Early modern humans from the Peştera Muierii, Baia de Fier, Romania

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Contributed by Erik Trinkaus, September 26, 2006 (sent for review September 4, 2006)

The early modern human remains from the Peştera Muierii, Romania have been directly dated to ≈30,000 radiocarbon years before present (≈30 ka ^{14}C BP) (≈35 ka cal BP) ("calendrical" age; based on CalPal 2005) and augment a small sample of securely dated, European, pre-28 ka ^{14}C BP (≈32.5 ka cal BP) modern human remains. The Muierii fossils exhibit a suite of derived modern human features, including reduced maxillae with pronounced canine fossae, a narrow nasal aperture, small superciliary arches, an arched parietal curve, zygomatic arch above the auditory porous, laterally bulbous mastoid processes, narrow mandibular corpus, reduced anterior dentition, ventral-to-bisulcate scapular axillary border, and planoconcave tibial and fibular diaphyseal surfaces. However, these traits co-occur with contextually archaic and/or Neandertal features, including a moderately low frontal arc, a large occipital bun, a high coronoid process and asymmetrical mandibular notch, a more medial mandibular notch crest to condylar position, and a narrow scapular glenoid fossa. As with other European early modern humans, the mosaic of modern human and archaic/Neandertal features, relative to their potential Middle Paleolithic ancestral populations, indicates considerable Neandertal/modern human admixture. Moreover, the narrow scapular glenoid fossa suggests habitual movements at variance with the associated projectile technology. The reproductive and scapulohumeral functional inferences emphasize the subtle natures of behavioral contrasts between Neandertals and these early modern Europeans.

cranium | Europe | Late Pleistocene | Neandertals | Upper Paleolithic

The paleontological analysis of modern human emergence in Europe has been shifting from considerations of the Neandertals to assessments of the biology and chronology of the earliest modern humans in western Eurasia. This focus has involved the paleontological reassessment of morphologically modern humans before ≈28,000 radiocarbon years before present (≈28 ka ^{14}C BP) (≈32.5 ka cal BP), with accumulating evidence that they present a variable mosaic of derived modern human, archaic human, and Neandertal features (1–6). This focus has concerned the chronological reassessment of these human remains, particularly through direct radiocarbon dating of human specimens. The results have assigned a number of specimens previously included in this sample to later periods of the Late Pleistocene or to the Holocene (6), but they have also secured the early ages for several key samples (2, 7, 8). These analyses, along with functional analyses of late Neandertals and the earliest European modern human remains (9, 10), have raised questions regarding the social, subsistence, and reproductive behavioral dynamics of Upper Paleolithic early modern humans as they dispersed westward across Europe, encountering indigenous Neandertal populations, eventually absorbing and/or replacing them by ≈30 ka ^{14}C BP (≈35 ka cal BP).

In the context of this work, we have reassessed one sample of modern human remains from Europe that should derive from this time period, the one from the Peştera Muierii, Romania. Although known since 1952, the Peştera Muierii remains have been poorly dated and largely ignored. They have the potential to shed light on several issues regarding early modern Europeans.

Peştera Muierii Human Remains

Discovery, Context, and History. The Peştera Muierii (Cave of the Old Woman) [also known as, Peştera Muierilor (Cave of the Old Women)], near Baia de Fier, Gorj County, Romania (45° 11′ N, 23° 46′ E), is a multichambered karstic system (Fig. 7, which is published as supporting information on the PNAS web site). The largest gallery, the Galeria Principală, is >70 m long and 5–10 m wide, with a smaller section, the Gura Peşterii, being the south cave entrance. Parallel to it is a narrower gallery at a lower elevation, Galeria Secundară toward the front of the system and the Galeria Musteriană deeper within. This lower chamber connects with the Galeria Principală at the front of the Galeria Secundară and at the back of the Galeria Musteriană. Additional galleries extend off of these main passageways and at their ends away from the modern entrance. The cave system has been known scientifically since the 1870s, but an initial sounding took place in the Galeria Principală only in 1929 (11). Subsequently, excavations in all three galleries were undertaken under the direction of C. S. Nicolăescu-Plopşor from 1951 to 1953 and in 1955 (12–14).

The Galeria Musteriană yielded a sequence with two levels of Middle Paleolithic separated by an archeologically sterile level. The excavation trench in the Galeria Principală yielded a stratigraphic sequence from a mixed Holocene (Eneolithic to Medieval) deposit underlain by an archeologically sterile level, followed by an Upper Paleolithic level, two Middle Paleolithic levels, and a multilayered geological sequence. The Pleistocene levels were rich in macromammal remains, both carnivores (i.e., *Ursus*, *Canis*, *Vulpes*, *Panthera*, *Hyaena*) and herbivores (i.e., *Cervus*, *Megaloceros*, *Saiga*, *Capra*, *Bos*, *Equus*) but especially the remains of Late Pleistocene cave bear (*Ursus spelaeus*).

In a surface depression at the back of the Galeria Musteriană, adjacent to its connection with the back of the Galeria Principală, in 1952 four human bones were found. Briefly described by Gheorghiu and Haas (15), the fossils have been frequently accepted as Late Pleistocene in age (e.g., refs. 14, 16, and 17). However, the largely complete neurocranial vault and facial skeleton is modern in its morphology (Fig. 1), leading to questions whether it was associated with the Middle Paleolithic in the Galeria Musteriană, was derived from the Holocene occupation, or was of an intermediate (Upper Paleolithic) age (17). This chronological uncertainty led Necrasov (18) to reject it as Pleistocene and hence to omit it from the standard inventory of Romanian fossil humans (19). As a result, the fossils have never been integrated into paleoanthropology (e.g., ref. 20).

Attention was refocused on these remains when Olariu and

Author contributions: A.S. and E.T. designed research; A.S., A.D., and E.T. performed research; E.T. analyzed data; and A.S., A.D., and E.T. wrote the paper.

The authors declare no conflict of interest.

Abbreviations: ka, thousands of years; BP, before present (1950).

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Fig. 1. Lateral view of the Muierii 1 cranium. Given limited contact through the frontozygomatic suture, the facial angle is approximate, and the largely complete frontal processes of the maxillae have been covered with filler to stabilize the reconstruction. (Scale bar: centimeters.)

colleagues (8) sampled three of the bones (mandible, tibia, and scapula) for radiocarbon dating in 2001. The mandible sample did not have sufficient collagen, but a combined sample from the scapula and the tibia provided an age of 30,150 ± 700 ^{14}C BP (LuA-5228) (8, 21) (Table 1). On the basis of this date, we reanalyzed of the Peştera Muierii human fossils.

The Peştera Muierii Human Remains. Six human skeletal elements are known from the Peştera Muierii, four from the Galeria Musteriană (cranium, mandible, scapula, and tibia) and two (temporal and fibula) of uncertain provenance. The bones from the Galeria Musteriană are taken to represent one individual, Muierii 1. The dimensions of the mandible and facial skeleton match, the maxillary and mandibular postcanine teeth are similar in size and degree of advanced attrition, and the scapula and tibia are modest in size and would conform to the probable female sex indicated by the external morphology of the cranium. The left temporal bone cannot be articulated with the Muierii 1 cranium because of postmortem damage, but its size and morphological comparisons to the more complete right side of Muierii 1 make it an unlikely portion of the same cranium; it is designated Muierii 2. The isolated fibular diaphysis cannot be associated with these bones although it could derive from either individual; it becomes Muierii 3.

Direct Dating of the Human Remains. To confirm and refine the ages of the Peştera Muierii human fossils and to assess the ages of Muierii 2 and 3, in 2005 we sampled four of the bones for accelerator mass spectrometry (AMS) ^{14}C dating. All samples were pretreated by using ultrafiltration (22), thereby screening the extracted collagen by molecular weight to reduce potential contamination. Even though smaller samples increase the risk of dating failure, bone samples were kept small to minimize paleontological damage and restricted to broken and/or morphologically less important portions of the bones: the left zygomatic orbital process for the cranium, the mesial lingual corpus for the

Table 1. Radiocarbon results for the human and faunal remains from the Peştera Muierii, Baia de Fier, Romania

Specimen	LuA-5228 Muierii 1 (scapula and tibia)	OxA-15529 Muierii 1 (cranium)	OxA-16252 Muierii 2 (temporal)	OxA-15554 *M. giganteus* molar (−0.9 m)	OxA-15530 *U. spelaeus* metapodial (−1.1/−1.2 m)
Radiocarbon age (^{14}C years BP)	30,150 ± 800	29,930 ± 170	29,110 ± 190	30,060 ± 280	40,850 ± 450
"Calendrical" age (cal years BP, based on CalPal 2005)	35,150 ± 908	35,257 ± 259	34,342 ± 457	35,367 ± 318	44,466 ± 677
δ^{13}C	−20.0	−19.3	−19.3	−19.9	−20.3
C:N	–	3.4	3.3	3.5	3.3
Sample weight	437	420	240	520	640
Collagen weight (ultrafiltered gelatin yield)	–	56.0	26.8	13.1	52.2
Burnweight (gelatin combusted for graphitization)	–	6.0	5.4	5.6	5.3
%C (% carbon on combustion)	–	41.5%	41.7%	46.9%	43.4%
%N (% nitrogen on combustion)	–	13.3%	14.9%	16.1%	15.1%

LuA-5228 data are from Olariu *et al*. (8) and A. Olariu (personal communication). All weights are in milligrams. CalPal 2005: www.calpal.de.

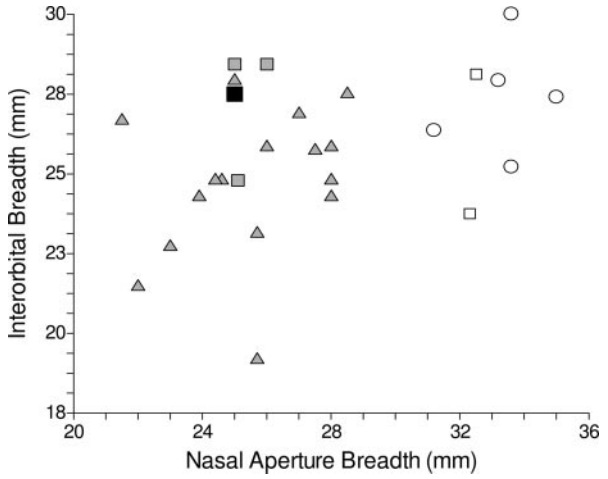

Fig. 2. Bivariate plot of interorbital breadth versus nasal aperture breadth. Open circles, Neandertals; open squares, ''African'' early modern humans; gray triangles, middle Upper Paleolithic Europeans; gray squares, early Upper Paleolithic Europeans; black square, Muierii 1.

mandible, the distal fibular shaft break, and the squamous edge of the temporal bone.

The mandibular and fibular pieces failed because of insufficient collagen, but the cranium and temporal bone provided reliable results (Table 1). The δ^{13}C values for the Muierii 1 cranium and the Muierii 2 temporal bone of −19.3 and −19.3 fall in the middle of acceptable range for bone, and their C:N ratios of 3.4 and 3.3 are within the range of 2.9 to 3.5 for well-preserved bone (23). The percent collagen weights of 13.3% and 11.2% are excellent for Pleistocene bone, and the collagen and nitrogen yields from the burnweights are acceptable.

The resultant dates of 29,930 ± 170 and 29,110 ± 190 ^{14}C BP are close to each other and statistically the same as the original scapula/tibia date, especially if the ''calendrical'' ages are used (Table 1). The bones therefore probably derive from a single occupation phase of the cave. The similar dates on the cranium and the postcrania support the inference that they derive from one individual. The date on Muierii 2 is only slightly younger than those for Muierii 1.

These data place the Peştera Muierii human remains within the early Upper Paleolithic of southeastern Europe, >28 ka ^{14}C BP, and close in age to the neurocranium from the Peştera Cioclovina, Romania at ≈29 ka ^{14}C BP (8) and to the large sample of early modern humans from Mladeč, Czech Republic at ≈31 ka ^{14}C BP (7). They postdate the mandible and cranium from the Peştera cu Oase, Romania at ≈35 ka ^{14}C BP (2, 24); they probably postdate the isolated remains with associated archeological dates from the Aurignacian levels of La Quina Aval and Brassempouy, but they may be slightly older than the Aurignacian associated sample from Les Rois, France (1, 25–27).

These dates make the human material later than the underlying Middle Paleolithic levels in the Galeria Musteriană, which yielded a conventional ^{14}C date of 42,560 +1,310/−1,120 ^{14}C BP (GrN-16977). It was unclear whether the human remains were contemporaneous with the Upper Paleolithic level in the adjacent Galeria Principală. To assess this association, a cervid (*Megaloceros giganteus*) molar from −0.9 m in the Galeria Principală, close to the interface between the Middle and Upper Paleolithic levels, was dated and yielded a similar ^{14}C age (Table 1). A *U. spelaeus* metapodial from within the Middle Paleolithic levels of the Galeria Principală (−1.1 to −1.2 m) provided a substantially older age (Table 1). These bones are probably not anthropogenic in origin and can only be stratigraphically associated with the archeological technocomplexes given limited data from the original excavations.

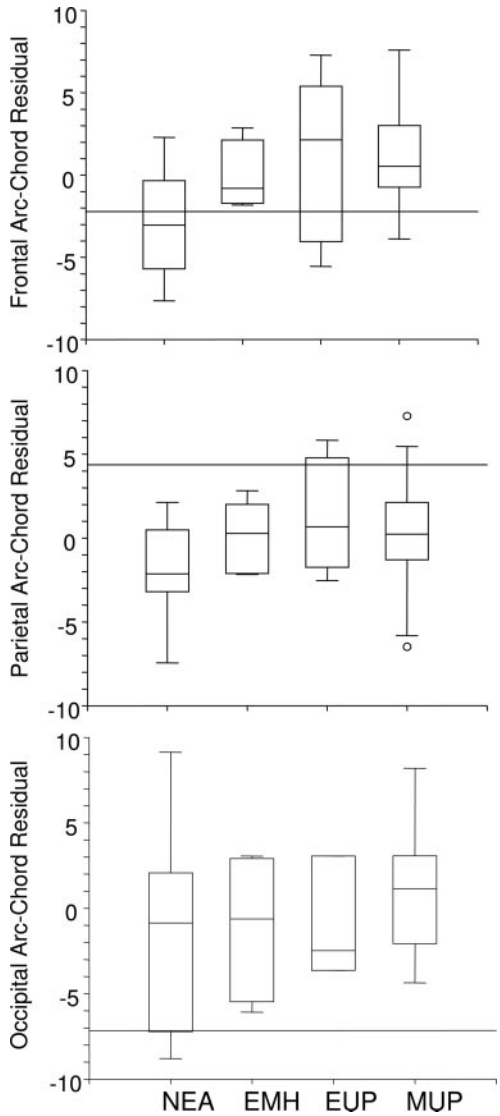

Fig. 3. Histograms of the linear residuals from the least squares regressions through the pooled comparative samples for mid-sagittal arc versus chord for the frontal (r^2 = 0.829; n = 44), parietal (r^2 = 0.888; n = 51), and occipital (r^2 = 0.530; n = 36) bones. The horizontal lines represent the Muierii 1 residual values. ANOVA P values across the comparative samples are 0.006, 0.093, and 0.484, respectively.

The technotypological features of the Upper Paleolithic assemblage from the Galeria Principală are consistent with the late Aurignacian age obtained for the associated *M. giganteus* molar (14, 28–30). The lithic assemblage consists of only 60 pieces, including 37 blades (entire or fragmentary; some retouched), 2 bladelets, 3 end scrapers, 2 burins, 2 raclettes, 3 side scrapers, 2 cores, 4 flakes, and 5 debris. In addition, there are three bone points, only one of which was found in the Galeria Principală (the others are from the Galeria Secundară and the Gura Peşterii). This early Upper Paleolithic assemblage therefore probably represents an evolved Aurignacian cultural context for the human bones from the cave.

Morphology of the Muierii Human Remains. The morphology of the Muierii fossils is compared with four Late Pleistocene samples: Middle Paleolithic Neandertals; Middle Paleolithic ancestral ''African'' early modern humans (Aduma, Bouri, Herto, Omo-

Table 2. Comparative cranial and dental trait frequencies and measurements

Sample	Suprainiac fossa	Occipital bun	$I^2 + C / M^1 + M^2$	$C / M^1 + M^2$
Muierii 1	Absent	Present	65.5	71.4
Neandertals	90.5%(21)	87.5%(16)	74.3 ± 2.1 (9)	79.5 ± 2.0 (13)
"African" EMH	0.0%(11)	0.0%(11)	70.6 ± 5.0 (6)	78.7 ± 7.8 (6)
Europe EUP	20.0% (5)	50.0% (6)	–	78.4
Europe MUP	4.2%(24)	37.0%(27)	65.8 ± 4.9 (13)	74.0 ± 6.0 (18)
P value	<0.001	<0.001	<0.001	0.018

Suprainiac fossa, percentage providing the full complex of horizontal oval fossa, absence of an external occipital presence, and median nuchal torus. Occipital bun, percentage with a clearly projecting occipital bun. Dental comparisons, ratio of anterior to molar dental buccolingual crown diameters (as a percentage). Sample sizes are in parentheses. *P* values, comparisons across the three primary reference samples; exact Kruskal–Wallis tests for discrete data (35), ANOVA for dental data. EMH, early modern humans; EUP, early Upper Paleolithic; MUP, middle Upper Paleolithic.

Kibish, Qafzeh, and Skhul), middle Upper Paleolithic (≈28 ka to ≈20 ka ^{14}C BP) European modern humans, and early Upper Paleolithic (>28 ka ^{14}C BP) European modern humans (primarily from Cioclovina, Mladeč, and Oase). The first two samples represent potential ancestral lineages, the third sample the probable descendant lineage, and the fourth sample the approximately contemporaneous European modern humans.

The superciliary arches of Muierii 1 are small, minimally projecting above only the medial orbit, and separated from the orbital margins and the lateral trigones (Fig. 1). There are deep canine fossae delineated from the adjacent infraorbital surfaces, and there are deep notches inferolaterally of the zygomaxillary regions (Fig. 8, which is published as supporting information on the PNAS web site). The anterior zygomatic roots are above the M^1s, and the zygomatic bones angle sharply from a coronally oriented infraorbital plane. The nasal floor is level with the inferior aperture margin; the lateral crests remain separate from the turbinal crests, but damage to the anterior nasal spine precludes determining whether the turbinal and spinal crests were fully fused [category 3 or 6 of Franciscus (31)] (Fig. 8), patterns variably present in the European and earlier "African" modern humans but absent from Late Pleistocene Neandertals (31, 32). Its nasal aperture breadth is modest, similar to those of other Upper Paleolithic (but not Middle Paleolithic) humans (Fig. 2). Yet, Muierii 1 has an absolutely and relatively large interorbital breadth, clustering with Mladeč 2, Oase 2, and the more recent Předmostí 9 (Fig. 2).

The neurocranial vault is high and rounded, with a strongly curved parietal arc (Fig. 1). However, similar to Cioclovina 1 and Oase 2 but not the Mladeč crania, the frontal curvature is along the flatter margins of the earliest modern human and middle Upper Paleolithic samples and well within the Neandertal range of variation (Fig. 3). This pattern holds even though these early Upper Paleolithic crania lack supraorbital tori. The Muierii 1 parietal arc is among the most curved of these samples, exceeded only by Mladeč 2 and Oase 2 and two more recent crania.

The occipital bone of Muierii 1 has a markedly projecting occipital bun (Fig. 1), a product of differential cerebral and neurocranial developmental rates during infancy (33). Although small buns occur in most later Pleistocene and recent human samples, they are absent from the "African" early modern human sample, present in most Neandertals, and occur in three of the other six early Upper Paleolithic European crania (Table 2). Large buns [as opposed to small "hemi-buns" (34)] are common in subsequent European samples. Despite its occipital bun, Muierii 1 has an overall relatively flat occipital bone (Fig. 3), a product of its long and flat nuchal plane.

The Muierii 1 occipital bone lacks an external occipital protuberance, has a unilaterally raised superior nuchal line region but not a true nuchal torus, and exhibits a shallow transverse fossa 21 mm wide above inion. The clear combination of a transversely oval suprainiac fossa with a median nuchal torus and no protuberance is found in all Neandertals except two southwestern Asian ones

Fig. 4. Lateral view of the Muierii 2 left temporal bone. (Scale bar: millimeters/centimeters.)

Fig. 5. Medial view of the Muierii 1 mandibular lateral corpus and ramus. (Scale bar: millimeters/centimeters.)

Table 3. Metric comparisons of mandible corpus thickness and scapula glenoid fossa relative breadth

Sample	Mandible corpus breadth at mental foramen, mm	Scapula right glenoid index
Muierii 1	11.6	62.7
Neandertals	15.7 ± 1.8 (23)	66.8 ± 6.9 (4)
"African" EMH	13.2,15.0,16.6	–
Europe EUP	12.2	–
Europe MUP	12.0 ± 1.6 (11)	73.1 ± 5.3 (16)
P value	<0.001	0.058

ANOVA or *t* test *P* values across the three or two reference samples. Abbreviations are as in Table 2.

(Table 2). It is present in Cioclovina 1, but rare to absent in the other early modern human samples. Muierii 1 is best characterized as lacking this complex of features, but incipient aspects of it are evident on the otherwise gracile occipital bone.

The Muierii 2 temporal bone (Fig. 4) is modern in its morphology. The straight zygomatic process is above the porous. The ovoid porous is anterosuperiorly to posteromedially oriented. There is no thickening of the lateral tympanic bone. The large mastoid process (height to porion ≈28.5 mm) is tapering, laterally bulbous, and lacks an anterior mastoid tubercle. The temporal juxtamastoid eminence consists of three small ridges along the occipitomastoid suture.

The Muierii 1 mandible (from the right C_1 alveolus to the condyle) (Fig. 5 and Fig. 9, which is published as supporting information on the PNAS web site) is lightly built, as indicated by its corpus breadth below all Middle Paleolithic values (Table 3). Its mental foramen position at the P_4M_1 level is intermediate between Neandertal and modern human samples, but mesial of those of half of the Neandertals (Table 4). It lacks a retromolar space, mandibular foramen bridging, or a pronounced superior medial pterygoid tubercle, all features that occur in higher frequencies among the Neandertals. However, its mandibular notch crest meets the anterior condyle in the lateral half of the middle third of the condyle (Fig. 9), a position distinct from the lateral crest position of all early modern humans and approaching the middle crest position of some Neandertals. Moreover, even though mandibular coronoid and notch shape is variable among Holocene humans, all earlier modern humans have coronoid processes near the condylar level and symmetrical mandibular notches, whereas about three-quarters of the Neandertals have high coronoid processes and asymmetrical notches with the lowest point in the posterior third of the notch. Muierii 1 has the Neandertal pattern.

The heavily worn Muierii 1 dentition provides little discrete trait detail (Fig. 10, which is published as supporting information on the PNAS web site). The I^2 has the remains of marginal ridges but no evidence of a lingual tubercle, indicating some shoveling but not the full Neandertal pattern (36). The C^1 is featureless,

Fig. 6. Lateral view of the Muierii 1 right scapula, taken in the plane of the glenoid fossa. Dorsal is left. The minor restoration of the ventral glenoid margin is based on both the glenoid margin contours and the underlying bone of the ventral surface; the estimation error should be <0.5 mm. (Scale bar: millimeters/centimeters.)

and the subrectangular M^1s seem to lack the metacone reduction and hypocone expansion characteristic of most Neandertal M^1s (37). The M^2s seem to have had some hypocone reduction, and the right M^3 is a peg tooth, such as are occasionally seen among Neandertals and middle Upper Paleolithic modern humans (38, 39). There is little of note on the two mandibular molars. It is possible to compare maxillary anterior to posterior buccolingual crown diameters (Table 2), in which the Neandertals have proportionately larger anterior teeth than do at least the middle Upper Paleolithic humans, a pattern more evident in their mandibular dentitions (40). This pattern is apparent in the I^2 and C^1 to molar comparison, but less evident in the C^1 to molar comparison. However, the latter comparison permits the inclusion of Mladeč 8, which has a relatively large C^1. Muierii 1 is aligned with the more recent Upper Paleolithic humans.

The axillary border of the Muierii 1 right scapula (Fig. 6) has an overall cross-sectional shape that conforms with the ventral sulcus pattern, but the lateral crest is in a mid-lateral position. It is intermediate between the strictly ventral and bisulcate patterns. It falls within recent and early modern human ranges of variation and separate from the Neandertals (41). It lacks the

Table 4. Comparisons of mandibular discrete traits, with the dominant Neandertal pattern as the character state

Sample	Mental foramen distal of P_4	Mental foramen distal of P_4M_1	Retromolar space presence	Mandibular notch asymmetry	Mandibular foramen bridging	Condylar crest position	Medial pterygoid tubercle
Muierii 1	Present	Absent	Absent	Present	Absent	Present	Absent
Neandertals	92.6% (27)	51.9% (27)	75.0% (28)	71.4% (14)	40.0% (22)	37.5% (16)	81.3% (16)
"African" EMH	42.9% (7)	14.3% (7)	42.9% (7)	0.0% (4)	0.0% (5)	0.0% (2)	0.0% (6)
Europe EUP (1)	Absent	Absent	Absent	Absent	Abs/Pres	Absent	Absent
Europe MUP	18.0% (25)	7.0% (27)	19.6% (23)	0.0% (17)	11.1% (18)	0.0% (17)	10.0% (10)
P value	<0.001	<0.001	<0.001	<0.001	0.008	0.005	<0.001

The early Upper Paleolithic specimen is Oase 1. Sample sizes are in parentheses. *P* values from exact Kruskal–Wallis tests (35). Abbreviations are as in Table 2.

Neandertal dorsal sulcus pattern, which nonetheless occurs in 25% ($n = 24$) of middle Upper Paleolithic humans.

Its glenoid fossa is relatively narrow (Table 3), with a breadth/height index below the lowest early modern human specimen (Barma Grande 2: 65.0) and among the Neandertals. Sufficiently intact glenoid fossae are not available for the earliest modern humans, but narrow glenoid fossae seem to be characteristic of archaic *Homo* generally (41). It has been argued (42) that relatively narrow glenoid fossae would limit the degree to which the glenohumeral joint could be loaded in the extremes of medial and lateral rotation, positions used mostly in projectile throwing. If this interpretation is accurate, the Muierii 1 glenoid proportions would suggest less of this behavior than the bone points from Peştera Muierii would indicate (43).

There is little of note on the Muierii 1 tibia and the Muierii 3 fibula. Their multiple, if shallow, sulci place them closer to early modern human patterns than to the planoconvex surfaces seen in most Neandertal distal leg diaphyses.

Discussion and Conclusion

The ≈30 ka ^{14}C BP human remains from the Peştera Muierii therefore present a basically modern human derived morphological pattern, which is evident in discrete traits and metric aspects throughout the sample. It therefore joins the sample of human remains from the sites of Peştera cu Oase and Peştera Cioclovina in southeastern Europe, Mladeč in central Europe, and Brassempouy, La Quina Aval, and Les Rois in western Europe in filling out the morphological pattern of the earliest of modern humans in Europe.

Yet, as with many of these other early Upper Paleolithic modern Europeans (1–6), the Muierii fossils exhibit a number of archaic and/or Neandertal features, when taken in the context of Late Pleistocene Europe and potential ancestral populations. These include the large interorbital breadth, the relatively flat frontal arc, the prominent occipital bun, the mandibular notch shape and coronoid height, the relative notch crest to condylar position, and the scapular glenoid breadth. These data reinforce the mosaic nature of these early modern Europeans and the complex dynamics of human reproductive patterns when modern humans dispersed westward across Europe. Strict population replacement of the Neandertals is no longer tenable.

The early Upper Paleolithic human remains from the Peştera Muierii provide a further window on the biology and behavior of the earliest modern humans in Europe. The cranial and postcranial remains provide a morphological mosaic indicating the prior blending of regional late archaic human populations with those of in-dispersing modern humans. The behavioral contrasts between the groups must therefore have been modest, and this inference is reinforced by the functional implications of the Muierii 1 scapula.

We thank A. Olariu for providing details on the initial dating of the Muierii human remains and R. G. Franciscus, K. R. Rosenberg, and J. Zilhão for providing helpful comments on the paper. The analysis of the Muierii human remains was made possible by I. Povara and C. Petrea (Bucharest, Romania) and by M. Fifor, F. Ridiche, and A. Popescu (Craiova, Romania) and was funded by National Science Foundation Grant BCS-0509072 and Wenner-Gren Foundation Grant 7290.

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