Renewed paleontological investigations in the Olteţ River Valley of Romania and the new paleontological locality of Râpa

Claire E. Terhune[1], Sabrina Curran[2], Alexandru Petculescu[3], Chris A. Robinson [4], Marius Robu[3], Emil Stiuca[3]

[1]Dept of Community and Family Medicine, Duke University School of Medicine, Durham NC; [2]Cleveland Museum of Natural History, Cleveland OH; [3]Dept of Geospeleology and Paleontology, "Emil Racovita" Institute of Speleology, Bucharest, Romania; [4]Dept of Biology, Bronx Community College, City University of New York, Bronx NY

ABSTRACT

Present evidence suggests that neither current intrinsic nor extrinsic hypotheses can fully explain the initial hominin dispersal out of Africa in the early Pleistocene, although paleoenvironmental data suggest this dispersal may have been facilitated by climatic changes. Though the earliest hominins outside of Africa appear at Dmanisi, Georgia at ~1.85 Ma, well dated European hominins have not been recovered before ~1.2 Ma (Sima del Elefante, Spain). Is this a true absence, perhaps due to ecological restrictions, or have hominins not yet been found in earlier European deposits?

In seeking to address these questions, we review existing data for early Pleistocene Romania and report the results of an initial survey of the Olteţ River Valley of Romania. This valley is the location of the richly fossiliferous early Pleistocene site of Grăunceanu. Fossils recovered at this site include the fossil papionin *Paradolichopithecus arvernensis*, which has been reconstructed as highly terrestrial and may have inhabited a niche similar to that of *Australopithecus*. Mode 1 stone tools have also been reported from this area, though their validity is questionable. Interpretation of both paleontological and archaeological remains from this region is hindered by lost excavation records and poor dating. Our preliminary surveys identified a new site (Râpa) containing *in situ* fossils, including a partial mammoth skeleton. These remains, in addition to the development of new stratigraphic profile, allow us to document the context of fossil deposition in this valley, through which we will assess whether hominin dispersal through this region during the early Pleistocene would have been possible.

HOMININ DISPERSAL OUT OF AFRICA

- Theories for how and why hominins initially dispersed out of Africa typically fall into two categories:

Intrinsic hypotheses suggest hominin dispersal was facilitated by:	Extrinsic hypotheses suggest hominin dispersal was related to:
New tool technologies ✗	Normal mammalian dispersals ✗
Increased meat consumption ✗	Hominins following predators ✗
Increased body size ✗	Hominins following prey species ✗
Increased brain size ✗	Demographic pressure
Human-like intermembral index	Escape from disease
Flexible behavior	Environmental pressure

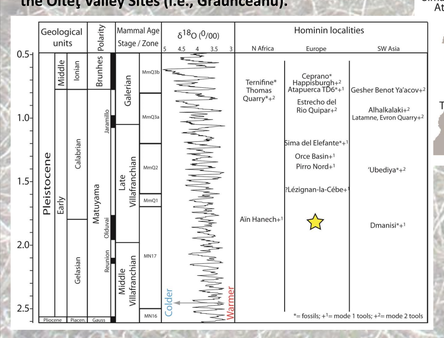
✗ Not supported by Dmanisi

- Many of these intrinsic and extrinsic hypotheses are unsupported by evidence from Dmanisi (e.g., Tappen 2009).
- At present, the best evidence is that climate fluctuations were a major influence on hominin dispersals out of Africa. Paleoclimatological studies demonstrate substantial changes during the early Pleistocene (e.g., Vrba 1995; Behrensmeyer et al. 1997) with an expansion of more open grassland biomes into Eurasia (e.g., Cerling 1991; deMenocal & Bloemendal 1995; Dennell & Roebroeks 2005).
- One outstanding possible intrinsic hypothesis that is not refuted by data from Dmanisi is that hominin dispersals were facilitated by increased behavioral flexibility (Potts 2012), which would have allowed hominins to exploit many types of habitats.

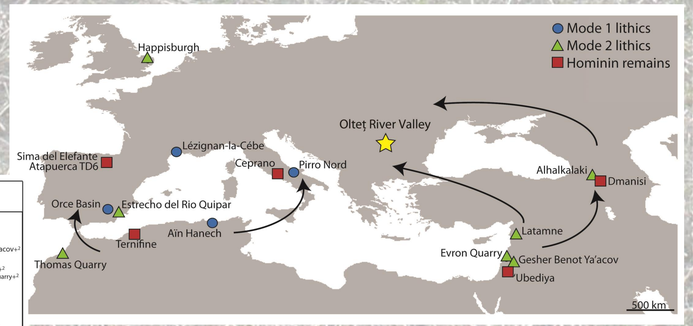
HOMININ DISPERSAL INTO EUROPE

- The earliest well-dated European hominin site (Sima del Elefante, Spain) is over 600 thousand years younger than Dmanisi (Carbonell et al. 2008).
- Were there geographic or environmental barriers that prevented or delayed hominin dispersal into Western Europe during the early Pleistocene?
  - One suggestion is that particular European carnivore species outcompeted hominins for resources (Turner 1992, 1999).
  - Another possibility is that there were some ecologies to which hominins were unable to adapt (e.g., because of the lack of specific prey species or plant food items).

Further data describing the range of habitats present in Eurasia during the early Pleistocene are necessary to fully evaluate the validity of these hypotheses. In particular, well-documented datasets from Eastern Europe, which likely served as a dispersal corridor into and out of Europe during the early Pleistocene, are critical. Only by further documenting paleoecological similarities or differences (e.g., habitat availability, carnivore guild composition, prey species) between sites in Eastern Europe and known hominin localities can we provide direct support for or against the hypothesis that these factors were important for preventing hominin dispersal into Europe.



Below: Chart showing geological units, polarity, land mammal ages, oxygen isotope data, and major hominin (or stone tool) localities in North Africa and Eurasia. Star indicates the approximate time frame represented by the Olteţ Valley Sites (i.e., Grăunceanu).



Above: Map showing hominin localities in Europe, Southwest Asia, and North Africa during the early Pleistocene. Arrows indicate hypothesized dispersal routes into Europe. Star indicates the Olteţ River Valley sites.

THE OLTEŢ RIVER VALLEY

An especially promising paleontological research area in Eastern Europe is situated in the Olteţ River Valley of Romania. Exploration in the 1960s identified multiple fossiliferous localities, several of which remain some of the most fossiliferous sites from this time period in Eastern Europe.

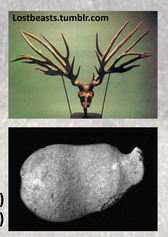
Photographs of the original Grăunceanu excavations

Map of the Olteţ River Valley project area showing fossil sites ©Google Earth

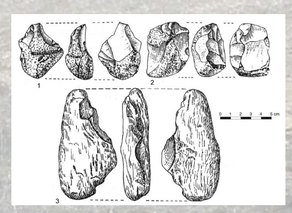
GRĂUNCEANU

- Late Villafranchian [MN17/MNQ1] (~2.0-1.8 Ma)
- Reconstructed as open habitat with some tree cover situated near a river
- Faunal assemblage and reconstruction similar to that for Dmanisi
- Best known for containing ***Paradolichopithecus arvernensis***
  - Baboon-like primate that inhabited Eurasia during the Villafranchian (~3.5-1.1 Ma)
  - Dental wear patterns of *P. arvernensis* converge with *Australopithecus africanus*
  - Post-crania and large body size suggest *P. arvernensis* was highly terrestrial
- Calcaneal morphology of ***Eucladoceros*** suggest Grăunceanu cervids were adapted to open conditions; pedal morphology indicates adaptation to hard, dry ground with topographic relief (Curran 2009)
  - Data suggest using cervids as indicators of closed habitats may not be valid. The widespread occurrence of *Eucladoceros* across Eurasia during the early Pleistocene indicates open conditions at the time of hominin dispersals out of Africa

P. arvernensis



***Eucladoceros* cranium (top) and proximal femur (bottom)**



Suggested Mode I stone tools recovered from the Olteţ River Valley in the 1960s (figure from Dobos 2008).

ARCHAEOLOGICAL REMAINS

No hominin remains have been identified from the early Pleistocene of Romania, but researchers in the 1960s reported finding Mode I stone tools in the Olteţ Valley.

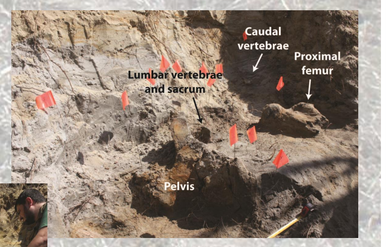
- Poor excavation records and doubts regarding the anthropogenic origin of these materials make the existence of a Lower Paleolithic record in Romania questionable

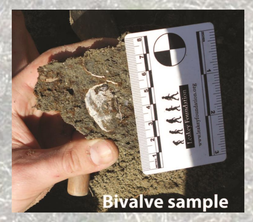
RECENT INVESTIGATIONS

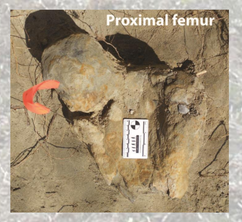
- The original excavations at Grăunceanu were halted when no fossils remained, and testing conducted in 2004 by a joint Romanian/American team recovered no specimens (McNulty pers. comm)
- As many as 15 smaller localities in the region have also yielded fossils. Unfortunately, the locations of many of these sites are currently unknown
- We undertook a preliminary survey of the region in March 2012 and successfully relocated two known localities- Grăunceanu and La Pietris- and identified a previously unknown site (Râpa) that yielded *in situ* fossils

RÂPA

- *In situ* fossil remains of a turtle and juvenile mammoth
- Mammoth specimens included a partial pelvis, femur, and multiple vertebrae; many elements are still in articulation
- Preliminary stratigraphic analysis suggests an alluvial/deltaic sequence similar to that described for Grăunceanu

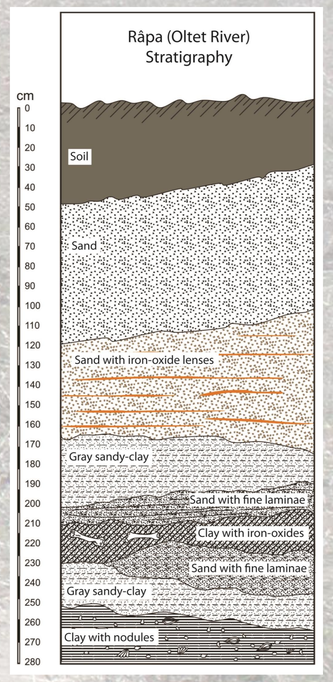






Above: Photograph of the March 2012 excavations (orange flags indicate locations of all fossils)

Left: Photo of the mammoth horizon (indicated by the orange flags and pelvis) in relation to the bivalve layer



FUTURE WORK

Additional data describing paleoecological conditions in early Pleistocene Eastern Europe are necessary to fully evaluate existing theories of hominin dispersal(s) into Europe. To that end, future work will include:

1. Museum analyses of existing fossils from the Olteţ River Valley, which will help build profiles of fauna from Eastern Europe during the early Pleistocene
2. Contextualization of the formerly richly fossiliferous sites of La Pietris and Grăunceanu, which allows us to spatially and temporally link these sites with the stratigraphic framework for Râpa and develop a picture of paleoclimatological conditions in the Olteţ Valley during the early Pleistocene
3. Continued excavations at Râpa, which will recover additional faunal remains that can be evaluated taphonomically; and
4. Ongoing paleontological survey of the Olteţ Valley, which will identify new fossil-bearing localities and relocate previously identified sites

Preliminary evidence suggests paleoenvironmental conditions in the Olteţ River Valley were similar to conditions at early hominin sites such as Dmanisi. If no convincing evidence of hominins can be recovered from the Olteţ Valley this would suggest the need for more refined analyses of the fossils from these sites. It will be important to compare the specific taxa found at these sites to those from sites where hominins have been recovered to explore whether particular predator or prey species or possibly particular flora are missing from these localities, making hominin dispersal throughout the region difficult.

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