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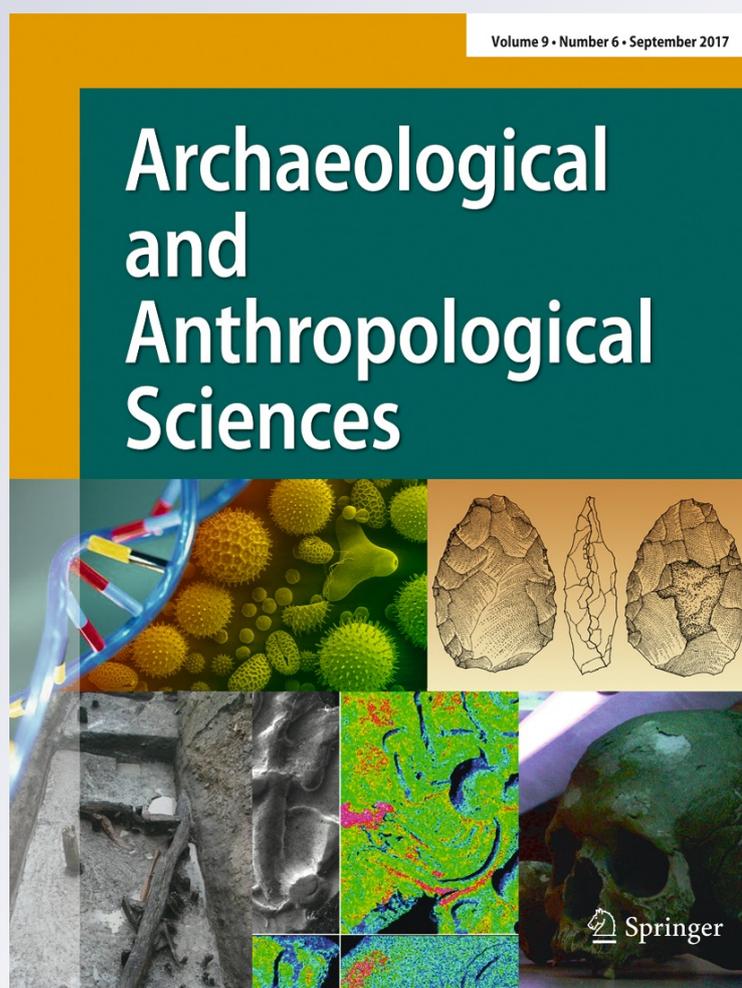
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Geoarchaeology of ritual behavior and sacred places: an introduction

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Conceived broadly, geoarchaeology is the application of earth science methods and techniques to archeological problems (Goldberg and Macphail 2006). In practice, this has meant providing information on paleoenvironmental contexts (Butzer 2008; Waters 1992) or stratigraphic integrity for archeological sites (Goldberg and Berna 2010). Increasingly sophisticated analytical techniques including micromorphology, microspectrometry, and instrumental chemical analysis (Canti and Huisman 2015) have expanded the geoarchaeological toolkit to enable the assessment of cultural and natural formation processes in a wide variety of archeological contexts (Schiffer 1996). Nonetheless, the scope of human behaviors considered in geoarchaeological analysis of cultural formation processes has tended to be limited to economic, technological, or “housekeeping” behaviors (Goldberg et al. 2009). It is our contention, as well as the contention of the contributing authors, that geoarchaeological methods are well-suited to identify behaviors that might be considered part of religious practice (e.g., Dalan and Bevan 2002). Indeed, with the right conceptual tools, behavioral geoarchaeologists are already contributing unique perspectives to our understanding of ritual behavior and sacred places.

Archeologists typically approach the study of ritual and religion through the analysis of uncommon artifacts, iconography, and architecture that are often linked with ethnographically or historically known ceremonial practices (Fogelin 2007; Rowan

2011). Over the last few decades, however, archeologists have begun to recognize that sacred places and objects have life histories that are significantly different than other places or objects (Boivin 2004; Walker 1995). The unique life histories of sacred places entail unique sequences of behaviors in the establishment, use, maintenance, and abandonment of these places that cannot be inferred from abandonment assemblages or architecture alone (Hollenback 2010). Geoarchaeologists have a unique role to play in the interpretation of ritual behavior and sacred places through the analysis of sediments and soils that have been physically and chemically altered by human behavior even in the absence of artifacts in primary contexts (e.g., Van Keuren and Roos 2013).

This special issue brings together archeologists and geoarchaeologists from across the world who have investigated sediments and soils from “sacred places” or at least in locations that have been hypothesized to have been loci for ritual behavior. Contributors to the volume use earth science concepts, methods, and techniques to parse the consequences of human and natural activity in the formation of archeological deposits from settings of ritual behavior in a manner that is accessible to our archeological colleagues. Important to these studies is a consideration of the “life history” of such places as well as the manner in which human behavior impacted sediments and soils from sacred places in ways that differed from secular, mundane, or “profane” contexts. Our contributions emphasize methodological rigor with-in a consideration of broader anthropological issues.

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Behavioral geoarchaeology and the study of ritual without objects

Anthropologists and other scholars of religion have traditionally defined ritual and religion on ideational grounds, focusing

on symbols and systems of belief. In recent decades, archeologists and other materialist scholars of religion have begun to emphasize the behavioral and material manifestations of religious practice as mechanisms for studying religion and as subjects worthy of study in their own right (Hollenback 2010:157). In this spirit, behavioral archeologists have adapted the use of key concepts from the study of human behavior to the study of ritual and religion. These include the “life history” approach (Walker 1995); cultural formation processes, including “trace production contexts” (Sullivan 1978); and the performance characteristics of objects or places (Hollenback 2010:160). Since ritual practice is a form of behavior, we subsume practice theory based approaches to ritual (Fogelin 2007) and behavioral archeology approaches (Walker 1995; Walker 1996) within the broader archeological study of ritual behavior in the past. For our purposes, we define ritual as structured patterns of behavior that are imbued with meaning through the symbols, contexts, objects, or people associated with the behavior that produce singularized life histories for the people, things, and places involved (Hollenback 2010; Walker 1995).

We use the term *behavioral geoarchaeology* to refer to all applications of geoarchaeological practice to the investigation and reconstruction of human behavior from soils, sediments, stratigraphy, and landforms. As for other materialist approaches to religion, behavioral geoarchaeology of ritual practice and sacred places benefits from concepts embedded in the life history approach, the partitioning of traces in soils, strata, or sedimentary records, and the assessment of the performance characteristics of landforms and geographic contexts. *Behavioral archeologists* have pioneered a “deposit-oriented approach” to studying ritual behavior from the archeological record (Hollenback 2010). In a deposit-oriented approach, archeological deposits are the basic unit of observation for identifying the singularized life histories of objects enclosed in the deposits. The sediments themselves, however, have often been overlooked as a source of information for identifying singularized life histories. Nonetheless behavioral geoarchaeologists have used soils and sediments from a deposit-oriented perspective to identify ritual behavior through the singularized treatment of sacred places. For example, Van Keuren and Roos (2013) distinguish deposits filling in a kiva as derived from ritual behavior on the basis of trace production contexts. The resulting reconstruction of the depositional sequence highlighted the unique post-use life history of the kiva, wherein multiple episodes of purposeful burial characterize the singular treatment of a sacred place.

Another useful analytical concept for behavioral geoarchaeology is the “cultural soilscape” (Wells 2006), which recognizes that soils and sediments are as much products of social forces as natural ones. As Wells (2006:126) describes, “While functioning soil is formed through the physical disintegration and chemical decomposition of rocks

through weathering and subsequent arrangement by biological and chemical agents, the cultural soilscape is formed through these processes plus human behavioural variables acting to disturb and displace soil.” Viewed in this way, soils and sediments (and other geological and geomorphological phenomena) can be studied as unique kinds of material culture that place earthen substances in the domain of social action (Salisbury 2012), whether strategic or unintended. Winiwarter and Blum (2006:108), for instance, argue that, while soils have “immaterial qualities, they were—to some extent—objects of religious reverence and corresponding ritual practices to ensure their sustained fertility existed.” Moreover, in their study of soil concepts of the ancient Maya, Wells and Mihok (2010:323) demonstrate that the Maya viewed some soils not as things, per se, but as “active cultural agents that contributed to fashioning and fixing worldview, values, and beliefs.” Such an expanded view of the role of cultural soilscares in ritual and religion can provide behavioral geoarchaeologists with important conceptual tools for understanding soils and sediments as social/religious constructs (e.g., McAnany and Hodder 2009).

Contributions to this special issue

Although all of the contributors to this special issue use geological evidence and concepts to evaluate some arguments about ritual behavior, not all contributors use behavioral concepts explicitly in their papers. For many of the contributors, concepts such as the life history approach and trace formation are implicit. Nonetheless, we think that all of the contributions to the special issue elaborate upon the base of behavioral geoarchaeology that we have described above. This special issue of *Archeological and Anthropological Sciences* stems from a 2012 Society for American Archeology symposium of the same title, co-sponsored by the Society for Archeological Sciences and the Geoarchaeology Interest Group.

Goldberg et al. (2017) employ micromorphology and an implicit life history approach to evaluate the geological evidence for purposeful burial of a Neandertal at Roc de Marsal. Using a formation process approach that parses the traces of sedimentary and weathering processes on the underlying bedrock, and encasing sediments, they argue that the “burial” is within a natural depression and filled episodically by natural processes. This interpretation remains controversial, and it is commendable that the authors acknowledge disagreement within the research team on the significance of the geological and fossil evidence.

Mentzer et al. (2017) similarly use micromorphology and pedology to reconstruct the life history of a Greek archeological feature hypothesized as an altar. In their case, they are able to parse micromorphological traces of natural

and cultural formation processes to infer the sets of human behaviors involved in the use of the altar, as well as how the surrounding cultural soilscape has been shaped by anthropogenic alterations even as they have been variably preserved by pedogenic activity. This is a remarkable study by which the traces of a very specific, historically described ritual practice are identified far earlier than had been expected and over a much longer period than had been previously known.

Contreras (2017) takes a cultural soilscape view of the sacredness of Chavin de Huantar in Peru. His geoarchaeological analysis is of the hazardous geomorphic context of the important ceremonial center, with implications for our understanding its origins and significance. Elsewhere in Latin America, Fulton et al. (2017) take another geographically broad view of human ritual behavior. Focusing on the large, expansive plazas at the Classic period capital settlement of Palmarejo in northwest Honduras, Fulton and colleagues use multiple lines of physical and chemical evidence from anthrosols to parse the traces of human behavior within and between plazas. Their results corroborate archeological inferences based on other lines of evidence that large plazas held distinct, spatially patterned activities that were likely associated with community ritual.

The cultural soilscape view is one that is shared by Kidder and Sherwood (2017), who argue that the selection of raw materials used in the construction of Archaic period and Mississippian period mounds connected mounds and symbolically meaningful places. Using micromorphology and stratigraphy of mound construction sequences, Kidder and Sherwood reconstruct the singularized life histories of mounds and construct a compelling argument that the construction of the mounds themselves constituted active, symbolically charged ritual behavior that created and maintained sacred spaces. Adams and Fladd (2017) similarly emphasize the information embedded in stratigraphic sequences that were purposely constructed. Using stratigraphic evidence for the particular use of ash deposits within the post-use stratigraphy of architectural spaces at the ancestral Hopi village of Chevelon, Adams and Fladd identify patterns consistent with use of the symbolically charged material described in Hopi ethnography. Although not explicitly geoarchaeological, Adams and Fladd engage an explicit deposit-oriented approach and life history model from behavioral archeology to analyze non-artifact data (sediments and stratigraphic sequences) that are the usufruct of geoarchaeological analysis.

Finally, Berna's study (2017) reminds us of the value of contemporary information for inferring ritual behavior in the past. Stimulated by the conundrum from Neolithic sites in the Near East about how to interpret monumental architecture with evidence for dung accumulations during the use life of the structure, Berna provides a micro-ethnoarchaeological case study of the geoarchaeological signatures of the use of dung as an architectural flooring material. Focusing on

micromorphological samples of flooring material, with microtopographic observations of the church floor, and historical descriptions of how church floors were constructed and maintained, Berna argues that dung floors and animal penning should be easily distinguished based on micromorphological features. Moreover, the processes of use and maintenance and the regularized patterns of ritual behaviors may be what best distinguishes dung floors in sacred spaces from dung floors in secular contexts.

Together, the contributions to this Special Issue of *Archeological and Anthropological Sciences* highlight the diversity and the potential of behavioral geoarchaeology to contribute to the archeological study of ritual, religion, and sacred places. We hope that these papers will stimulate the interest of both archeologists and geoarchaeologists to continue this work, in large part because these behavioral enterprises will surely be more successful in partnership.

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