NOTES ET DISCUSSIONS

MORPHOSTRUCTURAL STRATIGRAPHIC VARIABILITY OF AURIGNACIAN CULTURAL LEVELS AT MITOC-MALU GALBEN (BOTOȘANI COUNTY) MIDDLE PRUT VALLEY, ROMANIA

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The Upper Palaeolithic geoarchaeological levels at Mitoc—Malu Galben (48°07'N, 27°10'E) should be understood in terms of the proglacial morphostructural processes that were once in operation in North Moldavia during the Late Valdai Glacial. At that time, the periglacial permafrost zone in Southeast Europe embraced the regions from about 53° ti 45° N latitudes. The margins of the Late Valdai Glacial ice sheet were situated a little to the north of Minsk, or about 800 km from Mitoc [1]. This influenced considerably the climatic regime in all of Moldavia (Map 1).

In this account, we are concerned with cultural and chronoclimatic events at the beginning of the second Late Valdai interstade.

The following positions have recently been taken on the chronometric dating of Aurignacian occupational surfaces at this important site.

Vasile Chirica, chief of excavations there, offers the tenuous accounts:

"Le niveau de 7,85 m. que nous considérons comme représentant la dernière sequence d'habitat aurignacien .. est daté à 28,910 ± 480 B.P. (GrN. 12.636)". „D'après la documentation actuelle, l'habitat aurignacien est situé stratigraphiquement dans une couche jaune-rouge à lentilles de carbonates, entre 8,15—10,65 m." "Mais, ce niveau à 10,65 m, est-il la première couche de culture aurignacienne?" [2].

In speaking of the radiocarbon date of 31.850 ± 800 B.P. (GrN — 12637) for the Aurignacian 8.70 m level there [3], he makes these observations: " . . .nous apprécions que le premier niveau d'habitat aurignacien, situé à 10,65 m, pourrait avoir un age de 37,000—39,000 années, donc au niveau de l'oscillation Hengelo. Cet habitat représenterait, dans cette situation, le plus ancien Aurignacien de la Roumanie" [4].

Alexandru Păunescu, in talking of the same Aurignacian sample (GrN — 12637) [5], makes the following interesting ascertainments. "Si la toute dernière découverte effectuée dans cette même station . . . — les deux foyers et l'atelier de taille trouvés à 10,65 m de profondeur représente une étape plus ancienne que celle du niveau Ia de Ripiceni—Izvor, ils nous faut alors placer les débuts de l'Aurignacien de Roumanie vers 35,000 BP, ou peut-être même un peu plus tôt" [6]. (He neglects to say that the Ripiceni—Izvor level in question has never been absolutely dated. His reasoned hypothesis, then, appears to be based on tool typology only. Neither the Aurignacian nor the Gravettian levels there are separated by sterile sedimentary units).

The above excerpts of statements are concerned, basically, with *excavated depths* of certain "Aurignacian" radiocarbon samples. They are predicated by *approximate hand and tape measurements* made of their depths, which range from 7.85 to 10.65 m, in relation to the fixed surface datum point in square J8 (0.00 m). The various arbitrary horizontal excavation planes were all measured from this particular point. A theodolite was not used.

[1] O. Soffer, Patterns of Intensification as Seen from the Upper Palaeolithic of the Central Russian Plain, in T.C. Price, and J.A. Brown (eds), *Prehistoric Hunters and Gatherers*, 1985, Orlando.

[2] V. Chirica, *La Genèse et l'Evolution des Cultures Palaeolithiques sur le Territoire de la Roumanie*, Bibliotheca Archaeologica Iassensis, II, 1987, p. 27.

[3] K. Honea, SCIVA, 37, 1987, 4, p. 328.

[4] V. Chirica, *The Pleistocene Perspective*, I, 1986, London, p. 13.

[5] K. Honea, op. cit.

[6] Al. Păunescu, in H.P. Schwarcz (coordin.), *La Chronologie*, M. Otte (ed.), *L'Homme de Néanderthal*, I, Liege, 1988, p. 79.

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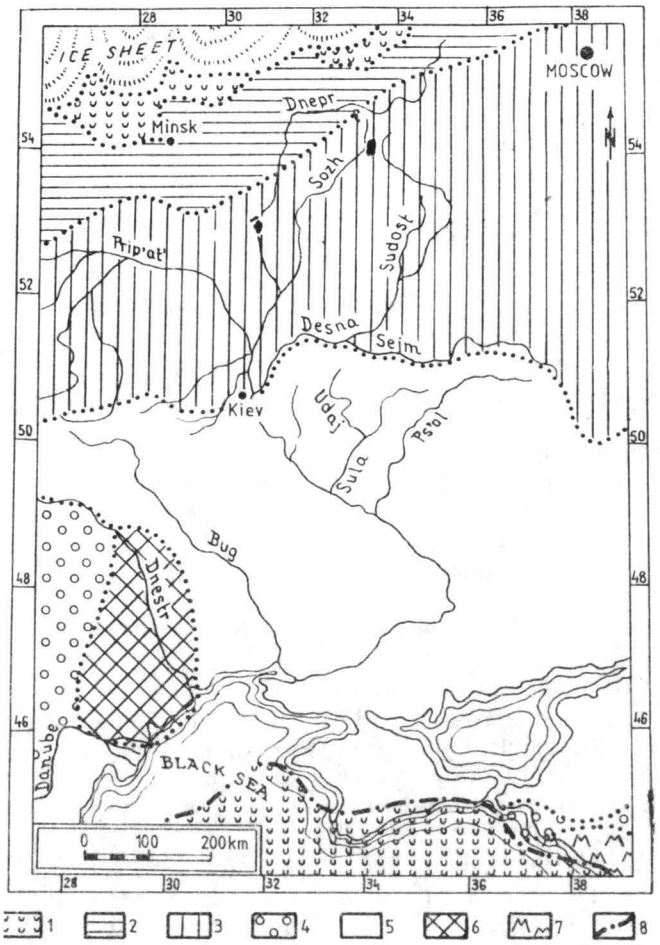
If this thesis put forward by both Chirica and Păunescu should indeed be correct, then at increasing depths, ages of radiocarbon samples should be older. The following list gives the depths of 13 such "Aurignacian" samples (Tables I and II)[7]:

34 (7.85 m)	31 (8.70 m)	35 (9.45 m)
10 (8.15 m)	38 (8.70 m)	23 (10.10 m)
20 (8.15 m)	28 (8.75 m)	15 (10.65 m)
33 (8.15 m)	25 (9.45 m)	37 (10.65 m)
29 (8.70 m)		



Map 1. — Vegetation on the Central Russian Plain during Late Valdai Cold Maximum: 1 water bodies; 2 shrub tundra-steppe; 3 periglacial forest-steppe; 4 mixed forest; 5 periglacial steppe; 6 Southern periglacial forest-steppe; 7 mountain areas; 8 limit of New Euxine Sea (after Soffer 1985; Grosswald 1980 and Soffer 1985.

Such horizontal planes, however, do not take into consideration the natural inclined geological and archaeological stratigraphies at the station. The geologic dip in the north profile is from west to east and that in the west profile, from north to south (Figs. 1—4). It can be argued that this could be due to the tilted limestone bedrock underlying the entire site. The bedrock's inclination is also from west to east.

It is useful to point out that the south and east margins of Malu Galben have been adversely affected by meandering of Ghireni Creek, ancient relic periglacial solifluctional, cryoturbational and anthropogenic disturbances. These processes may also have affected the *accuracy* of radiocarbon samples and accompanying cultural materials. The hypothesis is here offered that some south and east marginal samples and archaeological materials may not now always be *in situ*.

As a rejoinder, the resulting secure dates for the Aurignacian occupations are mostly not consonant with the above-quoted arguments that depth is an absolute indicator of age.

In fact, only four wood charcoal samples are congruent with such expectations. All stem from *different* depths and are associated with four distinctive occupations. Their ages place them in the earliest part of the second interstade:

34	GrN—12636	28,910 ± 480	Square D4,	7.85 m
35	GrN—15454	29,410 ± 310	Square H3,	9.45 m
37	OxA—1646	31,100 ± 900	Square D5,	10.65 m
38	GrN—12637	31,850 ± 800	Square B4,	8.70 m

The mean age of samples 34 and 35 is 29,160 ± 395 BP; samples 37 and 38 is 31,475 ± 850 BP. These are the earliest Aurignacian dates available in a secure closed cultural context in Romania.

The initial sample in question (15), from 10.65 m (square D5), was disturbed sparce charcoal. It has an anomalous date of

GrN—15457 24,400 ± 2200/—1700 BP.

Its range is from 26,600 to 22,700 BP. The sample has a *terminus antequem* age (W. G. Mook, 15 July 1988, personal communication). The disturbance can be attributed to either anthropogenic or periglacial agencies.

[7] P. Allswort-Jones, *The Szeletian and the Transition from Middle to Upper Palaeolithic in Central Europe*, Oxford, 1986, Table 1; K. Honea, Chronostratigraphic Database of the Eurasian Valdai Ice Sheet: Correlations with Romanian Palaeolithic Cultural Sequences, 1988, unpublished manuscript.

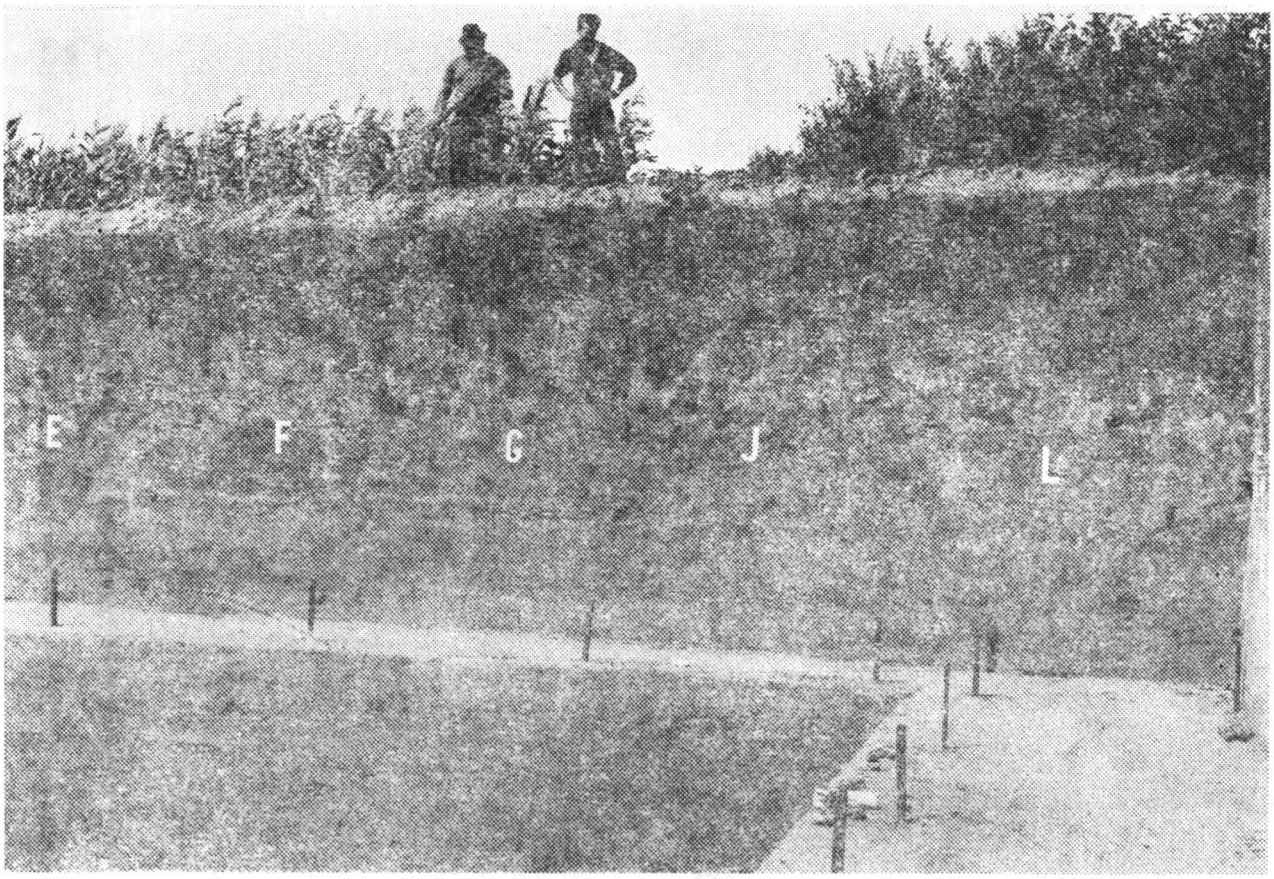


Fig. 1. — Mitoc-Malu Galben. Northwest corner of excavation. The surface datum point in the NW-corner of square J8 from whence all measurements for depth were made. The first horizontal step is about 3.00 m below the datum. Note the inclined dip of geoarchaeological levels to the south (left) (photographs by K. Honea 1985).

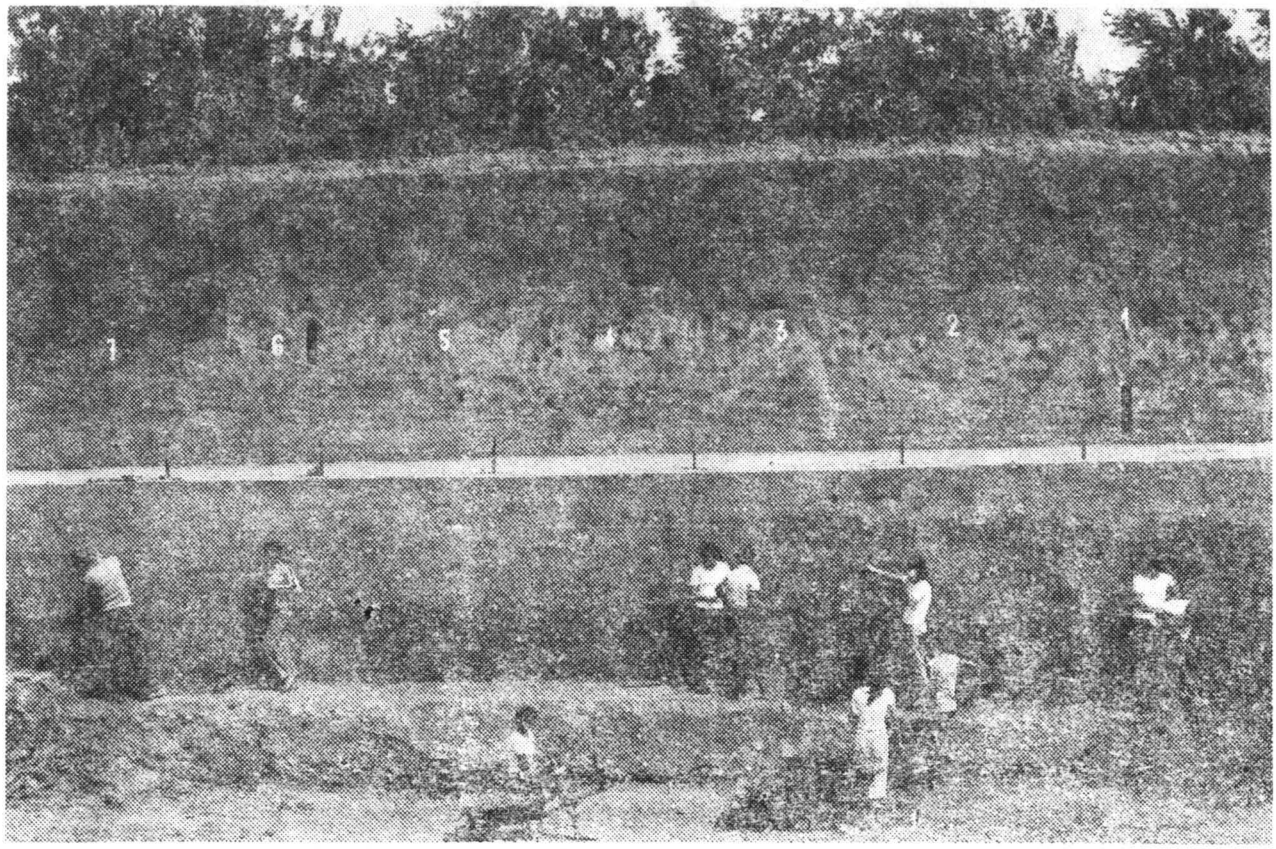


Fig. 2. — North profile. Coordinate squares 1 (right) to 7 (left). The inclined dip of geological levels is from west to east (right).

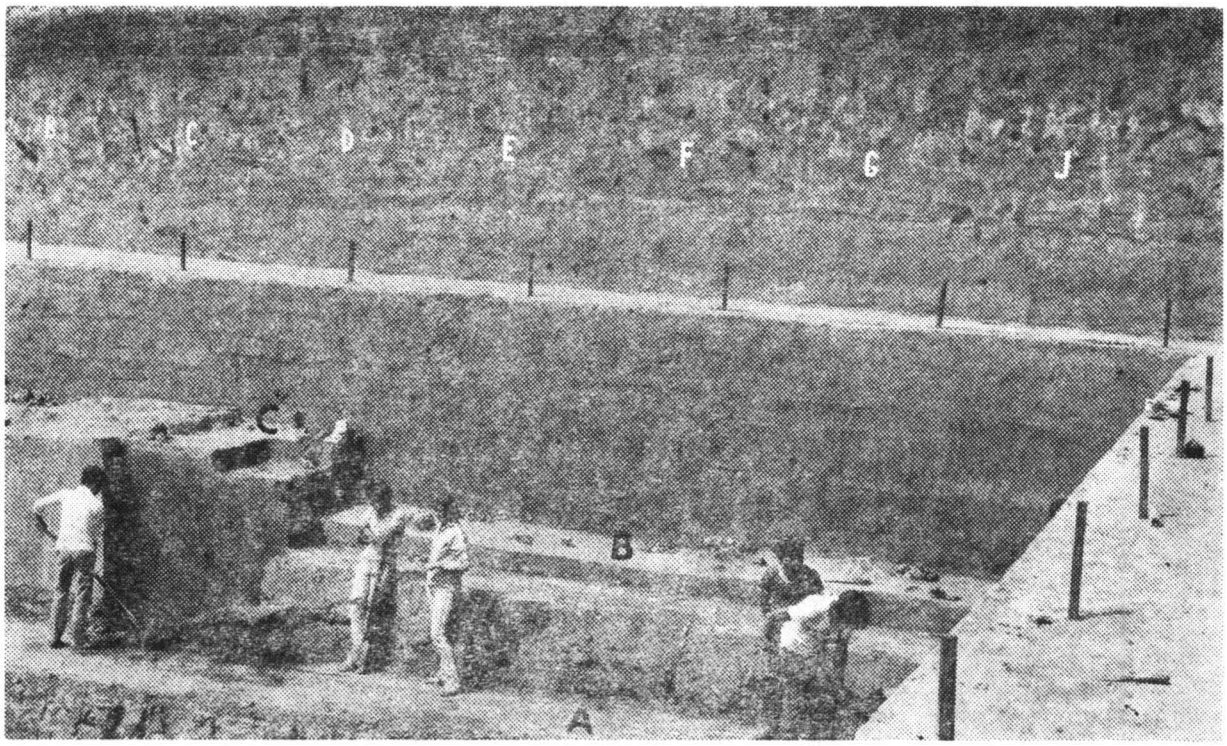


Fig. 3. — Part of west profile. Inclined dip of geological levels is from the north to south (left). Three East Gravettian occupation surfaces (A—C) are indicated in the lower foreground.

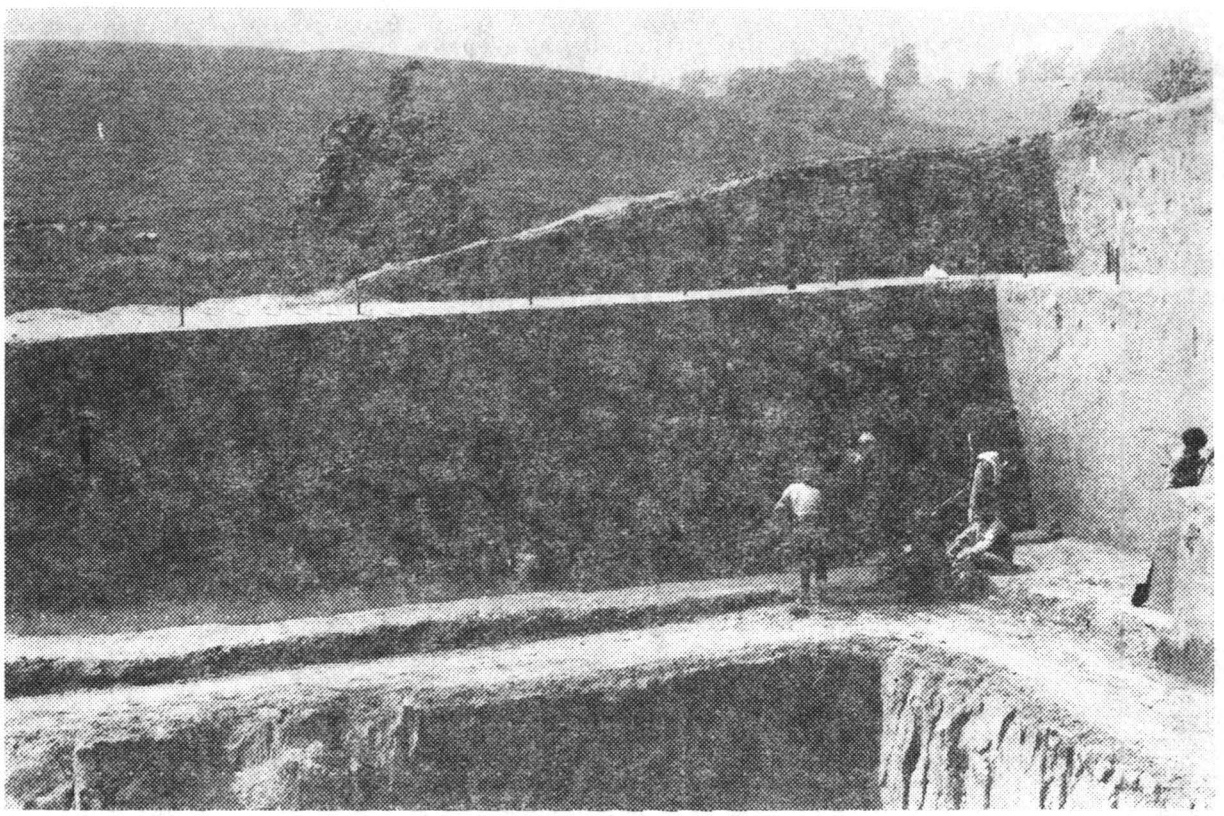


Fig. 4. — South profile. View of abruptly inclined dip of geological levels in the southwest corner of the excavations above Ghireni Creek (west to east; left in photograph).

A second sample was collected in the same square and same depth (D5, 10.65 m) by Chirica. It has now been dated by the Oxford University Accelerator Unit using the accelerator mass spectrometry (AMS) technique. It stems from a second *in situ* hearth in an early Aurignacian milieu (see above):

OxA—1646 31,100 ± 900 BP

The carbon context of this sample was 20 mg.

All the other nine in the above list pertain to various phases of the East Gravettian chronostratigraphic sequences. Some have been soliflucted (Tables I and II).

Table I

Mitoc — Malu Galben, Botoşani County, Romania. Sequence of assay results by depth below datum (last column on right). All were measured from the northwest corner of square J8(0.00 m). (*: 1987; **: 1989; assays 34, 38 previously published by Ilonea 1986.

Assay Sequence by Depth	Laboratory	Results BP	Material	Techno-complex	Square and Depth below Datum (m)
0	1	2	3	4	5
34	GrN-12636	28,910±480	C	Aurignacian	D4, 7.85
10*	GrN-13000	23,070±180	B	Gravettian	A3, 8.15
20**	GrN-14913	25,330±420	C	Gravettian	C4, 8,15
33**	OxA—1778	27,500±600	B	Gravettian	A2, 8.15
29**	GrN-15453	27,100±1500	C	Gravettian	C5, 8,70
31**	GrN-14914	27,410±430	C	Gravettian (soliflucted)	B4, 8.70
38	GrN-12637	31,850±800	C	Aurignacian	B4, 8.70
28*	GrN-14037	26,910±450	C	Gravettian	H7, 8.75
25**	GrN-15451	26,530±400	C	Gravettian	H3, 9.45
35**	GrN-15454	29,410±310	C	Aurignacian	H3, 9.45
23**	GrN-15456	25,930±450	C	Gravettian	A7, 10.10
15**	GrN-15457	24,400 +2200 −1700	C (sparce)	Aurignacian (anomalous; disturbed) (see sample 37)	D5, 10.65
37**	OxA-1646	31,100±900	C	Aurignacian	D5, 10.65

Table II

Mitoc — Malu Galben, Botoşani County, Romania. Chronostratigraphy of 38 radiocarbon dates obtained by 1989. Approximate depths measured in relation to the *fixed surface datum* (0.00 m) in the northwest corner of square J8. The lettered squares in the west profile are, from north to south: J, G, F, E, D, C, B, A, H and I. Their coordinates in the north profile are, from west to east, 8 to 1. All dates are at one sigma standard deviation with 68% certainty unless otherwise specified by bracketting. Two sigma deviations are at 95% certainty. GrN: Groningen, GX: Geochron, OxA: Oxford. C: wood charcoal, B: unburnt bone. New dates: *(1987), **(1989). CL: cultural level. Oxford dates are based on the accelerator mass spectrometry (AMS) technique, the first time used in Romania.

Assay Sequence by Age	Laboratory and Field Number	Results BP	Range	Material	Technocomplex	Square and Depth below Datum (m)
0	1	2	3	4	5	6
1	GX-9423 (20 A-B)	17,300+2100 −1670	19,400— 15,630	C	Gravettian	A4, 6.89
2	GX-9429 (16)	19,900 +1050 − 950	20,950— 18,950	B	Gravettian	C6, 6.60
3	GX-8724 (5)	19,910±990	20,900— 18,920	C	Gravettian	D3, 6.10
4**	GrN-13765 (8)	20,150±210	20,360— 19,940	B	Alluvium (non-cultural; mid-alluvium)	J7, 3.10
5	GrN-14031 (60)	20,300±70	20,370— 20,230	C	Gravettian (directly under alluvium)	J6, 3.60

Tabel II *(continuare)*

0	1	2	3	4	5	6
6	GX-8503 (2)	20,945±850	21,795–20,095	C	Gravettian	C2, 7.00
7	GX-9424 (22)	>21,000	1 SD	B	Gravettian (v. 18 same locus)	G7, 5.60
8	GX-9420 (12 A-B)	22,050±1250	23,300–20,800	C	Gravettian	C6, 6.60
9**	GrN-15448 (69)	⩾23,000 (1 SD 28,500+5900/–3400)	2 SD	C	Gravettian (v.14 adjacent locus)	J6, 5.75
10*	GrN-13006 (45)	23,070±180	23,250–22,890	B	Gravettian (soliflucted)	A3, 8.15
11	GX-8725 (6)	⩾23,100 (1SD>28,750)	2SD	C	Gravettian	F5, 6.40
12**	GrN-15805 (68)	23,490±280	23,770–23,210	B	Gravettian	J3–4, 6.15
13**	OxA-1779 (64)	23,650±400	24,050–23,250	B	Gravettian (CL above mammuth hut)	G8, 5.05
14*	GrN-14034 (70)	23,850±330	24,160–23,500	C	Gravettian (floor mammuth hut, pit)	J5, 5.75
15**	GrN-15457 (86B)	24,400+2200–1700	26,600–22,700	C (sparce)	Aurignacian (anomalous, disturbed ; v. sample 37)	D5, 10.65
16	GX-9422 (17 A-C)	24,620±810	25,430–23,810	C	Gravettian	B7, 5.00
17**	OxA-1780 (67)	24,650±450	25,100–24,200	B	Gravettian (floor mammuth hut)	J8, 5.40
18	GX-9425 (23)	24,820±850	25,670–23,970	C	Gravettian (v. 7 same locus)	G7, 5.60
19*	GrN-14036 (74 A-D)	25,140±210	25,350–24,930	C	Gravettian (v. 21 same locus)	G4, 7.00
20**	GrN-14913 (47)	25,330±420	25,750–24,910	C	Gravettian	C4, 8.15
21**	GrN-15450 (75 A-C)	25,160±220	25,830–25,390	C	Gravettian (v. 19 same locus)	G4, 7.00
22**	GrN-15808 (71)	25,840±90	25,930–25,750	B	Gravettian	J7, 7.00
23**	GrN-15456 (83)	25,930±450	26,380–25,480	C	Gravettian (soliflucted)	A7, 10.10
24**	GrN-15449 (72)	26,100±800	26,900–25,300	C	Gravettian (CL under mammuth hut)	J5, 6.80
25**	GrN-15451 (79)	26,530±400	26,930–26,130	C	Gravettian (soliflucted ; v 35)	H3, 9.45
26	GX-9418 (9A)	26,700±1040	27,740–25,660	C	Gravettian (pendant)	B5, 7.10
27*	GrN-14035 (73)	26,750±600	27,350–26,150	C	Gravettian (figurine)	G5, 6.80
28*	GrN-14037 (78)	26,910±450	27,360–26,460	C	Gravettian (soliflucted)	H7, 8.75
29**	GrN-15453 (52–53)	27,100±1500	28,600–25,600	C	Gravettian (soliflucted)	C5, 8.70
30	GrN-12635 (32–35)	27,150±750	27,900–26,400	C	Gravettian	G1, 6.35
31**	GrN-14914 (50)	27,410±430	27,840–26,980	C	Gravettian (soliflucted)	B4, 8.70
32	GX-8723 (3)	⩾27,500 (1SD>33,000)	2 SD	C	Gravettian	B6, 5.00
33**	OxA-1778 (43)	27,500±600	28,100–26,900	B	Gravettian (soliflucted)	A2, 8.15
34	GrN-12636 (41–42)	28,910±480	29,390–28,430	C	Aurignacian	D4, 7.85
35**	GrN-15454 (80)	29,410±310	29,720–29,100	C	Aurignacian (*in situ* : v. 25)	H3, 9.45
36*	GrN-13007 (48)	30,000+6500–4300 (2SD>24,000)	1 SD	B	Aurignacian (intrusive?)	B6, 8.60
37**	OxA-1646 (86A)	31,100±900	32,000–30,200	C	Aurignacian (*in situ*)	D5, 10.65
38	GrN-12637 (49)	31,850±800	32,650–31,050	C	Aurignacian (*in situ*)	B4, 8.70

As a consequence, it may not be practical at Mitoc to utilize arbitrary horizontal planes, fixed on a 0.00 m surface datum, as a measuring point for approximate depths. Especially, in view of variable sloping gradients of ground surfaces and geoarchaeological deposits there. Precise depth measurements should be made of all finds with a theodolite, at least in my mind's eye.

Given the above outlined complexities of structural stratigraphy at Mitoc, absolute depths of some radiocarbon samples may not *always* be a clue to their respective ages. Unless, perhaps, they are in more *or* less close proximity to one another horizontally. Some are noted in Table II (assays 2 and 8, 9 and 14, 19 and 21). Relic solifluctional disturbances have also affected the accuracy of some in the southern eastern peripheries.

In some cases, anthropogenic disturbances may also play a decisive role in sample provience. Meant, of course, are intrusive ash, bone or other refuse pits dug from overlaying archaeological occupation surfaces. Such disturbances must be carefully noted and recorded in the field as individual samples are collected.

It seems likely that what has been said above, by extrapolation, can also be used in eventual interpretations of East Gravettian radiocarbon samples at this site.

A computer based 3-dimensional map would be desirable of all cultural levels and samples. Stratigraphic profiles of the all-important north and west walls (square J8 principal datum point 0.00 m) and sloping ground surface and geoarchaeological levels have not yet been worked out in detail. A preliminary draft, however, has been prepared by Chirica. The gradients of both profiles and the glaciofluvial alluvial unit capping the top of the last Gravettian level are carefully indicated but not yet the geoarchaeological levels themselves. It will soon be forthcoming.

The complete list of all 38 Mitoc—Malu Galben radiocarbon assays available by February 1989 is appended (Table II). A few more will become available later that year.

On the basis of the cumulative schedule of 38 radiocarbon dates retrieved over the years, the following cultural scenario now seems possible at Mitoc.

The local *East Aurignacian Technocomplex* in North Moldavia and Middle Prut Valley appears fully constituted by 32,000 and 29,000 BP (radiocarbon samples 38 to 34). The equivalent chronoclimatic marker horizon is the Arcy-Denekamp 1 oscillations, a period then, of 3,000 years.

The transition to the *East Gravettian Technocomplex* there can be placed at c. 27,500 BP (radiocarbon sample — 33). The chronoclimatic correlate is the later part of the Stillfried B-Denekamp 2 oscillations. Continuing Gravettian occupations there (samples 28 to 8), perhaps the main one, are dated to both the later part of the Stillfried B-Denekamp 2 and throughout the Tursac oscillations (27,000 through 22,000 BP). The last Gravettian occupation at Malu Galben is dated to 20,300 BP (sample 5). It is equivalent to the beginning of the Valdai Glacial Maximum.

The glaciofluvial alluvium mantling the top of the site is dated to 20,150 BP (sample 4). In sum, the total Gravettian occupations at Mitoc had a period of about 7,000 years to develop before its local extinction on the verge of the Valdai Maximum at 20,000 BP.

In conclusion, let a quote drawn from a recent publication of Mook and Waterbolk stand as a final rejoinder : " . . .a radiocarbon date will be of great help — not for dating the find itself, but for verifying archaeological conclusions derived from typology and stratigraphy" [8].

All samples were submitted for laboratory analyses by this author as a consultant in radiometric dating on the Mitoc project. They were collected in aluminium foil by myself and Chirica. Dr. Chirica is to be sincerely thanked for placing the samples at my disposal over the years.

Funding for sample processing became available when a series of stipends from Northern Illinois University were awarded the writer. A substantially larger grant was later given by the rgational Science Foundation, Washington, D.C. (grant number BNS-8703711). They are here Natefully acknowledged.

[8] W.G. Mook and H.T. Waterbolk, *Radiocarbon Dating*, Fundation, Strasbourg, 1985, p. 45. Handbooks for Archaeologistes, N. 3, European Science