

## Uranium series dating of the Neanderthal footprint at Vârtop Cave, Romania

Bogdan Petroniu Onac<sup>1</sup>, Iosif Viehmann<sup>1</sup>, Joyce Lundberg<sup>2</sup>, Stein-Erik Lauritzen<sup>3</sup>, Chris Stringer<sup>4</sup>, Vasile Popiță<sup>5</sup>

<sup>1</sup> Quaternary Research Group, University of Cluj & Speleological Institute “Emil Racovița” 400006 Cluj, Romania, e-mail: bonac@bioge.ubbcluj.ro

<sup>2</sup> Department of Geography and Environmental Studies, Carleton University, Ontario K1S 5B6, Canada

<sup>3</sup> Department of Geosciences, University of Bergen, Bergen 5007, Norway

<sup>4</sup> Department of Palaeontology, The Natural History Museum, London SW7 5BD

<sup>5</sup> Oncologic Institute „Ioan Chiricuță”, 3400 Cluj, Romania

Early human footprints are rare in the fossil record. A survey of the literature reveals only two well documented and dated cases. The first, from ~325 kyr in Italy, represents a very early, pre-Neanderthal human. The other, from ~117 kyr in Africa, is probably a *Homo sapiens* print. Here we report the first clear *Homo neanderthalensis* footprint. It was found in Vârtop Cave, Romania. The individual stepped into calcareous mud that later hardened. The 22 cm long print suggests a body height of ~1.46 m; a gap of 1.6 cm marks the separation of big and second toes. The date of the footprint is constrained by the date of the deposition of the mud (~97 kyr, dated by U-Th isochron method) and the date on the base of a nearby stalagmite on top of the mud (~64 kyr). Thus the Vârtop Cave individual lived in Romania sometime between 97 and 64 kyr, long before the appearance of *Homo sapiens* in Central and Eastern Europe, the earliest records of which date from only ~40-30 kyr. To our knowledge, this is the first recognised and dated *Homo neanderthalensis* footprint.