

The Atapuerca (Spain) fossil sites: potential, progress and questions

EMILIANO AGUIRRE

Museo Nacional de Ciencias Naturales - CSIC, José Gutierrez Abascal, 2, E-28006 Madrid, Spain
mcntm616@mncn.csic.es

The Sierra de Atapuerca (Burgos, Spain) possesses numerous present and ancient caves. Cueva Mayor includes a deep shaft, Sima de los Huesos (SH), which has yielded abundant human fossils. A dismantled railway cut (Trinchera) has exposed three sections, Gran Dolina (GD, TD), Trinchera Galeria (TG) and Sima del Elefante (TE), which are between 13 and 20 m thick and filled with stratified fossiliferous deposits.

The upper GD layers (late TD8 to TD11 beds) reveal three major and several minor climate oscillations (HOYOS & AGUIRRE 1995). They have yielded mammal remains, the age of which can be correlated with Arago, Bilzingsleben, Swanscombe and Malagrotta (AGUIRRE 1995; MADE 2001). They have been dated at 300-400 ka B.P. (FALGUÉRES et al. 2001) and contain lithic assemblages transitional from Mode 2 to Mode 3 (CARBONELL et al. 1998), together with evidence of the permanent occupation of a shelter following the collapse of the roof. A hiatus, lacking materials from outside, occurs in the middle of the TD8 unit.

The lower GD units (TD2 to lower TD8) include the period beginning with an early lateral opening of the deep cavity and ending with its closure, which represents four to five major, and several minor, thermal fluctuations (HOYOS & AGUIRRE 1995). A date of ca. 600 ka B.P. has been obtained from lower TD8 and ca. 800 ka B.P. from TD6 (FALGUÉRES et al. 2001). The M/B magnetic reversal occurs in TD7, whilst the basal TD2 unit is younger than the Jaramillo (PARÉS & PÉREZ-GONZÁLEZ 1999). There is a succession of mammal assemblages from TD3 upwards similar to Untermaßfeld, Vallonnet, Solihac (AGUIRRE 1995; MADE 2001), Huéscar and Nagyharsány-hegy, indicating the sequence represents the transition from lower to upper Biharian (SESÉ & GIL 1987; CUENCA et al. 2001). Mode 1 lithic

artefacts occur in the upper part of unit TD4, concurrent with indications of butchery at the cave entrance and the trapping of animals at the vertical wall under the portal (ROSELL 1998). Evolved Mode 1 occurs throughout unit TD6. There is also evidence of occupation, tool-making, meat consumption and cannibalism in the upper part of this unit – “Aurora” Bed (DÍEZ et al. 1999; FERNÁNDEZ-JALVO et al. 1999). More than 80 human fossils represent an Eurasian deme, the descent of the earliest occupants of this area and related to later Zhoukoudian and Dali (AGUIRRE 2000a). These were classified as *Homo antecessor* (BERMÚDEZ DE CASTRO et al. 1997) and tentatively presented as the last common ancestor of Neanderthals and modern humans.

The long record from GD also includes insectivores (SESÉ & GIL 1987), chiropterans (SEVILLA 1988), birds (either as fossils or by taphonomic inference and as ecological indicators: FERNÁNDEZ-JALVO 1998; SÁNCHEZ-MARCO 1999), fishes, amphibians and reptiles (SANCHIZ 1987). Mammal communities are comparatively well studied (RODRÍGUEZ 2001). Changes in the precipitation regime can be inferred from the sedimentary evidence (HOYOS & AGUIRRE 1995).

The upper and middle units from the TG site contain a speleothem dated at around 200 ka B.P. (FALGUÉRES et al. 2001), which overlies a sterile period of cold and arid climate. Below this is a sequence with more than ten fertile horizons, which include evidence of large mammals that have fallen into a pit and of canids, some of which have been anthropogenically modified, together with evolved Mode 2 artefacts. This lower unit has been dated at over 400 ka B.P. and has yielded evidence of temporary occupation (through a former, now blocked, entrance) in association with Mode 2 artefacts. Two human fossils have been found in the middle TG beds (CARBONELL et al. 1999).

The SH site at Cueva Mayor was full of the bones of *Ursus deningeri* and other carnivores, which overlay thousands of human fossils compressed into a narrow clayish mass. Their abundance allowed palaeoepidemiological (PÉREZ & GRACIA 1998) and palaeodemographic (BERMÚDEZ DE CASTRO & NICOLÁS 1997) studies. Interpretation of this case has been affected by the way in which the site formed. The only scenario consistent with all the evidence is that a single group were trapped by a landslide when seeking refuge inside a cave during heavy rain. Thereafter, scavengers may have entered and finally the corpses were transported into the deep SH shaft by mudflows (AGUIRRE 2000b). Subsequent collapse moved the mass still further downwards, to below a broken speleothem that has been dated to more than 350 ka B.P. In other words, a stratigraphic inversion

must have taken place, since the human bones are dated at ca. 320 ka B.P. (FALGUÉRES et al. 2001). The SH population has been attributed to *Homo heidelbergensis*, as ancestors of the Neanderthals (ARSUAGA et al. 1998). They most likely originated in the African Bodo deme (AGUIRRE 2000a).

The Sima del Elefante cut continues to be excavated and remains full of promise. The archaeological evidence at its bottom is approaching 1 Ma B.P., whilst the fauna, tools and hearths from its upper part represent the period up to OIS 5. The portals of two current caves that contain protohistorical remains are also excavated and Palaeolithic to Bronze Age sites from different environments throughout the Sierra are being surveyed (NAVAZO RUIZ 2002). The wealth of material will provide work for generations of researchers.

- AGUIRRE, E. (1995): Registro faunístico pleistoceno antiguo de Atapuerca. Old Pleistocene faunal record of Atapuerca (Burgos). – *Trabaj. Prehist.*, **52** 2: 47-60; Madrid.
- AGUIRRE, E. (2000a): Evolución humana. Debates actuales y vías abiertas. – 170 pp.; Madrid (Real Academia de Ciencias Exactas, Físicas y Naturales).
- AGUIRRE, E. (2000b): Sima de los Huesos. Escenarios de la formación del yacimiento, crítica y sesgo demográfico. In: L. CARO DOBÓN, H. RODRÍGUEZ OTERO et al. (eds.), *Tendencias actuales de Investigación en la Antropología Física española.*: 31-42; Leon (Universidad de León).
- AGUIRRE, E. (2002): Human fossils. In: W. GIBBONS & T. MORENO (eds.), *The Geology of Spain.*: 358-366; London (The Geological Society).
- ARSUAGA, J.L., LORENZO, C., GRACIA, A. & MARTÍNEZ, J. (1998): Los fósiles humanos de la Sima de los Huesos (Sima de Atapuerca): su significado en la evolución humana. In: E. AGUIRRE (ed.), *Atapuerca y la evolución humana.*: 169-192; Madrid (Fundación Ramón Areces).
- BERMÚDEZ DE CASTRO, J.M., ARSUAGA, J.L., CARBONELL, E., ROSAS, A., MARTÍNEZ, I. & MOSQUERA, M. (1997): A Hominid from the Lower Pleistocene of Atapuerca, Spain: Possible Ancestor to Neandertals and Modern Humans. – *Science*, **276**: 1392-1395; Washington.
- BERMÚDEZ DE CASTRO, J.M. & NICOLÁS, M.E. (1997): Paleodemography of the Atapuerca-SH Middle Pleistocene hominid sample. – *Journ. Human Evol.*, **33**: 333-355; London.
- CARBONELL, E., RODRÍGUEZ, X.P. & SALA, R. (1998): Secuencia diacrónica de sistemas litotécnicos en la Sierra de Atapuerca (Burgos). In: E. AGUIRRE (ed.), *Atapuerca y la evolución humana.*: 391-420; Madrid (Fundación Ramón Areces).
- CARBONELL, E., ROSAS, A. & DíEZ, J.C. (1999): Atapuerca: Ocupaciones humanas y paleoecología del yacimiento de Galería. – *Mem. Arqueol. en Castilla y León*, **7**: 390 pp; Madrid.
- CUENCA, G., CANUDO, J.I. & LAPLANA, C. (2001): La séquence des rongeurs (Mammalia) des sites du Pleistocène inférieur et moyen d'Atapuerca (Burgos, Espagne). – *L'Anthropologie*, **105** 1: 115-130; Paris.
- DÍEZ, J.C., FERNÁNDEZ-JALVO, Y., ROSELL, J. & CÁCERES, I. (1999): Zooarchaeology and Taphonomy of Aurora Stratum (Gran Dolina, Sierra de Atapuerca, Spain). – *Journ. Hum. Evol.*, **37**: 623-652; London.
- FALGUÉRES, C. BAHAIN, J.J., YOKOYAMA, Y., BISCHOFF, J.L., ARSUAGA, J.L., BERMUDEZ DE CASTRO, J.M., CARBONELL, E. & DOLO, J.M. (2001): Datation par RPE et U-Th des sites pleistocènes d'Atapuerca: Sima de los Huesos. Trinchera Dolina et Trinchera Galería. Bilan géochronologique. – *L'Anthropologie*, **105** 1: 71-82; Paris.
- FERNÁNDEZ-JALVO, Y. (1998): Interpretación paleoambiental y etológica en Atapuerca a través de métodos tafonómicos. In: E. AGUIRRE (ed.), *Atapuerca y la evolución humana.*: 111-152; Madrid (Fundación Ramón Areces).
- FERNÁNDEZ-JALVO, Y., DIEZ, J.C., CÁCERES, I. & ROSELL, J. (1999): Human cannibalism in the Early Pleistocene of Europe (Gran Dolina, Sierra de Atapuerca, Burgos, Spain). – *Journ. Hum. Evol.*, **37**: 591-622; London.
- HOYOS, M. & AGUIRRE, E. (1995): El registro paleoclimático pleistoceno en la evolución del karst de Atapuerca (Burgos): el corte de Gran Dolina. Palaeoclimate record of Pleistocene in the evolution of

- Atapuerca karst (Burgos): "Gran Dolina" section. – *Trabaj. Prehist.*, **52** 2: 31-45; Madrid.
- MADE, J. VAN DER (2001): Les Ongulés d'Atapuerca. Stratigraphie et biogéographie. – *L'Anthropologie*, **105** 1: 95-104; Paris.
- NAVAZO RUIZ, M. (2002): Asentamientos prehistóricos en la Sierra de Atapuerca. – 256 pp, 16 maps; Burgos (Ediciones Sierra de Atapuerca).
- PARÉS, J.M. & PÉREZ-GONZÁLEZ, A. (1999): Magnetochronology and stratigraphy at Gran Dolina section, Atapuerca (Burgos, Spain). – *Journ. Hum. Evol.*, **37** 2: 325-342; London.
- PÉREZ, P.J. & GRACIA, A. (1998): Los homínidos de Atapuerca: información sobre modos de vida a partir de datos paleoepidemiológicos. In: E. AGUIRRE (ed.), *Atapuerca y la evolución humana.*: 333-360; Madrid (Fundación Ramón Areces).
- RODRÍGUEZ, J. (2001): Structure de la communauté de mammifères pléistocènes de Gran Dolina (Sierra de Atapuerca, Burgos, Espagne). – *L'Anthropologie*, **105** 1: 131-157; Paris.
- ROSAS, A., PÉREZ-GONZÁLEZ, A., CARBONELL, E., VAN DER MADE, J., SÁNCHEZ, A., LAPLANA, C., CUENCA G., PARÉS, J.M. & HUGUET, E. (2001): Le gisement pléistocène de la "Sima del Elefante" (Sierra de Atapuerca, Espagne). – *L'Anthropologie*, **105** 2: 301-312; Paris.
- ROSELL, J. (1998): Les premières occupations humaines à la Sierra de Atapuerca (Burgos, Espagne): les niveaux TDW-4 et TDW-4B. In: *Economie préhistorique: les comportements de subsistance au Paléolithique.*: 153-162; Sophia Antipolis (Éditions APDCA).
- SÁNCHEZ-MARCO, A. (1999): Implications of the avian fauna for paleoecology in the Early Pleistocene of the Iberian Peninsula. – *Journ. Hum. Evol.*, **37**: 375-388; London.
- SANCHIZ, B. (1987): Nota preliminar sobre ictiofauna y herpetofauna del Pleistoceno de Atapuerca (Burgos). In: E. AGUIRRE, E. CARBONELL & J.M. BERMÚDEZ DE CASTRO (eds.), *El hombre fósil de Ibeas y el Pleistoceno de la Sierra de Atapuerca.*: 61-65; Valladolid (Junta de Castilla y León).
- SESÉ, C. & GIL, E. (1987): Los micromamíferos del Pleistoceno Medio del complejo cárstico de Atapuerca (Burgos). In: E. AGUIRRE, E. CARBONELL & J.M. BERMÚDEZ DE CASTRO (eds.), *El hombre fósil de Ibeas y el Pleistoceno de la Sierra de Atapuerca.*: 75-92; Valladolid (Junta de Castilla y León).
- SEVILLA, P. (1988): Estudio paleontológico de los Quirópteros del Cuaternario español. – *Paleontología i Evolució*, **22**:113-233; Sabadell.