

# Walking with the Unicorn

Social Organization and Material Culture  
in Ancient South Asia

Jonathan Mark Kenoyer  
Felicitation Volume

Edited by

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Front cover: SEM microphotograph of Indus unicorn seal H95-2491 from Harappa (photograph by J. Mark Kenoyer © Harappa Archaeological Research Project).

Back cover, background: Pot from the Cemetery H Culture levels of Harappa with a hoard of beads and decorative objects (photograph by Toshihiko Kakima © Prof. Hideo Kondo and NHK promotions).

Back cover, box: Jonathan Mark Kenoyer excavating a unicorn seal found at Harappa (© Harappa Archaeological Research Project).



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# The Smallest Scale of Stone. Pebbles as a Diminutive Form of Nature

Monica L. Smith

Of all the potential raw materials available in nature, stone is the most durable and has been used for both practical and symbolic constructions throughout the world. Much archaeological theorizing on stone has focused on portable objects such as tools, ornamental objects such as beads, and shaped architectural elements such as blocks. Unmodified stones such as pebbles also provide the opportunity to evaluate individual engagements with stone, in which pebble-carrying and pebble-deposition provide opportunities for all members of society to participate in monumental actions through the incremental addition of tangible devotional and construction elements. This paper examines pebbles as a measure of individual participation in archaeologically detectable religious and social rituals at the ancient city of Sisupalgarh in India where thousands of quartzite pebbles were transported and embedded into the plaster floors of the site's central ritual structure.

**Keywords:** Stone, monuments, India, urbanism, ritual.

Craft production is a process in which humans transform natural materials into artifacts that bear the marks of modification and subsequent use. Over the past two million years, our ancestors have engaged with a wide variety of 'found' materials including bone, antler, ivory, fur, feathers, leather, sinew, shells, stone, wood, leaves, clay, and ochre. Many of these materials are quite versatile, allowing craftsmakers and consumers to engage in a dynamic realm of differential value in the process of embellishment and use. Shells, both freshwater and marine, served as the raw material for some of the very first beadmaking by hunter-gatherers (Stiner 2014), and later became used in complex societies for bangle-making as an index of social status and trade (Kenoyer 1983). Bone is a durable yet malleable material that served for ornamental use as well as for tools, while clay was similarly used for the fashioning of art objects, devotional items, and pottery vessels (Orton and Hughes 2013).

Of all of the natural materials with which humans have engaged, stone is the most durable. The natural world's longest-lasting known material, stone continues to be the preferred medium for creations meant to surpass the human lifetime such as sculpture, monumental architecture, political and ritual proclamations, and gravestones. Its perceived durability even extends to its use as the medium for long-term warning symbols for nuclear waste (Kaplan and Adams 1986). In addition to its inherent properties that make it suitable for the creation of many artifact types such as tools, its widespread availability makes it an ideal material for both practical and symbolic use.

The archaeological analysis of stone focuses on both worked and unworked exemplars. Stone is most often

modified through glyptic techniques, in which the craftmaker chips away at the raw material to yield a finished product. Once stone is broken, it is nearly impossible to render whole again, and archaeologists have examined the psychological and social impacts of deliberate fragmentation on stone artifacts (e.g. Burström 2013; Carter 2007; Chapman 2000) as a way of understanding the cause-and-effect relationship between people and their effect upon the natural world. Stones also were used in their wholly natural form, with cobble manuports subsequently used as hammerstones, grinding stones (e.g. manos and metates), and cooking stones (see Thoms 2009).

Ancient people worked with pebble-sized stones in a variety of ways: as components of wooden plows (Brady 1988), for polishing clay prior to firing (Valado 2008), as mulch for gardens in arid environments (Lightfoot and Eddy 1995), for spreading asphaltum on the interior of water-carrying baskets (Braje *et al.* 2005), as slingstones (Skov 2013), tallying stones (Lagercrantz 1970), game pieces (see Rollefson 1992), and fishing weights (e.g., Casasola 2010). Used *en masse*, pebbles provided architectural elaboration, as seen for example in pavements in Mesopotamian buildings (e.g. Matney and Donkin 2006) and mortuary contexts (e.g. Alden and Balcer 1978), and pavements in buildings and mortuary contexts in Greece (e.g. Catling 1987-88: 7, 13, 18, 28). In fluid mixtures such as plaster and cement, small stones or other durable materials known as 'aggregate' provide bulk and strength (Chen and Liu 2004; Moropoulou *et al.* 2005). Pebbles however appear to have been collected, transported and curated in the archaeological record far beyond their range of practical uses, providing the opportunity to consider how this smallest scale of stone functioned in both the social and symbolic realms.

## The cultural value of stone

Ancient peoples used stone at a variety of scales. Large-sized stones included natural shelters such as caves, overhangs and sinkholes. Large stones were also moved to make megalithic architecture, a global phenomenon associated with both nomadic and settled populations of Africa, Japan, Europe, the Indian subcontinent, the Pacific Islands, and the Americas. Structures made of large stone elements would have required significant strength and engineering skill. The cooperation required to transport the Stonehenge monoliths, for example, suggests that large groups of people came together to move and place the uprights as demonstrated through archaeological experiments that address both the technical and social components of monument construction (e.g. Pavel 1992).

Despite the obvious challenges of displacement in a pre-mechanical era, stone was the medium of choice for many ritual monuments. Although some structures were made of wood, cloth, reeds, or even bones, ancient people would have recognized the permanence implied in a stone structure compared to organic construction. Wooden structures such as homes, fieldhouses, ramadas and workshops were subject to weathering, fire, and insect damage that would have required regular replacement and maintenance of the wooden elements, but stone was a medium that changed little, if at all, within a human lifespan.

As Dean (2010: 5) has noted for the Andean world, stone was an immutable substance that served as 'life immobilized'. In the alluvial plains of southern Mesopotamia, stone had magical powers, was placed in foundation deposits, and served as a metaphor for rulers' ability to link distant mountains to local realms (Postgate 1997). And in contexts as varied as the British Neolithic and contemporary Madagascar, stone is 'an everlasting material with which one honors and commemorates the dead' (Parker Pearson *et al.* 2012: 9-10). Structures made of stone were meant to be permanent records of events and emotions, made variable by the nature of the material itself. Stone retained its original characteristic even when it was displaced from its original locale: rough or smooth, porous or impermeable, dull or shiny (Tilley 2004; see also Scarre 2004). The range of physical textures is accompanied by distinct visual and even aural qualities (Tilley 2004; see also Boivin 2004) and constituted phenomenological distinctions that would have been evident to ancient peoples.

Paralleling the use of stone in large-size form was the practice of moving smaller-sized stones for use as tools. The earliest stone tools date to c. 2.6 million years ago in East and South Africa and slightly later in Asia, associated primarily with early *Homo*; more

sophisticated, bifacial stone tools include handaxes that appear in the archaeological record c. 1.7 million years ago (Kuman 2014). Selective stone transportation is seen throughout subsequent eras, such as the movement of 'chocolate flint' in Late Glacial Europe from 10-14,000 years ago (Sulgostowska 2002) and starting from the earliest occupation of the New World when stone was moved hundreds of kilometers across North America (Amick 1996; Ellis 2011) and South America (Flegenheimer *et al.* 2003). Throughout the development of social complexity and well into the present, people have traded distinctive stones: obsidian in Mesoamerica and the Aegean (Freund 2013); lapis lazuli, carnelian and steatite from Central Asia to the Near East and the Arabian Gulf (Potts 1993); and semi-precious stones from the Indian subcontinent to the Roman Mediterranean (Casson 1989).

Ethnographic accounts indicate the perception of a range of practical and spiritual qualities inherent in stone, especially in societies that did not have an indigenous use of metals (Brumm *et al.* 2006). These qualities would have been seen and appreciated in even the smallest stone elements, through which there could be an individualized relationship to the natural world. Stone artifacts such as projectile points, grinding stones, querns, and drills were explicitly designed to be used by one person. Small chipped stones worked into elaborate 'eccentric' pieces would not have been suitable for practical tasks such as cutting or scraping in the same way as the blades and other tools that the makers would have fashioned from the same raw material. The manufacture of stone items not only expressed individual symbolic qualities, but also enabled the transmission of social information which provided the opportunity for collective engagement, as well as one-to-one instruction through apprenticeship (e.g. Milne 2005).

Two avenues of theory enable us to further address the use of small-sized stone objects: miniaturization theory and collection theory.

## Miniaturization in natural objects

Portable stone, whether naturally formed or culturally modified, can be evaluated through the concept of miniaturization. Miniatures encompass cognitive categories such as representation in which the full value of the sign is present in even the smallest exemplar (Stewart 1984). The archaeological record provides ample evidence of the manufacture of small versions of utilitarian objects, variously interpreted by archaeologists as 'practice' objects, votives, commemoratives, models or toys. Doug Bailey (2014) suggests that these traditional views of small-scale exemplars should be productively expanded given that miniaturization has other powerful psychological



effects including the ability for enhanced well-being and feelings of control when objects or environments are reduced in size.

In addition to their use as representation of larger-scale activities in portable form and as a means of fitting objects into small spaces, miniature objects are endowed with a distinct aesthetic potential that informs their selection, use and deposition. Small cut stones in mosaics, for example, result in a distinct visual effect through the pointillist manipulation of thousands of tiny fragments. The miniaturization of stone bladelets in the microlithic tradition also could be suggested to perform an aesthetic function, given the relative lack of practicality of direct use of such small flaked items and the necessity of incorporating them into a handle in order to serve as a tool.

The selection of pebbles as small *natural* objects provides a type of miniature whose aesthetic and phenomenological appeal comes from being found rather than made. Pebbles are defined as a distinct geological category in a size range from 4 to 64mm ('sand' is defined as 0.0625-2mm, 'granule' from 2-4mm, and 'cobble' from 64-256mm; Plummer *et al.* 2005: 129). These natural objects exhibit a roundedness and symmetry that are reminiscent of human-made objects, but are collected and used in their natural form. The distinctive qualities of stone that were perceived in living rock were also materialized in their smallest fragments, in which pebbles and cobbles were essentialized with same qualities of durability and texture. Compared to manufactured items that were shaped through irreversible glyptic processes, cobbles and pebbles came in a form that was ready-to-use and did not require additional formations to have either practical or symbolic use.

The specific size and shape of pebbles can be meaningful to those who handle and use them; Valado (2008: 173) notes that in the ethnographic record, 'potters have often been known to curate or scavenge polishing stones that they particularly like, sometimes passing them down through generations'. Pebbles also have been the focus of embellishment through engraving, a factor that enhanced a stone's distinctiveness, and perhaps also, its perceived power and durability (Brumm *et al.* 2006; Koldehoff and Bukowski 2010). Unlike lithic tools and debitage that present sharp edges that are hard to hold one's hand around, the size and shape of pebbles provides a gentle tactile engagement. Pebbles can be easily hidden tucked away in the hand, a pocket, or a bag away from the gaze of others until such time as the individual deems fit. As forms of 'inconspicuous consumption', pebbles and other miniature objects enable agentive acts in both ritual and domestic contexts as individuals selectively reveal and conceal

matters of faith, attachment, belonging and identity (cf. Smith 2007).

### Collection theory and natural objects

Collecting as a distinct form of human-material engagement has been primarily the focus of studies in art history, psychology, and economics. These fields have provided the basis for conceptualizing the ways in which collecting is an activity that, although it has been greatly diversified by modern manufacturing, has long historical and prehistoric antecedents. Researchers identify 'collecting' as an active process that also isolates objects from daily use, in which selection is controlled by the actions and preferences of individuals who make autonomous decisions about acquisition of any particular object, subject to time and budgetary constraints (Belk 2001: 67, 2014: 34; Bianchi 1997; Danet and Katriel 1994[1989]).

Viewed in this way, many archaeologically-recovered masses of objects ranging from mortuary assemblages and medicine bundles to caches and ritual deposits can be evaluated through the perspective of 'collecting' in which the selection of items is made with explicit reference to understandings of what constitutes a representative, effective and internally-consistent set of objects. As Danet and Katriel (1994[1989]: 228-9) observe, collections incorporate an element of control and domination over some aspect of the material world. Collecting also is a deliberate activity that provides a 'flow' experience [with] a merging of action and awareness incorporated into daily routines and habits (Danet and Katriel 1994[1989]: 222; see also Bianchi 1997: 279). Even when handling small, inexpensive or trivial items, individuals exercise agency as they elect to include or exclude particular items from a collection.

Collection theory applied to pebbles that are acquired, carried and redeposited at selected locales provides an example of the way in which people utilize essentially 'free' natural objects in a discrete and distinctive expression of self. Unlike manufactured goods whose acquisition is governed by intermediaries such as artisans and vendors and limited by cultural constructs of legitimacy in procurement, collecting natural objects is an activity open to all ages, genders, and levels of physical ability. The only expenditure required in the collection of inert natural specimens is the physical exertion of the collector, who in the case of pebbles would encounter such items while undertaking other landscape-related tasks such as fishing, bathing, washing clothes, or while crossing water bodies en route to agricultural fields and herding-grounds.

The literature on collection theory focuses on the role of collecting in the formation of individual identity, with the assumption that the prime motive for

collecting is to retain control over the objects (e.g. Belk 2001, 2014; Danet and Katriel 1994[1989]). Most of the analytic literature on collecting focuses on the ways in which individuals amass items for pleasure, a sense of accomplishment and the display of identity. However, one could broaden the interpretation of collection as a form of cognitive investment in material transfer for socially-integrative purposes, such as picking up objects for redeposition at collective locales in which the act of collecting is meant to serve donative or votive purposes. Such acts of selection-for-donation illustrates the blurred boundaries between private/individual and social/collective consumption (cf. Fine and Leopold 1993: ch. 21).

### **Small is beautiful. The concept of ‘incremental monuments’**

The concept of monumentality generally is reserved for the discussion of structures whose individual elements also are large, such as the monolithic stones that comprise Stonehenge, the larger-than-life sculptures of Easter Island, or the many megaliths and dolmens throughout Asia. The application of collection theory as a process of agentive selection and deposition enables us to address how monumentality also can be achieved through the accumulations of objects and items even when none of the individual parts are ‘monumental’ in any way. The results of these processes of deliberate collection and deposition can be characterized as incremental monuments.

Recent studies of middens have emphasized the ritual value of accumulations, particularly in natural objects deposited at distinct landscape locales (e.g. Claassen 2010; McNiven 2012; Moore and Thompson 2012). These authors show how shell middens were not merely trash heaps but also had ideological significance, and often were invested with other symbolic content such as burials. Viewed as ‘persistent places’ (Moore and Thompson 2012: 276), middens were participatory signals of individual action. In many cases, the accumulations that form middens were of natural objects that had been only slightly modified, such as shells that had been opened by human hands. Everyone, from young to old and vigorous to infirm, could contribute to the creation of a shell midden, signaling a sense of belonging through abundant discard (cf. Smith 2012).

The combination of accumulative behavior and the special regard for stone as a natural substance resulted in the not-infrequent use of pebbles as a specific focus of devotional ritual in contexts other than middens, evident at all levels of sociopolitical complexity and in both monotheistic and polytheistic contexts. Darvill (2002: 80–4) provides an extensive list of barrows and

tombs of the British Neolithic and subsequent periods in which quartz pebbles are prominent, interpreting them ‘as part of the portable material culture associated with the actions and events enacted at these places’. In the Iron Age megalithic tradition of India, ancient builders of boulder-lined circles brought different types of soil and stone to cover the burials within (Mohanty and Walimbe 1993: 100–101). In some cases, pebbles appear to have been used as a referent to larger outcrops of living rock, as was the case for the passage grave at the Swedish site of Rosdala, where beach pebbles of Cambrian sandstone were found intermingled with offerings of pots and flint axes (Tilley 2004: 210–11).

The use of pebbles in devotional context is also seen in more recent religious contexts. Pebbles are cast at the devil during the Hajj pilgrimage (Al-Haboubi 2003), and on the East African coast the ethnohistoric and archaeological records indicate the use of washed, perfumed quartz pebbles strewn on Islamic tombs as ‘repeated acts of memorialization’ (Fleisher 2014: 15). These examples illustrate how the use of pebbles provides a distinctive and democratic potential for widespread public participation in ritual. Only the adult and able-bodied could lift large boulders, but any young, frail or elderly person could tip a shell into a midden, or place a pebble as an offering. Archaeological theory is increasingly focused on telling an inclusive story of the human past, including the perspectives that emanate from distinctive life-states such as childbirth (e.g. Beausang 2005) and childhood (e.g. Baxter 2005). Archaeologies of the disabled and of the aged are still to be fully incorporated into the lexicon of perspectives on ancient activity, although such developments are to be welcomed.

### **Pebble-carrying at Sisupalgarh**

The ancient city of Sisupalgarh, located in the Mahanadi delta of eastern India, dates to the Initial Urban/Early Historic period (starting mid-1st millennium BC through the middle of the 1st millennium AD). Among the walled urban settlements of this period in the subcontinent, Sisupalgarh is distinct in having a rectilinear rampart and monolithic standing pillars. In addition, the site is highly readable because it has, until recently, had little occupation after the Early Historic period providing an ideal opportunity to address a complete ancient urban landscape. The site has been the focus of several research efforts, starting in the mid-20th century (Lal 1949) and renewed in the past decade through a program of systematic surface survey and reconnaissance (Smith 2005) followed by remote sensing, fine-grained topographic mapping, and excavations to examine site-wide activity patterns (e.g., Mohanty *et al.* 2007; Mohanty and Smith 2008; Smith and Mohanty 2016).

The survey project utilized a systematic, non-aligned random sampling process to place collection units ranging from 1.5 x 1m to 10 x 10m in size for the collection of artifacts, production debris, and architectural fragments throughout the interior of the rampart. Our team crisscrossed every survey unit in two directions to maximize the collection of even the smallest items, and noted the soil texture, surface condition, and weather at the time of collection. Most of the 208 collection units were placed in the plowed fields that were at the time the dominant form of land-use. The majority of the collected items consisted of ceramics, brick fragments and tile fragments with a very limited number of other items such as abraded terracotta ornaments, iron fragments and slag. Within the collection units, natural items such as unmodified pebbles and stone spalls exhibiting anthropogenic effects also were consistently collected, counted and weighed.

Quartzite pebbles in the 1-5cm size range were recovered in 182 (87%) of the collection units (Figure 1). Pebbles were not proportional to other categories of finds: for example, collection unit L10 had 8.65kg of pottery, tile fragments and brick fragments, but only one quartzite pebble in the 1cm size range; similarly, unit M11 had 4.4kg of collected material but only four quartzite pebbles in the 1cm size range. By contrast, some units had an extremely high proportion of pebbles compared to other recovered materials. In the area of the central zone around the monumental pillars, we took note of a surprisingly large amount of quartzite pebbles in the 1-4cm size range (e.g., 99 in Unit P20, 120 in Unit Q21, 142 in unit S22) but at the time could not discern their function.

Several years later as part of the excavation project, we returned to the central portion of the site to investigate the monumental pillars, whose arresting

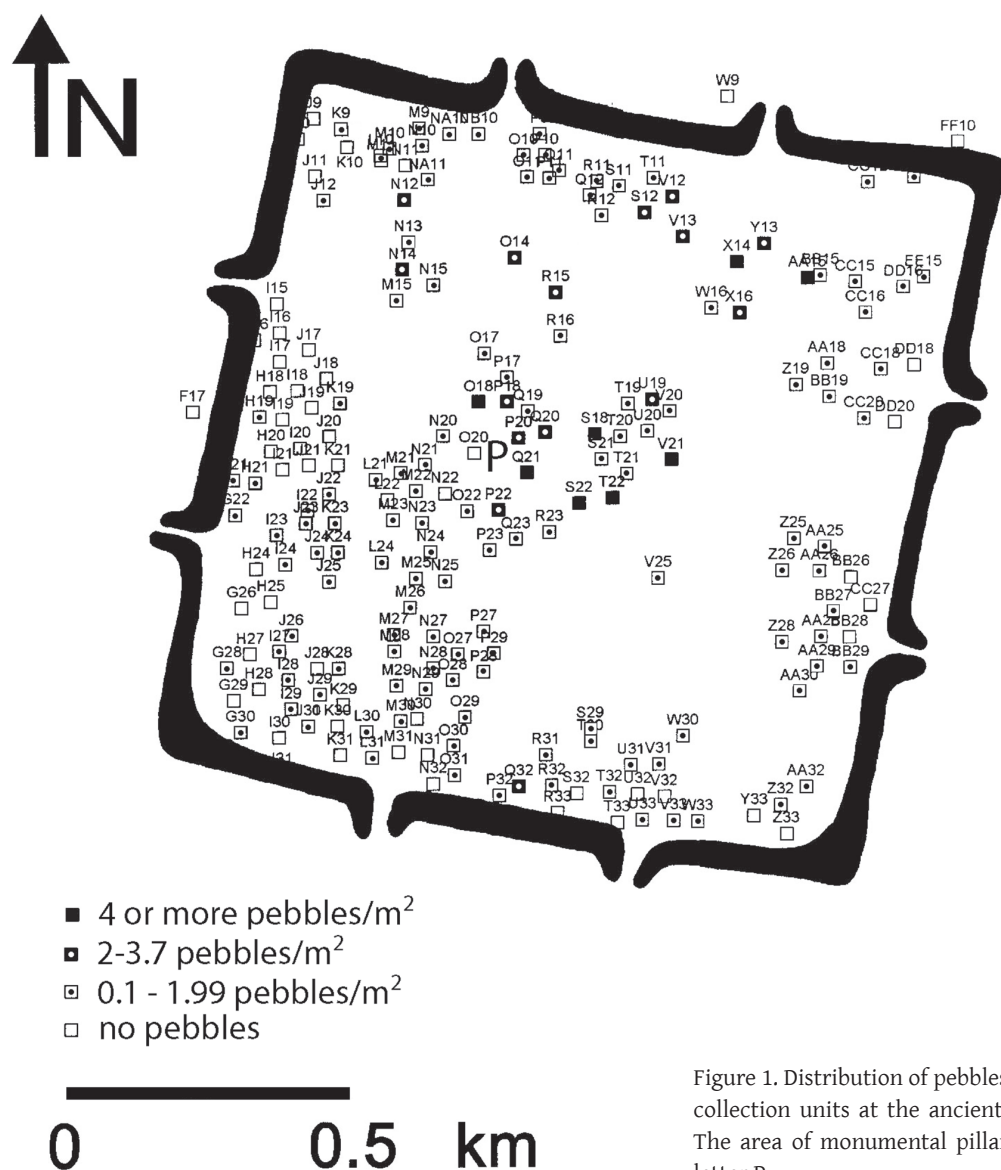


Figure 1. Distribution of pebbles found in systematic collection units at the ancient city of Sisupalgarh. The area of monumental pillars is denoted by the letter P.





Figure 2. Pillar mound of Sisupalgarh, view to west. Note human figures for scale.

visual characteristics are matched by an enigmatic architectural plan (Figure 2). In and around the low mound on which the pillars stood, we opened a total of twenty-two excavation trenches ranging from 1 x 4m to 5 x 5.5m in size revealing both broken-off and fallen pillars. The trenches confirmed the presence of many more pillars than what was currently visible above ground. The recovered and extant pillars revealed a U-shaped configuration reminiscent of the apsidal structure type known as a *chaitya* hall that was a common element of contemporaneous South Asian Buddhist sites (Mohanty and Smith 2008).

Near the bottom of the stone pillars that formed the main architectural elements of the structure was a 3-8cm layer comprised of quartzite pebbles (Figure 3). The pebbles were exactly the same type as the ones recovered in the surrounding fields during the survey of the monumental mound area. Subsequent sections of additional excavation trenches showed that these pebbles formed a consistently level 'floor-like' configuration, and were recovered by the thousands in the trenches of the pillar excavations. In the investigations of adjacent structures we also recovered several disarticulated fragments of plaster in the 20-30cm range with similar pebbles embedded in them (Figure 4). At the western end of the pillar mound, where agricultural activities had trimmed the mound's edges, we were able to view a floor layer that was still intact as a 8-10cm section of plaster with pebbles.

At Sisupalgarh, we cannot be sure that the pebbles had a ritual use, but they are clearly associated with a ritual place. The pebbles that were noted in the survey and as part of the floors at Sisupalgarh were not part of the immediate underlying geological or pedological substrate, which consists of a lateritic soil. Instead, they were most likely to have come from the streams that laced the Mahanadi delta or from the pebbly bands of sandstone outcrops (S. D. Mohanty, pers. comm.). The nearest such outcrop is at Dhauli hill four km away, a site

that itself had significant ritual investment including a third-century BC Ashokan inscription and subsequent evidence for Buddhist ritual activity. Other unmarked sandstone outcrops were distributed throughout the Mahanadi delta.

Pebbles found within the archaeological deposits at Sisupalgarh would thus have been deliberately brought to the site, and deposited with a disproportionate frequency in the central area where the presence of monumental stone columns clearly suggests a ritual function. The central mound represents a juxtaposition of both sophisticated planned architecture that would have been executed by a selected few, and the contributive activities that could have been undertaken by a much greater variety of individuals. This juxtaposition is a familiar one in many religious traditions, in which soaring monumental architecture forms (mosques, cathedrals, temples) provide the scene for repetitive actions. In South Asia even today, ritual activities involve the cumulative effects of numerous individual small-scale efforts, such as the placement of flowers, the pouring of milk, the placement of coins, or the tying of strings to trees as votive offerings. Most of these efforts are organic and transitory, and would not leave any trace in the archaeological record.

In the central pillar mound at Sisupalgarh, the proxy of pebbles provides a tangible and long-lasting testament to individual action. They may also have constituted a dual-use strategy in which practical considerations were integrated with symbolic ones, as the use of pebbles provided stability in the plaster matrix of the floor. Chen and Liu (2004: 589) note that in their tests of aggregate size, the largest-size aggregate that they experimented with (in their case, the largest used was 20mm) provided the best mitigation of fracturing, while de Larrard and Belloc (1997: 424) have noted that rounded aggregate within composites requires less of the binding matrix. Through the use of a rounded pebble aggregate, the ancient builders of Sisupalgarh's

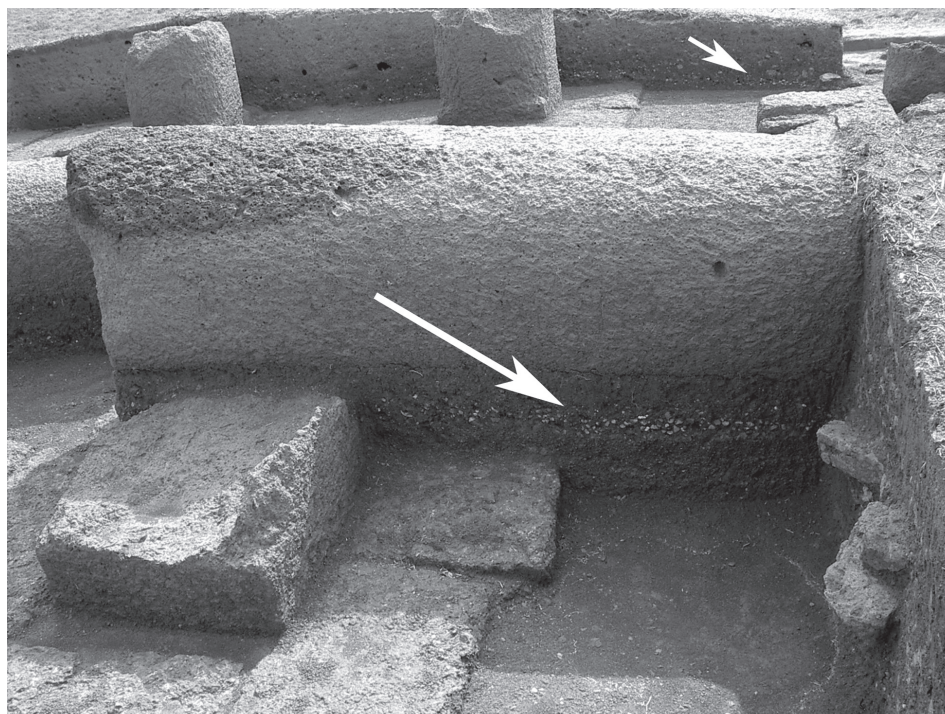


Figure 3. Layer of pebbles preserved as stratigraphic band under fallen pillar (photograph by R.K. Mohanty).



Figure 4. Pebbles in disarticulated plaster fragment recovered in pillar-area excavations at Sisupalgarh.

monumental premises would have economized on plaster, which was made of lime for which the most probable source was marine shells from the coast at a minimum distance of 45km away (Thakuria 2012).

The use of pebbles within the floor plaster was not likely to have been prompted merely by cost-effectiveness but also by the symbolism of pebbles as part of the ritual composition. Smoothness was expressed not merely in the surface of the floor but incorporated into the very fabric of it through the incorporation of waterworn pebbles instead of the angular laterite gravel that is ubiquitous at the site. The leaching of reddish color from iron oxides also might have resulted in reddish stains or an unwanted color shift had it been

used as aggregate in the white plaster of the central pillar zone. In sum, regionally-available aggregate in the form of pebbles that could be brought in as part of routine local activities would have been attractive from an economic maximization perspective as well as providing a practical focus for ritual activity along with a distinct, aesthetically pleasing outcome.

### Discussion and conclusion

Stone is a scalable medium, enabling human creativity to be expressed through massive blocks as well as through the smallest manuports. Each fragment of stone is a partible representation of the parent rock and exhibits the same material properties. While fragments of stone in the form of chips or flakes indicate human actions through the violence of quarrying, pebbles convey this scalability through a ready-made form. Although many acts of ritual engagement are intangible (such as gesture or prayer), such acts take place in a materialized context often marked by the transfer of human-made or natural objects from the hands of the devotee towards the object of ritual devotion. More often it is the context of the act that is significant, rather than the size of the donative object which can be emplaced almost unnoticed by the incremental actions of those who each carry and deposit a small item.

Landscape studies acknowledge the ways in which ancient people endowed their surroundings with a richness of perception even if there are no visible markers of anthropogenic investment (e.g. Bradley 2000; Claassen 2010; Taçon 1999; Tilley 2004). Stone



is a distinct form of material because it cannot be created or augmented by human volition: it is a wholly natural product that cannot be imitated, in contrast to the organic materials that humans cultivated to provide more bountiful and predictable supplies: the domestication of animals for wool and hair; the cultivation of plants such as cotton, flax and agave for fiber; and the husbanding of silkworms for silk and birds for feathers. Pebbles can be found in quantity, but only in natural locales, rendering them a distinct medium for agentive expressions of the nature-culture interface. Individuals could select pebbles from the natural environment according to a rubric of personal choice in color and shape, and select how and when to transport and redeposit them in a cultural context.

Like the many other 'small things forgotten' in the archaeological record (cf. Deetz 1997), pebbles and other naturally formed objects provide the opportunity to examine the nexus of collection, deposition, ritual, miniaturization and agency. Their acquisition can be done by individuals of any age or strength, hidden from view until desired, cast upon collections in public and in private, and carry inscrutable messages of hope, desire, belonging, and belief. Pebbles also can ideologically refer to specific types of landscapes; as Darvill (2002: 84) notes, pebbles evoke a 'close physical association with water, their place of origin in the sea or in riverbeds, and in particular wells and springs' suggestive of symbolic links to those aquatic locales. Water availability (characterized through seasonal processes of drought and flood as well as human interventions of rice fields, dams, sluices, and canals) played a strong political and social role in the Early Historic period; the association of pebbles with water might have suggested to pebble-carriers a sense of control over or accommodation with the otherwise fickle realm of water.

As seen at the ancient city of Sisupalgarh, the recovery of pebbles in cultural locales such as the central pillar mound provides insights about the lived relationship between urban dwellers and their rural surroundings. Given the lack of production debris found within the site, most items utilized at Sisupalgarh seem to have been manufactured elsewhere. People transported to the city a myriad of items including agricultural products, ceramics, architectural elements such as bricks and tiles, metal items, and ornaments. Indirect acquisition of items such as food through intermediaries resulted in urban experiences that became further and further removed from a direct experience of nature (a critique of modern cities that may well have resonance in ancient times; cf. Benton-Short and Short 2013).

Richard Bradley's research on the 'archaeology of natural places' (2000: 18) emphasizes that the partibility of stone as it is quarried and transported renders it a particularly powerful carrier of landscape

connectivity and ritual concepts. Perceptions of the natural would have persisted as societies moved from migratory to sedentary lifeways and then to the densely-populated realms of the city, where natural objects were increasingly mediated by human-made forms of architecture and spirituality. For residents at Sisupalgarh, the act of collecting pebbles outside of the settlement, followed by deposition in the central portion of the city, was an individual, direct and materialized engagement with the world outside of the rampart walls and a participatory opportunity that served to 'domesticate' the natural world within the urban confine.

The examination of pebbles from Sisupalgarh also provides insights on the practice of field archaeology and the value of recording unusual occurrences in both survey and excavation, even if their potential interpretation is unknown at the time of data collection. At Sisupalgarh, the survey in the central portion of the site recorded the presence of hundreds of quartzite pebbles in the collection units; it was not until the excavations at the pillar mound several years later that it was realized that the pebbles had an architectural function through incorporation into floor plaster. Recording forms that allow for open-ended comments are key elements of fieldwork and database strategies, as are stand-alone narrative fieldnotes that enable investigators to build hypotheses and record seemingly inconclusive phenomena while in the process of data collection.

Seeing things as ancient people did requires attentive re-imagination to create architecture, living-context assemblages and cultural practices from artifacts and ecofacts that were subsequently subjected to what often constitutes hundreds or thousands of years of site-formation processes (cf. Schiffer 1987). Sometimes these insights are gained when we extract materials from the ground, washing and sorting them to see them the way that ancient people would have seen them (see, e.g. Fleisher 2014, fig. 13). Sometimes we observe connections serendipitously, as in the case of Sisupalgarh where the presence of a preserved section enabled us to see the banding of an otherwise disarticulated architectural element in the form of a pebble-laden floor. The careful observation of patterning enables us not only to see what is made and used, but also what is out of place and therefore likely to have been meaningful, deliberate and noteworthy to ancient people.

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## Bibliography

- Alden, J. R. and Balcer, J. 1978. Excavations at Tal-i Malyan. *Iran* 16: 79–92.
- Al-Haboubi, M. H. 2003. New layout design for the Jamarat Area (Stoning the Devil). *The Arabian Journal for Science and Engineering* 28 (2B): 131–142.
- Amick, D. S. 1996. Regional patterns of Folsom mobility and land use in the American Southwest. *World Archaeology* 27(3): 411–426.
- Bailey, D. 2014. Touch and the cheirotic apprehension of prehistoric figurines. In P. Dent (ed.), *Sculpture and Touch*: 27–43. Farnham, Ashgate.
- Baxter, J. E. 2005. *The archaeology of childhood: Children, gender, and material culture*. Walnut Creek CA, Alta Mira.
- Beausang, E. 2005. *Childbirth and mothering in archaeology*. Göteborg, Department of Archaeology, University of Gothenburg.
- Belk, R. W. 2001. *Collecting in a consumer society*. London, Routledge.
- Belk, R. 2014. Ownership and collecting. In R. O. Frost and G. Steketee (eds), *The Oxford Handbook of Hoarding and Acquiring*: 33–42. Oxford, Oxford University Press.
- Benton-Short, L. and Short, J. R. 2013. *Cities and Nature*, second edition. New York, Routledge.
- Bianchi, M. 1997. Collecting as a paradigm of consumption. *Journal of Cultural Economics* 21: 275–289.
- Boivin, N. 2004. Rock art and rock music: Petroglyphs of the South Indian Neolithic. *Antiquity* 78: 38–53.
- Bradley, R. 2000. *An archaeology of natural places*. London, Routledge.
- Brady, N. D. K. 1988. The plough pebbles of Ireland. *Tools and Tillage* 6(1): 47–60.
- Braje, T. J., Erlandson, J. M. and Timbrook, J. 2005. An asphaltum coiled basket impression, tarring pebbles, and Middle Holocene water bottles from San Miguel Island, California. *Journal of California and Great Basin Anthropology* 25(2): 207–213.
- Brumm, A., Boivin, N. and Fullagar, R. 2006. Signs of life: Engraved stone artefacts from neolithic South India. *Cambridge Archaeological Journal* 16(2): 165–190.
- Burström, M. 2013. Fragments as something more: Archaeological experience and reflection. In A. González-Ruibal (ed.), *Reclaiming archaeology: Beyond the tropes of modernity*: 197–210. New York, Routledge.
- Carter, T. 2007. The theatrics of technology: Consuming obsidian in the Early Cycladic burial arena. In Z. X. Hruby and R. K. Flad (eds), *Rethinking craft specialization in complex societies: Archaeological analyses of the social meaning of production* (Archeological Papers of the American Anthropological Association No. 17): 88–107. Washington DC.
- Casasola, D. B. 2010. Fishing tackle in Hispania: Reflections, proposals and first results. In T. Bekker-Nielsen and D. B. Casasola (eds), *Ancient nets and fishing gear: Proceedings of the international workshop on 'Nets and fishing gear in classical antiquity: A first approach'*: 83–137. Aarhus, Aarhus University Press.
- Casson, L. 1989. *The Periplus Maris Erythraei*. Princeton, Princeton University Press.
- Catling, H. W. 1987–88. Archaeology in Greece, 1987–88. *Archaeological Reports* 34: 3–85.
- Chapman, J. 2000. *Fragmentation in archaeology: People, places, and broken objects in the prehistory of South Eastern Europe*. New York, Routledge.
- Chen, B. and Liu, J. 2004. Effect of aggregate on the fracture behavior of high strength concrete. *Construction and Building Materials* 18: 585–590.
- Claassen, C. 2010. *Feasting with shellfish in the Southern Ohio Valley: Archaic sacred sites and rituals*. Knoxville, University of Tennessee Press.
- Danet, B. and Katriel, T. 1994 [1989]. No two alike: Play and aesthetics in collecting. In S. M. Pearce (ed.), *Interpreting objects and collections*: 220–239. London, Routledge.
- Darvill, T. 2002. White on blonde: Quartz pebbles and the use of quartz at neolithic monuments in the Isle of Man and beyond. In A. Jones and G. MacGregor (eds), *Colouring the past. The significance of colour in archaeological research*, Vol. 1: 73–9. Oxford, Berg.
- de Larrard, F. and Belloc, A. 1997. The influence of aggregate on the compressive strength of normal and high-strength concrete. *ACI Materials Journal* 94(5): 417–425.
- Dean, C. 2010. *A culture of stone: Inka perspectives on rock*. Durham, Duke University Press.
- Deetz, J. 1977. *In small things forgotten*. Garden City, New York, Anchor Press.
- Ellis, C. 2011. Measuring Paleoindian range mobility and land-use in the Great Lakes/Northeast. *Journal of Anthropological Archaeology* 30: 385–401.

- Fine, B. and Leopold, E. 1993. *The world of consumption*. London, Routledge.
- Flegenheimer, N., Bayón, C., Valente, M., Baeza, J., and Femenías, J. 2003. Long distance tool stone transport in the Argentine Pampas. *Quaternary International* 109-110: 49-64.
- Fleisher, J. 2014. The complexity of public space at the Swahili town of Songo Mnara, Tanzania. *Journal of Anthropological Archaeology* 35: 1-22.
- Freund, K. P. 2013. An assessment of the current applications and future directions of obsidian sourcing studies in archaeological research. *Archaeometry* 55(5): 779-793.
- Kaplan, M. F. and Adams, M. 1986. Using the past to protect the future: Marking nuclear waste disposal sites. *Archaeology* 39(5): 51-54.
- Kenoyer, J. M. 1983. *Shell Working Industries of the Indus Civilization. An Archaeological and Ethnographic Perspective*. University Microfilms, Ann Arbor, Michigan.
- Kuman, K. 2014. Oldowan industrial complex. In C. Smith (ed.), *Encyclopedia of Global Archaeology*: 5560-5570. New York, Springer.
- Lagercrantz, S. 1970. Tallying by means of lines, stones, and sticks. *Paideuma: Mitteilungen zur Kulturkunde* 16: 52-62.
- Lal, B. B. 1949. Sisupalgarh 1948: An Early Historical fort in eastern India. *Ancient India* 5: 62-105.
- Lightfoot, D. R. and Eddy, F. W. 1995. The construction and configuration of Anasazi pebble-mulch gardens in the northern Rio Grande. *American Antiquity* 60(3): 459-460.
- Matney, T. and Donkin, A. 2006. Mapping the past. An archaeogeophysical case study from southeastern Turkey. *Near Eastern Archaeology* 69(1): 12-26.
- McNiven, I. J. 2012. Ritualized middening practices. *Journal of Archaeological Method and Theory* 20(4): 552-587.
- Milne, S. B. 2005. Palaeo-Eskimo novice flintknapping in the eastern Canadian arctic. *Journal of Field Archaeology* 30(3): 329-345.
- Mohanty, R. K. and Smith, M. L. 2008. *Excavations at Sisupalgarh, Orissa*. Indian Archaeological Society, New Delhi.
- Mohanty, R. K., Smith, M. L., Matney, T., Donkin, A., and Greene, G. 2007. Archaeological research at Sisupalgarh 2007: An Early Historical city in Orissa. *Puratattva* 37: 142-154.
- Mohanty, R. K. and Walimbe, S. R. 1993. A demographic approach to the Vidarbha megalithic culture. *Man and Environment* 28(2): 93-103.
- Moore, C. R. and Thompson, V. D. 2012. Animism and Green River persistent places: A dwelling perspective of the Shell Mound Archaic. *Journal of Social Archaeology* 12(2): 264-284.
- Moropoulou, A., Bakolas, A. and Anagnostopoulou, S. 2005. Composite materials in ancient structures. *Cement and Concrete Composites* 27: 295-300.
- Orton, C. and Hughes, M. 2013. *Pottery in Archaeology* (2nd edition). Cambridge, Cambridge University Press.
- Parker Pearson, M. and the Stonehenge Riverside Project 2012. *Stonehenge. Exploring the greatest Stone Age mystery*. London, Simon and Schuster.
- Pavel, P. 1992. Raising the Stonehenge lintels in Czechoslovakia. *Antiquity* 66(251): 389-438.
- Plummer, C. C., McGeary, D. and Carlson, D. H. 2005. *Physical Geology* (10th edition). New York, McGraw Hill.
- Postgate, J. N. 1997. Mesopotamian petrology: Stages in the classification of the material world. *Cambridge Archaeological Journal* 7(2): 205-224.
- Potts, T. F. 1993. Patterns of trade in third-millennium BC Mesopotamia and Iran. *World Archaeology* 24(3): 379-402.
- Rollefson, G. O. 1992. A Neolithic Game Board from 'Ain Ghazal, Jordan. *Bulletin of the American Schools of Oriental Research* 286: 1-5.
- Scarre, C. 2004. Choosing stones, remembering places: Geology and intention in the megalithic monuments of western Europe. In N. Boivin and M. A. Owoc (eds), *Soils, stones and symbols: Cultural perceptions of the mineral world*: 187-202. London, UCL Press.
- Schiffer, M. B. 1987. *Formation processes of the archaeological record*. Albuquerque, University of New Mexico.
- Skov, E. T. 2013. Experimentation in sling weaponry: Effectiveness of and archaeological implications for a world-wide primitive technology. Unpublished MA thesis, University of Nebraska-Lincoln.
- Smith, M. L. 2005. Archaeological research at Sisupalgarh, an Early Historic city in eastern India. In U. Franke-Vogt and H.-J. Weisshaar (eds), *South Asian Archaeology 2003*: 297-306. Aachen, Kommission für Archäologie Außereuropäischer Kulturen.
- Smith, M. L. 2007. Inconspicuous consumption: Non-display goods and identity formation. *Journal of Archaeological Method and Theory* 14: 412-438.
- Smith, M. L. 2012. Seeking abundance: Consumption as a motivating factor in cities past and present. *Research in Economic Anthropology* 32: 27-51.
- Smith, M. L. and Mohanty, R. K. 2016. Archaeology at Sisupalgarh: The chronology of an Early Historic urban centre in Eastern India. In V. Lefèvre, A. Didier and B. Mutin (eds), 2016. *South Asian Archaeology and Art 2012*, Vol. 2: 683-695. Brepols, Turnhout.
- Stewart, S. 1984. *On longing. Narratives of the miniature, the gigantic, the souvenir, the collection*. Baltimore, The Johns Hopkins University Press.
- Stiner, M. C. 2014. Finding a common bandwidth: Causes of convergence and diversity in Paleolithic beads. *Biological Theory* 9: 51-64.
- Sulgostowska, Z. 2002. Flint raw material economy during the late glacial and early postglacial in the Oder-Daugava-Prypet Basin. In L. Fisher and B. V. Eriksen (eds), *Lithic raw material economies in late*



- glacial and early postglacial Europe* (BAR International Series 1093): 7–17. Oxford, Archaeopress.
- Taçon, P. S. C. 1999. Identifying ancient sacred landscapes in Australia: From physical to social. In W. Ashmore and A. B. Knapp (eds), *Archaeologies of landscape: Contemporary perspectives*. Malden, MA: Blackwell, 33–57.
- Thakuria, T. 2012. An ethnoarchaeological study of shell fishing and lime manufacturing technique at Manikapatana, Orissa, India. *Man and Environment* 37(2), 89–101.
- Thoms, A. V. 2009. Rocks of ages: Propagation of hot-rock cookery in western North America. *Journal of Archaeological Science* 36, 573–591.
- Tilley, C. with the assistance of Wayne Bennett. 2004. *The materiality of stone: Explorations in landscape phenomenology*: 1. Oxford: Berg.
- Valado, M. T. 2008. Identifying lightly used polishing stones: Experiments and implications. In Y. M. Rowan and J. R. Ebeling (eds), *New approaches to old stones: Recent studies of ground stone artifacts*. London: Equinox, 173–181.