

of course, the K/Ar dates for the Cover Basalt provide limiting dates for the Gadot–Hazor formations, which can be related to the Günz glaciation of the Alps only tenuously and by tortuous reasoning.

It is only for the last glacial cycle (“Würmian”) that the correspondences between Israeli pluvials and interstadials with the European glacials and interstadials can be tested. Unfortunately, Horowitz’ subdivisions do not match well with published European sequences, a conspicuous example being his “Middle–Late Würm Interstadial” between 20,000–22,000 and 16,000–18,000 B.P. and controlled primarily by a ¹⁴C date of 18,800 B.P. in the Hula K-Jam borehole. This “interstadial” straddles the time of the maximum glacial advance in Europe and North America, the 18,000 B.P. datum of the CLIMAP program, and “polar desert” conditions in the Netherlands.

At the outset Horowitz (p. 7) states that he will retain Depéret’s (1918) terminology, which he says is “now widely accepted,” although he admits some altitudinal and faunal problems. Implicit in Horowitz’ usage is an acceptance of the old “altimetric correlation” scheme, nonetheless. Accepting this scheme of eustatic levels, Horowitz infers little or no tectonic activity south of the Haifa Bay during the “Glacial Pleistocene.” He is thus led to the conception (and definition) of the Quaternary as one mega-eustatic cycle from the Pliocene minimum sea level to the Calabrian maximum, 120 m above present sea level, followed by oscillating regression down to the present-day sea level.

Tectonic stability in coastal Israel is in fact refuted by other phenomena discussed by Horowitz. According to Horowitz, the Jordan–Dead Sea rifting occurred without any appreciable effect on the coastal plain area, only a few tens of kilometers to the west. It is difficult to understand how the coastal area could have been uncoupled from the strong rifting movements.

In trying to summarize the value of this book, this reviewer is sorely perplexed. Horowitz has ably succeeded in summarizing and synthesizing the local late Cenozoic geology of this small but crucial country. Its marine, tectonic, and volcanic phenomena provide ample opportunities for correlation with other areas of the world, and its location at the “crossroads” of three continents is perhaps unique for an area so rich in its Quaternary record. However, Horowitz ignores completely the relations with surrounding countries of the Levant, and he fails abysmally in correlating the Quaternary of Israel to the rest of the world. He has missed a golden opportunity because his stratigraphic scheme is both anachronistic and faulty. It will serve only to compound the confusion already rampant in Quaternary stratigraphic literature.

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Quaternaire et Préhistoire du Nahr el Kébir Septentrional (Les Débuts de l’Occupation Humaine dans la Syrie du Nord et au Levant). Paul Sanlaville, Lorraine Copeland, Francis Hours, and Jacques Besançon. Collection de la Maison de l’Orient Méditerranéen, No. 9; Série Géographique et Préhistorique no. 1; Editions du Centre National de la Recherche Scientifique, Paris, 161 pp. including a 10 pp. English summary.

The team of Sanlaville and Besançon (geomorphologists) and Copeland and Hours (prehistorians) has already made its mark on the Quaternary literature of the Levant, especially on that of Lebanon. Here they have concentrated their efforts on a small, but extremely interesting area, perhaps unique along the Near Eastern coast in its combination of fluvial as well as marine terraces and richness in archaeological remains. The Nahr el Kébir Septentrional (literally the “northern big stream valley”) is a relatively small drainage heading in the coastal mountains of north-westernmost Syria and debouching into the Mediterranean at Lattakia, and not be confused with the Nahr el Kébir Méridional that marks the Syro-Lebanese border about 100 km to the south. The lower alluvial valley of the Nahr el Kébir Septentrional is quite broad (up to 6 km) and forms a natural passage to the interior, the Ghab depression and the Syrian Desert. Judging by the abundance of artifacts this passage must have been as attractive in prehistoric times as it has been in Classic and historic periods.

The area investigated by Sanlaville and colleagues is only about 15 by 15 km square, but it includes a wealth of landforms and stratigraphic exposures that allow the authors to “define early, middle, late and final Acheulean” industries within a “solid chronostratigraphic framework.” As it turns out, the relative chronology appears to be well established, but the absolute age of the industries and their correlations beyond the local area are tenuous.

Most of the work reported here was carried out in a single field season (1976), and the geomorphic, sedimentological, and stratigraphic observations are based on field observations unsupported by laboratory analyses. Nevertheless, the previous experience of this team in neighboring areas lends a strong degree of confidence in their interpretations.

This volume is organized into three parts. In the first part Sanlaville presents the general geographic and bedrock setting of the area and then elaborates on the occurrence of marine terraces and fluvial formations. A widely represented fossiliferous sandstone and conglomerate flanking an old sea cliff at 80–85 m above sea level is the dominant marine feature. The Enfean (Tyrrhenian) shoreline of the last interglacial is lacking locally, but from its known altitude in nearby areas and from comparisons with the Jbailian transgression in Lebanon, Sanlaville correlates the 80- to 85-m shoreline with the penultimate interglacial, or with the Mindel/Riss of the Alps. The altitude of this shoreline suggests considerable epeirogenic uplift of the Le-

vantine area, but there appears to have been little or no differential deformation parallel to the coast throughout this sector of Syria and Lebanon. Scraps of still higher marine deposits at 110–120 and 150–180 m are attributed to the “Günz/Mindel” and “pre-Günz” interglacials, respectively.

The uniqueness of the Nahr el Kébir, however, is in its fluvial record. Well-developed Quaternary stream terraces are rare along the coastal Levant, but here four terrace-forming episodes have been distinguished, and the youngest of these can be subdivided into three intervals. By arguments based on their altitudes and degrees of preservation Sanlaville assigns them to four successive “pluvials” that alternated with the marine interglacial formations. Stream aggradation is attributed to climatic crises during humid “pluvial” phases that followed an initial phase of incision due to marine regression. Interestingly, reconstructed gradients of the terraces show progressively lower slopes from oldest to youngest, another proof of the progressive uplift of the region throughout the Quaternary.

The four “pluvial” terraces are given local names, but are correlated by “convenience” with the “traditional Alpine chronology,” Günz, Mindel, Riss, and Würm. Although the authors make apologies for this usage, they apply these epithets throughout their work, muddying the chronologic waters. In fact, this finger-counting correlation leads to an age assignment (“Günz”) for the early Acheulean artifacts found in the highest stream terrace that in turn leads the authors to conclude (a) that the Acheulean tradition appears here earlier than in Europe and (b) that it is older than the artifact assemblage (advanced Oldowan) of Ubeidiya in the Jordan valley, dated as “Mindel” at ca. 700,000 years by Israeli workers. However, there appears to be no assurance at all that this high terrace should correlate with Günz or any other specific Alpine glaciation. Surely four “pluvial” episodes in the Levant cannot represent all the 15–20 glacial cycles known from the deep-sea record. Therefore the question remains, if such “pluvials” can indeed be correlated one-to-one with glaciations or with marine isotope cycles, “Which glaciation does this ‘pluvial’ represent?” Applying Alpine names for “convenience,” but without any assurance of a detailed correlation and in the absence of radiometric dates, cannot answer this question. Therefore, the age of the early Acheulean of the Nahr el Kébir must be considered to be floating.

The second part, constituting some two-thirds of the French text, is written Copeland and Hours, who give a detailed analysis of the abundant artifacts that they recovered, many from stratigraphic context, others from surface occurrences clearly related to geomorphic features. No living floors were found, but the authors claim, probably justifiably, that their collections are more exhaustive and better controlled than those from most well-known Acheulean sites from the Thames River to Olduvai Gorge. Their major conclusion is that the Acheulean was an astonishingly stable

typological tradition throughout the broad range of Quaternary time, showing only slow progressive size decrease and a gradual change in the proportions of *ovulaire* to *amygdaloïde* bifaces. The oldest artifacts of presumed “Günzian” age were mentioned in the preceding paragraph. The “final Acheulean” industry to which the authors give the local name “Samoukian facies” recalls a number of other “Riss/Würm” assemblages of the Near East, such as the Yabrudian and Amudian (“pre-Aurignacian”). These industries show a strong incidence of the Levalloisian technique while preserving an abundance of bifaces, thus forming a transition between traditional Acheulean industries and the Middle Paleolithic “Levalloiso-Mousterian” that dominates the first half of the last glacial cycle.

The third part consists of “reflections of a methodologic nature” on the interrelations of the prehistoric record and geomorphology by Besançon. His main concern is with surface collections of artifacts and the limitations of using the artifacts to date the surfaces and vice-versa. The problems enumerated deal both with the subsequent occupations, widely separated in time, of an old geomorphic surface and with the concentration of artifacts on these surfaces by “karstic digestion,” i.e., atmospheric weathering of the abundant carbonate component of the alluvium leading to a relative enrichment of the nonsoluble components, mainly the siliceous artifacts. The latter process in extreme cases can even lead to the formation of a lag deposit of artifacts after the disappearance of the original enclosing matrix. Besançon discusses the criteria used to separate artifacts of different ages from a mixed surface collection, primarily the degree of preservation of the flints, their patina, and comparison with other, stratigraphically controlled collections. His comments are interesting as an example of the essential methodological interactions between geologists and archaeologists in such a study.

In summary, this is an interesting and valuable contribution to the Quaternary geology and prehistory of the Levant, and an excellent example of fruitful interdisciplinary collaboration. Geologically it documents episodes of “pluvial” stream aggradation, and archaeologically the whole gamut of the Levantine Acheulean seems to have been put into a solid stratigraphic framework. The authors and the French CNRS are to be congratulated on speedy publication of these results.

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Solar-Terrestrial Influences on Weather and Climate. Edited by B. M. McCormac and Thomas A. Seliga. Kluwer, Boston, 1979, \$24.00.

Perhaps the most direct mechanism which has been proposed to explain past fluctuations in the earth's