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Evidence for the repeated use of a central hearth at Middle Pleistocene (300 ky ago) Qesem Cave, Israel

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ABSTRACT

A major debate in prehistory revolves around the time and place of the earliest habitual use of fire and the hominin species responsible for it. Here we present a newly discovered hearth at Qesem Cave (Israel) that was repeatedly used and was the focus of hearth-centered human activities, as early as three-hundred-thousand years ago. The hearth, identified based on mineralogical and microscopic criteria, contains two superimposed use cycles, each composed of shorter episodes – possibly the earliest superimposed hearth securely identified to date. The hearth covers ca. 4 m^2 in area making it a uniquely large hearth in comparison to any contemporaneous hearth identified thus far, possibly indicating it has been used by a relatively large group of people. In addition, the hearth is located in the center of the cave and is associated with butchered animal remains and a dense flint assemblage. The flint assemblage indicates spatially differentiated meat cutting and hide working activity areas. The central location of the hearth within the cave and the activities associated with it may reflect an embedded perception of space organization of the Qesem Cave inhabitants. Since fire was habitually used throughout the 420–200 ky sequence of Qesem Cave, where preservation conditions are alike throughout, we suggest that this unique hearth may reflect a development in nature and most probably in the intensity of fire use in Qesem Cave, from ca. 300 ka ago onwards.

1. Introduction

A major debate is taking place in recent years concerning the time and place of human early and habitual use of fire. Early fire occurrences, dating between 1.7 and 0.8 My ago (Lower and Middle Pleistocene) have been reported in sites such as Wonderwerk Cave and Gesher Benot Ya'aqov (Alperson-Afil et al., 2007; Alperson-Afil and Goren-Inbar, 2010; Beaumont, 2011; Berna et al., 2012; Chazan et al., 2012; Goren-Inbar et al., 2004; Gowlett, 2010). These indicate sporadic presence of fire, for example as stated for the site of Wonderwerk Cave "… burning took place within the cave during the Early Acheulean, approximately 1.0 My ago" (Berna et al., 2012). Such 'early fire' occurrences (Gowlett, 2010) remained on the scene until the late Middle Pleistocene and possibly as late as the Late Pleistocene in the Old World, based on the currently available evidence (Roebroeks and Villa, 2011). The turning point from 'early fire' to the 'habitual use of fire' is a matter of dispute.

Roebroeks and Villa (2011) relate to the habitual use of fire as a 'systematically repeated use of fire in specific sites and/or regions'. Based on an increased number of archaeological sites with evidence for fire, associated with evidence for fire being extensively used in domestic contexts, Roebroeks and Villa (2011) suggested that the earliest habitual use of fire occurs in Middle Pleistocene (ca. 400–300 ky ago) Europe and southwest Asia and that this archaeological signal becomes common and well established in sites younger than 100 ky. They thus view the habitual use of fire as a common cultural trait across wide geographical regions. On the other hand, Sandgathe et al. (2011a, 2011b) argue that this archaeological signal becomes well established in Europe only after mid MIS3.

Here we present new evidence for the repeated use of a large central hearth at Qesem Cave as early as 300 ky ago. The importance of this find lies with the fact that the feature presented below is incorporated within a well dated stratigraphic sequence (Barkai et al., 2003; Gopher et al., 2010; Merceir et al., 2013), is, to our knowledge, the earliest of its kind identified to date, and is overlain

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by a sedimentary sequence that has been previously proven to include concrete evidence for the habitual use of fire (Karkanas et al., 2007).

1.1. Stratigraphy, spatial field relationships, and associated macroscopic remains

Qesem Cave is located at the foothills of the central mountainous ridge of Israel (Fig. 1a). It consists of a 9.5 m sedimentary sequence divided into a lower (5 m thick) clay-dominated and an upper (4.5 m thick) calcite-dominated sequence (Karkanas et al., 2007). High-resolution U-series, thermoluminescence (TL) and electron spin resonance (ESR) dates made on speleothems, burnt flint and teeth enamel (respectively), originating from the lower and upper sequences, indicate that the border between the two sequences dates to 300 ± 30 ky (Barkai et al., 2003; Gopher et al., 2010; see also Merceir et al., 2013).

The feature under study is gray-colored, covers an area of ca. 4 m^2, and is located in the central part of the cave, away from cave walls (Fig. 1b). It has been excavated in half, leaving it sectioned, during the 2006, 2009 and 2011–2012 excavation seasons (Fig. 2a, b). Stratigraphically, the feature is found at the topmost part of the Qesem Cave lower sequence, thus dating to, or somewhat earlier, than 300 ky ago. It is covered by ca. 10 cm of brown sediments which are overlain by large boulders attributed to a major roof collapse (Fig. 3; and see Frumkin et al., 2009; Karkanas et al., 2007). Its total thickness is between 38 and 28 cm (between 560 and 598 cm below datum in the eastern part, and between 572 and 600 cm below datum in the western part). Sediments below elevation 600 cm below datum were not yet excavated.

The feature is slightly inclined southwesterly (Fig. 2). The reason for this tilt is still under study. In section, four macroscopic sublayers are identified from top to bottom: consolidated white sediment with bone-rich laminae, gray–brown crumbly sediment, white–gray consolidated sediment with bones, and brown crumbly soft sediment (Fig. 2c). Within the light-colored macroscopic layers, multiple thin laminae have been identified (Fig. 3). Bone colors vary between white, gray, yellow, brown and black. Burnt flint is abundant.

The late use phases of the feature may have been delineated by a row of stones, 10–20 cm in diameter, at its northern and western edges, separating the whitish–gray sediments characteristic of the top part of the feature from the soft brown sediments immediately to their north and west (Fig. 2a). Only a few stones of such a relatively large diameter have been recorded on top and within the feature (Fig. 2a) while the sediment to its east is mostly devoid of stones larger than 6.5 cm. This evidence rules out the possibility that the apparent stone line is due to rock fall. An area measuring slightly more than 1 m^2 covered by generally flat stones up to 40 cm in size was exposed south and southwest of the feature (Fig. 2b) and may be related to the feature under study.

The lithic assemblage from the feature and areas around it consists of two distinct industries of the Acheulo-Yabrudian Cultural Complex – the blade-dominated Amudian (Barkai et al., 2005; Gopher et al., 2005; Shimelmitz et al., 2011) and the Quina scraper-dominated Yabrudian (Barkai and Gopher, 2011). Amudian items related to the stratigraphic level of the feature occur within and around it (in Squares E12, H8, J8 and M12; Fig. 1). Yabrudian lithic assemblages are found a few meters away from the feature, in the same stratigraphic level, under a natural rock shelf (in Squares E9, G9, F10 and E11; Fig. 1). A speleothem that formed under the rock shelf and directly overlies this stratigraphic level has been dated to ca. 300 ky ago (Gopher et al., 2010).

The Amudian lithic assemblage is characterized by the production of sharp edges for cutting tasks, dominated by blades, and includes small recycled flakes. Functional (use-wear) analysis indicates that the activities performed by these artifacts at Qesem Cave are mostly related to meat processing, butchering and cutting (Barkai et al., 2010; Lemorini et al., 2006). The Yabrudian lithic assemblage is dominated by Quina scrapers. Initial observations

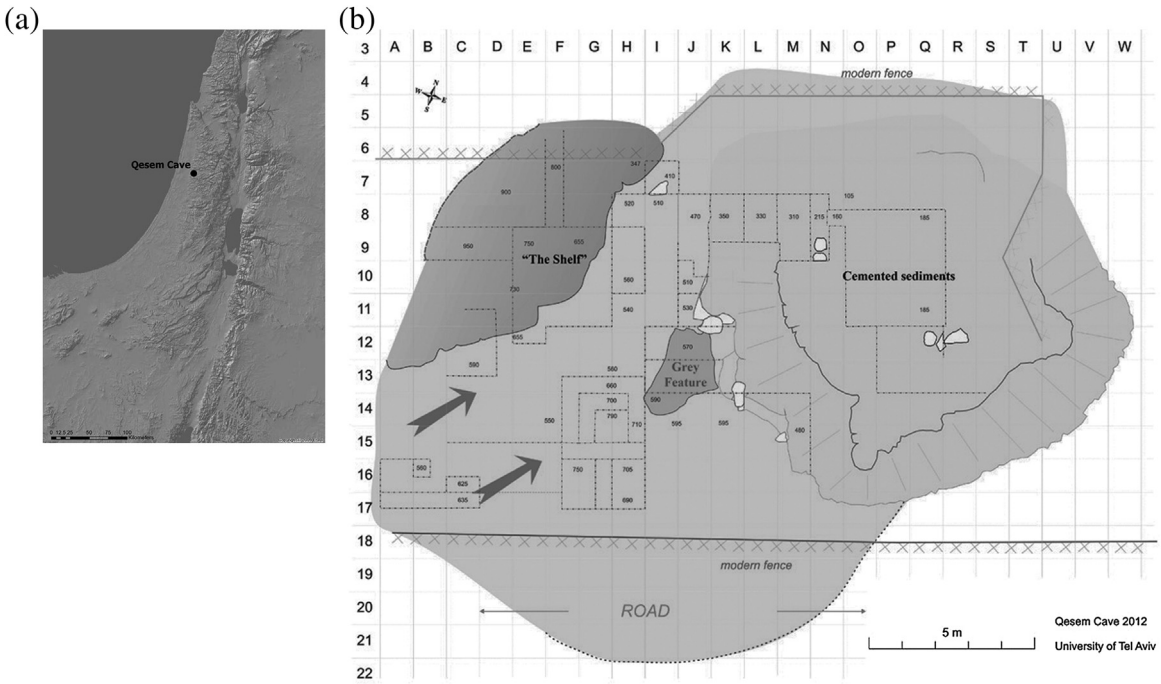

Fig. 1. (a) Location of Qesem Cave in Israel. (b) Location of the studied Gray Feature within the grid system of Qesem Cave. Note the rock shelf located northwest of the gray feature. The arrows on the lower left indicate the assumed area of the paleo-entrance to the cave. The area marked "Cemented Sediments" is an elevated lithified area that comprises most of the upper stratigraphic sequence in the cave. The gray feature is located at the border between the upper and lower stratigraphic sequences.