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# The palaeoenvironmental context of the Palaeolithic of Java: A brief review

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ABSTRACT

The earliest Palaeolithic implements found in Java Island are older than 1 Ma, postdating the oldest *Homo erectus* fossils. The archaeological record subsequently documents Acheulean-like tools in early Middle Pleistocene deposits, a diversity of flake tools assemblages found in late Middle/early Upper Pleistocene sites, and the conspicuous development of cave occupations during the end of the Pleistocene and the early Holocene.

The environment, mostly forested during the Lower Pleistocene, underwent important changes during the setup of Mid-Pleistocene climatic conditions, then at the beginning of the Upper Pleistocene and at the boundary between MIS 2 and 1. Its reconstructions must also consider more local factors, e.g. the repetitive effects of the tectonic and volcanic activities, which had severe consequences on local climate, on the palaeogeography and the vegetal formations, or even isolation of faunistic and floristic groups.

Examples presented here broach the context of ancient human settlements and adaptation, from a multidisciplinary viewpoint that includes the study of the vegetal cover and the availability of lithic raw material. The associated vertebrate faunas, considered both as an environmental proxy and as a subsistence resource, reflect the contrasts between periods of contact with the mainland (increased biodiversity) and periods of isolation favouring endemism, and also the impact of local environmental constraints.



## 1. The early colonizers' adaptation and the chronology of human dispersals

*Homo erectus*, as attested by c. 1.5 Ma remains of archaic specimens discovered in the Solo sedimentary basin in Sangiran (Central Java, see for instance Swisher et al. 1994; Sémah et al., 2000), colonized new lands south of the Equator during the Lower Pleistocene, through land bridges (Fig. 1a) reaching the southernmost part of the Sunda shelf. These earliest islanders subsequently lived in isolated conditions during glacial periods, and had to adapt to several environments in which they had to find their subsistence. Their behaviours are poorly known owing to the lack of preserved actual archaeological sites (and a likely intensive use of vegetal resources for their implements), but the oldest stratigraphically controlled lithic implements (related to the famous "Sangiran Flakes", von Koenigswald and Gosh, 1973) date to more than 1 Ma (Widianto, 2006).

The Lower to Middle Pleistocene boundary is marked by new important interchanges with the continent. Though still poorly documented through palaeoanthropological analyses, the latter are attested by the emergence of Acheulean-like assemblages in sites dated between 1 and 0.8 Ma (Sémah et al., 1992; Gaillard et al., 2007), that picture the extension of the human dispersals throughout the Sunda shelf, the geographical extension of human

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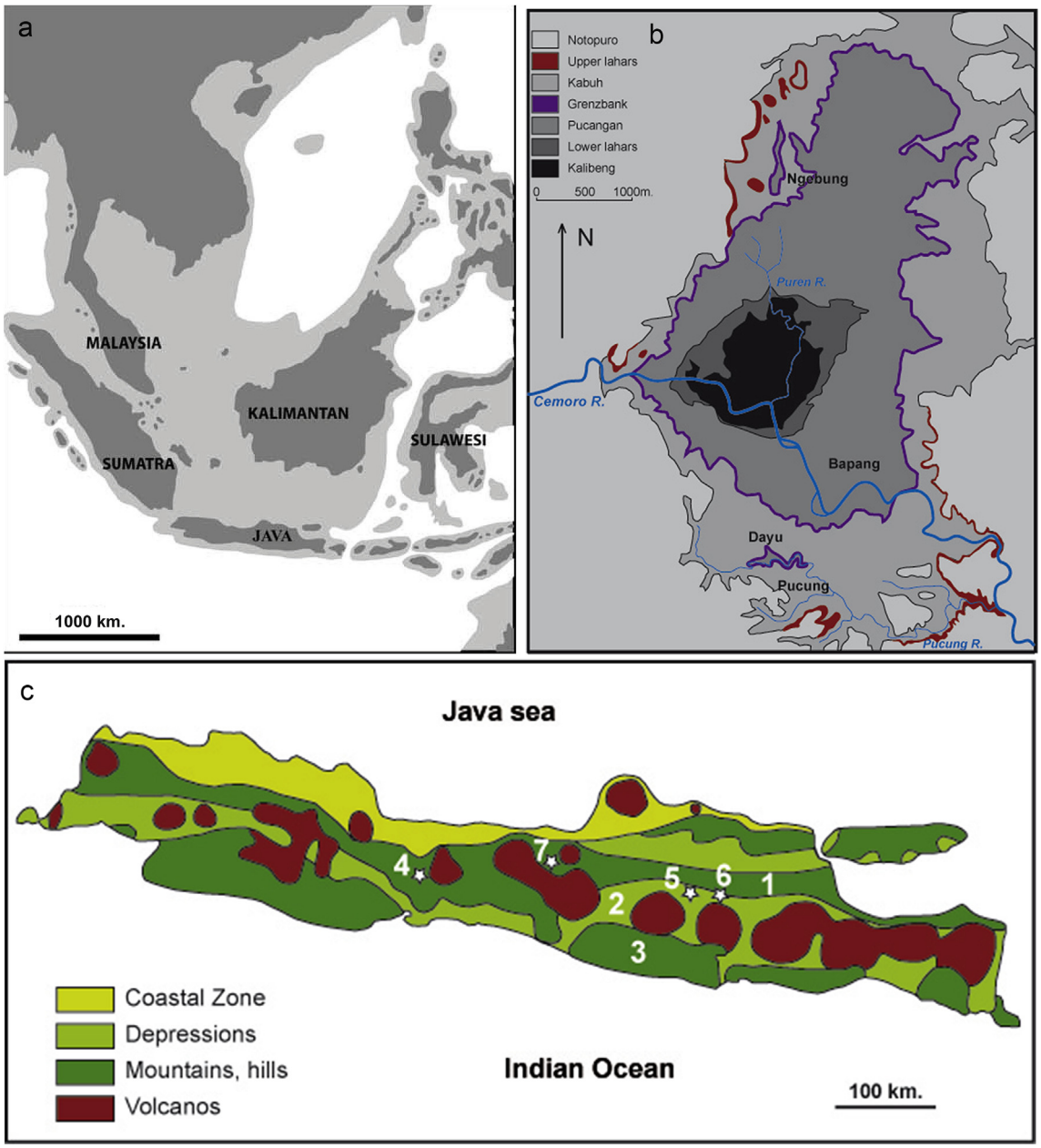


**Fig. 1.** a/Map of Southeast Asia indicating the maximum extension of land bridges during the Quaternary (−120 m) (A.-M. Sémah). b/Schematic map of the Sangiran Dome with location of Ngebung and Pucung sites (modified from von Koenigswald, 1949 and other authors incl. Sémah, 1986 and Brasseur, 2009). c/Schematic geomorphological map of Java (after van Bemmelen, 1949): 1, Kendeng hills; 2, Solo depression (Sangiran); 3, Southern Mountains (Punung, Song terus); 4, Bumiayu; 5, Trinil; 6, Kedungbrubus; 7, Ambarawa.

groups' territories, and even (although not directly related with Acheulean traditions) probable crossings of Wallace's line (Brumm et al., 2010; Lindelof, 2014).

The chronology of the second part of the Middle Pleistocene is less detailed, i.e. the period that covers the important register of 'classical' *Homo erectus* in Sangiran (Fig. 1b) and the extinction of the taxon postdating the most derived human fossils known as the 'Solo men' (Oppenoorth, 1931; see recent update *in* Indriati et al., 2011), claimed to become extinct during the Upper Pleistocene (Swisher III et al., 1996; Yokoyama et al., 2008). The study of the immense stratigraphical series of the Solo basin and the Kendeng hills in Java (Fig. 1c) (van Bemmelen, 1949) does not fulfil the need to establish a continuous chronology.

On another hand, research undertaken in karst massifs such as the Punung one, in the Gunung Sewu massif that belongs to the mountains bordering the Indian Ocean coast revealed the high potential of cave and fissures fillings for archaeology. Besides the well-known Pacitan Palaeolithic assemblage (Fig. 2a) (von Koenigswald, 1936) that may be compared to the Acheulean (Gaillard et al., 2007), abundant flake tools assemblages (Fig. 5b) were discovered in the oldest karst cave fillings (Sémah et al., 2004), dated between 350 ka and the end of the Pleistocene.

The related sites therefore encompass the critical period that witnessed the extinction of *Homo erectus* and the arrival of Anatomically Modern Humans in the archipelagos. In Song Terus, the lower part of the filling (c. 350–80 ka) yields a homogenous flake assemblage (see Tiauzon, 2011) in alluvial layers capped by cave occupation floors. Subsequent Upper Pleistocene layers contain rare stone artefacts and are mostly characterized by faunal accumulation.

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