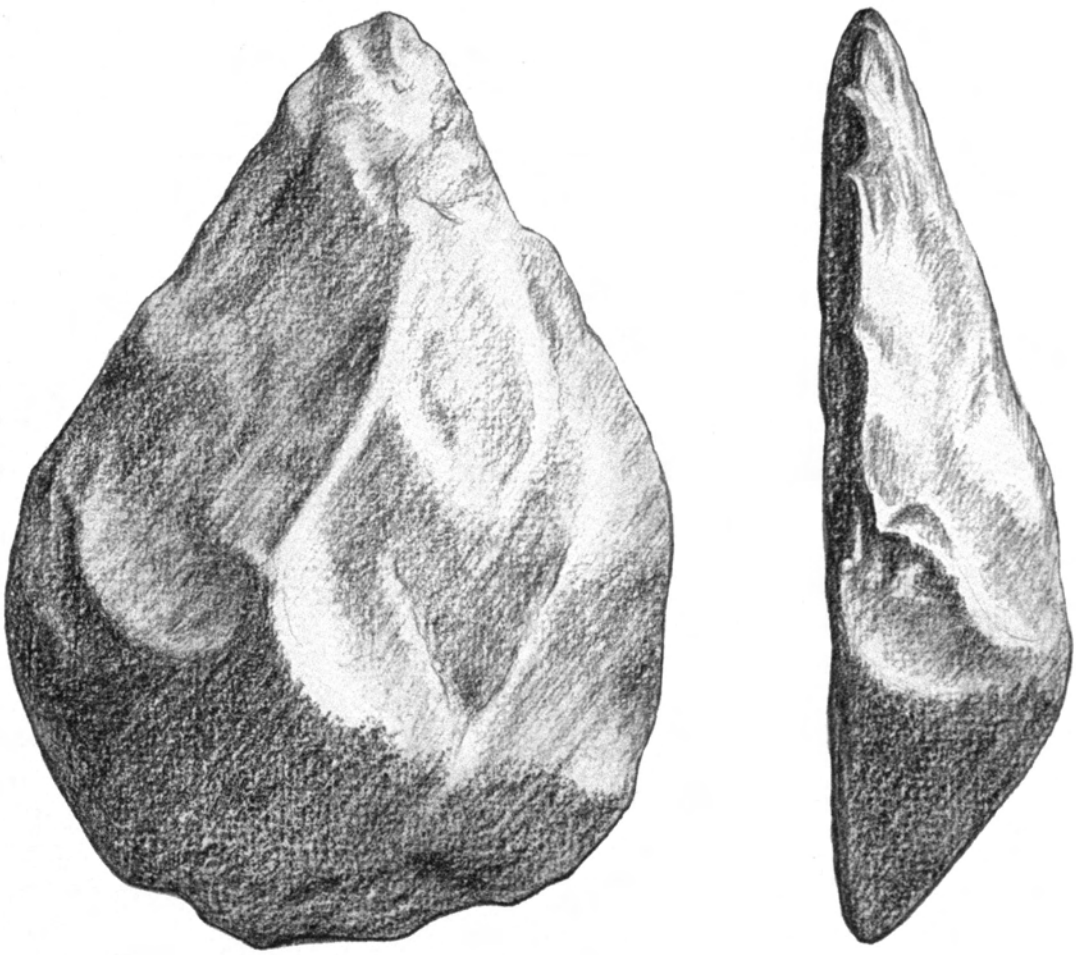
PLATE XXII



12

12.—Waterworn coup-de-poing of greenstone from the Red Sea Hills, from 100- to 50-foot gravels near Munihah, Kom Ombo area, Upper Egypt.

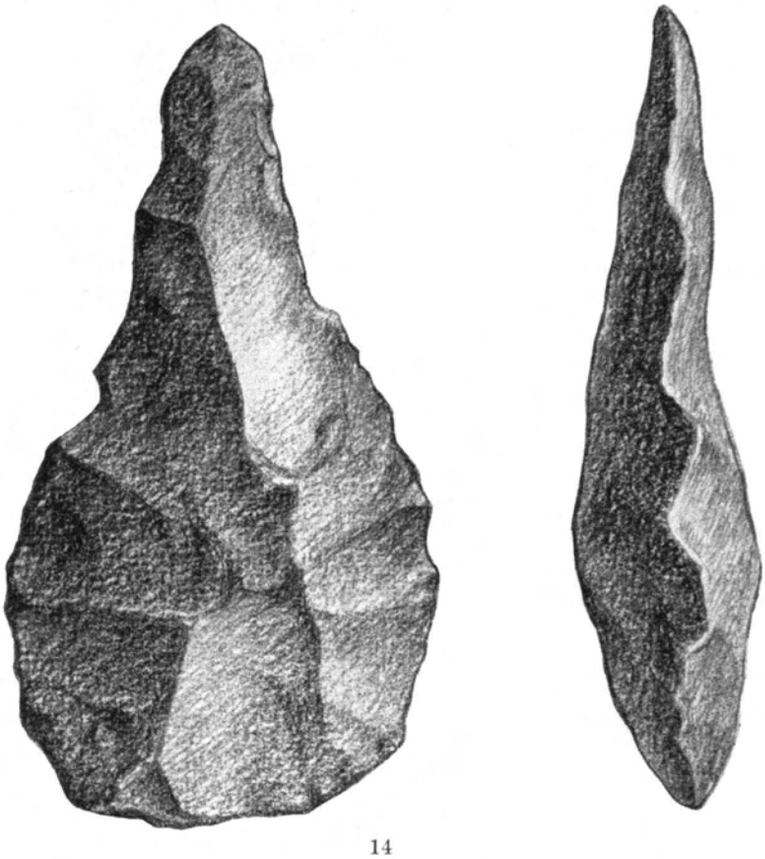
PLATE XXIII



13

13.—Chellean-Acheulean coup-de-poing, much waterworn, made from bowlder of schistose rock from Red Sea Hills; from 100- to 50-foot gravels near Aklit north of Kom Ombo, Upper Egypt. Drawn from plaster cast; original in Cairo Museum.

PLATE XXIV



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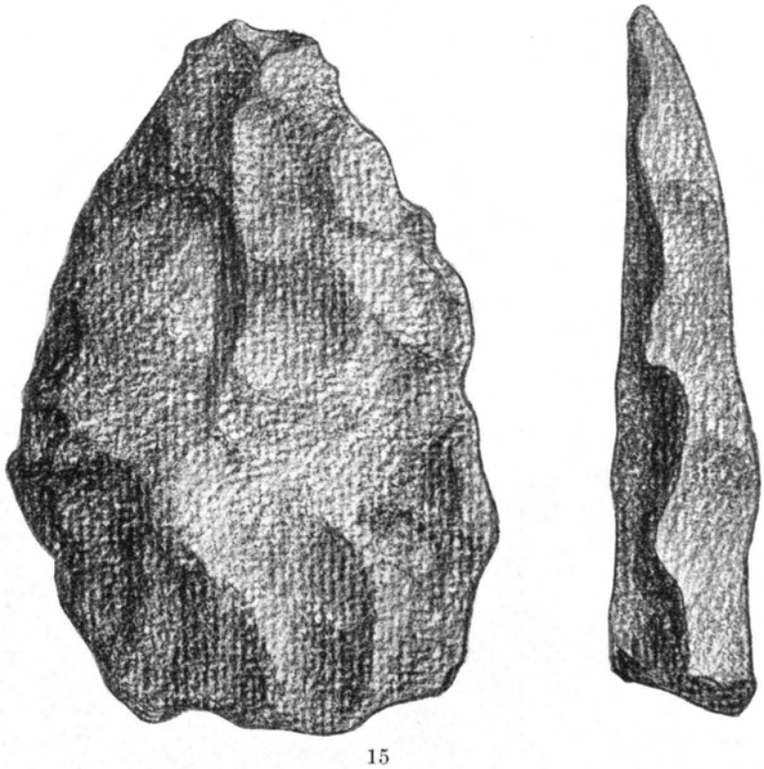
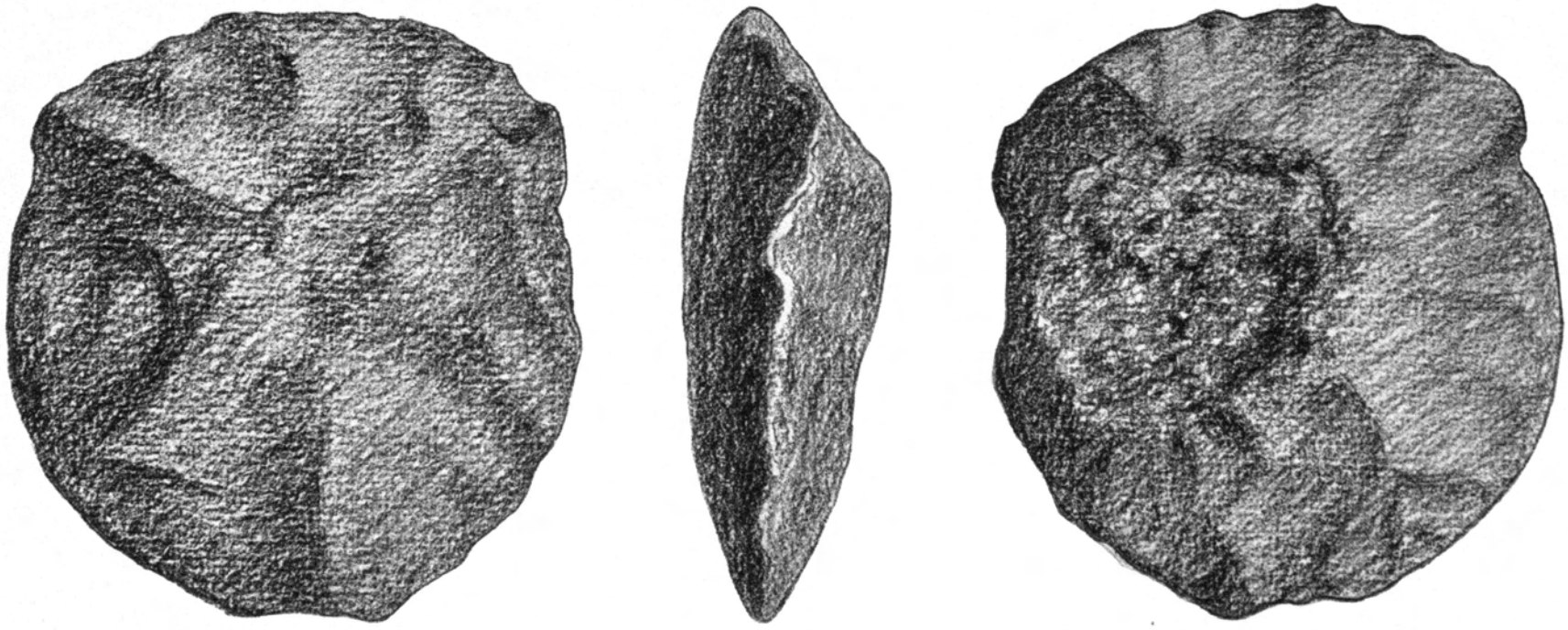


15

14–15.—Implements of ironstone (No. 15 waterworn) from 50-foot terrace gravels at Ashkit near Wadi Halfa

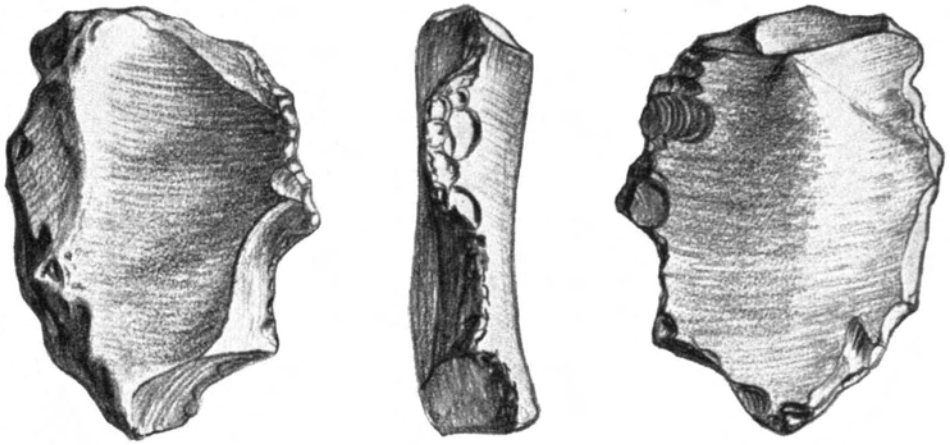
PLATE XXV



16

16.—Disk of ironstone, much waterworn, from 50-foot terrace gravels at Ashkit near Wadi Halfa

PLATE XXVI



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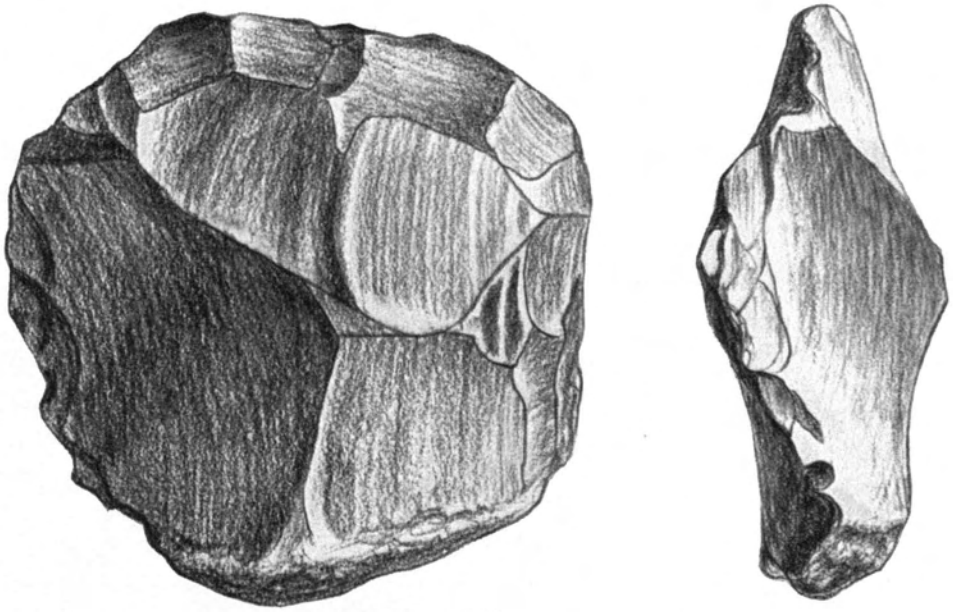
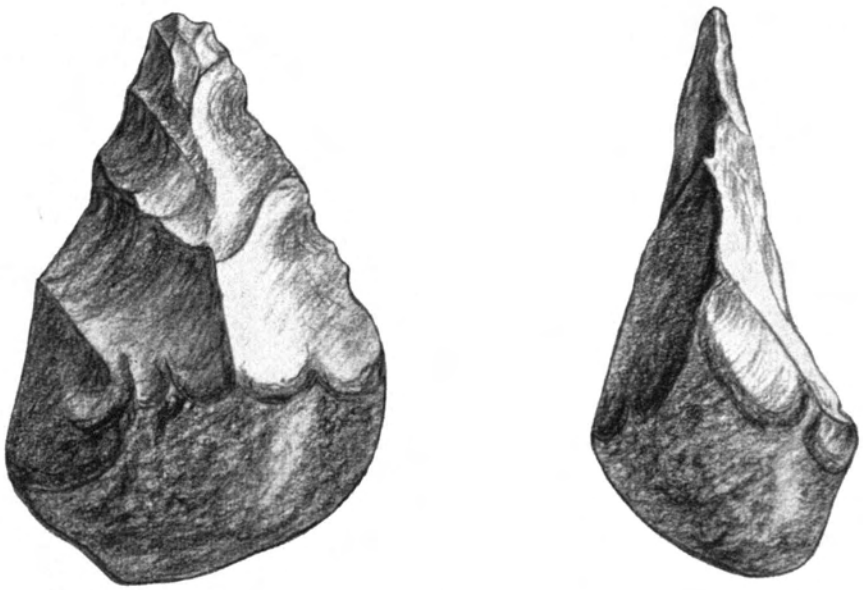


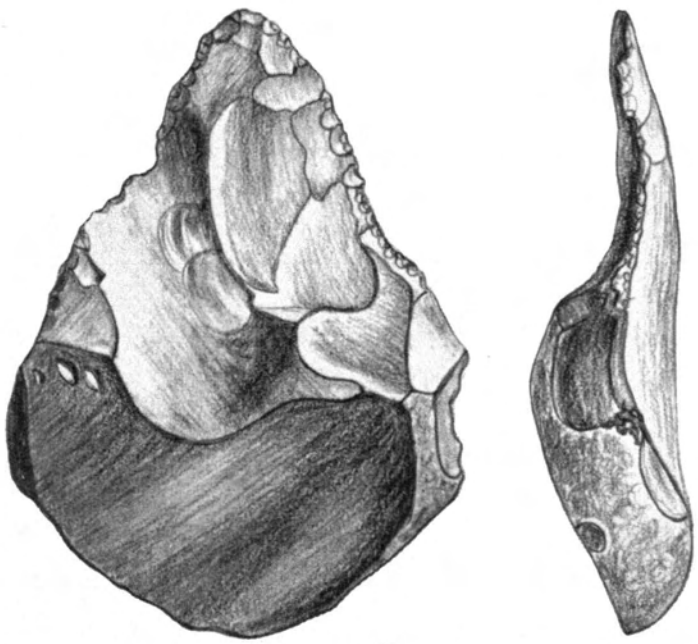
18

17–18.—Coarse flake and disk of impure flint (No. 18 slightly waterworn) from 50-foot terrace gravels at el-Kab Upper Egypt.

PLATE XXVII



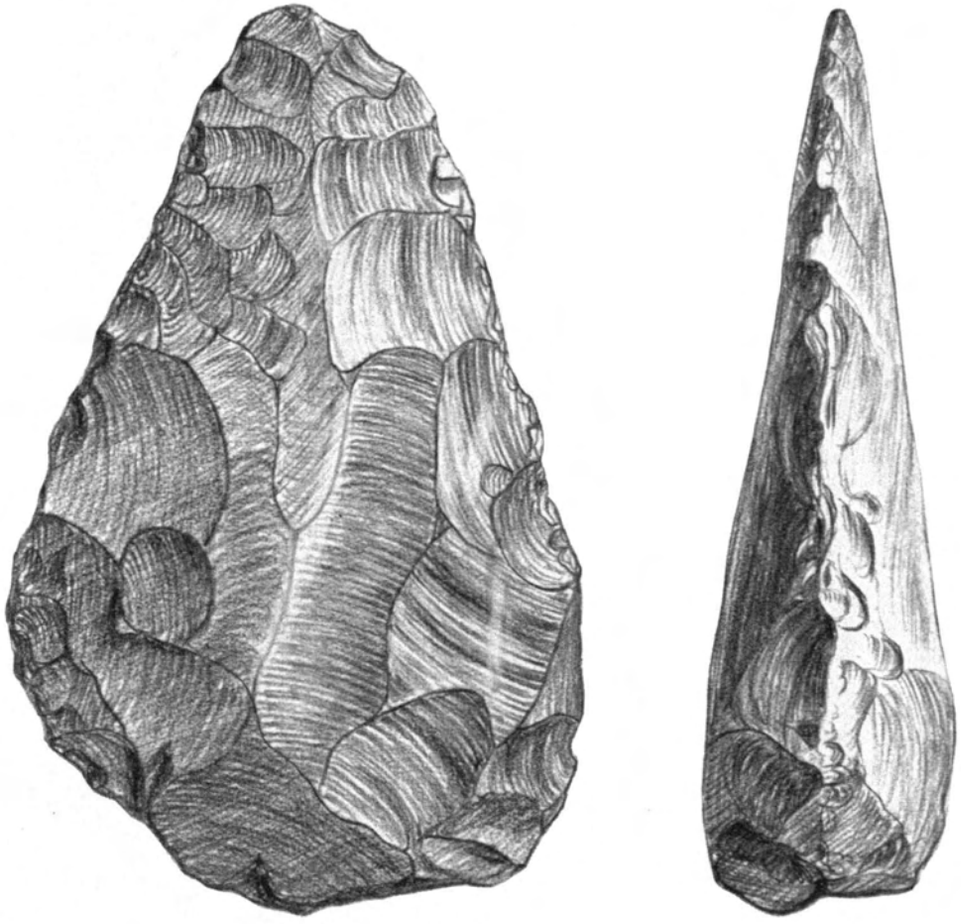
19



20

19.—Small coup-de-poing made from "flint" pebble, from gravels of 50-foot terrace, el-Kab, Upper Egypt. *20.*—Small point made from fresh "flint," from 30-foot terrace gravels, el-Mataʿnah, Upper Egypt.

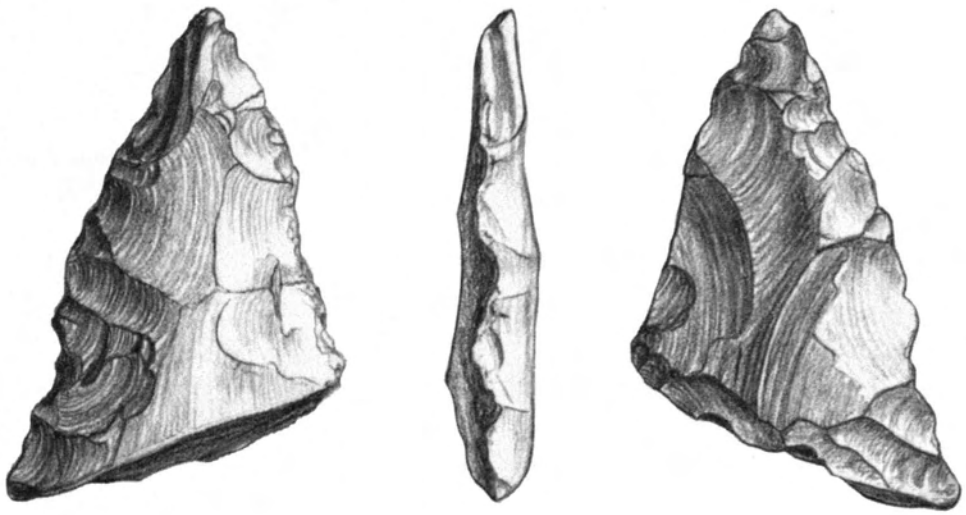
PLATE XXVIII



21

21.—Acheulean coup-de-poing of gray "flint," very slightly waterworn, from gravels of 30-foot terrace, Armant, southwest of Thebes.

PLATE XXIX



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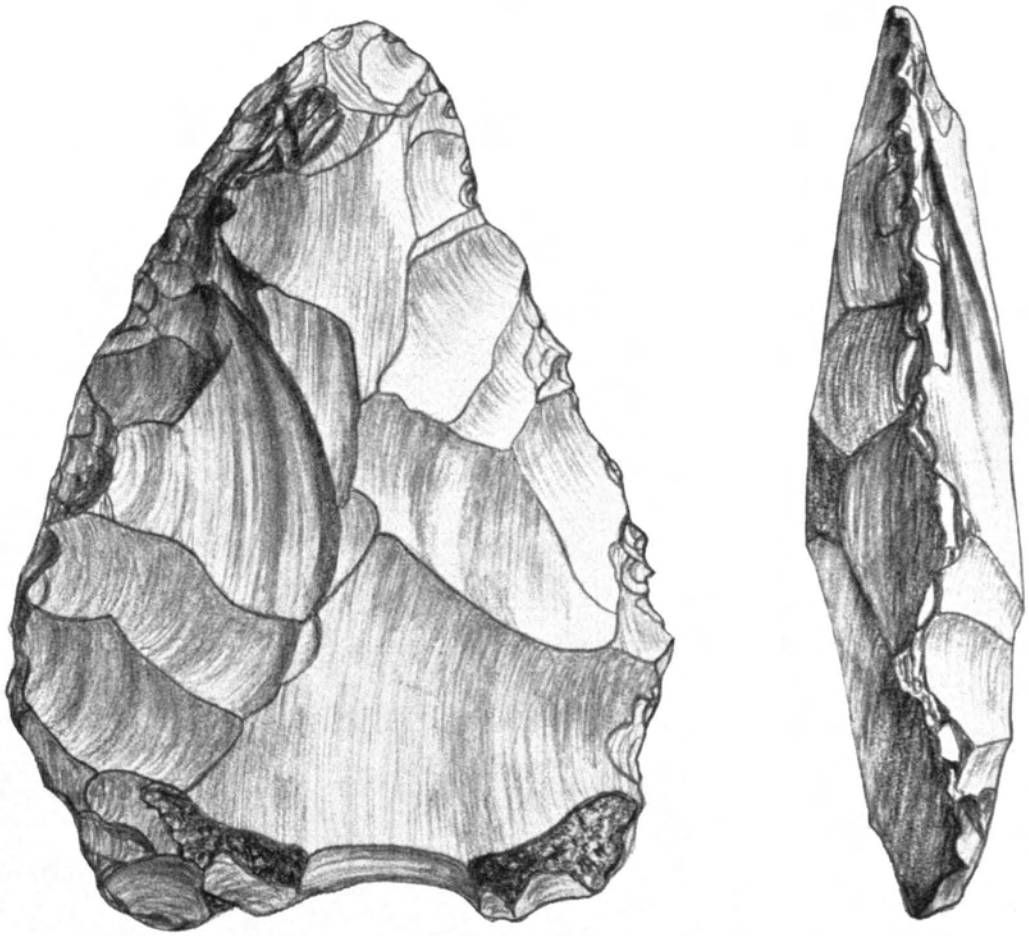
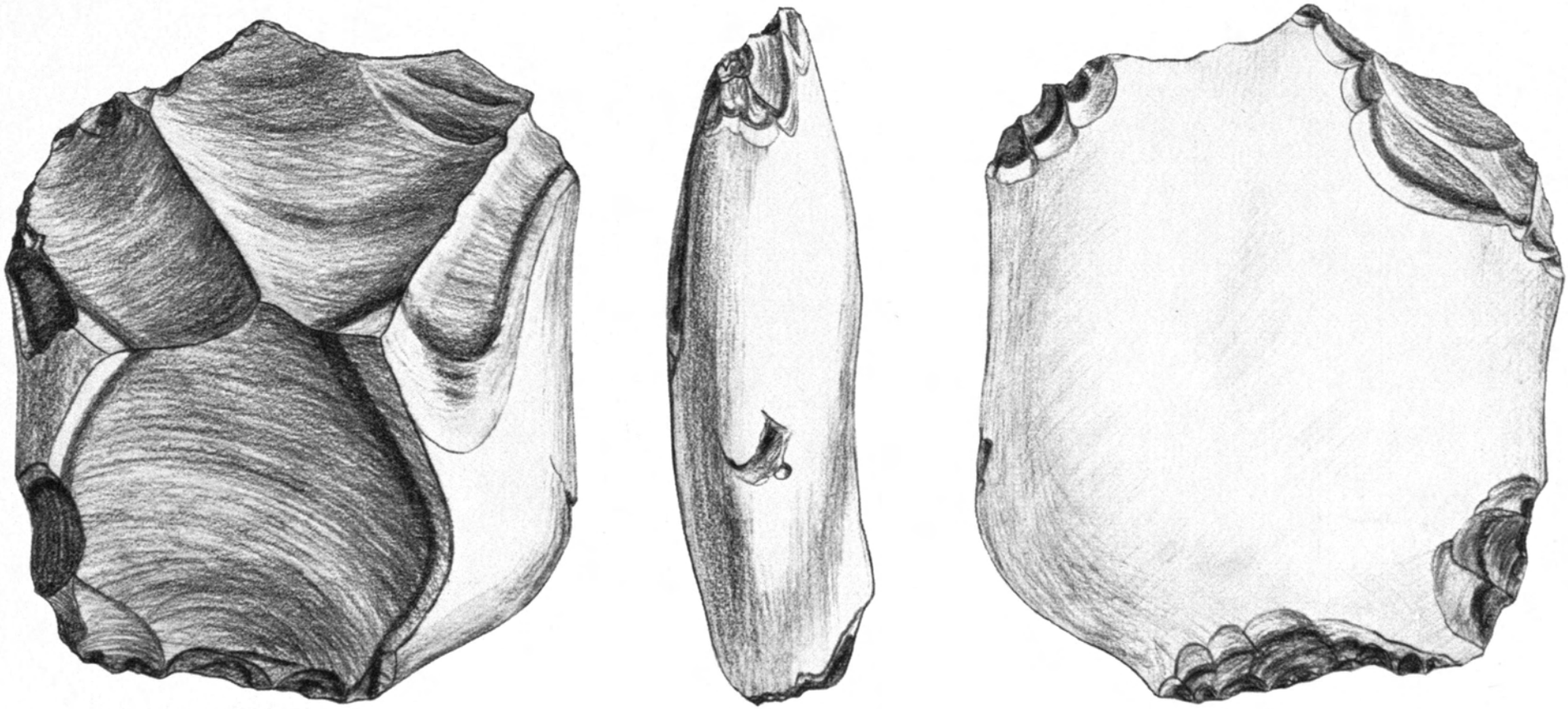


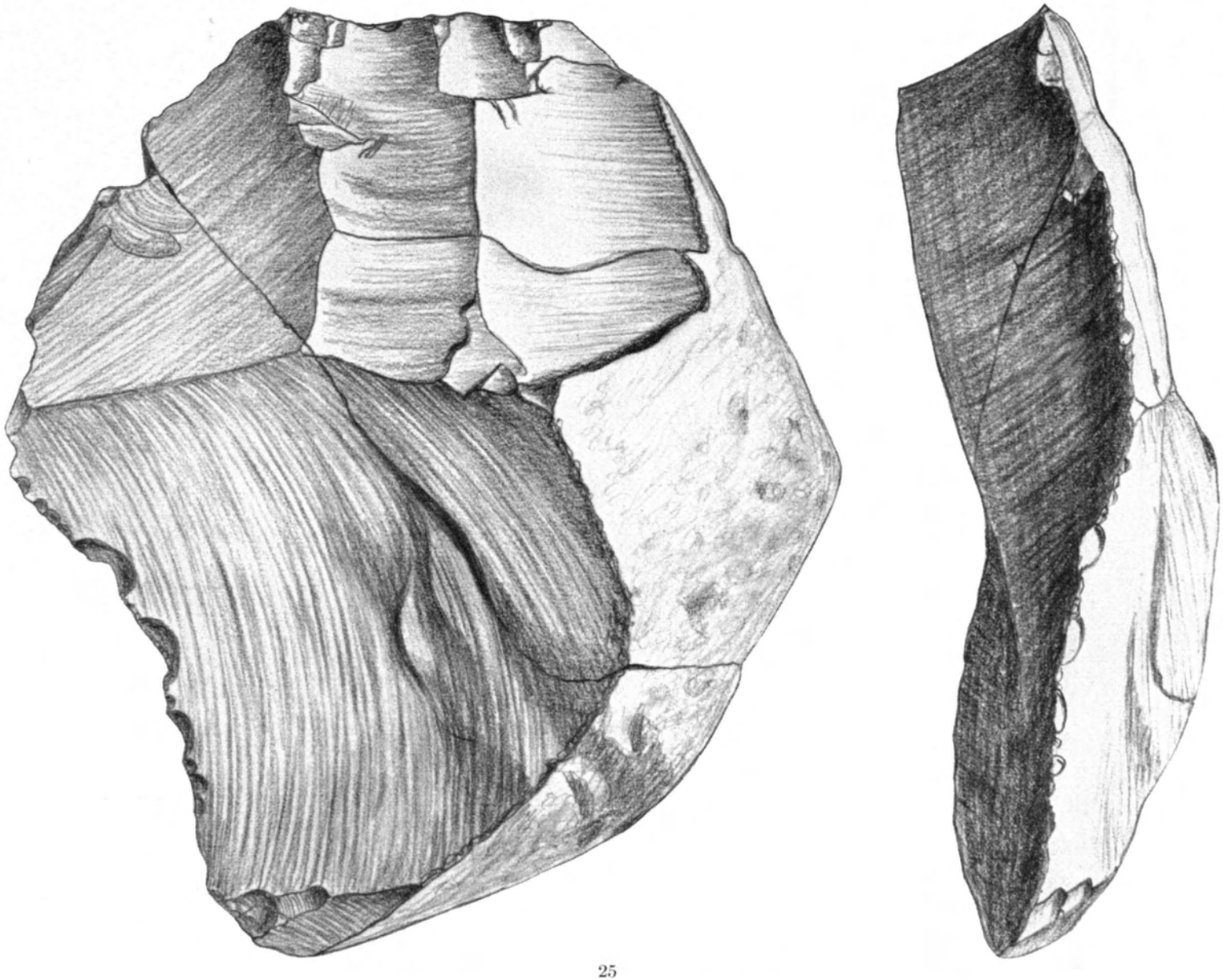
23

22–23.—Broken point and coup-de-poing of Acheulean form, made of white "flint," unrolled, from 10-foot terrace gravels, Valley of the Queens' Tombs, Thebes.



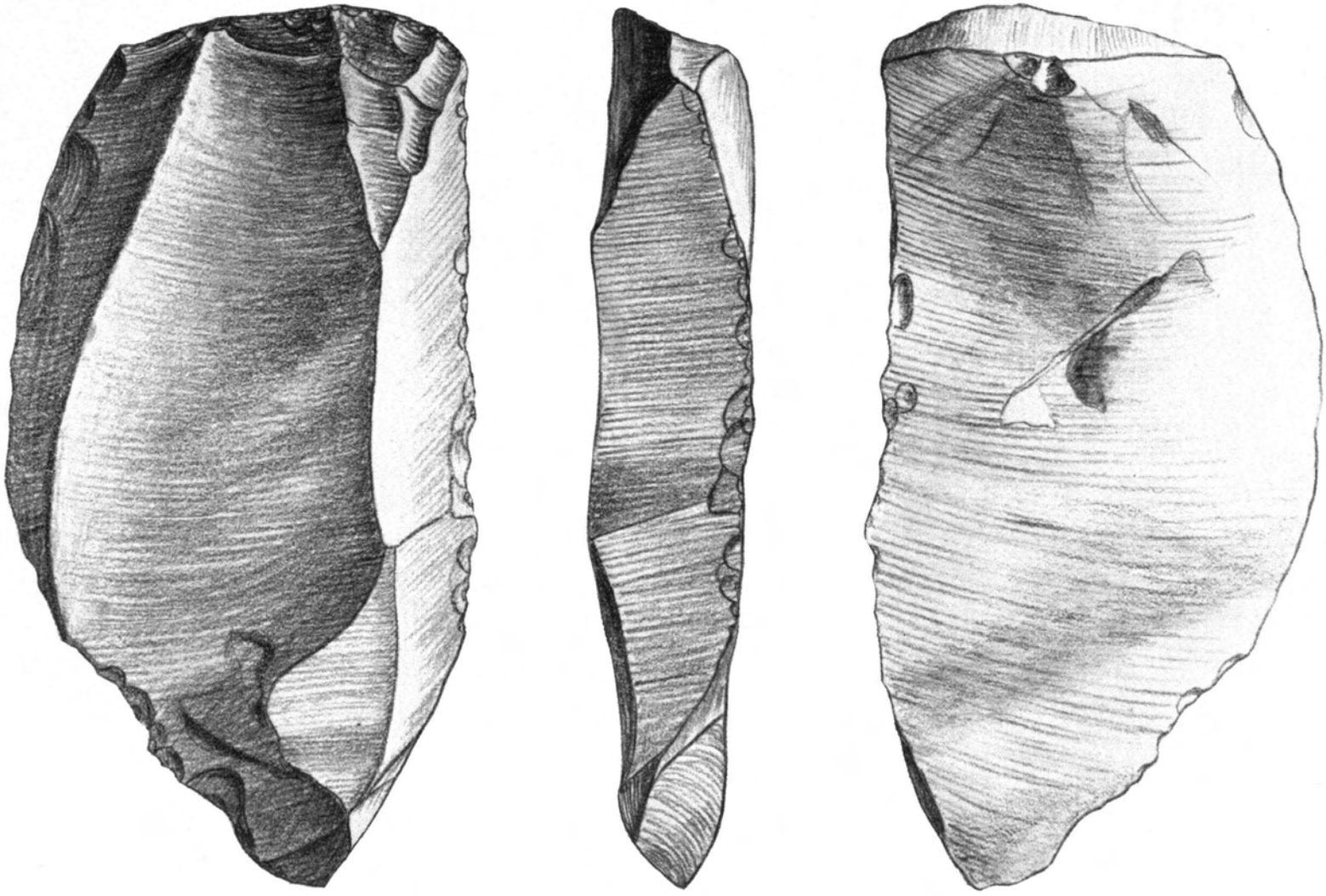
24

24.—Mousterian disk of white-coated gray "flint," very slightly waterworn, from 10-foot terrace gravels, Valley of the Queens' Tombs, Thebes



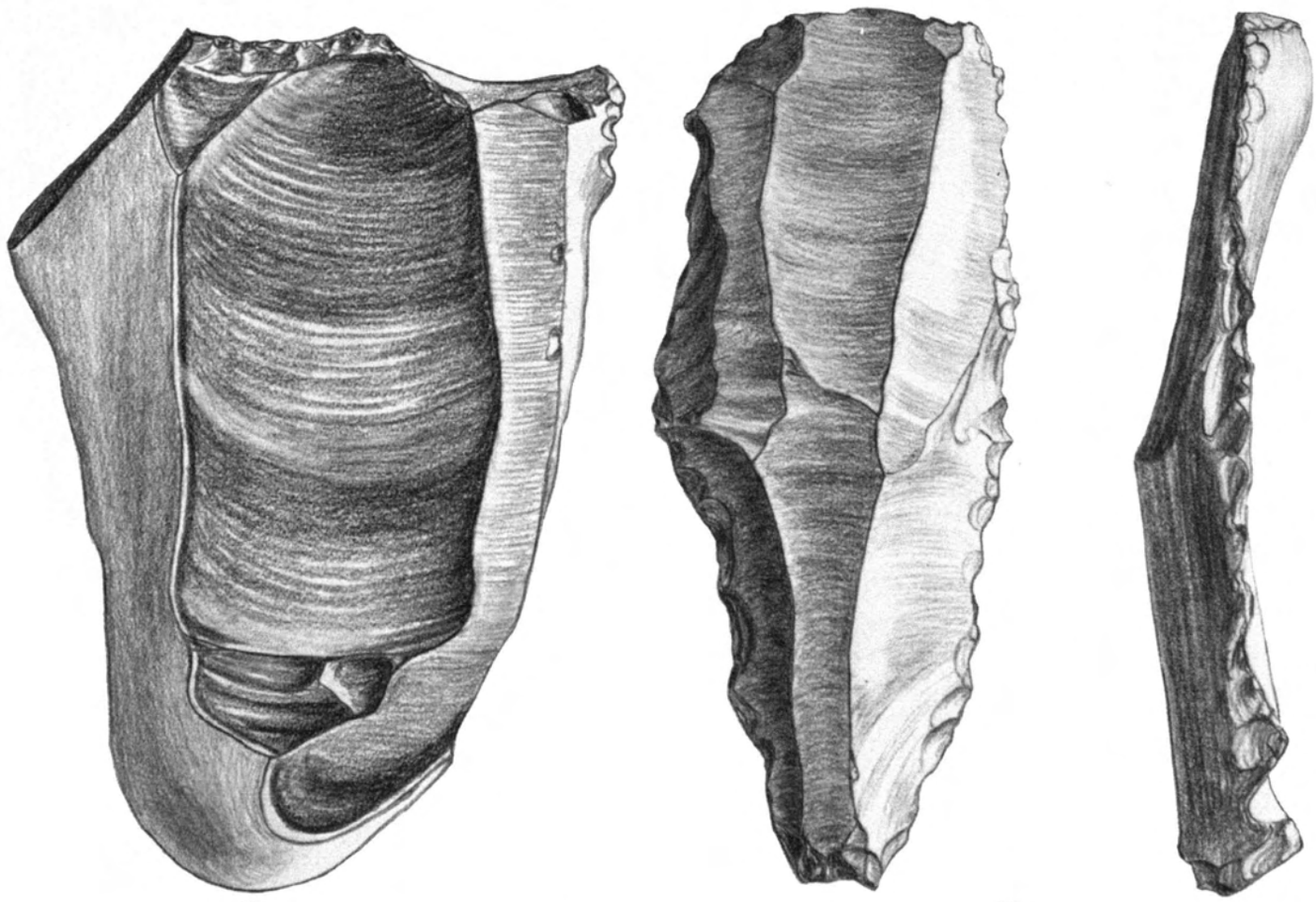
25

25.—Large flake of white "flint," unrolled, from 10-foot terrace gravels, Armant, southwest of Thebes



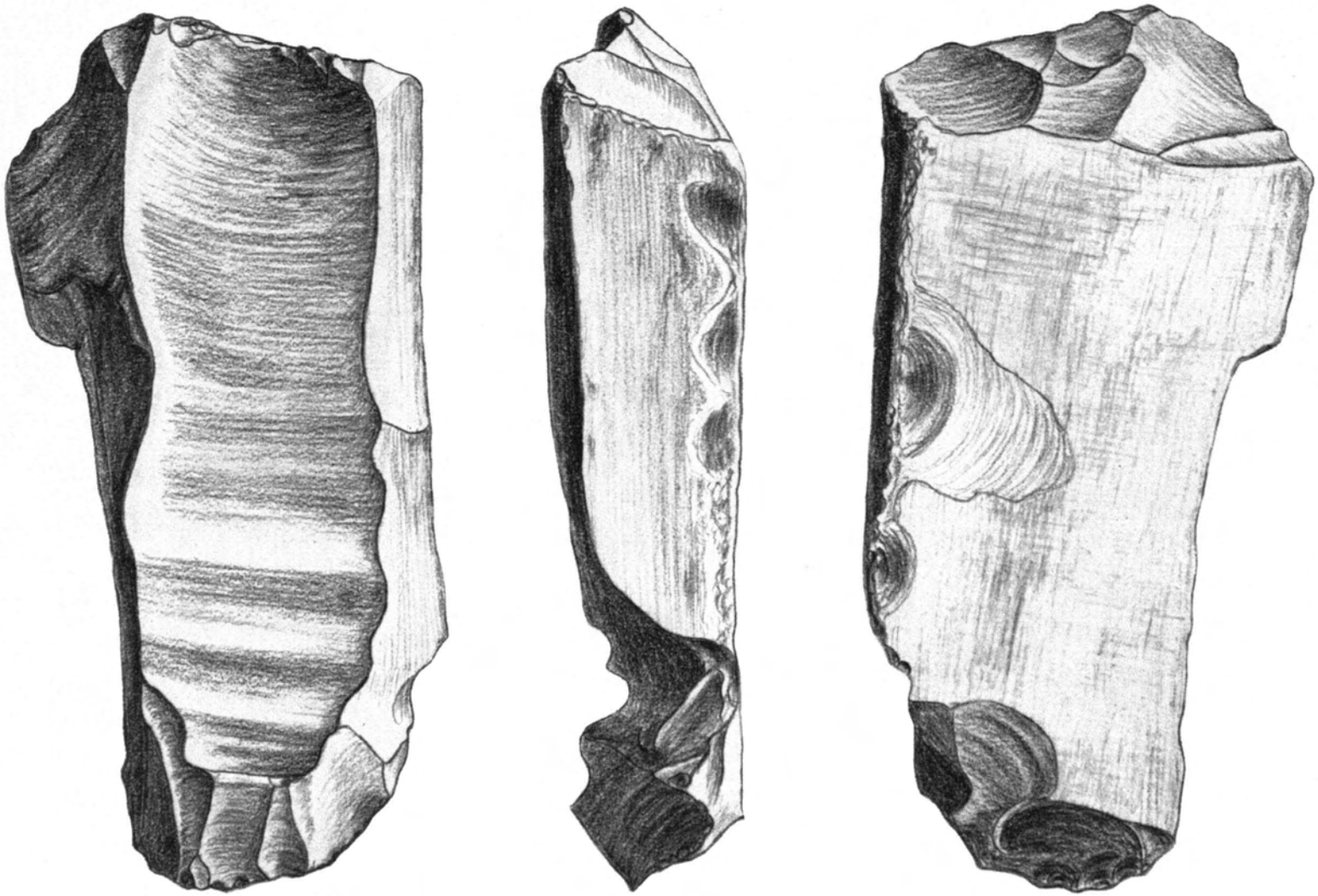
26

26.—Large flake of gray "flint," slightly waterworn, from surface of 10-foot terrace gravels near Valley of the Queens' Tombs, Thebes



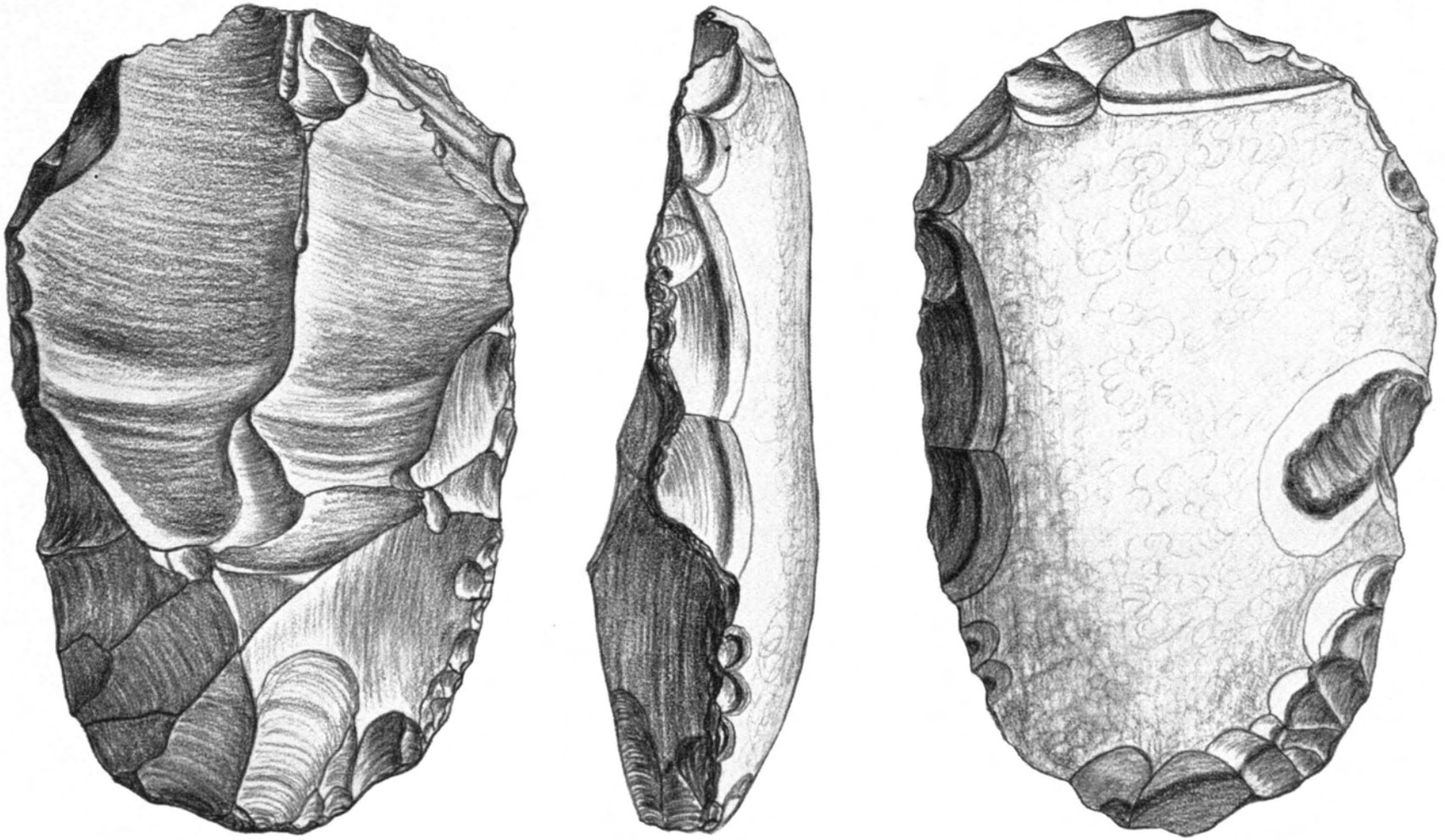
27 28

27.—Mousterian core of white-coated gray "flint," unrolled, from 10-foot terrace gravels, Valley of the Queens' Tombs, Thebes. *28*.—Mousterian flake of buff "flint," slightly waterworn, from 10-foot terrace gravels, Armant, southwest of Thebes.



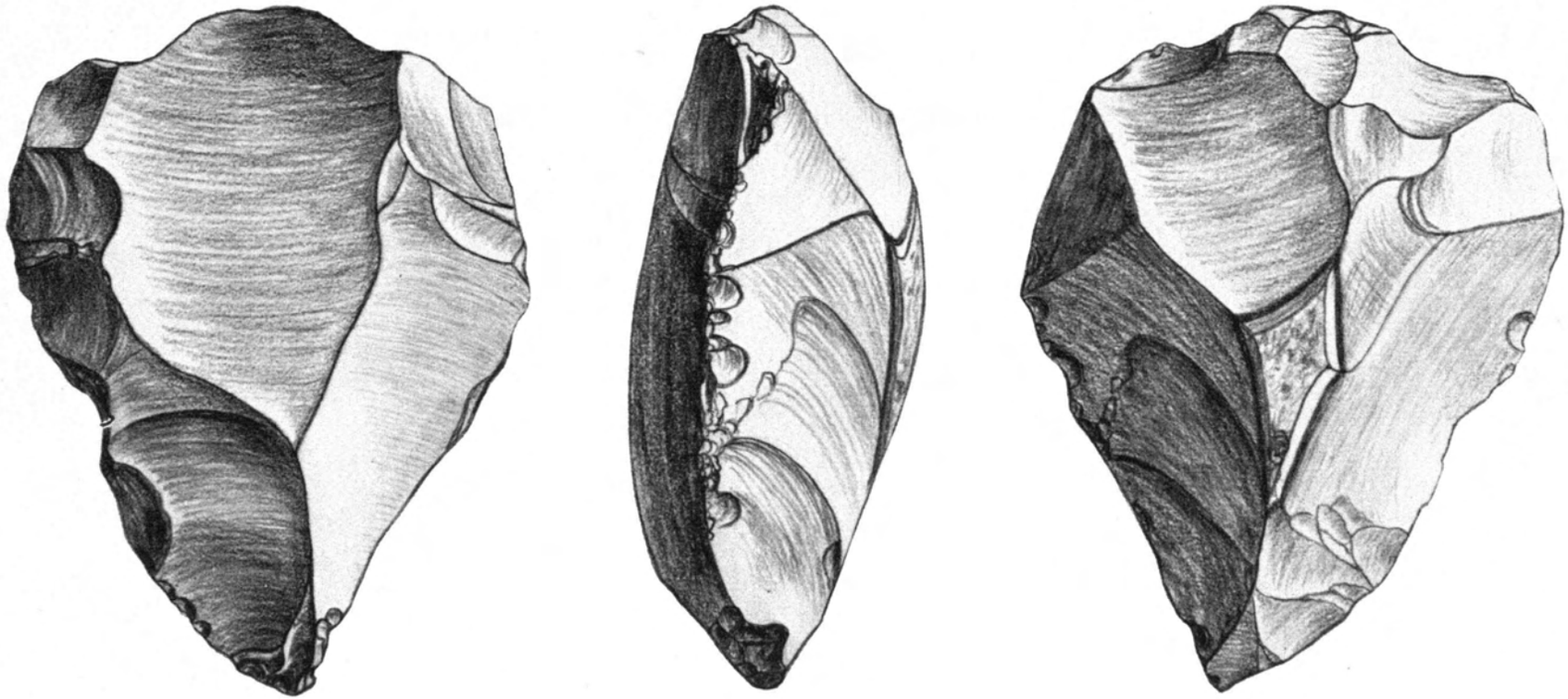
29

29.—Mousterian core of gray "flint" from 10-foot terrace gravels, Wadiyein, Thebes



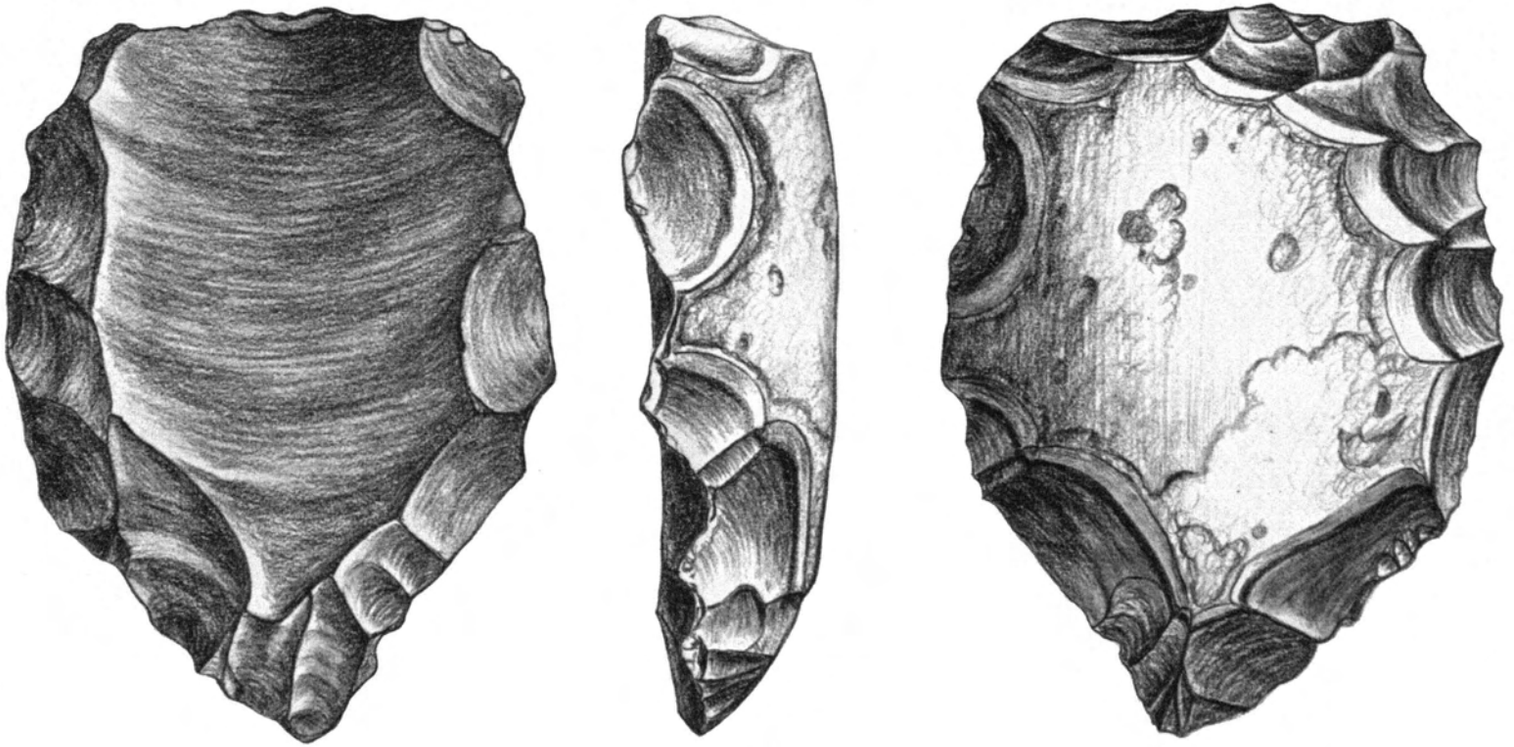
30

30.—Mousterian core of white-coated gray "flint," slightly waterworn, from 10-foot terrace gravels, Valley of the Queens' Tombs, Thebes



31

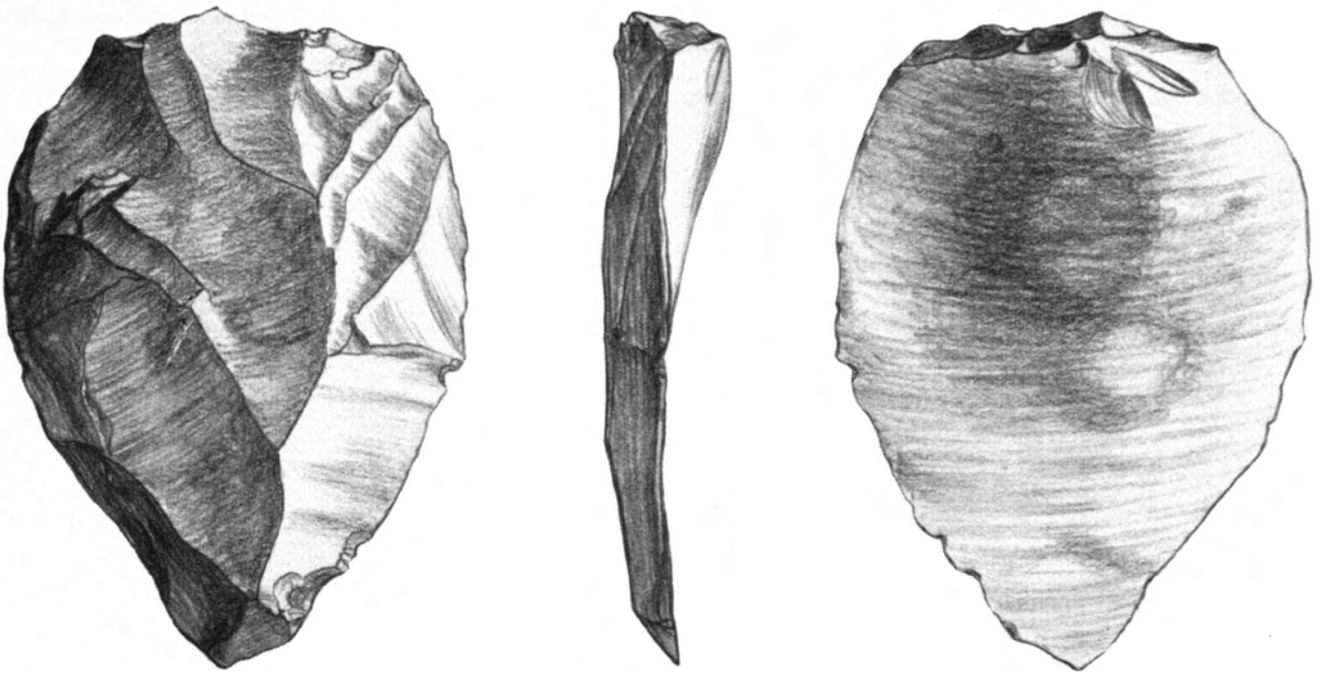
31.—Mousterian core of cream-colored "flint" from 10-foot terrace gravels near Coptic church west of Medinet Habu, Thebes



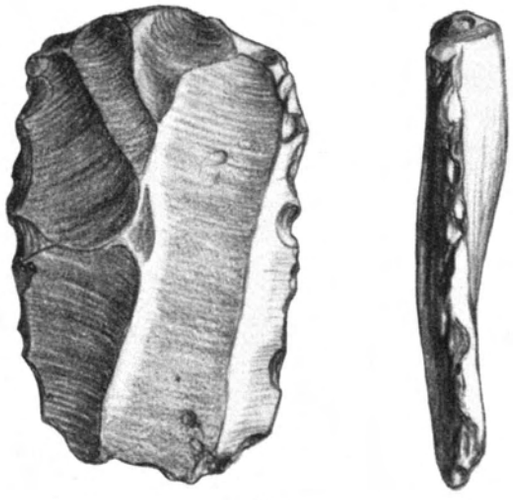
32

32.—Mousterian core of light-coated brown "flint" from 10-foot terrace gravels, Armant, southwest of Thebes

PLATE XXXVIII



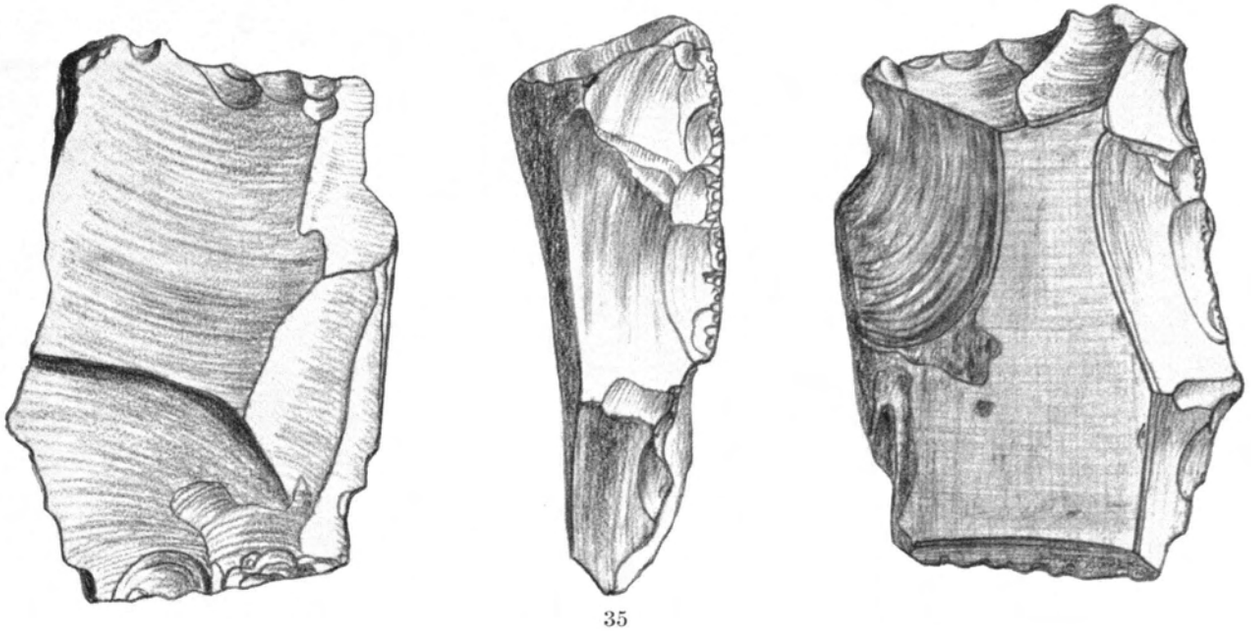
33



34

33–34.—Mousterian flakes of "flint," buff and gray respectively (No. 34 slightly waterworn), from 10-foot terrace gravels, Armant, southwest of Thebes.

PLATE XXXIX



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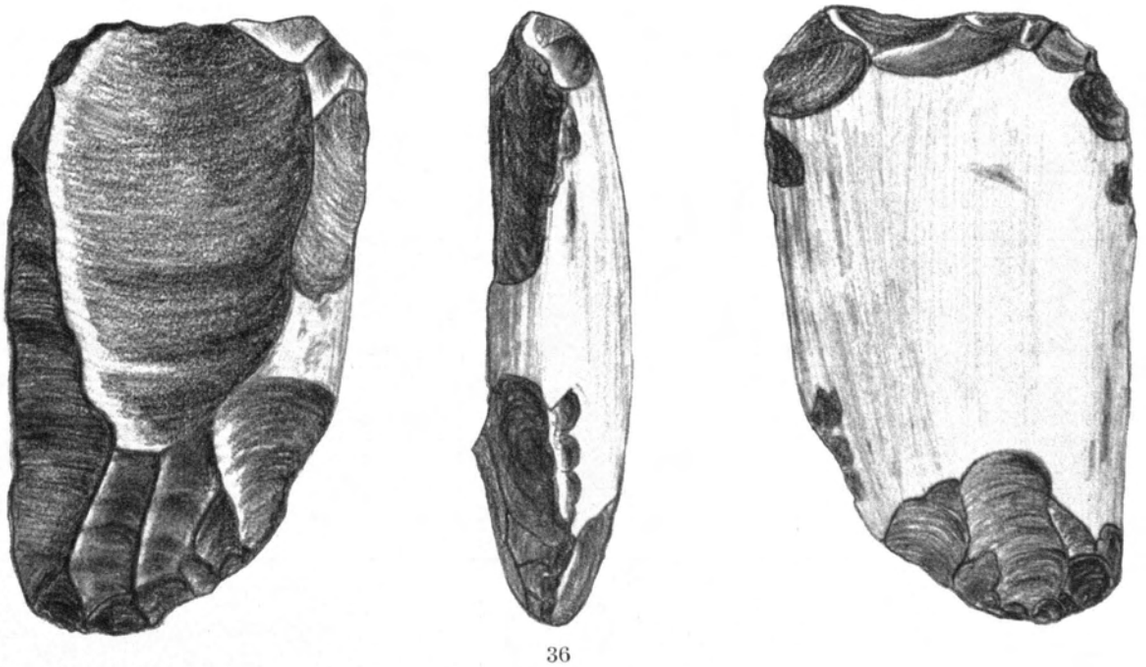
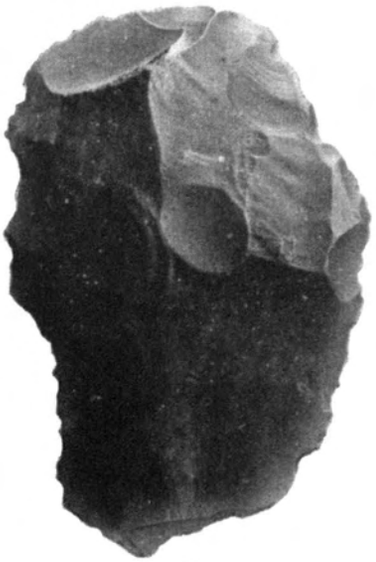


36

35.—Mousterian core of white "flint" from 10-foot terrace gravels near Coptic church, Thebes. *36.*—Mousterian core of black flint with white crust, from 10-foot terrace gravels, Valley of the Queens' Tombs, Thebes.

37



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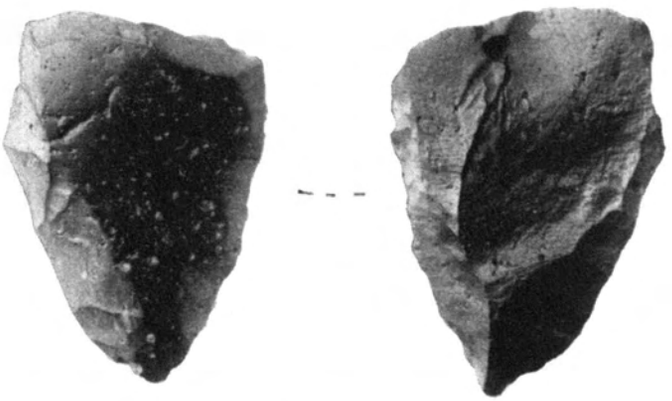
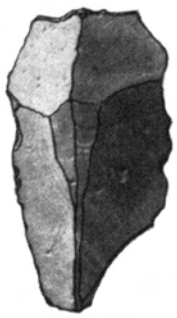


46

37–46.—Sequence of implements from Mousterian to Middle Sebilian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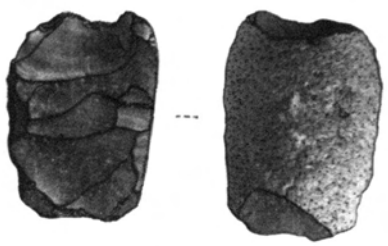
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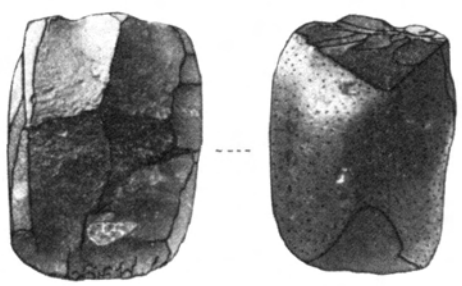
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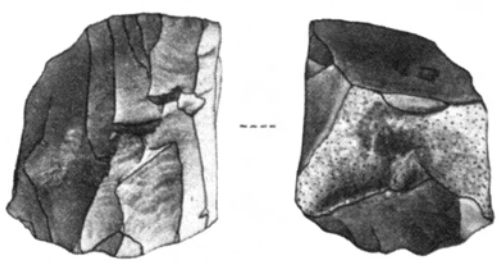
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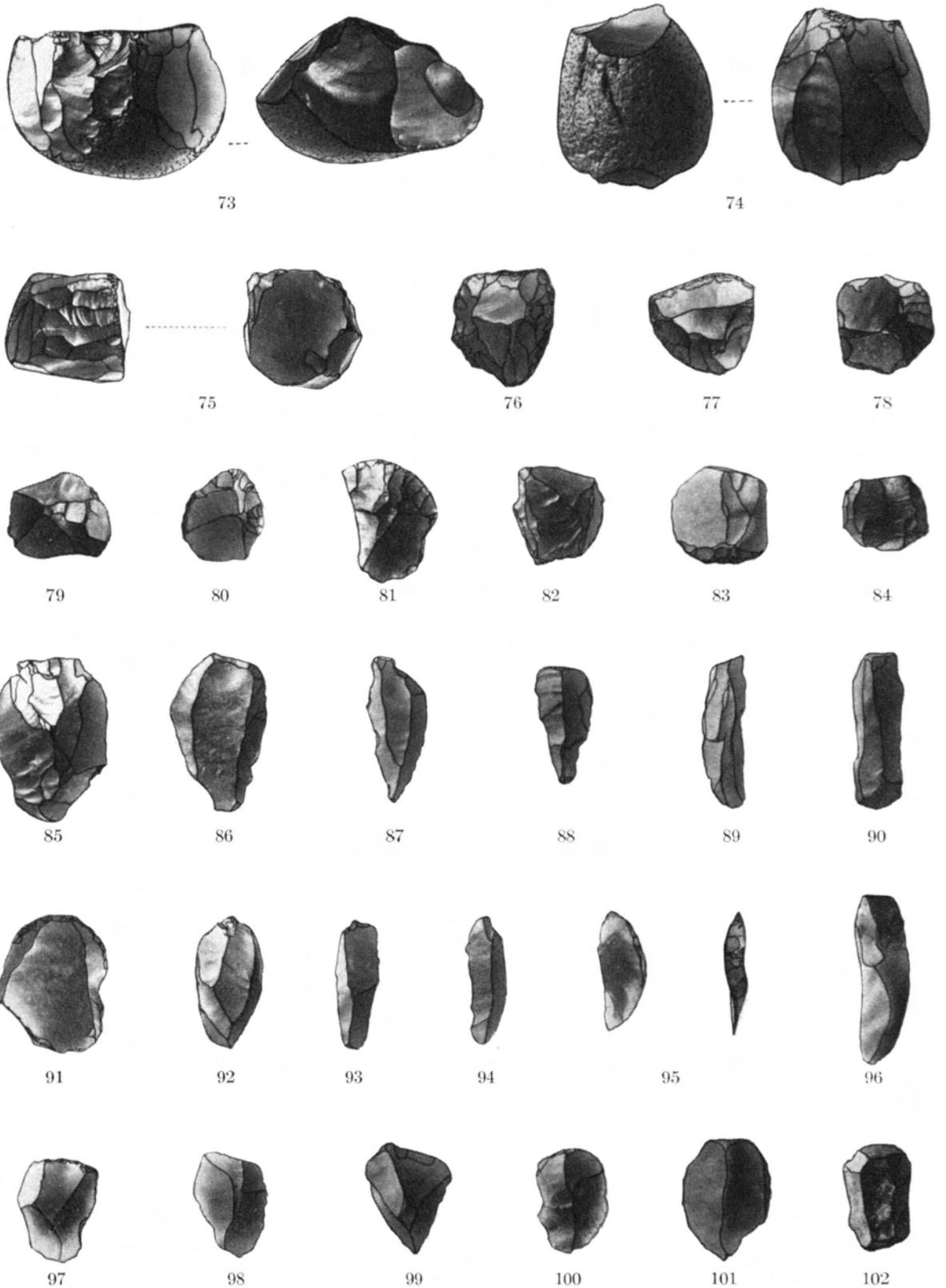
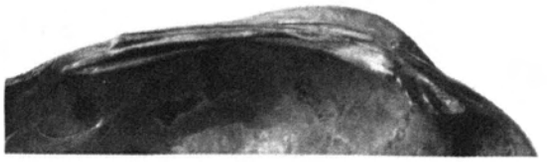
72

47–72.—Middle and Upper Sebilian implements from flaking sites on west bank of Nile about 7 miles south of Edfu

PLATE XLII



73–102.—Upper Sebilian implements from a site 40 feet above flood plain at Dibeira West, north of Wadi Halfa



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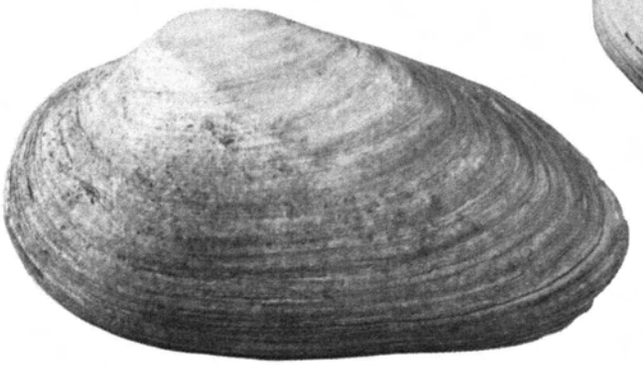

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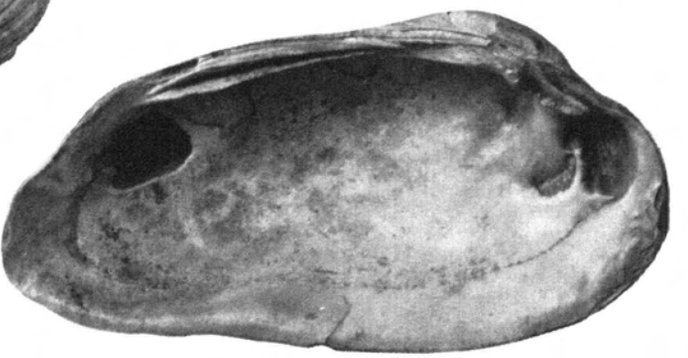
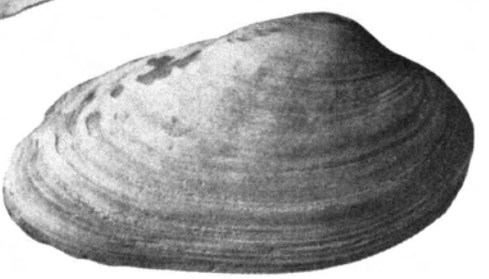


2*a*

3



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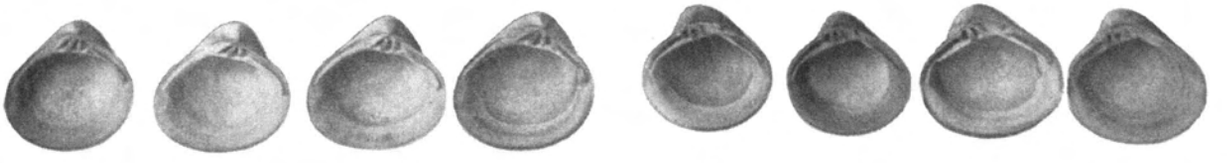

23 24 25 26 27 28 29 30

1–30.—The principal species of shells found in Sebilian kitchen middens and silt deposits of Upper Egypt