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Bronze-Age faulting at Mycenae (Greece) and a glimpse at cultural responses

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Abstract: The upper citadel at Mycenae is the upthrown block between two active normal faults, both represented by prominent scarps. One of these faults is known to have moved during Mycenaean times (in this case between about 1650 and 1300 B.C.), and a temple complex is draped across a fault scarp along a splay of the other, the more famous Lion Gate fault zone. The sole outcrop exposure of this fault scarp within the temple complex was already thought to have had "cultic" significance. The scarp itself provided the focus for the arrangement of adjacent cultic paraphernalia. Inhabitants of Mycenae, accustomed to the movement of faults in their midst as well as accompanying earthquakes, responded in a cultic/religious framework reflecting an appreciation of a link between these phenomena and their relation to the "underworld."

Introduction

A role of tectonic activity in ancient Hellenic cultures has recently been documented (e.g. de Boer and Sanders 2005, Force 2015). Currently, the review of Stewart (in press) is finding that temples and sanctuaries of classical ancient Hellenic culture took advantage of active faults in various ways--topographic scarps formed along the planes of such faults are commonly found in such association, for example. Stewart suggested that this association at Mycenae is possible. The numerous implications of such early religious/tectonic links there, including what form they might take, require testing of this hypothesis.

The hilltop citadel of Mycenae at the head of the Argos basin gives its name to the entire Late Bronze-Age culture of mainland Greece. "Well-built Mycenae" was a referent for several aspects of later classical Greek culture via Homer. It was a major center of Mycenaean culture from at least 1600 B.C. until this culture ended (and the Bronze Age ended with it) after 1200 B.C. Its position at the head of an extensional basin produces high seismicity today (e.g. Ambraseys 2009), and its geology reveals a Holocene history of complex tectonic behavior.

Local tectonic setting

Two of the citadel's most famous cultural features are themselves tectonic features—the Lion Gate on its western margin (FIG 1) and the Perseia spring on its northern margin. These are located along recently active faults that form the SW and NE margins of the upper citadel, respectively (FIG. 2). The faults are both steeply dipping normal faults, i.e. upper block thrown down, but dip away from each other so that the citadel between them is a horst, i.e. a block raised up relative to those on either side.

The bedrock wall on which the NE bastion of the Lion Gate rests is itself a fault plane striking SE and dipping about 60 degrees SW (FIG. 1) It preserves details of its movement (down-dip "slickensides"), showing its last movement to be very recent in a geologic sense, as erosion degrades such features (Stewart and Hancock

1988). The Lion Gate and the "cyclopean" wall built atop this bedrock, however, show that this fault has not moved since their construction in the LH III A2 or early LH III B period (French 1996), ca. 1350-1300 B.C. For convenience I will refer to this as the Lion Gate fault zone.

The NE-dipping fault forming the NE margin of the citadel, mapped and described by Maroukian et al. (1996), also has cyclopean walls built atop its exposures (their fig. 3).). I will refer to this fault as the Perseia fault. The Perseia spring along the fault plane feeds a cistern accessed by three flights of steps within a corbel-vaulted tunnel starting from inside the citadel, a design for surviving siege (FIG. 2). Maroukian et al. (1996) made another important observation: the Perseia fault, present as a continuous fault scarp (readily visible on Google Earth) dammed the Havos stream SE of the spring (FIG. 2), and the 2.5 m of sediments that filled the impoundment contain only "Mycenaean" sherds at the base, and only significantly more recent sherds higher within this fill. Maroukian et al. conclude that this drainage disruption occurred in the Mycenaean period, i.e. probably 1650 to 1200 B.C However, an additional constraint is the age of walls built on its scarp, about 1350-1300 B.C.., suggesting the available period of movement is about 1650 to 1300 B.C.

This is consistent with the observation of Maroukian et al. (their fig. 5) that the lowest 1.5 m of the Perseia fault plane is fresh, complete with slickensides and showing no evidence of weathering or erosion, in contrast to the weathered and eroded 1.5 m portion above. Since the lower interval corresponds with the part of the fault plane that impounds Mycenaean-age sediment, the lower portion must have been exposed by fault movement at that time. We must conclude as did Maroukian that faulting occurred "during Mycenaean time", and we can assume that Mycenaeans were present to observe at least the changes in exposed fault planes.

Earlier offset followed by partial burial in the channel of the Havos drainage is documented by Maroukian et al. (1996) along the Perseia fault. Also known is earthquake damage to the citadel during LH III B Middle time, about 1250 BC (French 1996) and probably also in early LH III C (about 1200 BC; Kilian 1996). There is no evidence of fault offset in Mycenae for these later seismic events, but clearly Mycenae was seismically risky in prehistory, as it has been since.

There is no direct evidence that the Lion Gate fault moved in the 1650-1300 B.C. interval as the Perseia fault did, but the similarity of the faults and their symmetry certainly suggest the possibility. The extension of the Lion Gate fault through the citadel is uncertain; based on Google Earth images I would extend it as a slightly sinuous fault zone trending first about S30W across the citadel, then S40W to the lip of the Havos stream's ravine. A historical image of the fault rock at the Lion Gate (e.g. Taylour 1983 fig. 94) as well as my own observation (FIG. 1) show that it is not a single plane. Google Earth images show a conspicuous "avenue" of poor rock exposure about 15-30 m wide along the trend of this fault as it is exposed at Lion Gate (FIG. 2). Foundations of Mycenaean structures are conspicuously absent in this avenue, either because of deeper burial on the down-dropped block, or an ancient perception of great seismic risk. Indeed it is this zone that divides Mycenae into a lower and an upper citadel.

The Lion Gate fault zone in the temple complex

The evidence of Mycenaean-age fault movement might moderate our surprise in finding it involved in the architecture and culture of the lower citadel. Excavation by Taylour (1970) of a temple complex of about 1300 B.C. in the lower citadel documented a planar bedrock exposure with about the same trend and slope as the fault-scarp at the Lion Gate (and quite unlike that of country-rock bedding). That is, this plane strikes NW-SE and dips steeply SW. The exposure occurs in a back room of the temple dubbed “the alcove” by its excavators (FIG. 2). The details of architecture, cultic offerings, etc. prompted Taylour to suggest that the rock exposure itself was of some “cultic” significance. He pointedly repeated this suggestion in a later summary (Taylour 1983, p. 50), adding details such as the planar shape and unaltered natural surface of this outcrop. Taylour (1983, p. 56) was willing to consider that this outcrop might be central to activities at the temple, the cultic/religious significance of which is not in dispute.

The location and elevation of this temple and its outcrop/alcove are quite close to my projection of the Lion Gate fault zone toward the SE; they lie SW of it (FIG. 2) and topographically about 8 m below its elevation at the Lion Gate or its SE projection, as might be expected from the fault’s SW dip. Thus it is likely that the outcrop in the alcove is part of the Lion Gate fault zone in the broad sense. Taylour’s (1970, 1983) descriptions of the outcrop are insufficient to determine whether it is fault-rock, and no photograph that includes it (Taylour 1983 fig. 24, see also Moore and Taylour 1999 including microfiche) is useful for this purpose, but its attitude (Taylour 1970 fig. 1; 1983 fig. 26) is as one would expect for an exposure of the Lion Gate fault zone, and is not that of regional bedding.

This outcrop is continuous and along-trend with the SW margin of bedrock shelves on either side of the temple complex per se, i.e. under South House annex to the NW and the megaron to the SE (FIG. 3). That is, this margin is an abrupt down-to-SW step in the bedrock surface as shown by excavations along trend (p. 32 and 33 respectively in Taylour 1981), perhaps as far as the similar bedrock shelf within grave circle A (Wace 1921-3).

The excavation literature reveals details of bedrock exposed in the temple complex (Taylour 1981, Moore and Taylour 1999). They show that Taylour’s outcrop in the alcove abruptly separates plastered bedrock floors to the NE 1.75 m higher (room 19, known as the Room of the Idols) than that to the SW (room 18, in the central temple). A considerable amount of bedrock excavation and removal would be required to produce this relation, and clearly would alter the natural surface of the exposures in the alcove. So the outcrop itself represents a SW-dipping fault plane, this exposure of which forms a fault scarp (FIG. 3). Room 19 is on the upthrown block, the alcove floor and room 18 on the downthrown block. The fault plane and its scarp elsewhere in the temple complex is obscured by walls and stairways; it trends obliquely under the SW corner of room 19 and the stairway leading up to it (FIG. 3). Its extensions to the SE and NW are marked by the bedrock shelf margin. The temple complex and its neighboring structures are thus draped across a fault scarp, apparently a splay within the Lion Gate fault zone. However, the only exposure of the fault plane itself after temple-complex construction would have been that in the alcove.

Apparent cultic/religious responses

Construction of the temple complex required intimate knowledge of the fault scarp there, and obscured it in all but one place. Three additional features of the alcove and adjacent room 19 suggest that Taylour (1970, 1983) was correct in assigning a cultic significance to the alcove outcrop, and that this significance relates to the fault scarp exposed there. First, the anomalous concentration of snake figurines near the fault scarp and its hidden extensions suggests an association with the underworld (Taylour 1983, p. 53-55, Moore and Taylour 1999, p. 117).

Second, the excavators found that most figurines in these two rooms were broken in half, one half of which was found in each room (Moore and Taylour, 1999, p. 17). Thus half of each of these figurines was found on the upthrown block and half on the downthrown block of the fault. The geometry of this arrangement is roughly symmetrical about the fault scarp, though subsequent construction obscured this even from excavators. It seems likely that the placement of figurines was intentional, and reflects some attempt at correlation or landscape reconstruction across the offset, i.e. “stitching” together their landscape. If these particular figurines are heirlooms as suggested by Taylour 1983, p. 53, perhaps appropriate terms describing their placement would be commemoration or even re-enactment of the fault’s movement. Following a later earthquake of ca. 1250 B.C. (Taylour 1983, French 1996) room 19 and its cultic paraphernalia were walled off. The placement of figurines is thus constrained between construction of the rooms and the walling off of one of them. If the breaks in the figurines are a result of the 1250 B.C. earthquake, then their arrangement is constrained between that earthquake and the walling-off of room 19. However, Hinzen et al. 2014 found such breakage etc. of these figurines unlikely for this particular earthquake.

Third, leaving only one exposure of the fault plane and obscuring it elsewhere suggests an aspect of the alcove outcrop that could be like a museum or sanctuary.

Conclusion and speculation

First, it seems clear that ties between faults and cultic/religious practices documented for ancient Hellenic cultures of later periods extend back into the Mycenaean era. Indeed, these ties are quite vivid, though mysterious to us.

Available evidence strongly suggests that the Mycenaeans would have been cognizant of fault-scarp planes as features of significance; they would have observed that their precious spring was along one of the two conspicuous scarps (the Perseia fault) that was growing in height, and that the upper part of their citadel was being uplifted, accompanied no doubt by earthquakes. They would have observed a similarity of the Perseia scarp to that at the Lion Gate and the alcove, and generational memory might even have included the latter’s appearance after an earthquake. It would be a powerful experience to see fault scarps appear in the aftermath of an earthquake, forming a continuous curtain that offset their landscape. Links among landscape, solid-earth structure, and earthquakes would become apparent.

It also appears that their observations had cultic/religious responses, as they linked the surface of their citadel to their underworld. Indeed Taylour (1983 p. 56) thought the significance of his "cultic" outcrop with attendant snake figurines was that of a link to the underworld, even though he was not aware of this outcrop as a fault scarp. Mycenaean awareness of a "before-and-after" aspect of their faulted landscape is apparently marked by their remarkable arrangement of cultic figurines in the temple complex.

Thus Mycenaean need for a religious response to their tectonic environment required an underworld aspect, an earth-structure aspect, and an earthquake aspect. The latter two aspects recall the suggestion by Polimenakos (1996, p. 252-255) that our earliest glimpses of Poseidon (PO-SE-DA-O-NE in Linear B) include both of these, i.e. as earth-smith and earth-shaker, though navigation of the underworld might have required additional deities.

The fascinating possibility suggests itself that the inhabitants of ancient Mycenae appreciated something about their local tectonic processes as these unfolded before them. They probably had a precocious appreciation that earthquakes and faults are related. Despite seismic/faulting disruption they responded in several constructive ways: they took advantage of the increased elevation of their upper citadel by building walls ("Well-Built") on the margins of uplifted blocks, and they took advantage of springs along them. But they also apparently envisioned these processes as links to their underworld, enshrining them in various ways and commemorating their tectonic history. Perhaps it is no accident that the Lion Gate itself displays this tectonic-cultural relationship.

Recommended further work

Results described here suggest further avenues of research for confirmation and for exploring implications. Perhaps most urgent is the need for more specific ages for the "Mycenaean" sherds in basal sediments impounded behind the Perseia fault-scarp dam on Havos stream (cf.. Force 2004 for criteria of dating using detrital sherd assemblages). Work on the age and geometry of faulting along the Lion Gate zone is also needed; examination of the Havos stream's ravine might be helpful in this regard. A proper description of the rock outcrop in the alcove would be useful. I have a hunch that in view of results presented here, the age and nature of figurines in the temple complex will be re-evaluated.

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Figure 1—Photograph of the back side of Lion Gate with slickensided fault rock visible through it, and “cyclopean” walls atop and beside it.

Figure 2—Sketch map of Mycenae showing citadel walls (solid), Perseia and Lion Gate fault and fault zone (dashed), and Havos Stream ravine (dotted). Upper citadel upthrown relative to blocks across these faults. Lettered localities: A, Lion Gate, B. “alcove” outcrop, C. Perseia spring and xxxx, D. Section of Havos Stream dammed by Perseia fault.

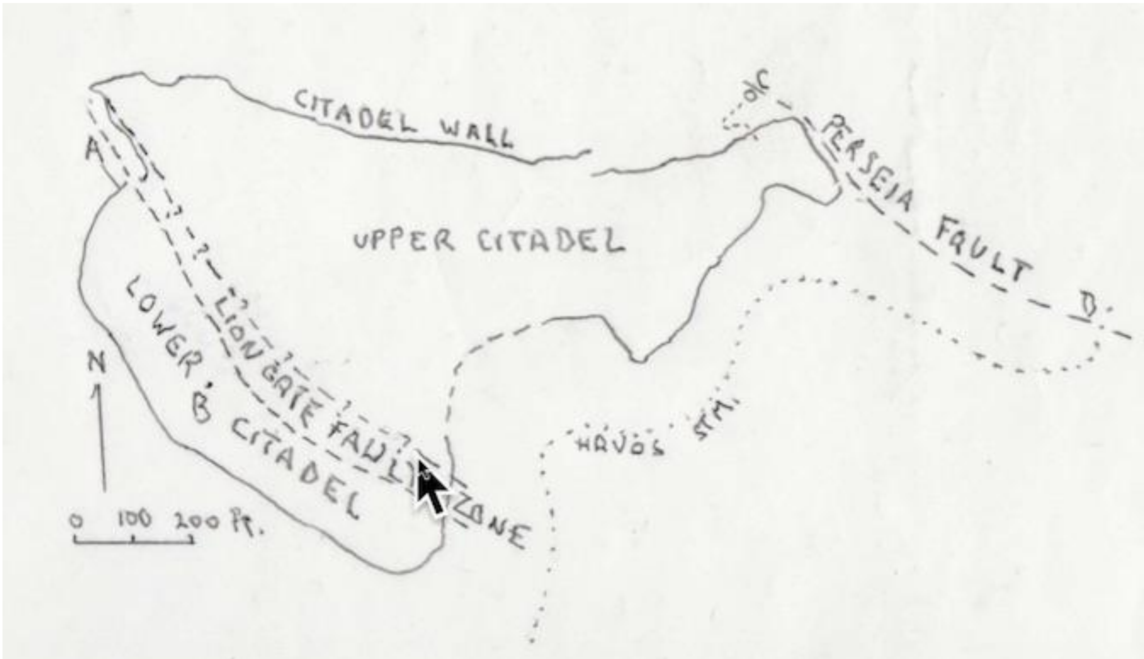
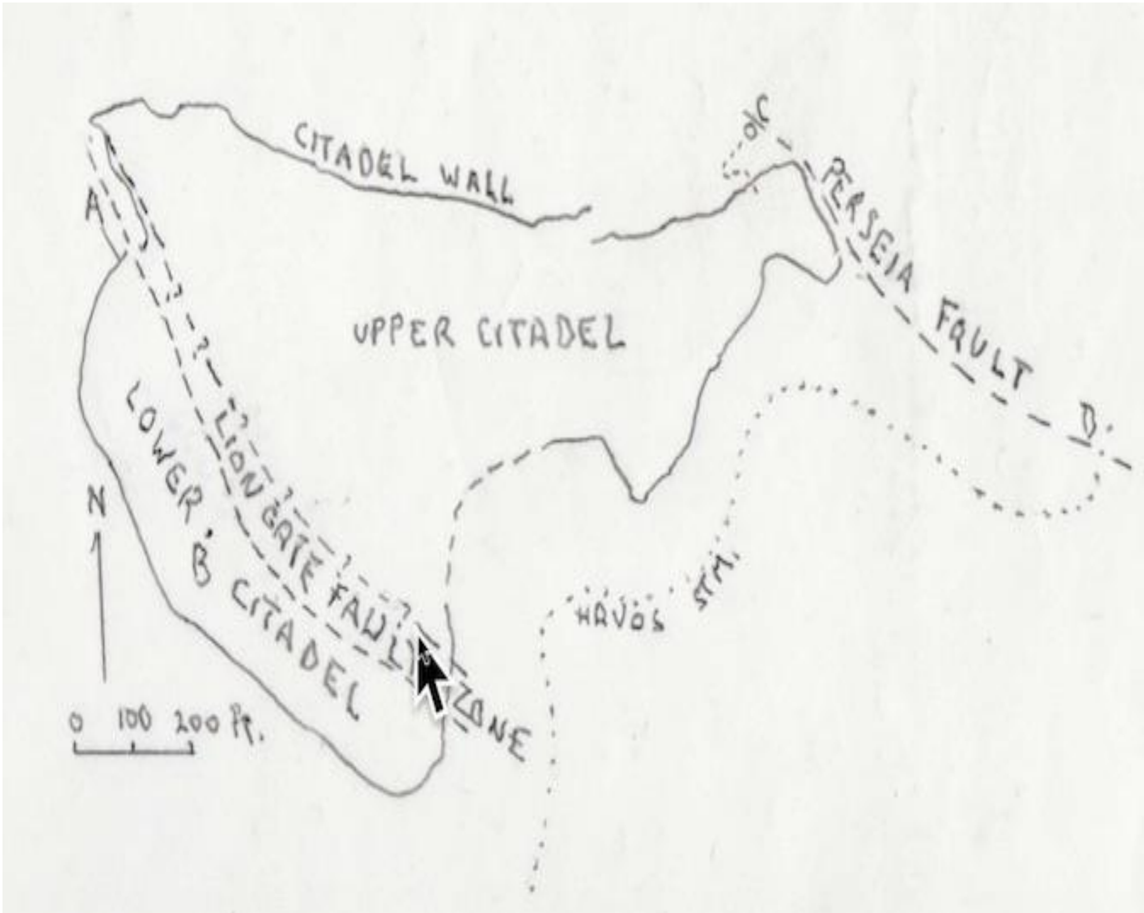


Figure 3—Environs of the Temple Complex at Mycenae after Taylour 1983, annotated in red with the normal fault at the elevation of bedrock in room 18. U, upthrown block; D, downthrown block; ticks on fault in the direction of steep dip. Floors in rooms 18 and 19 are plastered bedrock.



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