ORIENTAL INSTITUTE COMMUNICATIONS

Edited by

JAMES HENRY BREASTED

FIRST REPORT OF THE PREHISTORIC SURVEY EXPEDITION

THE UNIVERSITY OF CHICAGO PRESS
CHICAGO, ILLINOIS

THE BAKER & TAYLOR COMPANY
NEW YORK

THE MACMILLAN COMPANY OF CANADA, LIMITED
TORONTO

THE CAMBRIDGE UNIVERSITY PRESS
LONDON

THE MARUZEN-KABUSHIKI-KAISHA
TOKYO, OSAKA, KYOTO, FUKUOKA, SENDAI

THE COMMERCIAL PRESS, LIMITED
SHANGHAI

ORIENTAL INSTITUTE COMMUNICATIONS NO. 8

FIRST REPORT OF THE PREHISTORIC SURVEY EXPEDITION

By
K. S. SANDFORD
AND
W. J. ARKELL

THE UNIVERSITY OF CHICAGO PRESS
CHICAGO, ILLINOIS

Published January 1928

Composed and Printed By
The University of Chicago Press
Chicago, Illinois, U.S.A.

FOREWORD

The attractions of Egyptian art and archaeology of the Dynastic Age have always been so strong that the earlier and cruder stages of Egyptian culture have been seriously neglected. While the study of prehistoric man by means of his stone implements left buried in the glacial gravels, kitchen middens, and caverns of Western Europe has been steadily advancing for two generations past, only slight progress in such studies has been made in the Nile Valley. It has long been my hope that the Oriental Institute might undertake, or at least begin, the collection of the vast body of evidence revealing the prehistoric career of man in Egypt and Western Asia.

In terms of culture the present state of our knowledge carries us back only to an already existent Egyptian civilization based on cattle-breeding, agriculture, metal, and writing. We have never been able to push behind these possessions of the earlier Nile dwellers, to investigate the origins of cattle-breeding and agriculture, and to link up this stage of settled agricultural civilization with the hunting stage which preceded. In endeavoring to penetrate the darkness which completely envelops the origins of the agricultural stage of human life, and to examine the Stone Age culture of the Nile Valley, the archaeologists have for the most part been content to collect flint implements from the surface of the desert—evidence associated with no geological context by which it might be dated. The fruitlessness of such flint collections has been graphically described by Dr. Sandford (p. 3).

The demonstrated sequence of the stages of the prehistoric human career recovered by investigators of European man has never been tested by a parallel succession of stages from another continent. For making such a comparison Egypt offers a unique opportunity. With much diffidence, and entirely lacking any competence in this field, the present editor suggested in his Hale Lectures before the National Academy in Washington, D.C., in 1919, the possibility of a rough parallelism between the then-known Nile terraces and the succession of glaciations in Europe; but the knowledge of Nile geology then

available was far too incomplete and imperfect to give such a reconstruction a stable basis.

There has been a natural desire on the part of the Egyptian government to carry on extensive explorations of the desert at some distance from the Nile Valley, in the hope of discovering mineral resources which might be of economic value. In the admirable explorations of the Survey Department, therefore, relatively little work has been done in the Nile Valley itself. As a consequence, our knowledge of Nile Valley geology has heretofore been very incomplete. As Dr. Sandford has clearly demonstrated in the following *Report*, we can gain no understanding of the stages of the early human career in the Nile Valley without a full knowledge of the related geology.

Realizing this situation, the writer therefore turned to the General Education Board with a presentation of the facts; and in cordial response to these representations the Board generously granted a subvention for the support of an organized Prehistoric Survey of the Nile Valley and Western Asia, the personnel of which should possess full geological competence and at the same time be able to deal with the archaeological data involved.

It was with great gratification that the Institute enlisted the interest of Dr. K. S. Sandford as field director of this Survey, as well as of his associate, Mr. W. J. Arkell, both of the Department of Geology in the University of Oxford. Dr. Sandford had already been in Egypt during the previous winter on behalf of the British School of Archaeology and had gained much valuable knowledge of local conditions.

The results of their first season's work already throw valuable new light on both geology and human development in the Nile Valley. For the first time the fundamentals of its geology are beginning to emerge. Such things as the discovery of the southern terminus of the prehistoric Nile lake or gulf, the recognition of the five river terraces, and the discovery of early Paleolithic implements imbedded in and contemporaneous with the hundred-foot terrace, are outstanding illustrations of the kind of fact and observation which we have hitherto lacked. The conclusions to be drawn must for the present be cautiously held in reserve, but the enormous age of man in the Nile Valley is now obvious; for the gigantic task of cutting down to its present level has been accomplished by the river since those early Nile dwellers

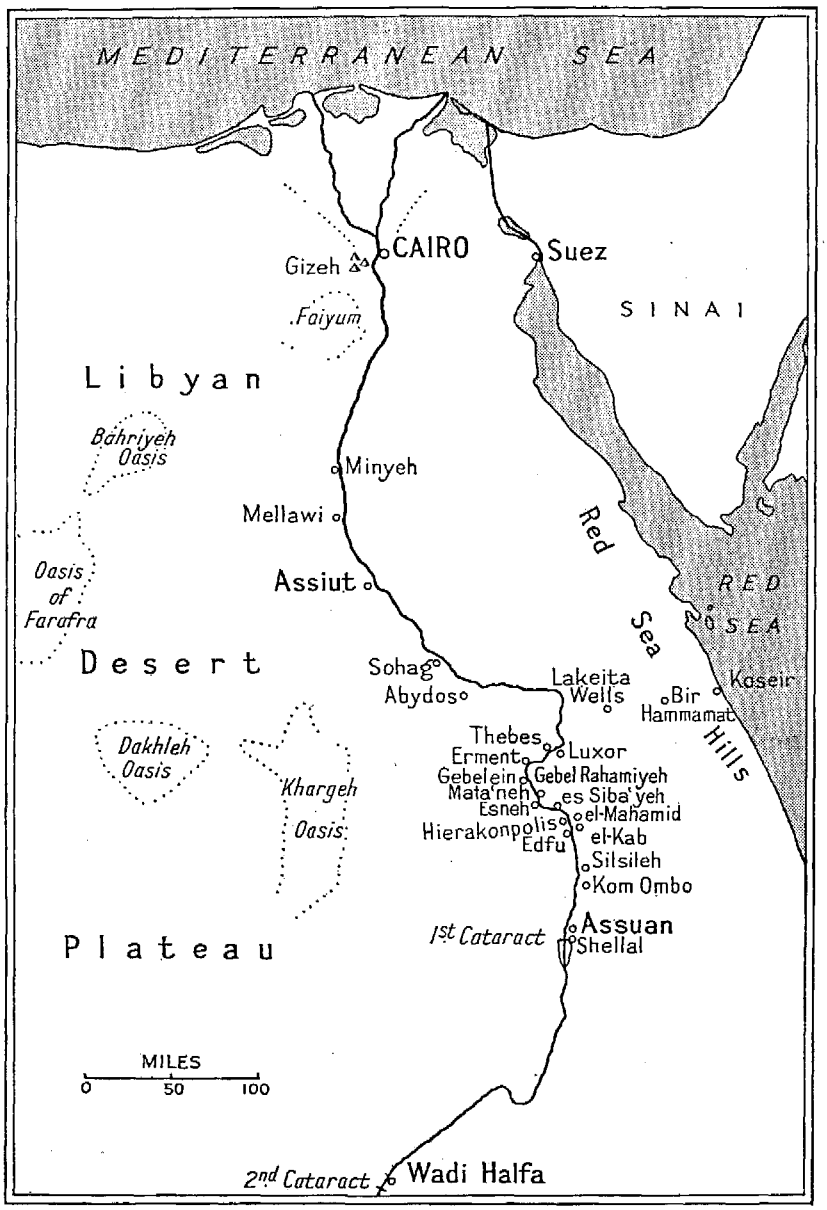
hunted and fished along vanished shores now marked only here and there by a terrace one hundred feet above the present Nile. Outside the Nile Valley this Survey has likewise contributed the discovery of human artifacts lying imbedded in geological deposits above the Red Sea. This is the first discovery of stratigraphically dated human handiwork in the Red Sea region. Dr. Sandford and his colleague are to be congratulated on the new and instructive results which are presented in the following *Report*.

I ought to add that the spellings of geographical proper names, as well as of some words like color (for "colour"), in this report have been modified to conform with the system adopted by the Oriental Institute or with American custom, and hence the authors are not to be held responsible for them.

JAMES HENRY BREASTED

THE ORIENTAL INSTITUTE
UNIVERSITY OF CHICAGO
October 28, 1927

TABLE OF CONTENTS



SKETCH MAP OF EGYPT, SHOWING PLACES MENTIONED IN THIS REPORT

I

INTRODUCTION

In writing this *Report* we have in view one main object—to convey to our archaeological colleagues, and to others not concerned with, or versed in the technicalities of, our work, a general idea of our objective and of the methods employed in attaining it.

Invariably a stimulating interest is taken in our search; but as this is seldom accompanied by an adequate conception of natural and geological processes, to explain its nature and objects is a matter of much difficulty. In the following pages we hope to overcome this difficulty, that others may share the interest of the work. The *Report* is not intended for the expert, though we hope he may get some useful information from it. Our endeavor is to interest the educated reader rather than to supply technical data to the specialist.

We are concerned primarily with the history of a great river and with reading the chapters of this history which have been preserved to us at successive stages of its evolution. But our problems only begin at this point, for our mission is to rediscover those chapters of the history of Man[1] in Egypt which are missing from the written record, and to add them as a preface to the work of the archaeologist. Our colleague is working in a library in which certain volumes of a serial are damaged; in our library we have many empty shelves and we must find the books—if indeed they exist—before we can read them. At best we must fill in for ourselves, by deduction, the serial numbers between such isolated volumes as we discover. We find our chapters written in the alteration of the face of the country, in the tearing away of the surface by rain and flood and the redeposition of the material elsewhere. We find incorporated in the deposits so formed Man's personal property (Figs. 1–3), which he dropped by accident into the ancient river, or which was swept there from the surface on which he lived. Sometimes indeed we find sites on which Man lived

[1] Throughout this *Report* we use the word "Man" to indicate not only *homo sapiens* but also his more primitive implement-making progenitors.

and made his implements; and on rare and important occasions we find these sites intimately associated with silt or gravel which we can "date" stratigraphically.

Our object, then, is to find out the history of the components of a river system, their changes in level and course, and the order in which these events took place. Next we must find the implements of men who were living at these epochs actually incorporated in the deposits

FIG. 1.—In the Valley of the Queens at Thebes. A Mousterian implement still imbedded in the gravel of the 10-foot terrace (see p. 24) is being pointed out by its discoverer.

which mark the changes (Figs. 1–3). Having fulfilled both these conditions, we have some framework on which to begin our work of piecing together Man's history.

The reader may consider that the chances of success in such circumstances are slight, but in practice this is not found to be so. The work, however, is the business of a geologist; and he must have specialized knowledge, a sense of proportion—and good eyesight.

Egypt, and particularly Thebes, has long been a happy hunting-ground for the collector of flint implements. In certain localities the worked flints lie so thickly upon the surface of the desert that it is

impossible to walk without treading upon the skilled workmanship of men who lived scores of thousands of years ago. These flints, scorched daily by the sun and reduced by night to freezing-point, have acquired a superficial colored film (called *patina*) of great beauty; the color varies from orange to deep chocolate in its most attractive shades and greatly enhances the value of the implements in the eyes of collectors. Thus these implements, which are exceedingly common, have been

FIG. 2.—The same Mousterian implement whose position was indicated in Fig. 1. It still lies undisturbed, just to the left of, and almost touching, the modern coin.

eagerly sought after, and no collection of any scope is without them. So great has been the demand, and so great the lure which the patinated implement exercises, that collectors have commonly hired ignorant natives to scour the desert and bring in these works of art in sacks, like potatoes. The implements so collected are without data of any sort and are virtually useless. There is a dreary monotony in finding in one museum after another a collection of these gems torn from their settings and proudly displayed under the legend "Implements from Egypt" or "Flints from Thebes."

Lamentable as this may be, it is perhaps better than the steady infiltration of the material into dealers' hands, to disappear as "curi-

osities" in the capacious grip of the tourist. At present both processes go on; and the native, now thoroughly alive to the fact that he will get *baksheesh* for bringing in the implements, is far too good a business man to leave off until he has exhausted the possibilities of the trade. When he has cleared the ground of its rich spoil he will endeavor to bolster up his exchequer by fabricating "implements" and selling them; some of the shrewder "tradesmen" have already started to do this. They cannot imitate the patination of the

FIG. 3.—The same Mousterian implement, a flake struck from a core, after its removal from the gravel of the 10-foot terrace in which it was found imbedded (Figs. 1 and 2).

implements found lying on the surface, but they can—and do—rise to greater cunning by asserting that they found their unpatinated "implements" buried in the ground. It is at this point that the purveyor of implements becomes pernicious, for we know that implements do occur *in situ* in the ground—incorporated in ancient river deposits (Figs. 1–3).[1] If the native removes these, he is tearing pages from our book of reference; for we know that the gravels laid down by the rivers in former times succeed one another in stages or terraces, each representing a cycle of fluvial activity with which we are intimately concerned and which we hope to fix chronologically with reference to the others.

[1] We are not considering at the moment implements buried in graves.

II

OUTLINE OF THE GEOLOGY OF EGYPT

We may digress at this point to touch on the geology of Egypt, as it is essential to an understanding of what we are about to discuss.

Egypt is a great table-land of sedimentary rocks (i.e., layers or strata deposited on the sea floor) elevated uniformly in comparatively recent times—speaking in a geological sense (i.e., perhaps only a few million years ago). Although this elevation was of astounding uniformity, the table was in fact slightly tilted toward the north; so that on traveling southward from the Mediterranean into Upper Egypt we pass on to successively older rocks until we meet the oldest of all

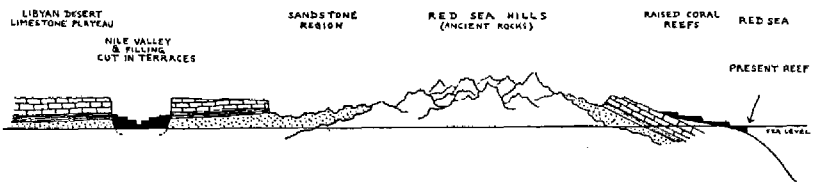


FIG. 4.—Purely diagrammatic geological section from the Nile to the Red Sea at about the latitude of Thebes.

at the First Cataract (Assuan), on the borders of Nubia. These are granite and associated rocks which are not of sedimentary origin but are actually a part of the ancient floor on which the marine sediments have been deposited, so that if borings were sunk at Cairo or elsewhere we should eventually reach this same floor.

The floor is also turned up at the edge, so to speak, to form the rugged mountains which separate the Nile Valley from the Red Sea; and if we pass through these ranges we find on the east side rocks of similar age and appearance to those seen at about the same latitude along the Nile (Fig. 4). In addition there are found here, banked against the granite mountains, other sedimentary rocks younger than any seen in the interior of Egypt. These consist largely of ancient coral reefs and gypsum which pass indistinguishably into the living coral reefs of the Red Sea.

Now it is evident that to raise the northeast corner of Africa in this manner gigantic forces were necessary. It is probable that the steady uplift was contemporary and associated with the stupendous thrusts and folds which built up out of the sea floor the Alps, the Carpathians, the Himalayas, and other mountain chains; for these, with the Andes, are the youngest in the world.

During the period of uplift of Northeast Africa from the sea the eastern flank of the Red Sea Hills remained as a shore line of the ancient Red Sea, of which the modern representative is probably only a shrunken survivor. It is believed that the Red Sea, as we see it today, was formed by a collapse of its rocky floor along a narrow belt, the trough so formed being a part of the great rift, or break in the earth's surface layer, running from East Africa to the Jordan Valley. Nevertheless, the marine beds formed during this time remain to mark the sequence of events.

What happened in Egypt itself, on the surface of the newly elevated and still rising land? At first there was no Nile Valley, and the plateau was not afflicted by desert conditions as it is today. Rain fell heavily, no doubt, and it had to find its way to the sea; hence one or more rivers ran northward—i.e., down the slope of the table-land—toward the Mediterranean. Of these probably the Nile is one—and the only one which, for particular reasons, has survived to the present day. Traces of at least one other are still to be found in the great Libyan Plateau west of the Nile, unless, as is probable, this abandoned river course is the ancestral Nile.

At this time, too, the great limestone plateau, the surface of which stands nearly two thousand feet above Thebes, stretched far to the south beyond Assuan toward the Sudan; but, as the rivers continued their work of eroding the surface of the country, they cut their beds downward into the solid rock. Then tributary streams joined them from the sides, so that the whole drainage system cut into the old sea bed. In particular, the southern end of the limestone plateau, where it rested on older rocks, was gradually eroded until it ceased to be a featheredge and became a cliff. Ever since that time the cliff has been creeping steadily northward, as the streams pouring down it and sweeping along its foot cut it away.

This does not give us a picture of Egypt as we see it today, a hard

and desolate waste ribbed by the green and silver band of the Nile. But the reader must remember that Northeast Africa has not always been a desert; far from it, for the advent of desert conditions in at least the Egyptian portion of this region is a "recent" event, subsequent indeed to that time when Paleolithic Man established himself there. Since the advent of desert conditions the processes of erosion have virtually been brought to a standstill; indeed, the topography of Egypt has been "fossilized" by the cutting off of rain. We look at it just as it was left at the end of the Old Stone Age; except in minor points there has been no change.

As soon as the tributaries of our river—the ancestral Nile—collected water from the west and turned the plateau edge into an escarpment, the water from the south was cut off from feeding similar rivers consequent upon the raising of the sea floor into dry land; all the run-off was then compelled to travel down the slope to the Mediterranean via the Nile Valley. The erosive power of the river was thus enormously increased and its valley deepened more and more as the plateau was elevated (or as the level of the old Mediterranean fell in relation to it). Soon a very deep and narrow channel, a gorge or canyon, was cut through the limestone plateau, all other river systems were captured or cut off, and the Nile alone remained.

So deep did the cutting go in northern Egypt that the bottom of the valley has not yet been found in borings. This means that, since the Nile cut its valley to a maximum depth, Northeast Africa has sunk slightly and the northern Nile Valley has been flooded by the sea and filled up.

All this was accomplished before Man appeared. In fact, the process had so far settled into quiescence that an arm of the sea, or a long lake, stretched southward as far as Esneh. The deposits of this strange basin are still to be found as one of the most important geological features (sometimes as a strongly marked topographical element; cf. Fig. 5) of the Nile Valley in Upper Egypt.

We now enter the last stage—the state of affairs when Man arrived. Another change had set in: Northeast Africa was slowly rising again; the old processes were repeated and the gulf or lake was turned once more into an active river.

We can see the last deposits of the sea or lake (Fig. 5), the sudden

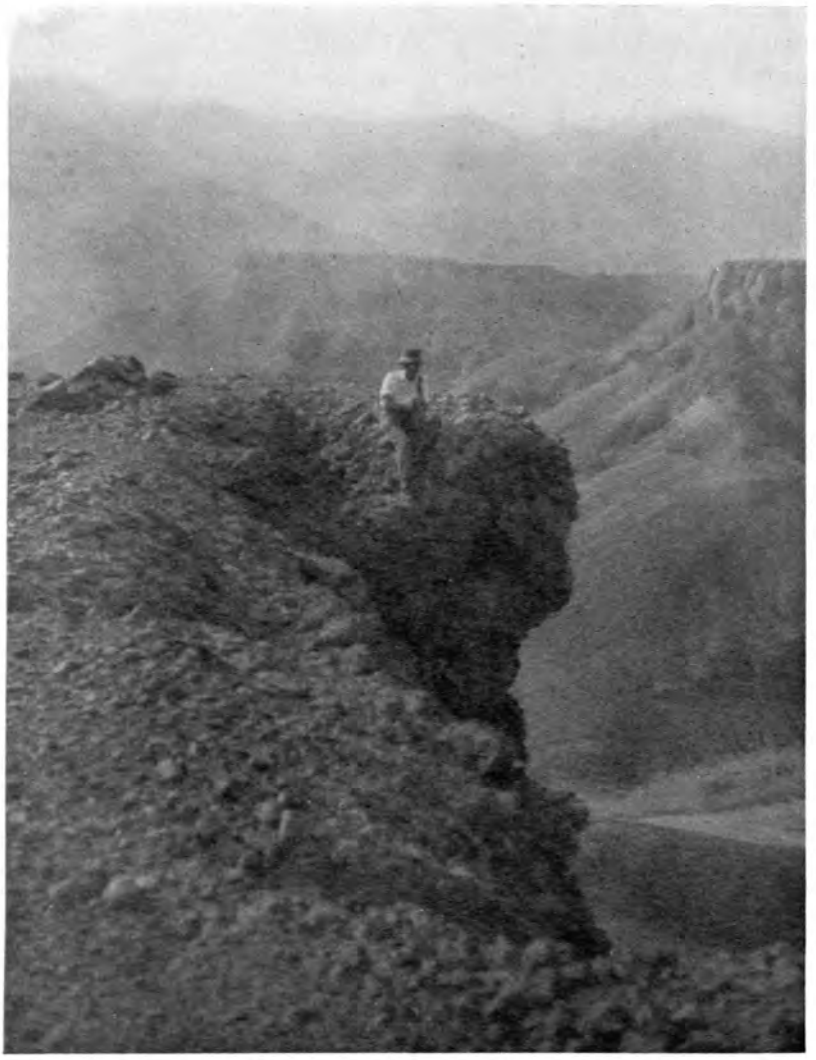


FIG. 5.—Deposits in the North Valley at Thebes laid down during the lake or gulf stage of the Nile's history. They rise here in the foreground about 300 feet above the present river level. The higher hills in the middle distance are part of the limestone plateau into which the Nile Valley is cut (cf. Fig. 7).

advent of torrents and accompanying gravel spreads, the destruction of much of the material previously laid down; and the great cycles of erosion and deposition which Man has witnessed in the Nile Valley have begun.

It is the stages of this latter impressive sequence of events—those that Man has seen and lived through—that we are to study.

III

LATER STAGES IN THE HISTORY OF THE NILE VALLEY

Let us now take as our starting-point the return to fluvial conditions in the Nile Valley of Upper Egypt, as mentioned in the final paragraphs above.

The old valley was filled with deposits of "pseudo-lacustrine type," i.e., with clays and marls near the center line and coarse material near the valley walls. The river would tend under these conditions to flow in the region of softer material, and the coarse material would in most places protect the old valley walls. As soon as the Nile started to erode its soft bed the coarse lateral material was left high and dry; and from that time onward rain which fell upon it ran down the lateral slope into the river, eroding the older material as it did so. Thus at an early stage deeply incised lateral valleys, within the old valley wall and draining into the Nile, were initiated. In the subsequent history of the river these have been both deepened and moved laterally by meandering, so that much of the older coarse material has been removed.

We have found that the earliest "river stage" of this post-"lake" or -gulf phase has left deposits about one hundred and fifty feet above the Nile in Upper Egypt (Fig. 6).

But it has already been pointed out that *lateral* valleys were early formed in the main valley and drained into the river. Gravel and similar material might therefore be expected in them at a height above their present floor equal to that of contemporaneous Nile deposits above the present river, just as modern wash is found in the floors of these wadies or valleys contemporaneous with the recent flood alluvium of the Nile.

Gravel does run up hundreds of feet above the Nile, just as we should expect; but it does not belong to that river but to the laterals within its own valley cut in the old "lake" deposits. This is a principle of the first importance to our work, and one that does not seem always

to have been appreciated. In many places the Nile gravel stages have been destroyed by erosion, and in such circumstances the survival of stages or terraces in the adjacent lateral valleys is of the greatest value. It is for this type of work that the experience and training of a geologist are essential, for it is his business to appreciate the differences between two deposits by studying the stones of which they are composed. It is the geologist who can tell whether the constituents belong to the Nile or not.

FIG. 6.—Hills southwest of Edfu capped with gravel of the 150-foot terrace, representing the earliest river stage after the lake or gulf stage of the Nile Valley (cf. Fig. 7). Near the expedition's camp in foreground dinosaur bones were found (p. 34).

Now it is found by investigation over a wide area that the Nile, in common with many rivers, has deepened its channel in definite stages; that between these periods of down-cutting there were intervals during which the Nile laid down extensive alluvial tracts and meandered through them (Fig. 7). Thus, as already stated (p. 10), the first great tract lies at one hundred and fifty feet above the present level of the river (Fig. 6), and up- and downstream the present river and the ancient deposits seen in section are mutually parallel. In the deposits of this stage we have never found an implement; upon them may be found implements of any age, as explained early in this paper.

The next terrace is at about one hundred feet above the Nile (and

its lateral equivalents one hundred feet above the lateral valleys). In this (Fig. 8) we find in certain places implements in plenty. Again upon the surface of this terrace may be found implements of any age

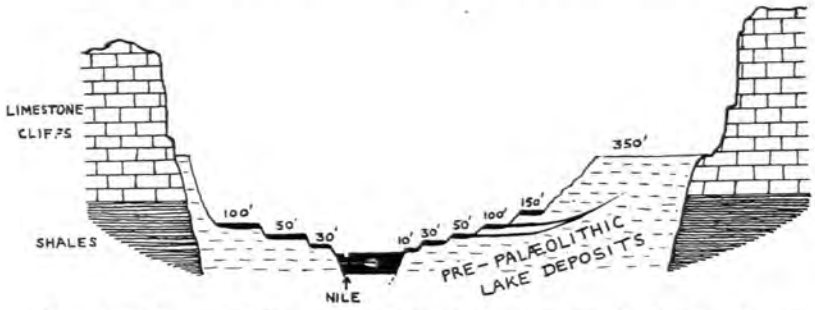


FIG. 7.—Diagram to illustrate the Nile terraces cut by the river in the pre-Paleolithic lake or gulf deposits, as found in the region of Thebes. The river has meandered to the left in 100-foot and modern alluvium times, for on that side the 150- and 10-foot terraces have been cut away. The right side, however, shows the full sequence of terraces, also the tributary wadies developed at the 100- and 50-foot-terrace periods.

FIG. 8.—Edge of the eastern desert near Erment. The spurs of gravel extending toward the alluvium are remains of the 100-foot Nile terrace.

—including those which have been brought to the surface by the erosion of the gravel in which they are actually incorporated. The reader may ask, How do we know that some of the surface-found implements exist in the gravel as well? The answer is simple. In the first place, one expects, from experience, to find their fellows in the gravel; in the second place, it should be remembered that gravel is deposited from a fast stream, in which the pebbles are continually being battered by mutual impact. Thus a flint implement dropped into this stream will be similarly battered. If it has traveled far its sharp edges are smoothed and its surface covered with batter-marks; there is no mistaking the evidence of such a specimen. Implements accidentally dropped on the surface and allowed to lie there may be blasted by the wind-borne sand or be partially rotted by long exposure, but they are neither water worn nor pebble battered. There is, further, the difference in color or patination. The implement dropped upon the surface has been exposed to the elements since that time; the surface-found implement which belongs to the underlying gravel may have been eroded out of it in the last rainstorm and consequently is only now taking patination upon its surface. Most frequently the two classes may be distinguished by difference of patination alone, but the reader will now realize that this is neither the only criterion nor the best.

There is, finally, a third class of implement, sometimes very important: that dropped into the ancient stream and incorporated in gravel without traveling; it is thus virtually unworn and perhaps unbattered. If such an implement is found on the terrace, it may be accepted as a surface-dropped specimen, younger than the surface on which it lies. On the other hand, the condition of the patination may very probably arouse the suspicion of a careful observer and lead him to search all available exposures of the fresh (unpatinated) gravel until he finds similar implements *in situ*. If there is any doubt whatever, the specimen is treated as a surface-find and as virtually worthless as a criterion for fixing the age of the deposit. This is a rule that is strictly adhered to, and the site is not left until the point is settled one way or the other.

We find that after the hundred-foot stage the Nile and its laterals deepened their channels some fifty feet. This means that in all proba-

bility the level of the Mediterranean, or of the land, changed by an approximately similar amount (i.e., the sea was that amount lower with relation to the land), and the Nile thus had to accommodate itself to the new level of its outfall by intensive bed erosion. Such a process undoubtedly takes an enormous period of time, and to a certain extent it is progressive from the mouth of the river toward its

FIG. 9.—Flooding due to a rise in base level. An ancient river valley now an arm of the lake formed by the Assuan Dam.

headwaters. In the Nile such changes, in so far as they are connected with an altered level of outfall into the sea, will affect only the eight hundred miles or so from the Mediterranean to the First Cataract at Assuan. Here the rocky barrier presents an additional base-level, simulating sea-level, to which the section of the Nile as far as the Second Cataract (Wadi Halfa) endeavors to adapt itself. It is true that the rock floors of the cataracts are themselves lowered by the rush of water, but the process is immeasurably slow owing to the durability and hardness of the granite and similar rocks of which they are composed. If the reverse process were to take place, i.e., if the

sea were to rise greatly with relation to the land and its rivers, the lower part of the river's course would be flooded and erosion would cease. Instead the silt normally carried out to sea would be deposited in the river valley. Such was the cause of the formation of the Nile Delta. A similar effect is obtained artificially by the construction of a barrage. Thus the Assuan Dam, above the First Cataract, turns the old river course into a lake which reaches more than halfway to the Second Cataract (Fig. 9). Here the river becomes normal only when the sluices are opened and the lake drained.

During the time occupied by the river in reaching its new level throughout its course (or from the sea to the First Cataract), the curve which a vertical section of its course presents is altered. When the river is wandering through its own alluvial tract this curve is, on the whole, flat; when the bed is being lowered the curve is steeper; and, in process of time, it flattens out (as erosion proceeds) progressively from the outfall upstream. When the process is completed the new curve is wholly below and parallel to the old one (Fig. 10).

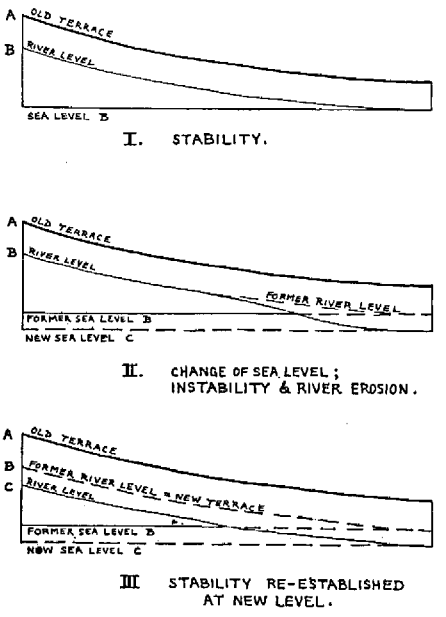


FIG. 10.—Diagrams to illustrate the formation of a new river level (*C*) when the relative sea-level is lowered from *B* to *C*.

Once more the river has accomplished its work and once more it settles into a meandering course through its own alluvial tract. The fact that it has carried to completion such a task as we have just described is shown by the old alluvium now left as a terrace fifty feet above the new valley floor.

Admittedly, such an evolution is a slow business. Yet we have

found that the terraces exist at remarkably uniform height for hundreds of miles in Upper Egypt and—most important and most remarkable of all—they contain from end to end each its own suite of human implements. This in itself shows that the periods during which certain associations of implements were used by earliest Man were exceedingly long. The implements of the hundred-foot terrace (Fig. 8) are rough and primitive; those of lower terraces are of more and more advanced culture; and each terrace produces a certain definite association of types. Thus the succession of terraces reveals not only the long vista of time during which implement-making Man has been in existence, but also how slow were the earliest advances in the evolution of his culture and probably of his own body and brain.

To return to our terrace fifty feet below the hundred-foot stage (i.e., fifty feet above the present stream and hence for convenience called the "fifty-foot terrace"): with its contained implements of more advanced type than those of the hundred-foot stage are found occasional specimens torn from the older deposit and still further battered and worn in the process. These well-scarred relics are valuable as corroborative dating evidence, because they show of themselves that the older deposit lies above and not below the terrace we are now investigating. This brings us to another point. The river might have raised its bed, instead of lowering it, and thus have buried its older deposits under more recent alluvial material. If it had done so (as we know that at a much later time it actually did), the earlier implements also would be buried and twice river-worn specimens would not appear in the younger gravel.[1]

This is the general principle of the work: The river system has been lowered repeatedly, and in the deposits of each stage we find an association of human implements, each of definite type and of progressive stages of human culture.

The critic may say that we use the implements to date the stages and then reverse the evidence to prove the advance of Man. That is not so. At a later date, or even now, it might be justifiable, because sufficient is known to make them a reliable guide and because they display such a remarkable similarity to forms dated stratigraphically

[1] It is true that occasional specimens might still appear in special circumstances, into which we need not enter at the moment.

in Europe; but it seems far better that the Egyptian implements should stand by themselves, clear of all evidence from outside, and that their true sequence should be proved by geological evidence unaided. This has been our work—to fix each terrace geologically with relation to its higher and lower neighbors. In this paper, however, the sequence of events is given from the human rather than the geological point of view for the convenience of the general reader, and it is not proposed to enter here into the technical details of the geological evidence. The general principle has already been stated; but the field study is likely to be complicated, and its explanation in writing is a matter for a technical paper.

It must suffice here to say: first, that the existence of these terraces one below the other is the indication of their time relation; second, that it is not difficult to find examples of a lower terrace banked against a river-eroded scarp of a higher one, thus indicating that the lower is the younger. Conversely, when the Nile in southern Egypt built up its bed at one epoch, the silts of this stage overlapped and concealed some of the older terrace deposits.

Complication is provided by the river at each and every stage having meandered and side slipped in its alluvial tract, destroying old deposits, cutting them into overhanging scarps, depositing material under the overhang, engulfing masses of older gravel (with the contained implements), and so on. Into such a series of snakelike meanderings of the river, at various altitudes, the lateral valleys debouched; and these also meandered and behaved in more turbulent fashion than the main river.

This repeated time and again, at each stage complicating further the stratigraphical evidence of the preceding epoch, leads the observer to marvel that any evidence at all remains; yet it exists in abundance and is comparatively easy to follow. Each complication adds zest to the work, and on its solution adds to the great body of evidence which is being accumulated.[1]

[1] Toward the end of March, 1927, we were able to carry out a short reconnaissance to a part of the Red Sea coast (see pp. 45 ff.) working on principles similar to those described in the foregoing pages. We were fortunate enough to pick up the story of Man again, based on stratigraphical evidence (p. 50), and thus to carry the research beyond the narrow confines of the Nile Valley.

IV

THE SUCCESSION OF HUMAN INDUSTRIES IN EUROPE AND IN EGYPT

In Western Europe (including the British Isles) investigation has shown that a definite succession of human industries exists. These fall into two main groups: Paleolithic or Old Stone Age, and Neolithic or New Stone Age. As far as time is concerned, the former passes into the latter. Many hold that the Paleolithic was preceded by an Eolithic age ("dawn of stone"); but this is still a controversial problem which we do not propose to discuss here. The Neolithic passed into the earliest Age of Metal.

The earliest Paleolithic implements are found on, and in, river terraces; later, Man took to living in caves and under rock shelters almost exclusively, and it is there that we find his implements most abundantly. By that time the main evolution of the river systems was complete. In Neolithic times Man tended to abandon his caves, and we find him living in the open; it was in Neolithic times that he began to turn his attention to agriculture, domestication of animals, making of pottery, and other pursuits which we associate with the beginning of civilization. In Paleolithic times Man lived the rough-and-ready life of an uncivilized hunter; but already in late Paleolithic times—when he was living in caves—he had brought pictorial art, incised drawings, and even modeling in clay and bone to a high technique, and we find the walls of his caves beautifully ornamented. With this step he had also elaborated the types of stone implements to meet his increasing needs of life and art.

In the earliest stages of development, however, Man was content with a very few types of implement; it is true that he learned to make them with consummate skill and that some of his handiwork is art of a very high order. His earliest needs were probably supplied by a wooden stake smoothed to a point, large pebbles used as hammer-stones, and a type of implement called the *coup-de-poing* or *boucher*,[1] which seems to have been of universal utility (Fig. 11).

[1] The term *boucher* was introduced some years ago by Professor W. J. Sollas to designate this type of implement. The word commemorates the French archaeologist, Boucher de Perthes.

Such in retrospect is the most meager and generalized outline of Man's progress in the matter of his equipment.

FIG. 11.—A Chellean *boucher* or *coup-de-poing* from the vicinity of Abydos (p. 33).

Now Paleolithic Man in Europe lived in the time of the Great Ice Age. Many competent scientists believe there was but one ice age

and that he appeared in its later stages; but modern thought tends to the opinion that he appeared in the Old World before the Great Ice Age, existed round the edges of the great mantle of ice that overwhelmed much of Western Europe, and spread over the country as the ice disappeared. Further, there is a great body of evidence to show that there was more than one period of glaciation even in the Great Ice Age or Pleistocene period—that there were three or four such, of varying intensity, and that Man was compelled to adapt himself to the conditions of glacial or genial climate. Thus it is believed that in earliest Paleolithic times the climate was genial in Western Europe and that he then lived by the banks of the rivers (hence his implements were incorporated in large numbers in the alluvial deposits); later the climate changed for the worse and he took to living in caves, in which he maintained himself until the latest stages of Paleolithic time, though there is evidence that the climate was not uniformly rigorous throughout that long period.

Now we can go a step farther. The rivers of France and England have carved out their beds in successive stages, leaving gravel terraces and platforms behind them. On these, non-fluvial deposits also have been laid down—notably the loess of Northern France and Germany, a peculiar deposit formed of the finest rock dust, believed to have been blown by the winds from the morainic débris of neighboring ice sheets.

In each of the river terrace gravels and in the several layers of loess are found implements made by Man at successive stages of his cultural development. The age of each period of loess (or equivalent deposit) and of its implements is fixed with relation to the terraces it covers. In this way there has been built up on geological evidence alone a table of the succession of the earlier human industries, and the relation of each to its contemporary climate has been determined with some degree of accuracy. But it is in this matter that the science of paleontology—the study of extinct forms of life preserved as fossils—comes to our aid; for in these gravels and loess are found abundant remains of animals now extinct or migrated to other parts of the world. Thus in certain English gravels we find remains of mammoth, woolly rhinoceros, reindeer, musk ox, bear, pointing to a rigorous climate; in others occur the bones of hippopotamus, species of elephant and rhinoceros and other mammals, with at least one species of mollusk now

found in the Nile, all pointing to a genial climate. Such evidence as this gives us an excellent idea of the climate of the time.

To the Lower Paleolithic industries in Western Europe distinctive titles have been given, based on some implement sites of major importance in France:

Chellean (Chelles, in Northern France): an industry of *coup-de-poing*, associated with a warm climate.

Acheulian (St. Acheul, on the river Somme): a refined type, often of exquisite workmanship, following the rougher Chellean; perhaps a natural development of the earlier industry, but adapted to meet more varied needs. The climate was changing; for a time it was rigorous, but probably became more genial again toward the close.

Mousterian (Le Moustier, a cave in the Dordogne, Southwestern France), of the Middle Paleolithic period, shows a totally different type of technique (Fig. 12): a block of flint (called the core) was carefully trimmed, and then by a skilful blow a sharp-edged flake was struck off; the flake seems to have been the requirement, and the core was frequently discarded—a wasteful process. Implements performing the function of the *coup-de-poing* were still made, particularly in earliest Mousterian times, but the type was finally abandoned. The climate was warm at first, but rigorous conditions set in and Man took to the caves. As yet he neither painted nor made drawings, but he was now forced to live in a community—even if he had not done so before—and from this time he certainly developed communal habits which led to civilization. He already buried his dead.

This also virtually ended the period of the association of human implements with river gravels; after this time the rivers of Northwestern Europe were—within certain limits—as we see them today. It is true, however, that Upper Paleolithic implements are found in the lowest and youngest of the river stages, which was followed by the "modern" alluvium.

Let us digress here. We have found that Man and his culture developed along certain lines in Western Europe and that his implements are associated in stages with river terraces, with a periodic oscillation of climate from rigorous to genial, i.e., glacial and interglacial periods. Now a glacial episode in Europe seriously affected the climate of neighboring regions, and that effect was expressed chiefly

either in heavier rainfall or in a reduction below the normal. If, then, we could find a region which was inhabited by Paleolithic Man and on which the periodic fluctuation of rainfall had left its mark, we

FIG. 12.—A Mousterian core from which a broad flake has been struck. It was found *in situ* in the 10-foot Nile terrace on the edge of the western desert near Erment.

might get a complete succession of the events in his cultural development plotted graphically, so to say, against the climate. If we could do this we should confirm or correct the evidence obtained in Europe, where the greater proximity of the ice sheets and other factors have led to a variety of complex problems in the interpretation of the evidence.

Perhaps the reader will now understand the enormous significance of the work in Egypt. A region of well-marked topographic and physiographic composition, it is separated from the glaciated portion of Europe by the broad Mediterranean and is traversed by a majestic river which for our special benefit falls over a step at the First Cataract and starts its life anew on the downstream side of it, receiving (in Paleolithic times) tributaries as it continues its northerly course. It is a country habitable, even in its present extreme desert condition, along the borders of that great river, the highroad from Western Asia to the heart of Africa; it is supplied with unlimited quantities of the finest material for making implements, material which fractures almost identically like the flint used by Paleolithic Man in Europe.

Of all regions in the world Egypt, and particularly Upper Egypt, offers an opportunity for discovering Man's past independently of all evidence obtained from Europe. If the evidence agrees with that of Europe, so much the better; if it does not, we would incline to rely upon it none the less.

We have already shown that in Paleolithic times the Land of the Nile was not a desert but that it had at times a heavy rainfall. We have shown that the rainfall was periodic, and that there were certain periods of great river activity giving rise to erosion and to enormous spreads of gravel; that there were periods of rest during which the river and its tributaries smoothed out the material and put everything in order before the next period of rainfall and erosion renewed the process. Above all, we have found in these terrace gravels human implements falling into cultural assemblages, *each in its own terrace;* and, most important of all, the assemblages are *of type and technique similar to those found in similar circumstances in Europe.* We can apply the culture classification in Africa just as we can on the river Somme or in the caves of Dordogne. We can say that the implements were contemporary with pluvial periods; and we have reason to hope that one day we shall be able to say what relation those pluvial periods bear to glacial or interglacial periods in Europe. We have a strong suspicion of those relations now, but this is neither the time nor the place to discuss them in the detail that they demand.

We have found a sequence of terraces and implements which we can present briefly to the reader in the form given below. We ask him to realize that, although a great deal more lies behind this simple

table, both in qualification and in detail, than we can discuss here, in substance it is essentially true.

150-foot terrace	Barren
100-foot terrace	Chellean implements
50-foot terrace	Acheulian implements
25–30-foot terrace	Earliest Mousterian
10–15-foot terrace	Mousterian

Upper Paleolithic times mark a great change in Egypt. In the first place, the copious rainfall of earlier times ceased and the country gradually became a desert. Until this epoch Man had wandered where he listed over the plains and plateaus, but now he was forced to keep closer and closer to the Nile and to certain of the oases.

It may be said that the main facts of Lower and Middle Paleolithic Man's existence in Egypt are now known; it is true, we would rather say, that certain very important facts are established, but they only serve to open our eyes to what may yet remain.

When we turn to Upper Paleolithic times we plunge into darkness. The Nile and its tributaries have finished their work so far as we can see; yet we know that the river was just as busy—carving out a bed which it has since filled up again and hidden from our eyes. It would seem that the hope of dating by stratigraphical evidence is at an end.

The European situation adds greatly to our difficulties. During this period Northwest Europe was in the grip of a rigorous climate; Man was living in caves; he was developing rapidly a complicated equipment of flint implements to meet his needs of life and of art. But there is more than that: Man seems to have developed in Europe into a variety of communities racially distinct from one another, each with its own art and implement technique. This is already marked in Acheulian and even earlier times—the earlier industries are not found uniformly distributed over Europe—but it is accentuated in Upper Paleolithic times in Western Europe. It is true that a clearly defined succession of peoples has been established—Aurignacian, Solutrian, and Magdalenian (named after the French caves of Aurignac, Solutré, and La Madeleine)—but these peoples do not bear the same relation to one another as do those of Lower Paleolithic times. Thus the Solutrian is supposed to have been a "barbarian" who knew not the art of his predecessors or successors in the caves; yet his implement

technique at its best was infinitely superior, rivaling the finest work of the earliest dynasties of Egypt.

It seems that Western Europe was occupied by successive waves of population. We can hardly expect to find the same industries in Egypt and in the same order—and we do not; Egypt was apparently immune from some of these invasions, yet some of the specialized technique reached the country long after the appearance (and maybe after the disappearance) of the people who introduced them into Europe. We are passing, in fact, to "modern" times, to the period of mass movement of peoples to which Egypt has been subjected down to the Arab invasion of the seventh century A.D. We must not assume, however, that the appearance of characteristic elements of a technique necessarily implies the presence of the originators of that work; each case must be judged on its own evidence.

A quite new technique made its appearance in Egypt in post-Mousterian times; it has affinities with an industry of Southern Europe known as the Capsian, which was contemporary with the whole of the Aurignacian, Solutrian, and Magdalenian. We may say there is a Capsian influence in the post-Mousterian implements of Egypt, but that is all we are justified in saying at the moment. After this the people of Egypt seem to have been left unmolested, to develop their new technique on their own lines. This they did, to no great extent, and the process may have gone on until a date contemporary with the earliest Neolithic industries of Europe.

But how do we know that this workmanship was post-Mousterian? Most fortunately an invaluable piece of geological evidence remains. We have said that the Nile devoted its energy to cutting a gorge which it subsequently filled up; but we have found that a slight land movement altered the gradient of the river north of the First Cataract so that for a considerable distance farther north the river deposited silt *above* its present-day level, while farther north still the material of the same age is *below* that level. Thus we are provided with a slight thickness of geological strata in which we find implements of the type we have just been discussing, and they are dated stratigraphically. The knowledge of the existence of such conditions was one of the reasons that took us to southern Egypt. It remains to discover (if possible) what was happening in northern Egypt during this long

period, and to find if there was any influence from outside which did not penetrate farther south.

Between the close of this period and the next well-marked epoch in Man's history in Egypt is a hiatus which it is our endeavor to bridge. Admittedly it is a difficult task, and the evidence may or may not exist. If it is not to be found in the Nile Valley, we may find it in the oases, or beyond the First Cataract; who can tell?

We can only place a note of interrogation between this period and the purely Neolithic times. Here the story is taken up by the archaeologist, but he has much the same difficulties as ours: knowledge of his earliest periods is as disconnected as that of our later Paleolithic times. But three great patches of light in the darkness may be discerned:

1. The important researches of Miss Caton Thompson in the Faiyum Oasis have brought to light a people of Neolithic age, living in communities by the side of a lake, planting, reaping, and storing their wheat, using pottery, possessing an elaborate array of beautiful flint implements. The last, totally distinct from those we have just been considering, are with little doubt Neolithic in age, though admittedly they bear a certain resemblance to the Solutrian work of Europe. Did this technique, at a late date, override the Capsian and its later developmental forms and enter northern Egypt? It seems so. We must remember that pseudo-Solutrian workmanship is far more widely distributed than this, for it reappears in the finest work of the North American Indians!

2. Mr. and Mrs. Guy Brunton have made known in the Nile Valley the remarkable Badarian culture. This was the work of a people living in the valley and making splendid pottery, possessing implements markedly similar to those of the people of the Oasis, and equipped with all the necessities of a highly organized and artistic community.

There is as yet no evidence of the precise interrelationship of these two peoples, or of their affinities.

3. The great protodynastic towns and forts: we are now at the dawn of dynastic times, at the meeting-point of the Neolithic age and the Age of Metals. The community has all that goes with a completely

civilized people living in a walled town. The pottery recalls the Badarian, as does some of the flintwork; but with it we have that flint technique which persisted into the early dynasties and which, to some eyes, resembles the highest type of Solutrian workmanship.

In addition to these three, we have indications of other industries. They are as yet isolated links, but may some day make a chain.

V

THE FIELD SEASON, 1926–27

Trusting that we have now given the reader sufficient introduction to the general principles of our work, we may turn to consider the organization of the expedition, the route it followed, and how it fared in the field.

The plan of work necessitated covering as much ground as possible, for reasons which have been made clear in the foregoing pages. In the previous year one of us (K.S.) had used camel transport exclusively for the same type of work; this, though sure, is slow, wasteful of time, and involves much unnecessary exertion. This year it was determined to sacrifice the high reliability of camel transport for the rapid, though more hazardous, progress of motor transport. In view of the nature of the work and the type of country to be covered, it was, however, essential to keep the outfit to the smallest proportions in both personnel and equipment. Accordingly, only two natives were employed—a cook and a driver-mechanic; and, with equipment reduced to a minimum of weight and bulk, it was just possible to move the Prehistoric Survey and its belongings in two small motor cars. It had been intended originally to take two Ford ton trucks adapted to desert work; but a storm in the Mediterranean prevented an important letter from reaching its destination, and on our arrival in Cairo we found neither cars nor servants at our disposal.

In the next three days a couple of cars were brought into service: a veteran Ford tourer with special back wheels and a truck body, which had done yeoman service with Miss Caton Thompson, of the British School of Archaeology, was dragged from its resting place in Faiyum and reconditioned, and a little seven-horse-power Jowett was purchased in Cairo. This proved a valuable asset; it carried as heavy a load as the Ford and was admirably suited to long-distance reconnaissance work. It enabled us to investigate a much greater area than could otherwise have been covered. A driver-mechanic was found, thanks to the good offices of our friends, who also produced a cook.

The latter was a portly Nubian of enormous bulk and stature; he deserted as soon as he saw the cars, which was fortunate, as he probably weighed little less than a couple of hundredweight. The driver came to the rescue and introduced a friend and colleague, who filled the onerous post of cook-mechanic to perfection.

The work on the Ford being finished and our dispositions made, the expedition was in the field within ten days of our landing at Alexandria.

Little can be said here about the all-important item of stores and equipment, a subject of absorbing interest to us, which occupies weeks of preparation at home and upon which the success or failure of the expedition chiefly depends. Our camp equipment was bought in London, with exacting regard to strength, lightness, and comfort; we also sent our canned-food stores out from England, packed in boxes each of which contained every requirement for a fortnight, except water.

The Survey Department in Cairo was kind enough to lend us water tanks, and we could carry a maximum capacity of thirty gallons (for drinking, washing, and filling the Ford radiator—the Jowett never boiled and only once leaked; the Ford did both continuously). Our scientific equipment included the usual surveying instruments, less a theodolite, and the usual outfit of a field geologist. Our combined personal property occupied about eight cubic feet.

The first object of the expedition in the season 1926–27 was to study the deserts bordering the Nile between Assuan, i.e., the First Cataract, and Luxor. If there was time to spare between completing this and the weather getting too warm for efficient field work, one of a number of further schemes could be carried out. Accordingly, our first task was to get the expedition and its personnel, stores, and equipment from Cairo to Luxor, where Chicago House, the headquarters of the Epigraphic Survey of the Oriental Institute, was to be our home and base of operations.

It would have been quicker possibly, and certainly less trouble, to entrain the automobiles and their loads from Cairo to Luxor; but if we had done this we should have been unable to carry out certain work which needed doing en route, and we should have found ourselves at Luxor ready to move into the desert with men, cars, and equipment

untried—an unenviable position. So the journey up the Nile Valley was done by road. Roads in Egypt are the banks of irrigation canals and ditches, and they follow therefore the needs of irrigation and not of getting from north to south in a straight line. Of recent years these canal banks have been made into excellent mud tracks in northern, middle, and much of southern Egypt; and, so far as we knew, the route to Luxor held no terrors for the motorist. We were to be disillusioned.

Having camped for a day or two in the desert west of the pyramids of Gizeh to try out our equipment and to test the behavior of the cars in sand, we set out on the journey south, following the banks of the Ibrahimiyeh Canal. The first night brought us to the mouth of the Faiyum, the second to Minyeh, where we were checked by the necessity for a complete dismantling and overhaul of the Ford engine. Some miles north of Minyeh we had looked round, suddenly to discover that the familiar cloud of dust which denoted the on-coming of the other half of our party was no longer following us. On returning we had found our two henchmen with heads buried inside the almost empty hood, the rightful contents of which were spread around on the mud road. A connecting-rod bearing and a main crankshaft bearing had burnt out, and spares had to be fitted on the road (Fig. 13). Our admirable mechanic, disdaining the set of tools with which he had been provided, achieved equally satisfactory results with a hammer and a case-opener. At Minyeh it was discovered that the trouble had been caused by a piece of wood stopping up the oil lead. These matters having been put in order, we set out once more on the next stage to Assiut.

Plagued by delays, we were benighted on the road after taking a wrong turning and following a cul-de-sac into a native village. The night was moonless and inky dark, and the only hospitality the sheikh of the village could offer us was maize-stalk huts. Pitching camp was impossible; so, after turning around on a crumbling mud dike little wider than the Ford's wheelbase, we crept back to Mellawi. In spite of the evil reputation of this place, we were compelled to spend there a restless night (which no insecticide could cure) in an undesirable Greek-owned "hotel." Next morning we were early on the road and continued to Assiut.

South of Assiut an unexpected obstacle, in the form of road repairs, delayed us, and we covered only seventy miles in nine hours' driving. Western road repairs occupy only one half of the road at a time, while traffic proceeds unimpeded by the other half; further, a roller follows close in the wake of the road gang. Eastern methods are different. Trenches are dug beside the road, and from these gangs of men carry baskets of earth up the embankment from both sides at once and dump the contents on the road. Each basketful forms a mound of hard lumps of earth, which it is no man's duty to spread out. The result

FIG. 13.—Fitting new bearings to the Ford en route to Minyeh

transforms the road into a sea of earth heaps, each from one to three feet in height, a motoring surface far worse than a freshly plowed field (Fig. 14). This, however, is not the only trouble. The mud heaps raise the road level some three feet or so; but each gang of men is given a definite strip of road to "repair," and, that there may be no doubt about it, a yard or two is left to separate each strip from the next. The road was thus dissected by a system of trenches, and at short intervals the front axle thundered into one of these, sometimes burying front springs and part of the radiator in the far side. Then followed digging, hauling, and lifting, and the rear wheels followed into the trench—or were left suspended in the air. There were other pitfalls. Where the road was open, the sun soon dried the mud into

a mountainous surface as hard as iron; but where a few palms or bushes shaded the road, the mud remained soft. These patches were usually found only by the Jowett (which led) sinking up the running-boards, developing a dangerous list to port or starboard, and heaving its other two wheels clear off the ground. The nearest village had to be mobilized on such occasions to lift the automobiles bodily on to the "road" again. For hours at a stretch we scarcely disengaged from

FIG. 14.—A "repaired" road near Tema, between Assiut and Sohag. Halt to tighten up nuts and bolts.

bottom gear. The Ford boiled continually, and ominous smells arose from our ill-used clutch. The body-work creaked and cracked and shed innumerable nuts, and crowds of the juvenile inhabitants yelled and pushed and ran beside us, on the lookout for surreptitious joy rides on the running-boards.

It was a very tired and disheveled four who eventually arrived at Sohag that night. A broken spring on the Ford had to be mended, and many nuts had to be tightened or renewed on both cars; meanwhile, we were kindly accommodated by the British manager of Barclay's Bank.

The following evening brought us to Abydos, where we camped alongside the Egypt Exploration Society's headquarters on the edge of the desert. We employed a few days in working the neighborhood (Fig. 15), noting the terraces and older deposits and collecting some implements (Fig. 11). The last stage of one hundred and twenty miles from Abydos was accomplished easily in a day, the roads being excellent, and on January 14 we arrived at Luxor.

FIG. 15.—Survey work near Abydos

The neighborhood of Thebes occupied us for ten days with day excursions from Chicago House. A knowledge of the neighborhood having thus been obtained, and all being ready, we started south once more. Now we no longer followed the cultivation roads with the object of getting to a destination, but worked slowly along the low desert, between the western cliffs and the cultivation, studying the gravels and the geology as we went, camping where anything of sufficient interest demanded investigation.

The first camp was pitched near Erment. It was reported that south of this place the desert edge was well-nigh impassable; but after

a short stretch of disturbed ground we found our cars flying on top gear along the crests of rolling gravel ridges which continued until a point was reached a few miles north of Esneh. Here we made another halt for reconnaissance, subsequently encountering some very rough going before we reached Esneh. Bowlders covered the ground, and the cars began once more to complain. The Jowett sprang a leak in the radiator, and the Ford parted company with a nearly red-hot exhaust pipe. Several times we stuck in sand in wadi floors, and all our resources were needed to extricate the cars. Finally, on arrival at Esneh, we found that in spite of elaborate roping a vital element of our baggage had jumped off, and we were obliged to retrace our tracks to find it.

At Esneh we gratefully accepted the invitation of the British officials in charge of the barrage to carry out the necessary repairs in their workshop. Which being done, we returned to the desert.

The western desert between Esneh and Edfu proved of great importance, some fresh discovery of an exciting kind being made nearly every day. We remained in the district ten days, most of the work being accomplished by offset journeys from two camps. We stumbled accidentally upon dinosaur bones in an outcrop of the Nubian sandstone. Though these were not strictly within our province, in the interests of science we could not pass them by; so we communicated our find to the Geological Survey in Cairo. Later Mr. O. H. Little came down to inspect the site; and a fine tooth, an assortment of bones, and some turtle plates were taken back to Cairo.

Our principal camp near Edfu (Fig. 6) was pitched against the edge of a vast plateau of old Nile gravel at one hundred and fifty feet above present river level. This gravel belongs to the oldest stage of the river terraces, and its great extent testifies to a rushing Nile perhaps ten miles wide and capable of transporting large bowlders. In front of our camp and stretching far to the north and south was a dusty plain of ancient Nile silt, thick with mollusk shells whitening its surface. Here we found abundant flint implements, sometimes in "floors" or flaking-sites.

Water, petrol, and mails were fetched from Edfu, about eight miles distant. Before the right road was found, we were wrongly directed; and our excursion was an eventful one, through numerous water-

courses, some of which had to be filled in before we could pass, and across the dry beds of three deep canals (Fig. 16). Social relief was provided by a visit one evening from the *omdeh* and some sheikhs from a neighboring village. Unlike the natives near the towns of Luxor and Cairo, unfavorably influenced by tourists, these old men of Upper Egypt were full of amiable but dignified courtesy. They smoked our cigarettes and drank our strange tea and lemon with all requisite solemnity and loud lip-smacking to show approval. In return we were pressed to take tea with them in the village. We drank pints of tea with cheesy buffalo milk floating like oil upon it, the streets were cleared in our honor, and we were provided with two beautifully clipped donkeys upon which to ride back into the desert to our camp.

FIG. 16.—Crossing an empty canal bed between the western desert and Edfu.

At a point about fifteen miles south of Edfu high cliffs close in on both sides of the Nile Valley, and the river runs through a narrow gorge for many miles. At this point cultivation roads come to an end and there is no way through except by water or by railway—the rails running along the east bank. We continued our survey of the west bank until the driving became impossible, when we left our mechanic in charge of the Jowett and walked some distance beyond. Eventually high cliffs, with only a rough single-file camel track winding at their foot, rose straight out of the Nile, and we were obliged to turn our faces north once more and to

acknowledge that we had reached our farthest point south on the west bank. At the same time it was apparent that the evidences which we were seeking also disappeared at this point, and that no very useful purpose would be served by continuing, even were it possible. So, laden with spoils, we returned to Edfu, thence to dispatch them to headquarters at Chicago House.

Our next problem was how to cross the Nile with our cars, for since the west bank was impassable we must try the east. The facilities at Edfu proved unequal to the task—or, properly speaking, none existed. True, there were plenty of the peculiar native boats; but the river was but a foot or so deep for a hundred yards from the west bank and the weight of a car could only sink the keel of the boat into the mud and anchor it there immovably. So we saw that we should be obliged to return to Esneh by road and cross by the barrage. In order to turn this opportunity to some account we determined to strike into the desert en route and camp for a few days, thereby completing our survey of a district we had been unable to reach on the way south, the neighborhood of the ancient Hierakonpolis.

A convenient *gizeh* or offset road to the desert was found, but a deep watercourse was cut right through it at one point and had to be filled in before we could proceed. As the evening shadows were lengthening we drew up under the ruins of the protodynastic fortress and pitched our tents in the shelter of its massive mud-brick walls (Fig. 17). Tea had been brought, and we were resting from our day's exertions at the door of the tent, when a figure was seen making toward us from the cultivation. When he approached we saw that he wore the badge of the Department of Antiquities, and he demanded solemnly if we had our antiquities tickets for visiting ancient monuments. We had camped in his ruin!

On the following day we made a long tramp along the desert edge to the next headland to the north, linking up with our previous reconnaissances and obtaining eminently satisfactory results. We then packed up and returned to Esneh by road.

Meanwhile, our plans had been many times revolved and discussed, and we had decided upon a definite course—to reach our objective, Assuan, as soon as possible and then, having seen the difficulties which we should have to encounter, to work our way back by the

east bank. Accordingly, the fully loaded cars, in charge of our men, were put on the rail at Esneh and sent direct to Assuan, we following by train and taking careful note of the difficulties to be surmounted on the return journey. Some stretches proved, as we knew they would, quite impassable; but it was essential that we should have the motor transport at Assuan, for without it we should be crippled and there was much there to be studied, the change of conditions produced by the Nile cataract being of first importance in connection with the problems we hoped to solve.

FIG. 17.—Our departure from the protodynastic ruins of Hierakonpolis

The First Cataract in early Stone Age times consisted of three branches. The relatively insignificant stream of the present day still occupies the bed of one of these branches, while the other two remain high and dry as "fossil" cataracts, partly choked with old river deposits (Fig. 18). Through them the road and the railway, respectively, make their way from Assuan to Shellal, the point of embarkation for Khartum. The same silts and shells were found in these abandoned watercourses as those which we had noted between Esneh and Edfu, but implements here are scarce.

We were enabled to study the flooded valley above the Dam, with its interesting lake conditions, by the courtesy of Mr. Watt, of the Irrigation Department. In a steam launch put at our disposal we

steamed south almost to the Tropic, investigating the banks at intervals and being able to penetrate considerable distances up flooded wadies that had formerly been desert (Fig. 9).

Having exhausted the neighborhood of Assuan, we took train to Kom Ombo. There we hired camels, having determined to work our

FIG. 18.—An ancient river bed, now desert, near Assuan. The faceting and polishing of the granite are features characteristic of mountain torrents.

way with them along the desert to meet the cars, which we sent with one of our men by rail to Edfu.

Our first objective was to acquaint ourselves with the shells and implements littering the great plain surrounding Kom Ombo. This plain is formed of ancient river silts deposited on the floor of a vast lakelike expanse of water which was held up here before pouring through the narrow gorge toward Edfu—the gorge into the mouth of which we had penetrated from the other end on the west bank some weeks previously. With the approach of desert conditions the lake

dried up and marshes were formed, around which the late Stone Age men lived and into which they dropped their implements, so that they are now found in thousands in the dry mud, together with heaps of shells or "kitchen middens" that arose around their habitation sites.

The Kom Ombo Sugar Company generously lent us their fast motor launch, enabling us to proceed rapidly down the river, landing at frequent intervals on both banks to make observations and meas-

FIG. 19.—The end of the day's march. Unloading camels at Gebel Silsileh

urements. Half a week's work was thus accomplished in a single day, and we were able to join up with our previous "farthest south" point on the west side. The baggage camels having been sent on ahead, the first night from Kom Ombo found us encamped in the lea of Gebel Silsileh (Fig. 19), at the entrance to the great Silsileh gorge.

Next morning, while the caravan was getting under way, we climbed Gebel Silsileh, ascending a series of rock steps cut by the Nile at successive levels in its history and corresponding in heights with gravel terraces in more tranquil reaches of the river. From the summit a wonderful view was obtained back over the flat silt-filled basin or lake floor of Kom Ombo to the distant hills forming its

farther margin, out of which the Stone Age rivers issued from the Red Sea Hills. Here, as at Assuan, the volume of water was originally too great to be led off by one valley, and a second, dry valley to the east of Gebel Silsileh lies now abandoned and is utilized by the railway.

For the next two days we walked through the Silsileh gorge, while our baggage and tents followed on the camels. On the second evening we camped once again in sight of the pylons of the Edfu temple. Here we rejoined the cars, and the camels returned to Kom Ombo.

We had now negotiated the stretch which we knew to be impassable for motor transport, without missing any of its features; but we were still confronted with some thirty miles of doubtful country intervening between us and Esneh. In many places we knew the cliffs to close in, leaving only space for the railway between their perpendicular face and the cultivation or the river; for on the east bank the river runs always closer to the cliffs than on the west. Such points, however, were limited in number and never extensive, so we felt confident of negotiating them somehow.

After the slow camel transport the cars were a welcome relief, and floundering along over the execrable surface at fifteen miles per hour seemed like luxury traveling. Without further incident we arrived at el-Kab, where we joined our friends Mr. and Mrs. Guy Brunton and remained for a few days, working an extremely interesting district. In addition we had the advantage of their unequaled knowledge and experience of predynastic flintwork, when they accompanied us on a second visit to the predynastic town site at Hierakonpolis. Much was learned and discussed relative to the all-important transition from our stratigraphically dated Stone Age flints to the industries which followed, dated by their association with pottery.

At el-Mahamid the first serious difficulty was encountered, the cliffs here rising directly from the cultivation edge. Inquiries elicited the information that the camel road, by which great herds are brought from the Sudan to Lower Egypt, passed inland behind the cliffs, rejoining the Nile Valley some miles farther north. Acting on this information, we followed a rough wadi for a few miles eastward. The track consisted of huge bowlders, over which we slowly jolted and boiled on low gear, until eventually the path left the wadi and struck diago-

nally up a steep, jagged hillside, where no motor vehicle could possibly follow it. Again we had been misinformed by natives, to whom a road good for camels is a "good road" (Fig. 20), irrespective of the form of transport to be used by the unfortunates seeking information. The

FIG. 20.—The Jowett (note bend in front axle) climbing a "good road" in the desert southeast of Esneh. The Ford is still traversing the plain below.

wadi was hot and almost windless, and the breeze that reached us occasionally was hotter than the still air—for today had brought the first of the hot south wind, or *khamsin*, which scorched us for the next few days. The scorching wind descends on southern Egypt some time in March and replaces the invigorating north wind of the winter months. From now until the end of our field season we suffered from bursting tires, while the steering-wheel was often most unpleasantly hot—as were the seats if exposed to the sun for a minute or two.

At el-Mahamid the population as usual thronged around the cars as we walked in to see the station master with a view to driving along the line. Having satisfied ourselves that no trains were due, and having telegraphed up and down the line that if any came through they were to be stopped, we drove on to the track. The ballast was newly laid, however, and consisted of loose, fine gravel, so that we made a quarter of the speed that we expected, never once reaching top gear throughout the ten kilometers. Remembering that the last party who drove along the railway, a party of Germans, had been "forgotten" and run into by a train, we grew somewhat uneasy at the delay, but eventually reached es-Sibaʿyeh in safety. Looking back, we saw the Ford at a standstill across the rails, with our two men viewing it with an air of listless dejection, as one views a serious breakdown. After much gesticulation, however, they remounted and crept slowly forward again. As the Ford approached, we saw that one wheel was being driven on the rim. The driver had tried to change his position on the track, and the tire had been ripped off.

After the hot drive along the railway line we waited in the station buildings to cool down, while the men replaced the tire on the Ford. In the sweltering wooden building the station master sat in a motor coat and woolen scarf, drinking hot lentil soup! His colleague at the previous station we left enjoying curried chicken and raw onions.

We camped that night a mile from es-Sibaʿyeh station. In the cool of the evening we took a walk and stumbled upon one of the richest implement sites it was our fortune to encounter during the season (Fig. 21). Next day we remained in the same camp, devoting the day to collecting and labeling our finds and packing them for transport.

During the next stage, from es-Sibaʿyeh to Esneh, the same difficulty was encountered with the cliffs, which approached again close to the cultivated fields. Determined this time to avoid the railway, we struck out eastward once more, hoping that the camel road would be kinder to us. Very rough ground was encountered, and the track sometimes became so steep that while one of us drove the others ran and pushed. About noon two tires on the Ford burst in quick succession from the heat. Owing to overloading, the springs were letting down the body when exceptional bumps were negotiated, and in conse-

quence the insides of the mudguards had been bearing on the wheels and stripping off the tread of the tires. Therefore, although some time back the mudguards had been lifted into a comical but more practical position to prevent this, we always suffered afterward from unsound tires.

Eventually the camel track regained the Nile Valley and continued its normal course within sight of cultivation. We pitched camp

FIG. 21.—Reconnaissance with the Jowett. On this site, near es-Siba'yeh, large numbers of Chellean implements (cf. Fig. 11) were found *in situ* in gravel of the 100-foot Nile terrace.

on nearing Esneh and the following day made a long circular walk from camp, loading our pockets with implements and our heads and notebooks with data. At last we found one of the objectives which we had long sought, the actual head of the long gulf or estuary which stretched up the Nile Valley from the Mediterranean in the time immediately before the advent of Man (mentioned already, p. 7). The great natural sections cut through the deposits of this gulf hereabouts were of exceptional interest. For the next three days we were principally engaged in following similar deposits northward and measuring their height, for from their flat top some idea can be obtained of the minimum height of the water-level in the Nile Valley at that time;

it was round about three hundred and fifty feet above the present cultivated floor of the valley. Spurs of this plateau, all at the same uniform height, are left jutting out below the great limestone cliffs of Gebel Rahamiyeh, which here rise nearly vertically above Mataʿneh and Shaghb to a height of two thousand feet. Up some of these spurs we climbed, and were able to study the relations of the great cliffs which hemmed in the strange gulf to the deposits formed beneath its waters. Everywhere signs of intense water action were apparent; immense bowlders had been rounded and piled up with hundreds of feet of coarse gravel, just as we had seen in the Valley of the Kings at Thebes on our early excursions from Chicago House. Landslips occurred here on a grandiose scale during the first cutting down of the Nile Valley, and from the low spurs below Gebel Rahamiyeh we could see how wave after wave of foundering rock bastions had broken from the cliffs and slipped down an inclined bed of greasy shale into the Nile Valley; one of these slipped masses forms the well-known rock of Gebelein, now three miles from the retreated parent-cliff. All this slipping, however, had settled into stability before the valley became a gulf, for the gravels were laid down over and among the slipped masses of rock and were not afterward disturbed.

We camped in the desert near Shaghb, under the cliffs of Gebel Rahamiyeh, and in the early morning climbed quickly up to the plateau spurs to check their height before the daily pressure variation affected our instruments. After a last look at these wonderful cliffs and tumbled landslips, in which is preserved so much of the past history of the Nile Valley, we descended to break camp and continued north toward Luxor.

A hot but uneventful drive along the cultivation edge, through the outskirts of villages, past extensive graveyards, sometimes sticking in sand, sometimes making a long detour to avoid impassable places, brought us once more within sight of the Winter Palace Hotel and the ruins of Karnak, and our survey of the banks of the Nile between Luxor and Assuan was virtually at an end.

Three weeks yet remained, however, before the weather would become too hot for useful work to be done in the desert; and in this time one of several attractive projects might be attempted. The one most promising to yield valuable results was a visit to the river terraces

and raised beaches of the Red Sea coast, on the other side of the watershed of the Red Sea Hills. Here we knew from the work of the Geological Survey, and especially from Messrs. Hume, Barron, and Beadnell, that a grand series of raised beaches and coral reefs existed, which might perhaps be linked up with the river terraces we had been studying in the Nile Valley. Furthermore, we knew of no record of implements of Paleolithic Man having been found on the Red Sea coast.

FIG. 22.—Driving back the wooden block which replaced the front spring of our Ford.

The discovery of such would be a matter of importance, especially if any could be found *in situ* in the gravels or the raised beaches. Professor Breasted expressed himself in accord with this plan and gave it his sanction and encouragement.

Accordingly, after three days at Chicago House, chiefly devoted to packing and arranging our collections, we crossed the Nile once more and set out along the age-old camel road to Koseir on the Red Sea.

Luck was against us at the outset, for a new spring ordered for the Ford had not arrived and we were obliged to bolster up the few remaining leaves with a block of wood (Fig. 22). It consequently ran

"solid"—not luxury traveling. The tires also were in a very bad state, supplies having again failed us at the last moment, and on the first day out from Luxor we had two more punctures.

However, we reached the beginning of the great Koseir road by sunset and pitched camp amid the rolling sea of gravel brought down in the past by Wadi Matulla and its affluents from the Red Sea Hills (Fig. 23). The storks were just arriving, and a dense flight of these

FIG. 23.—Halt in Wadi Matulla on the way to the Red Sea. The central figure (wearing cap) is our Egyptian driver; the one at left is our cook.

birds, like a dark cloud, wheeled slowly round and round over the desert.

Next morning we were eager to be away, and by eleven o'clock passed the little oasis of Lakeita Wells, a curious collection of odd mud buildings with a few twisted mimosas and palm trees, set in the midst of an utterly arid plain of sandy gravel. Some miles beyond, the camel road gradually settles into a wide wadi floor; later the wadi narrows; the sides become cliffs; hills and peaks rise behind the cliffs, until eventually all that is left is a winding mountain pass, threading its way among precipices of green schists and granitic rocks. The scenery here

is of the grandest, and one is in another world, the flat desert, plain, and plateau of Egypt being left behind.

The Romans built forts at intervals through the pass and dug wells to water their troops and animals. At one of these, Bir Hammamat, we descended a restored spiral staircase a hundred feet deep to obtain water for the Ford radiator. Empty stone coffins lie on the surface about the wellhead. In addition to the forts and wells, signal

FIG. 24.—In the Red Sea Hills; climbing the watershed

towers crown the more prominent peaks along the road, forming a continuous sight line, by means of which rapid messages could be signaled from the Red Sea to the Nile Valley.

Soon the engine began to thump and labor, the twists in the track became steeper and more frequent (Fig. 24), and camel skeletons were increasingly numerous by the wayside. Eventually the head of the pass was reached—a narrow defile in the rock, whence a momentary view is obtained over a jumbled sea of terra-cotta-colored hills and peaks before plunging down into their midst. The eastern slope of the watershed resembles the western, except that the successive zones of scenery are traversed in reverse order as the north-south core of the hills is crossed from side to side.

We pitched camp just as the sun was setting, having covered ninety-six miles from the Nile Valley. After the noises of the cultivation, the complete silence of the Red Sea Hills by moonlight was a most welcome relief. Only in the east we could occasionally detect a faint thumping, the distant thunder of the breakers on the coral reefs, fifteen miles away.

The first ten miles next day lay through similar scenery, as we descended the lower reaches of the same valley. Eventually the wadi flattened out, the hills opened, and we saw the sea, lifted into the air

FIG. 25.—The Red Sea coast at Old Koseir, with a raised coral reef at right, while waves break over the modern reef in center.

by mirage. The white foam breaking on the coral reef (Fig. 25) waved tantalizingly in the air and seemed to rest on false water created by the mirage—lighter in color than the real sea and more like a still lake with dark reflections on the surface.

On arrival at Koseir we walked out and looked at the sea, until our soliloquies were disturbed by the inhabitants flocking out as the news of our arrival spread through the town. At this we set the first comers to pushing the Ford out of the sand, where it had become imbedded, and moved off to find a camp site. A spot was selected close to the beach a few miles south of Koseir. We had scarcely settled in when we received a visit from an Egyptian subaltern and his Nubian soldier-servant, mounted on magnificent white camels. They had

come to inquire our business and to know why we had failed to report direct to the *mamur* on arrival. It was at once made clear that this was no oversight and that we intended to do so next day, but that our present clothing (or rather lack of it, for it was a warm day) was hardly suitable for an official visit—which was duly carried out with all pomp and circumstance the following morning. The *mamur* put himself to great trouble on our account, and the resources of the town and its phosphate company were put at our disposal, supplies from the canteen and petrol and oil being promised us should we require them.

FIG. 26.—Terraces in the Wadi Ambagi, near the Red Sea: one in center of picture, a higher one at extreme right.

While descending the wadi from the hills to Koseir we had noticed as fine a series of river terraces as we had seen anywhere in Egypt, and these we investigated during the next few days (Fig. 26). The wonderful development of coral reefs (Fig. 25) also occupied our attention, and collections of fossils were made. We then moved camp to a fresh site some seven miles north of Koseir, whence investigations were carried out northward in the Jowett (Fig. 27), traveling light and leaving the cook in charge of camp. The Ford had lost mobility owing to the breaking-up of the front spring, the remains of which were held up by a large block of wood driven between the front axle and the base of the radiator. At intervals, while traveling, this slipped out and the body rolled over like a ship on the point of foundering. When this happened we stopped, three of us pushed the heavy-laden

body into a horizontal position, while the other hammered back the block (Fig. 22). In addition, the tires were fast approaching a stage when further patching would be useless. It was therefore thought prudent to save the Ford's reserves for the final effort of bringing our men and equipment back through the hills.

By dint of diligent searching, a few flint implements were found. Much valuable information was also obtained relative to the sequence of events on this seaboard during the critical times of Man's earliest

FIG. 27.—Exploring the Red Sea coast about twenty miles north of Koseir. Raised rock platforms (terraces) are prominent along the foot of the hills.

development in the Nile Valley; and we had not yet lost hope of finding implements *in situ* in one of the terraces and thereby linking up with our Nile Valley work. An unpatinated flake, evidently newly exposed from some gravel terrace, was stumbled upon at our last camp before arriving at Koseir; so we returned in due course and camped near the old site. Systematic search soon revealed other unpatinated flakes, and they were eventually traced to their source of origin, others being found actually *in situ* in a gravel terrace. These were the first flint implements to be found *in situ* on the east of the Red Sea watershed, and even had we found nothing else of importance they alone would have justified our journey. At last the great mass

of facts assimilated on the seacoast and in the Nile Valley showed signs of hanging together and forming a picture of the early history of Northeast Africa as a whole.

FIG. 28.—The road entering the Red Sea Hills from the east

FIG. 29.—Our mechanic-driver taking charge of a stray camel with calf near the Red Sea coast.

With thoughts thus occupied we turned westward and retraced our tracks through the hills (Fig. 28) and over the watershed, arriving

at the Nile Valley two days later. Fortune was kind to us after all; for it was the very last day, only twenty-five miles from Luxor, when both rear springs on our small car snapped simultaneously, twisting the rear axle out of alignment and obliging us to crawl, crabwise, into town. We had actually ferried across the Nile and were within a few miles of Chicago House when the differential of the Ford also gave out, such a noise issuing from it that our approach could be heard from afar. Neither car could have done another day's work in the desert without lengthy repair, but neither had to.

[PRINTED IN U.S.A.]