ENVIRONMENTAL CHANGE AND HUMAN CULTURE
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UNTIL THE SECOND MILLENNIUM B.C.
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ANDREAS DITTMANN

Environmental and climatic change in the northern part of the Eastern Desert during Middle Palaeolithic and Neolithic times

The mountainous regions of the northern part of the Egyptian Eastern Desert are characterized by a multitude of widespread, partly interlocked systems of pediments and wadi-sediments. In search of possibilities for relative dating methods of the origin and the development of these geomorphologic forms, the cooperation of prehistoric and geomorphologic studies is of particular importance. Especially the palaeo-geographic reconstruction of a repeated alternation of erosion and accumulation can provide clues to former climatic and environmental conditions. The general value of a cooperation between geomorphologic and prehistoric studies in Northern Africa had been emphasized by Gabriel (1977; 1979; 1986).

To exemplify the geomorpho-dynamic processes of the Eastern Desert, brief account of results obtained on the southeastern slope of the Gebel Galala el-Qibliya (Andres 1987), the region of Wadi Deir Bolos and its drainage system, is pointed out here. Wadi Deir Bolos can easily be detected even in satellite maps, since in contrast to most of the adjacent wadis, it does not follow a W-E direction to the Gulf of Suez, but extends from the SW to the SE, probably along a tectonic fault-line. The investigations also include an affluent, which flows from the NE into the Wadi Deir. For better map orientation this wadi has been titled "Northern Wadi" (Fig. 1).

Within the eastern slope of the Gebel Galala el-Qibliya two steps of terraces had been formed in eocene and cretaceous chalks; they limit the study area to the NW. To the E and SE they are immediately followed by Nubian Sandstone. Miocene and pliocene sediments mark the transition to the coastal fringe. The drainage area of Wadi Deir Bolos is characterized by extended pediments of old

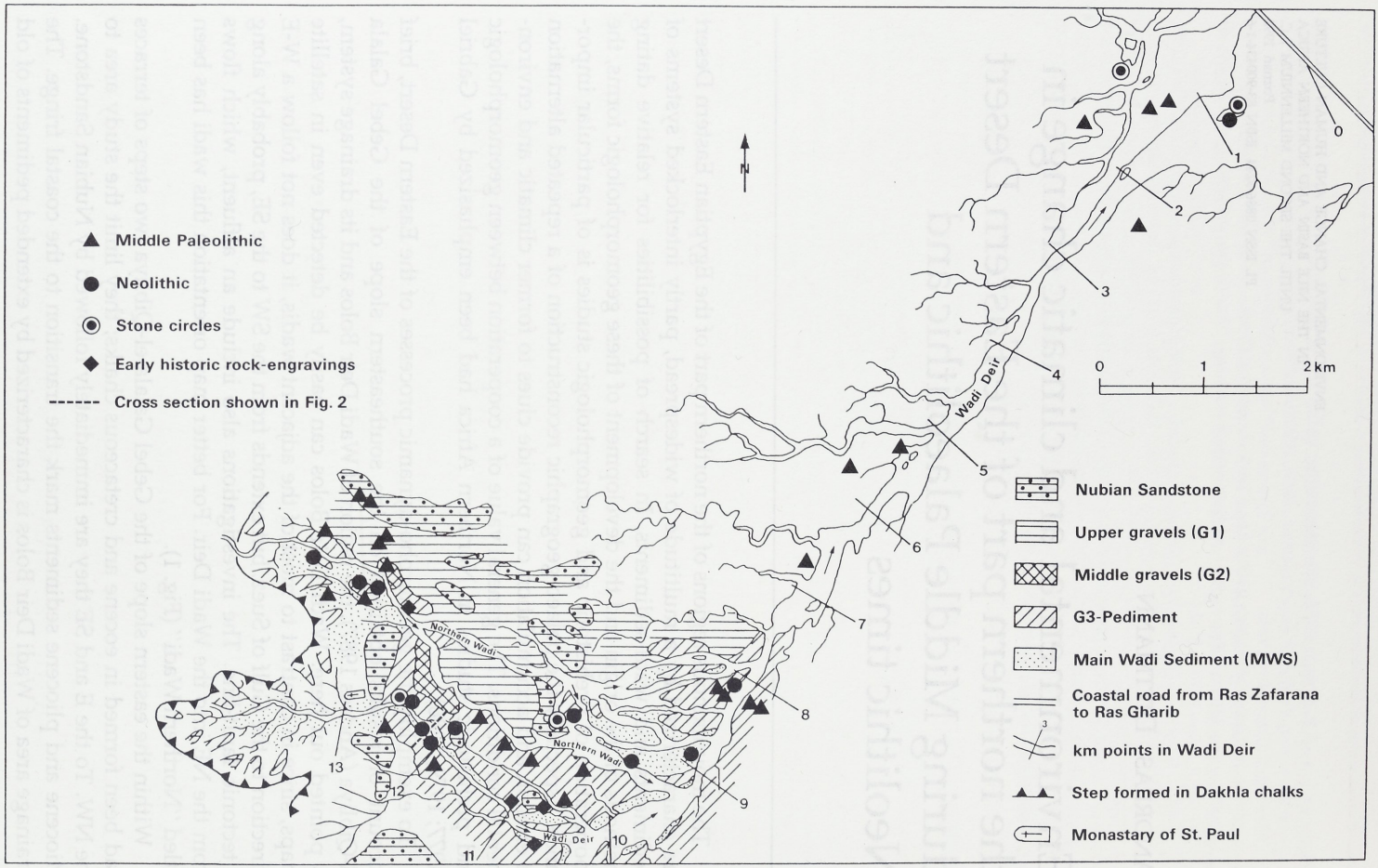

Fig. 1. Prehistoric traces of occupation with regard to distribution of pediments and wadi sediments in Wadi Deir, Eastern Desert .

gravels, which – especially in the middle and upper sections – are deeply dissected by wadi channels. Altogether three different levels of pediments can be recognized: The two upper levels, the G1- and G2-gravels, do not appear in all areas. The lower G3-gravels, however, form the pediments which are dissected by the recent wadi-channels (Figs. 1 and 2). The gravel material of the pediments is on the whole unsorted and more or less rounded.

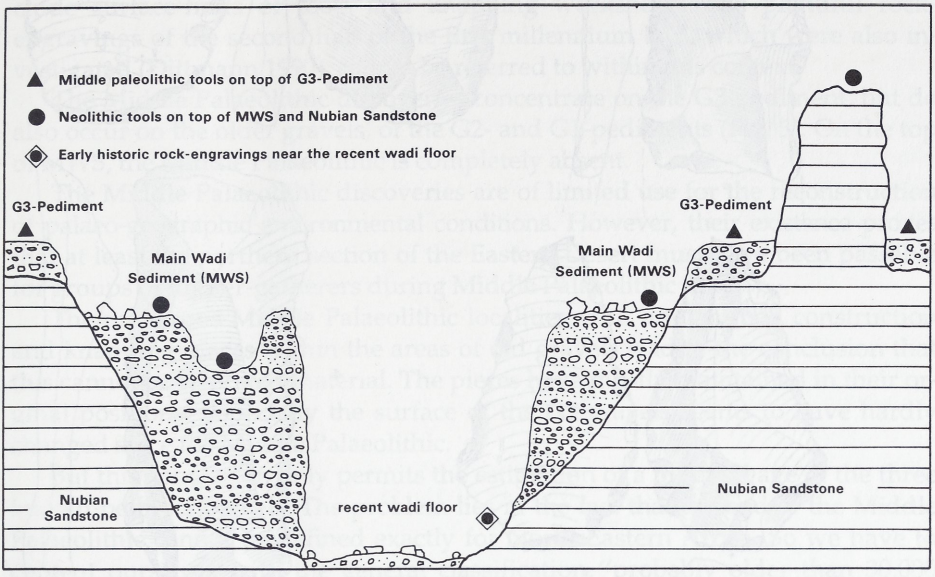

Fig. 2. Superelevated cross section through Upper Wadi Deir.

The recent channels of the wadis are deeply cut into the G3-pediment. They partly are following the course of older drainage systems within the Nubian Sandstone. Especially in the upper section of the wadis, these cuts are characterized by sediments of a recent wadi filling, which in the following will be titled "Main Wadi Sediment" (MWS) (Andres 1987). The MWS have also been cut; within the Northern Wadi it is still widely distributed, but within the upper Wadi Deir it is only partly preserved.

The structure of the MWS differs completely from that of the older gravels. Mostly horizontal levels and interlocked "fining-up" layers indicate that the MWS was formed by regular fluvial processes. These were characterized by an extreme overloading as well as by water flow, which started heavily and slowed down rapidly.

Between the MWS and the actual wadi-floor a terrace exists which is 1 m to 1.5 m high. This terrace originated when the MWS had already been cut. It represents the very recent product of geomorpho-dynamic processes within the drainage area of Wadi Deir.

Under present climatic conditions the drainage of the study area is characterized by single, episodic events of heavy wadi discharge and by dislocation of

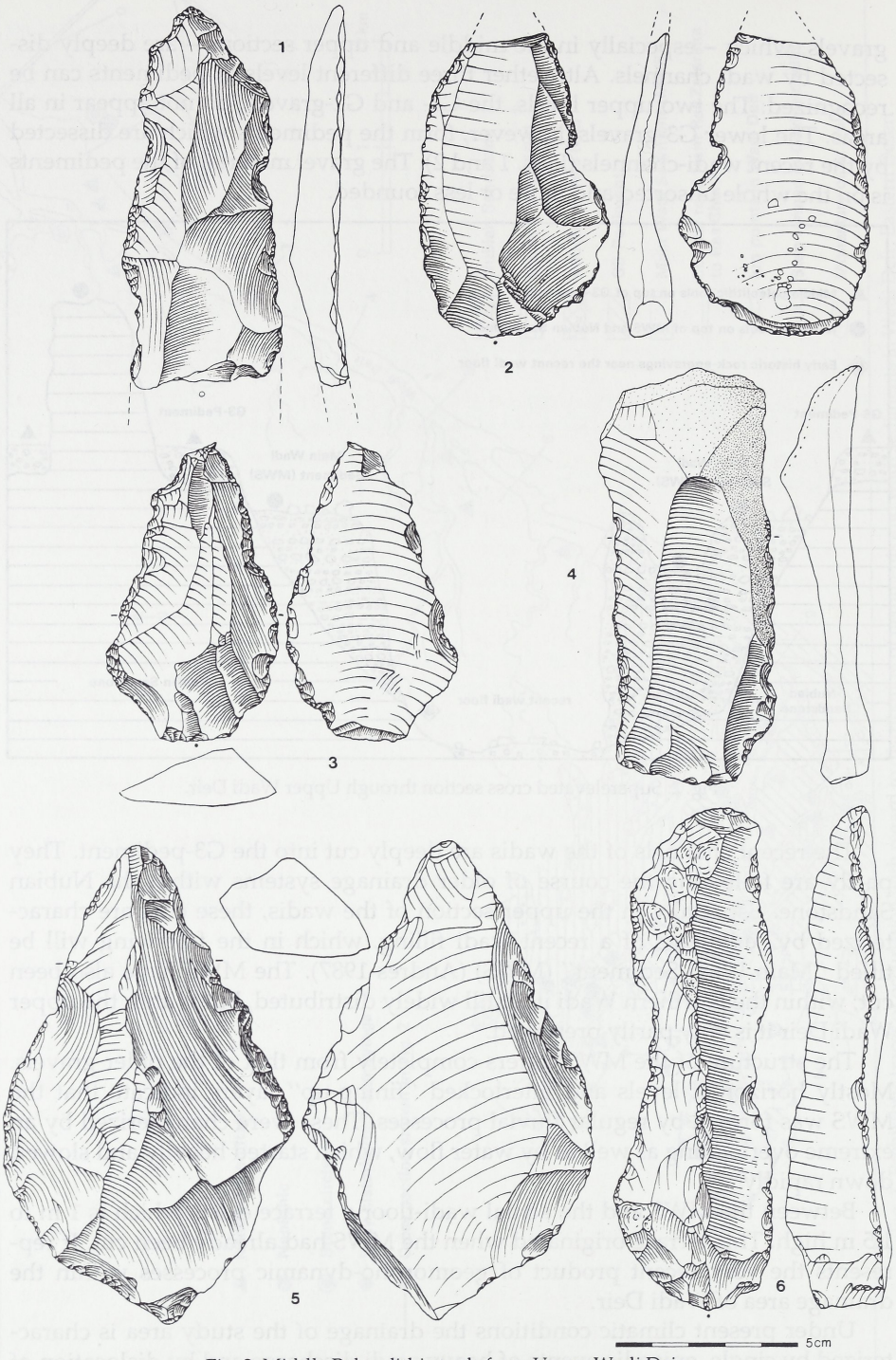

Fig. 3. Middle Palaeolithic tools from Upper Wadi Deir.

material being restricted to the actual wadi floor. Vegetation hardly exists but within the upper Wadi Deir a small spring is enclosed by the buildings of St. Paul's Monastery. The significance of this spring, should not be neglected during a palaeo-geographic reconstruction of former environmental conditions.

Within the area of Wadi Deir, traces of former settlement have been documented for both, the Middle Palaeolithic and Neolithic (Fig. 1). They mostly include surface-finds of tools and knapping workshops. The plentiful rock-engravings of the second half of the first millennium B.C., which were also investigated (Dittmann 1990), cannot be referred to within this context.

The Middle Palaeolithic discoveries concentrate on the G3-pediment, but do also occur on the older gravels, of the G2- and G1-pediments (Fig. 3). On the top of MWS, the Middle Palaeolithic is completely absent.

The Middle Palaeolithic discoveries are of limited use for the reconstruction of palaeo-geographic environmental conditions. However, their existence proves that at least the northern section of the Eastern Desert must have been passable for groups of hunter-gatherers during Middle Palaeolithic times.

The numerous Middle Palaeolithic localities with undisturbed construction and knapping places within the areas of old gravels lead to the conclusion that this cannot be relocated material. The pieces have mostly maintained in their orginal positions. Especially the surface of the G3-gravels seems to have hardly changed since the Middle Palaeolithic.

But this conclusion only permits the estimation of a minimal age of the three known pediment levels. The problem lies in the fact that the end of the Middle Palaeolithic cannot be defined exactly for North-Eastern Africa. So we have to content ourselves with the general classification "probably older than 30,000 B.C." A differentiation of the pediment-levels G1, G2, and G3 according to their age on the basis of prehistoric discoveries is not possible.

However, it is worth mentioning that the Middle Palaeolithic tools and knapping-places on top of the G3-gravels are concentrated where this pediment sinks down to the MWS-level or directly to the recent wadi floor. Such a concentration at the immediate margins of the wadi channels could be a proof for the fact that the basic structure of the actual drainage-system had already been developed during the Middle Palaeolithic.

However, the geomorphologic importance of the Middle Palaeolithic discoveries mainly lies in the determination of the relations between the MWS and the G3-pediment. The fact that Middle Palaeolithic discoveries do not occur on the top of the MWS suggests that these sediments did not exist during Middle Palaeolithic times.

Especially the sedimentological results seem to prove that the MWS-sedimentation took place after the end of a humid period: 95% of the MWS materials consist of chalk from the upper drainage area of the wadis, while Nubian Sandstone hardly occurs. During a humid period this material was fixed to be a protective vegetation cover on the slopes in the upper wadis.

Later the drying-up of the region truly took the character of an ecological catastrophe: the protective vegetation cover disappeared, the loose deposits fell

victim to erosion and their deposition took place within the upper and middle sections of the drainage systems of the G3-gravels. However, these fillings of the valleys never reached up to the levels of the older G3-gravels.

Indications of a humid phase, which existed before the deposition of the MWS, are not only furnished by relicts of fossil soils on the G3-gravels, but also by the dating of samples of sinter. These were taken from the upper Wadi Deir. The sinter was developed at a time when a spring within this area became so active that open water surfaces and sinter terraces were built up. The C-14 dates of the sinter are 26,350 and 26,900 B.C. (Andres 1987).

Heavily sintered older gravels were also found in the Northern Wadi and dated to 26,000 B.C. They were formed when the G3-pediment had already been deeply cut, that is to say not long before the deposition of the MWS. At this time large amounts of chalk-carrying water flooded along the bottom of the G3-gravels. Biogene CO_2 was largely responsible for the deposition of the chalk, so that the existence of a relatively rich vegetation may be assumed.

The sinter datings hint at the existence of a climatically favorable humid period at about 26,000 B.P. However, we cannot say when this humid period began, when it finished and how long it already had existed before 26,000 B.P. (Table 1). Therefore, we cannot definitely decide, whether the Middle Palaeolithic discoveries belong to the same or another, earlier, humid period.

It must be emphasized that shortly after the deposition of the MWS its erosion began without any climatic change. The cutting of the MWS occurred during arid conditions. After the slopes had been freed from fine material down to the rock, the lack of further erosive-materials immediately led to the cutting of the MWS in the wadis during episodic or periodic floods.

Neolithic finds provide information about the period after the deposition of the MWS: Their existence on the surface of these deposits proves that the MWS must already have existed during the Neolithic. Moreover, finds within cuts and bulges of the sediment document that its cutting was already more or less finished during this time. The Neolithic finds concentrate mainly on the surface of the MWS, but also frequently occur on G3-gravels and on the higher levels within the Nubian Sandstone (Figs. 1 and 2).

Important for the MWS, and providing a relative dating for deposits and recuttings, is a Neolithic occupation site within the upper Wadi Deir at km 12.2 (Fig. 1). It consists of relicts in an abri which roof has fallen, and conservated parts of stratified layers. This abri was formed, within MWS-deposits, which here extend to 13 m above the wadi bottom. The site is marked by a formation of a sediment pillar (Fig. 2) connected to the deposits on the margin of the wadi by two dumps of loose and dislocated material which are relics of the collapsed shelter. One of these two dumps faces north-east, the other south-west. During the investigations the site attracted attention because of eroded and dislocated pieces of bones and charcoal within the actual wadi bottom. Unfortunately, it soon turned out that the organic material had not, as was hoped, been incorporated during the deposition of the MWS. Thus it became evident that a dating of the site could not furnish information about the time of deposition of the MWS, but only about the minimum age of its recutting.

The shelter's appearance at the time of its occupation must already have been similar to that of today. Stratigraphic indications hint that there once was a continuous bottom surface between the stratified charcoal layers of the eastern and western side. The stratified layers on the western side are covered by great, compact sediment-blocks which do not show the typical horizontal stratification, but have slid down from their original position. The structure of their stratification is similar to the upper layers of the MWS-deposits encountered towards the edge of the wadi. The sediment-blocks here lie directly on the stratified layers with Neolithic finds and it seems that an overhang which was formed within the MWS served as a resting-place. Close to the sediment pillar the sediment layers are, however, not covered by MWS-sediment-blocks but by loose material from the nus. Either the sediment-pillar was already istolated, or there was an arc-like connection to the deposits at the edge of the valley. Today it is impossible to know which of these two possibilities is the most probable. In order to reconstruct the appearance of the site at the time of occupation the possibility of the existence of an arc-like connection was assumed.

C-14-datings exist for five stratified layers of the site. After a dendrochronologic calibration four clearly distinguishable occupation periods emerged:

Layer WR-4 on the western side belongs to the first occupation period between about 3,630 and 3,360 B.C. The second period between 3,050 and 2,690 B.C. is characterized in particular by numerous fragments of animal bones (nubian wild donkey, ibex, sheep/goat). Layers belonging to this period are WL-1, WL-2, WM-1 and WM-2 on the western side as well as OL-3 on the eastern side of the abri. Shortly afterwards, between 2,660 and 2,390 B.C., the third settlement period follows with layers OL-2 and OL-1 on the eastern side, which show stratigraphic connections with WR-3 and WR-2,5 on the western side. The stratified layers WR-2 and WR-1 between about 2,150 and 1,920 B.C., represents the fourth period, the last documentable phase of occupation.

The positions of the stratified layers WR-4 and OL-3, which are situated only 4.5 - 4.0 m above the actual wadi floor, proves that the MWS must have been cut down already to this level at about 3,700 B.C. Probably it had been cut much more deeply. Considering the fact that Late Neolithic camp sites most probably were not founded on the same level as the former gully, it can be concluded that during the first occupation period the MWS was cut at least to a level of about 1.5 - 3.0 m above the recent wadi floor.

The superelevated profile of a gross section through the upper Wadi Deir illustrates a synopsis of the present results (Fig. 2 and Table 1). The restriction of the Middle Palaeolithic discoveries to the G3-pediment and the concentration of the Neolithic discoveries to the MWS and higher landmarks is clearly shown. Also marked are post-Neolithic rock-engravings, which positions show that there have been no important changes of the level of the wadi bottoms since the second half of the first millennium B.C.

The investigations carried out within the region of Wadi Deir prove that numerous palaeo-geographic and palaeo-climatic questions can only be answered by a combination of geomorphologic and prehistoric research. But there are

Table 1

Climatic conditions and human culture in the later prehistory of the northern part of the Eastern Desert, Egypt.

Time	Climatic conditions	Geomorpho-dynamic processes	Human culture
Recent to proto-historic	Arid	Episodical wadi floods (one event during 5 - 6 years). Erosion at the margin of older sediments.	Rock-engravings
4,000 to 2,000 B.C.	Semi arid	Periodical wadi floods. No important transformation processes.	Neolithic occupation (hunting, stock breeding sheep and goat)
After 20,000 B.P.?	Arid	Episodical wadi floods. Dissection and erosion of the MWS.	
After 26,000 B.P.	Arid	Episodical wadi floods. Erosion on the slopes and accumulation of the MWS in the upper and middle sections of the wadis.	?
About 26,000 B.P.	Semi arid to semi humid	Longer, periodical wadi floods. Open water surfaces and development of sinter. No important geomorphic transformation processes.	?
Before 26,000 B.P.	? (Semi arid)	Dissection of the G3-pediment.	Middle Palaeolithic occupation

limits of such a cooperation: A relative dating especially of the higher, that is to say, older geomorphologic forms (pediments) is impossible at such places where exact differentiations of the prehistoric materials into different phases can not be effected. This holds true especially where older surface profiles are concerned. On the other hand not all pre- and protohistoric results can be converted to a geomorphological context.

In the overlapping fields of both sciences it is the task of palaeo-geography to lay out a rough and temporary frame for early climatic and environmental conditions; it is for prehistory to allocate the necessary cultural significance to this frame.

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