Partible, Permeable, and Relational Bodies in a Maya Mass Grave

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Introduction

Over the past 30 years, research on the anthropology of the body has demonstrated that some basic western perceptions about bodies, such as the concept of the individual, are far from universal [see DeMello (2011), Haraway (1991), Sharp (2011), Shilling (2008), Strathern (1998), Turner (2011) for recent discussions of various aspects of the boundedness of bodies]. In most Western societies, individuals' bodies have clear boundaries between the inside and outside and are self-contained units. However, ethnographers have demonstrated that many cultures view bodies not as individualized, but as permeable, partible, and highly relational entities (Strathern, 1998). Permeable bodies have porous boundaries with the outside world and may gain or lose animating essences or aspects of personhood throughout life. Partible bodies are internally divided, which is to say they have animating essences found in specific locations throughout the body. Relational bodies are defined in terms of their relationships with other people and objects and, as such, may well be quite fluid in definition and composition. There are many other potential aspects of non-individual bodies, but these characteristics are among the most common in non-individualized corporeal perspectives. In the past 15 years, bioarchaeologists have begun to engage such social constructionist perspectives (Sofaer, 2006). Archaeologists, notably John Chapman (Chapman, 2000; Chapman & Gaydarska, 2007), have explored the notion that a variety of media in the material record,

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A.J. Osterholtz et al. (eds.), *Commingled and Disarticulated Human Remains: Working Toward Improved Theory, Method, and Data*, DOI 10.1007/978-1-4614-7560-6_9,

including ceramics, lithics, figurines, and human bodies, were broken intentionally. Considering the intentional fragmentation of human bodies can shed light on aspects of individuality of bodies, particularly aspects of partibility, permeability, and relationality. One challenge for using fragmentation as a window into such aspects of embodiment is identifying intent. This is particularly challenging when considering bodies in disarticulated, commingled, and secondary contexts.

Here, we employ Ripley's *K* function to explore the spatial distribution of remains in a Postclassic (AD 950–1524) Maya mass grave. The statistic permits us to show empirically that bodies in the grave were fragmented and manipulated intentionally on the basis of side and element. We argue that this is a function of the fact that Maya bodies were non-individualized and reflected a host of processes in life and death. Considering the spatial distribution of the remains in light of the grave's historical and political context suggests that the grave was created as an attempt to fragment, appropriate, and agglomerate enemies' bodies into a collective but highly public monument to their defeat. This case study highlights the fact that understanding the manipulation of remains in some contexts is contingent on engaging non-individualized views of bodies and that spatial analyses, especially when considered in light of contextual data, can permit researchers to engage such perspectives in an empirically rigorous fashion.

Relational, Partible, and Permeable Bodies

Individuals, as considered in Western society, are circumscribed from nature and exist in a closed or bounded state. Norbert Elias (1991, p. 91) described this closed individual as kind of a "thinking statue" in which the mind largely defines personhood and is separated from the outside world (Shilling, 2008). Personhood is typically not embodied except in the mind in such a view. Losing a finger, from this viewpoint, has no inherent impact on your personhood any more than cutting your hair might. These bodies may be contrasted with a collective or corporate group, by virtue of their self-containment, but are otherwise not defined in terms of their relationship to other bodies or objects. Anthony Giddens (1991) argued that the individual body seemed to emerge with modernity in the West, though it is an oversimplification to suggest that the individual/non-individual distinction reflects solely a Western/non-Western dichotomy.

This notion of the individual has been challenged recently from a clinical standpoint. As Chris Fowler (2008) and Lambros Malafouris (2008) note, topics such as ghost pain in amputees, and the prospect of muscle memory among patients with memory problems, have highlighted the fact that aspects of personhood may be embodied to a greater degree than previously imagined in Western medicine (see also Csordas, 2011). At the same time, ethnographic research has contributed the idea of relational bodies. The two best known ethnographic concepts in this discussion are dividual and fractal bodies. The notion of the dividual is most frequently

associated with Marilyn Strathern's (1998) work, though she credits the term to McKim Marriott (1976, p. 111). Marriott notes that

> Persons—single actors—are not thought in South Asia to be "individual", that is, indivisible, bounded units, as they are in much of Western social and psychological theory as well as in common sense. Instead, it appears that persons are generally thought by South Asians to be "dividual" or divisible. To exist, dividual persons absorb heterogeneous material influences. They must also give out from themselves particles of their own coded substances—essences, residues, or other active influences—that may then reproduce in others something of the nature of the persons in whom they have originated.

The Hagen people in New Guinea are dividual; people are connected by gifts (Strathern, 1998). Gifts are not simply discrete possessions exchanged between separate individuals. Dividual people are never alienated from the gifts that they produce because "the labor is never extracted: it remains embedded" within the objects being exchanged (Strathern, 1998, p. 155). Thus, people give and take part of each other through their gifts, and accordingly, their bodies are the emerging outcome of such ongoing relations. Among the Mt. Hagen people, such gifts and exchanges are highly gendered and thus can influence and even change people's genders through the performance of exchanging objects (Strathern, 1998).

Roy Wagner (1991) originally proposed the concept of fractal bodies as a way to account for persons whose bodies are actually integral, being neither separate individuals nor truly corporate groups. Fractals are shapes in which the subsidiary parts have the same form as the larger whole, so zooming in or out results in seeing the same shape just on a different scale. Fowler (2008, pp. 48–49) succinctly illustrated the point by describing a person's fractal body as a potentially nested culmination of ancestors. In a single body, substances are passed on from our parents, grandparents, and great grandparents. Similar cumulative blending of genders, moieties, or entire communities within a particular person could result in other manifestations of fractal bodies. These relational bodies are defined, and in fact inextricably chained to one another, by virtue of their relationships to other people and objects.

Embodiment may be considered to be the corporeal manifestation of these and other (continuously unfolding) processes. The discussion of relational bodies opens up a host of other potential characteristics and processes of embodiment for consideration. Fowler (2008) describes a number of these aspects, but we would like to focus on two in particular: partibility and permeability. Partible bodies are internally divided and thus have mosaic corporeality, which is to say body parts have particular characteristics in and of themselves that may not be shared with other parts in the same body (Busby, 1997, p. 274). By virtue of this mosaic corporeality, partible bodies permit detachment and attachment of parts that contain their particular characteristics. Strathern (1998, p. 185) and Cecelia Busby (1997, p. 274) note that Melanesian bodies are partible and that this has implications for their relational nature. Since objects produced by labor are not alienated from the person who produced them, "transactions appear as the extraction, and absorption, of parts of the person" by others (Busby, 1997, p. 274). Permeable bodies, on the other hand, may also be dividual but are not necessarily internally divided. They are blended

rather than mosaic. Busby (1997) notes that in South Asia, maternal and paternal substances are recognized in such bodies, but they are not identified as separate entities or specifically embodied in anatomy. Substances can thus flow from individuals to others and can be relationally defined, but are not inherently partible.

Maya Bodies

Maya bodies illustrate how partibility, permeability, and relationality can co-occur, but before describing them, a caveat is in order. As the above (abbreviated) comparison of Melanesian and Southern Indian bodies demonstrated, non-individualized bodies are not all the same, and the presence or absence of specific characteristics of such bodies in the past needs to be evaluated on a case-by-case basis. In other words, hopefully, efforts to draw ecumenically from the ethnographic record will identify new concepts that may shed light on past cultures, but should not lead one to find Melanesian bodies in Mexico (see Jones, 2005). Even within a particular culture, such as the Maya, there is no inherent reason to think that bodies were uniform or even stable through time. Bodies are almost inherently political (Scheper-Hughes & Lock, 1987) and thus may have differed in important nuanced aspects of composition and construction between kingdoms in the Classic period (AD 300–950; Scherer & Golden, in press; Scherer, pers. comm.). To this end, future studies will no doubt refine our understanding of Maya bodies through space in time, but currently, we can demonstrate that ancient Maya bodies were not individualized (Geller, 2012; Gillespie, 2001, 2008; Houston, Stuart, & Taube, 2006; Meskell & Joyce, 2003).

The easiest way to characterize Maya bodies is to describe four concepts, the first of which is *baah*. *Baah* is not so much a soul or animating essence as it is a conflated manifestation of personhood, the self, and the head (Houston & Stuart, 1998; Houston et al., 2006). *Baah* could be taken and manipulated by others (Houston & Stuart, 1998; Houston et al., 2006). Research has shown that animating essences could be lost through the head (Duncan, Elson, Spencer, & Redmond, 2009; Duncan & Hofling, 2011; Tiesler, 2012), though it is unclear if this characterized *baah*. By virtue of its properties, heads were frequently targeted for violence. The vitality associated with skulls in Mesoamerica is well documented (Houston et al., 2006; Moser, 1973), but one example is the fact that maize seeds are called little skulls by Tzutujil Maya speakers even today (Carlsen & Prechtel, 1991). As a result, *baah* could be absorbed by captors after decapitation (Houston et al., 2006) or appropriated for other purposes such as to animate buildings (Duncan, 2011).

Although *baah* was associated with the biological head, the concept could be extended to metaphoric references, such as the head of a corporate group (Houston & Stuart, 1998; Houston et al., 2006). Also, images of the head in some cases likely reflected *baah*, indicating that its presence extended beyond the physical body (Houston & Stuart, 1998; Houston et al., 2006; Stuart, 1996). Thus, stelae depicting rulers' heads permitted them to be spiritually present and potent long after their biological death. Similarly, iconography showing captives' heads not only

commemorated their humiliation but perpetuated their shame and suffering across generations (Houston & Stuart, 1998; Houston et al., 2006).

Ik' was breath soul and was associated with wind (Taube, 2004). Breath and wind were both food for, as well as manifestations of, the gods' and ancestors' spiritual essences (Taube, 2004). Public speaking and singing were important methods for communicating with gods and ancestors (Taube, 2004), and thus, the word *ajaw* meant either "lord" or "he who shouts or proclaims" (Rice, 2004; Stuart, 1995, pp. 190–191). Rulership was not, of course, open to everyone in society, and *ik'* may not have been equivalent among all members of society. Words from rulers were likely regarded as particularly "precious" (Houston et al., 2006, p. 79). *Ik'* was explicitly embodied and was associated with the mouth, nose, and other orifices (see below). Researchers (e.g., Meskell & Joyce, 2003) have long noted that one style of dental modification looked like the *ik'* glyph. As a result of this emphasis on the mouth, caches of teeth have been reported at multiple sites in the Maya area (Duncan & Schwarz, in review), and maxillae were used as trophies in multiple areas in Mesoamerica (Duncan et al., 2009; Spence, White, Longstaffe, & Law, 2004).

Ik' is particularly interesting by virtue of its explicit relationship with other media, specifically jade, as well as a flowery afterlife. Iconographically and epigraphically, *ik'* is frequently associated with the *ochb'ih*, a death verb that means "enters the road" (Taube, 2004). This probably refers to *ik's* association with passage to a flowery paradise after death, though in the same way that not everyone had equal amounts of *ik'*, not everyone would have had access to this afterlife (Taube, 2004). This paradise was likely reserved for nobility or brave warriors who had died in battle (Taube, 2004). Placing a jade bead in the deceased's mouth after death reflects the explicit association between *ik'* and jade. Additionally, *ik'* was associated with jade earspools. Taube (2004) has argued that the opening of the ears for the spools constituted a gateway through which *ik'* could pass. This is interesting because it suggests that orifices could be created within the body to reflect its permeability. This may have implied a need to guard against loss of *ik'* (cf. Duncan and Hofling, 2011).

Finally, *ik'* is notable because it has been associated with evil airs in contemporary times (Helmke and Nielsen, 2009). The fact that *ik'* was associated with sweet wind and air and a flowery paradise in Classic period contexts strongly suggests that the meaning associated with *ik'* changed through contact and conquest to reflect medieval European humoral notions about health (Helmke and Nielsen, 2009).

The *wahy* were animal companion spirits that were active during sleep and could move independently of the body (Helmke & Nielsen, 2009). The *wahy* seem to have been "strangely impersonal" (Houston et al., 2006, p. 35), and thus, their manner and location in the body are not entirely clear. However, *wahy* beings seem to have had masculine characteristics (Houston et al., 2006), may have contributed to personhood, and may even been hereditary (Helmke & Nielsen, 2009). The *wahy* were unruly, wild, and associated with the forest (Taube, 2004). *Wahy* beings were also associated with the underworld, and it was precisely during sleep that sorcerers could attack people's *wahy* in dreams. Diseases were the manifestations of such attacks and were thus embodied. As such, diseases were in fact viewed as beings that people could engage in their dreams (Helmke & Nielsen, 2009).

Ethnographic descriptions of the *wayhel* from Tzotzil Maya speakers indicate that the *wayhel* die upon death (Guiteras-Holmes, 1961), unlike some aspects of personhood.

Finally, *ch'ulel* is an "eternal and indestructible" soul among the Tzotzil Maya (Gillespie, 2002; Houston et al., 2006; Meskell & Joyce, 2003, p. 24; Vogt, 1969, p. 370). Ethnographic descriptions of the *ch'ulel* indicated that it is associated with the essence of the individual, and with the heart and blood (Taube, 2004). Houston et al. (2006, p. 79) and Stuart (1996) have argued that *k'uh* or *ch'uh* was a cognate of *ch'ulel* that likely referred to holy things or essences and may have come "from royal hands, perhaps within blood." The association with royalty may imply that *k'uh* (like *ik'*) was not equally present in all members of society.

Given these aspects of Maya bodies and personhood, it is clear that they were thoroughly partible and permeable, and relational. This is an important point because it highlights the fact that Maya bodies are (and were) neither just like the internally divided Melanesian bodies nor like the permeable South Asian bodies described above. Additionally, we should note that many aspects of Maya bodies and personhood have yet to be tied to emic concepts. For example, long bones were important symbols for either establishing or undermining claims to legitimate political authority throughout Mesoamerica. Tombs in Oaxaca with missing femora have been interpreted as attempts by rulers to demonstrate a legitimate claim to power from deceased relatives (Feinman, Nicholas, & Baker, 2010). In the Maya area, though, similar examples of missing long bones have been interpreted as attempts to desecrate the deceased (Beck & Sievert, 2005; Hurtado Cen, Tiesler, & Folan, 2007; Miller, 2007). We still are not sure exactly of which soul or aspect of personhood was manifest in these long bones.

The relational aspect of Maya bodies stemmed in part from the intimate and dynamic connections between the living, the dead, and territory in Maya society as well as the role of cyclical time in the Mesoamerican religious worldview. Everything, including people, was caught up in cycles of birth and death and rebirth in Mesoamerica (Gossen, 1986; Mock, 1998). Parents passed on the connections of ancestors to their children, of course, but children were actually manifestations of ancestors (Meskell & Joyce, 2003). This is reflected today in Tzutujil speakers' description of the *jaloj k'exoj* cycles (Carlsen & Prechtel, 1991). *Jal* is associated with the changes that occur between birth and death—normal processes of aging. *K'ex* is the process (or processes) of essential change or transformation from one substance to another (Stuart, 1996). In this context, it is the change that occurs after death and before rebirth, a change that linked individuals over generations. Children were named for ancestors, and this link reflected and thus helped create "a form of consubstantiality with deceased predecessors" (see Geller, 2012 for discussion aspects of relational bodies in other contemporary Maya communities; Gillespie, 2002, pp. 68, 71). This was one reason the living, the ancestors, and the land were so closely tied. If the living were manifestations of the ancestors, and the ancestors were buried in the communities' land and houses, then there was an inescapable connection between the three. Legitimate claims to corporate territory were contingent on demonstrating and renewing that relationship (Houston & McAnany, 2003; McAnany, 1995; Stanton & Magnoni, 2008).

Considering Past Bodies

Researchers have used two principal approaches to engage notions of unbound and relational bodies in the material record: considering the relationship between human bodies and other media, such as animal bones or figurines, and the study of fragmentation. These approaches are not exclusive, but we focus on fragmentation here (Brittain & Harris, 2010; Chapman, 2000; Chapman & Gaydarska, 2007). Fragmentation theory considers whether and when the presence of broken objects in the material record is the result of a purposeful act rather than the product of accidental breakage, being thrown away, and/or decomposition. In the broadest sense, body fragmentation occurs in myriad circumstances including losing teeth; cutting fingernails or hair; circumcision; amputation via trauma, medical procedure, or punishment; organ donation or transplantation; trophy taking; some forms of ancestor veneration; the use of religious relics; dissection or autopsy; archaeological excavation and subsequent curation; or display of parts of human remains in museums. For Chapman, though, there are several key ways that fragmentation may occur (Chapman, 2000, p. 23; Chapman & Gaydarska, 2007, pp. 6–8): accidental breakage, intentional burial because objects have been broken, ritual killing, dispersal of objects to aid in fertility, and deliberate breakage to facilitate the distribution of an object's parts among individuals. A host of processes that follow intentional fragmentation, such as addition, removal, recombination, substitution, and reintegration, can happen in varying degrees to ceramics, figurines, houses, lithics, or human remains (Chapman, 2010; Garber, Driver, Sullivan, & Glassman, 1998; Joyce, 2008). Thus, for bioarchaeologists, a principal utility of fragmentation theory is that it provides a theoretical tool designed for the material record that can shed light on aspects of non-individualized bodies.

Two specific concepts that Chapman uses, enchainment and accumulation, are particularly relevant to this discussion. Enchainment is "the linking of person to person through object (fragment) exchange" (Chapman, 2010, p. 31). The idea is that by exchanging goods between individuals, cumulative social bonds are created between individuals and groups. As Chapman (2000, p. 31) notes, "each exchange act is pregnant with the whole history of these persons and their relationship." In societies with individuals, this may be imbued with varying degrees of importance or meaning, but in societies with relational bodies as described above, this may be a primary mechanism of embodiment. Accumulation occurs when complete objects (whether vessels or human bodies) are collected and interred together. In the case of many media, the value of a particular set of accumulated objects is defined not in terms of the relationships framed through enchainment, but rather in the value of the objects themselves. As such, accumulation is a complementary concept to enchainment (Chapman, 2010). The tension between fragmentation and accumulation is one that defines societies' relationship to a particular object or body and, as such, highlights the potential for investigating concepts such as dividual or fractal bodies in the past.

Researchers who have begun studying fragmentation among human remains in archaeological contexts typically focused on aspects of the relationship of parts to the whole (Chapman & Gaydarska, 2007; Lorentz, 2010; Rebay-Salisbury, 2010),

social enchainment (Chapman & Gaydarska, 2007; Feinman et al., 2010), the boundaries of bodies and other media (Hedager, 2010; Sørensen, 2010), body commodification (Cherryson, 2010), and the historical change in meaning associated with fragmented bodies over time (Tarlow, 2008; Weiss-Krejci, 2010). The degree to which people are able to engage concepts of non-individualized bodies and their fragmentation may reflect a host of factors that limit our knowledge about cultural context or our ability to historicize bodies precisely or thoroughly. These include sample size, preservation, written records or iconography, or even the number of bioarchaeologists working in a particular region to generate comparative data. However, one important challenge for engaging fragmentation theory is the degree to which intent may be assessed in an empirically rigorous fashion. This is particularly true for secondary, commingled contexts. Thus, here, we would like to build on this work and present a case study for how aspects of fragmentation may be considered in a contextual but statistically rigorous fashion to identify aspects and processes of non-individualized embodiment.

A Maya Mass Grave

Ethnohistoric sources have shown that two politically dominant social groups lived around the Petén lakes in northern Guatemala prior to contact with Europeans (Fig. 1; Jones, 1998, 2009). The Kowoj controlled the north and the Itzá controlled the south. These distinctions were probably based on ethnic, political, and linguistic differences (Jones, 2009). Research at the site of Zacpetén demonstrated that the

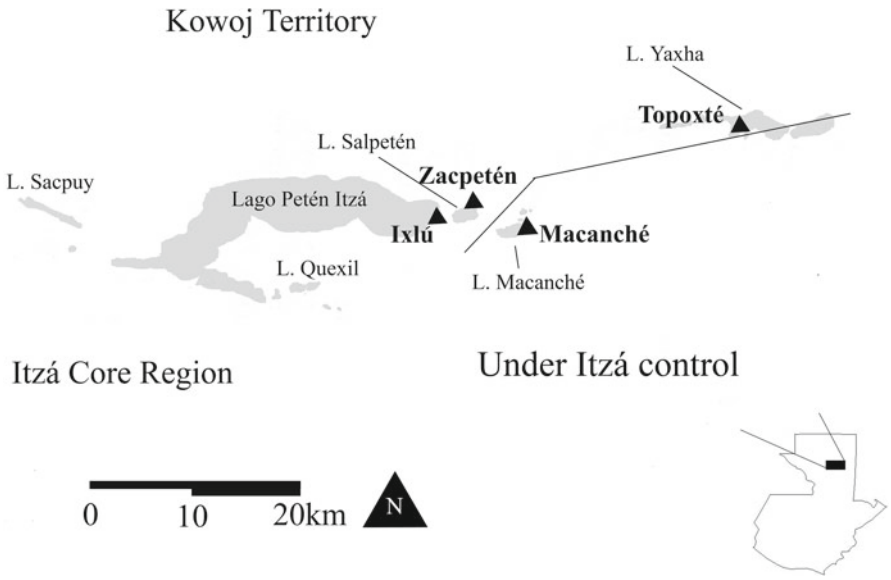

Fig. 1 Map of Petén lakes region with sites mentioned in text

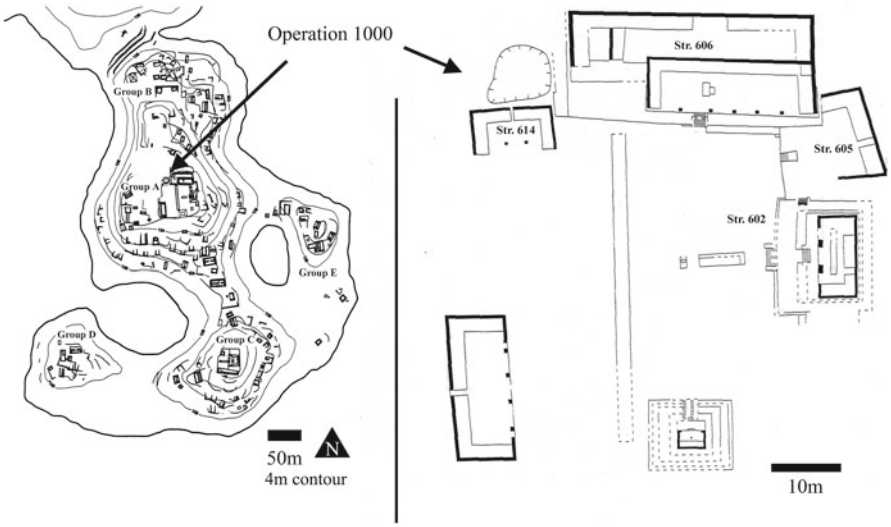

Fig. 2 Map of Zacpetén and Group A, the principal civic-ceremonial architectural group at the site

Kowoj controlled the site in the Late Postclassic (ca. AD 1200–1524), by virtue of the presence of Mayapán-style temple assemblages at the site (in Groups A and C; Fig. 2). The presence of these temple assemblages has been documented at other sites in the Petén lake region (at Topoxté) and at the site of Mayapán in the Yucatan peninsula. Mayapán-style temple assemblages constitute material evidence of Kowoj occupation (Pugh, 2001). Operation 1000 is a large depression on the northwest corner of the Mayapán-style temple assemblage in Group A at the site of Zacpetén. In Mesoamerican archaeology, major excavations are sometimes called operations, and hereafter, we refer to the excavation of the mass grave as Op. 1000. Excavations of Op. 1000 in 1997 identified a mass grave in the depression (Pugh, 2001). This was significant because other mass graves have been found on the western side of Mayapán-style temple assemblages, notably at Topoxté (Bullard, 1970), and thus, the mass graves are also thought to have been created by the Kowoj (Duncan & Schwarz, in review). Subsequent fieldwork by the senior author in 2002 excavated and analyzed the remainder of the mass grave at Zacpetén.

Op. 1000 was used most intensively in the Middle Preclassic period (1000–300 BC), Terminal Classic period (ca. AD 800–900), and Late Postclassic period (ca. AD 1200–1524) (Duncan & Schwarz, in review). The evidence for use in earlier time periods (the Preclassic and Terminal Classic) included three (and possibly four) features with temporally diagnostic ceramics on the edge of the feature. In the Late Postclassic, the northern portion of Op. 1000 was excavated and filled with fist-sized chunks of white limestone (Layer 8; Fig. 3). Layer 7 lay on top of layer 8 and consisted of smaller white limestones mixed in a brownish gray matrix. Layer 7 included a considerable amount of charcoal that indicated in situ burning. Layer 6, the mass grave, was placed on top of layer 7. The remains were then covered with a layer of

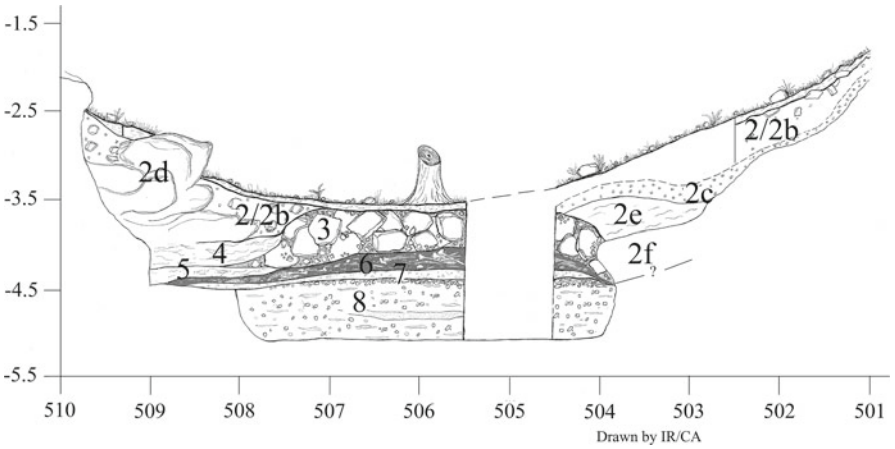

Fig. 3 Eastern facing profile of Op. 1000 on the 106 line

Table 1 Radiocarbon dates from Op. 1000, Zacpetén

Sample number	Level	Material	Measured C14 age	Conventional C14 age	2 sigma calibrated date
Beta-226378[a]	6	Bone collagen	160 ± 40 BP	410 ± 40 BP	AD 1430–1520; AD 1580–1630
Beta-226379[a]	6	Bone collagen	170 ± 40 BP	420 ± 40 BP	AD 1430–1520; AD 1590–1620
Beta-226380[a]	6	Bone collagen	190 ± 40 BP	470 ± 40 BP	AD 1410–1460
Beta 226381[b]	6	Wood charcoal	700 ± 60 BP	690 ± 60 BP	AD 1230–1400
Beta-226382[b]	6	Wood charcoal	580 ± 40 BP	580 ± 40 BP	AD 1300–1430
Beta-112318[a,c]	7	Wood charcoal	540 ± 30 BP	540 ± 30 BP	AD 1380–1440; AD 1310–1360

[a]AMS date
[b]Standard date
[c]From Pugh 2001

white limestone chunks in the center of the pit (layer 3). The periphery of the grave was covered by chipping off limestone from the sides of the feature (layer 5). All strata on top of layers 5 and 3 were produced by erosion from the surrounding plaza and structures. Radiocarbon dates from layers 6 and 7 all indicate that the grave was created around the time the Kowoj established a significant political presence in the Petén lakes region, in the 1400s (Table 1). Overall, the association with the Mayapán-style temple assemblage, the radiocarbon dates, and the stratigraphy indicate that Op. 1000 had been a focal point for ritual activity for over 1000 years, but the placement of the grave into the depression in the Late Postclassic period occurred when the Kowoj established control of the site. It was the last intentional act associated with the feature prior to its archaeological excavation.

The remains from the mass grave were inventoried and analyzed as outlined by Jane Buikstra and Douglas Ubelaker (1994) and by Ubelaker (1974). The MNI for Op. 1000 is 37 (left temporal and left femur) and underrepresentation of smaller

Table 2 Quantification and cutmarks of long bones in Op. 1000

Element	Side	Adult MNI	Juvenile MNI	Total MNI	PS	PSC	MS	MSC	DS	DSC
Humerus	L	15	5	20	5	0	16	0	10	1
Humerus	R	7	6	13	6	2	14	0	6	0
Radius	L	15	7	22	14	1	22	1	16	5
Radius	R	10	4	14	10	1	14	2	8	1
Ulna	L	17	11	28	19	1	24	1	17	3
Ulna	R	11	3	14	7	0	11	1	7	2
Femur	L	33	4	37	7	0	27	1	9	1
Femur	R	24	11	35	14	1	26	1	11	2
Tibia	L	28	6	34	5	1	24	3	10	1
Tibia	R	26	4	30	5	0	22	1	10	0
Fibula	L	20	2	22	13	2	22	2	16	1
Fibula	R	27	3	30	19	1	30	4	15	1

MNI minimum number of individuals, *P* proximal third of the diaphysis, *M* middle third of the diaphysis, *D* distal third of the diaphysis, *S* scorable segment, *SC* scorable segment with cutmarks

skeletal elements (e.g., MNI = 7 and 9 for distal manual and pedal phalanges, respectively) indicated that layer 6 was a secondary deposit (Table 2). Deposition occurred in a single event and articulation was rarely evident during excavation, which also suggests that the assemblage was a secondary deposit. However, spatial analysis indicated there some of the remains were paired, which could reflect intentional placement of bone pairs in the grave or postdepositional movement that masked articulation (see below). There were adult and juvenile remains in the assemblage (including an infant), and both sexes were represented, though sex was not quantified due to poor preservation. One skull, an adult male, exhibited cranial modification (contra Duncan, 2005).

Analysis of the remains indicated evidence of cutmarks, grinding, and drilling. The data on cutmarks demonstrated that the long bones were cut in the middle of the shafts as well as the ends (Table 2). This fact implied that the mortuary processing was more complex than simple dismemberment. Virtually, no cutmarks were found on flat bones, but as almost all were unscorable (75% present), this may reflect preservation. Additionally, two femoral shafts showed evidence of grinding. One had been split longitudinally and ground on the proximal end. One animal canine, one human canine, and one human molar exhibited holes drilled in their roots, out of a total of 372 permanent human teeth with scorable roots. These likely reflect desecratory acts (Duncan & Schwarz, in review).

In addition to the grinding and drilling of the femora and teeth, maxillary molars and right forearm bones were underrepresented relative to their mandibular and left counterparts, respectively. This discrepancy is significant for the comparison of left and right forearm bones even if you adjust the level of significance through a Bonferroni correction. That is to say, performing eight tests on the same sample would modify an original alpha value of 0.05 to 0.00625 (right versus left arm bones; $x^2 = 7.577$; df = 1; p-value = 0.0059). Chi-square tests comparing the MNI for the permanent and deciduous maxillary versus mandibular molars were also significant at a 0.05 level, though only the permanent chi-square was significant at the

modified alpha level (permanent molar $x^2 = 13.52$; df = 1; p-value = 0.00024; deciduous molar x^2 with Yates' correction = 6.72; df = 1; p-value = 0.0095). Did the Kowoj intentionally cause the discrepancy during the creation of the grave? The Kowoj moved to the Petén lakes region from Mayapán in the Yucatan peninsula (Jones, 1998) and there are collective graves at that site that may be family shrines. If the creators of the grave took remains from such a shrine and a side-based discrepancy already existed, then such a discrepancy might not reflect any volition on the part of the Op. 1000's creators. One way to test this notion is through a spatial analysis.

Recently, archaeologists have been using geographic information systems (GIS) and specialized software to create compelling analyses of spatial point patterns (Dirkmaat, Cabo, Adovasio, & Rozas, 2007; Kvamme, 1993; Schwarz & Mount, 2005, 2006). These methods employ the spatial location data (e.g., coordinates) of the variables of interest to assess strength of association among elements. The analysis presented here assesses spatial relationships among kinds of bones and provides comparisons of two categorical variables, such as side. We use Ripley's K function, which offers a number of advantages over other methods (Connolly & Lake, 2006), particularly when used in combination with Monte Carlo methods (Manly, 1997).

Ripley's K function is a scaled-distance algorithm that compares a spatial point pattern with a homogenous Poisson distribution, thus providing a baseline expectation of complete spatial randomness (CSR). The statistic defines a point process of intensity λ, where $\lambda K(t)$ defines the expected number of neighbors within a circle of radius (t) at an arbitrary point in the spatial point pattern (Connolly & Lake, 2006, p. 166; Pélissier & Goreaud, 2001). The statistic, $K(t)$, is a cumulative frequency distribution of the average density of points at fixed distances, which is then graphed. The interpretation of the statistic utilizing appropriate confidence limits can identify aggregation, CSR, and/or regularity at different scales across a spatial point pattern. Thus, Ripley's K analysis provides the user with a detailed, scaled analysis of pattern(s) of spatial association that is visually intuitive.

Ripley's K function was first used in plant ecology and has been used in the social sciences as well (Levine, 2002; Ripley, 1977, 1981). We reference Dirkmaat et al.'s (2007) use of Ripley's K function to analyze commingled remains from the Orton Ossuary in Pennsylvania. It is a good example of the value of the method in archaeology. These researchers utilized the bivariate extension of Ripley's K function (Diggle, 2003; Lotwick & Silverman, 1982). The bivariate extension allows for an assessment of the contribution that categorical variables (i.e., right and left bones) have on the overall spatial distribution of long bones, which in the present study is important given the side discrepancy of arm bones. Monte Carlo methods (Manly, 1997) were used to generate confidence limits for the statistic. We used the software package PASSaGE 2.0 (Rosenberg & Anderson, 2011) to complete the analysis presented below.

The bivariate extension of Ripley's K function outputs to a graph against distance (t), as Khat(t). The expected value for Khat(t) is a parabolic curve (Ripley, 1977) though, so in practice, a related statistic, Lhat, which is visually simpler to comprehend, is often used instead. Lhat creates an expectation of CSR at values of around 0,

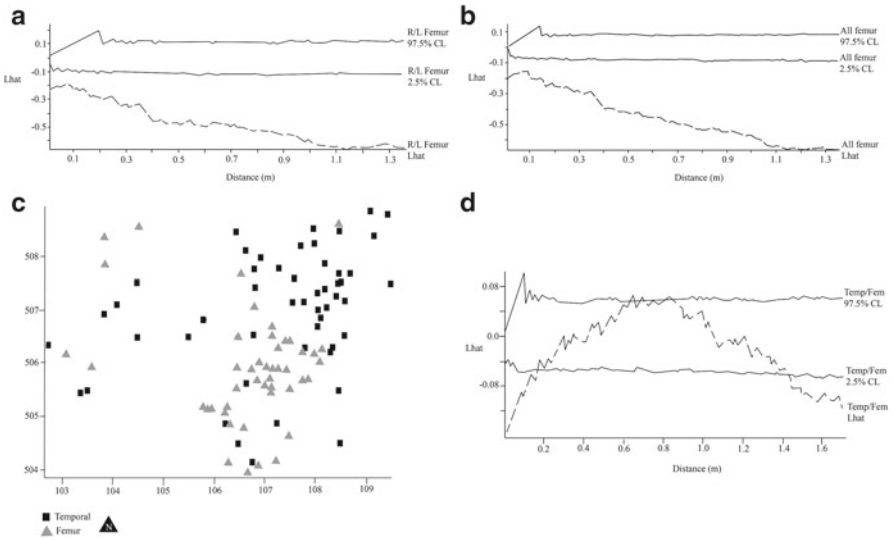

Fig. 4 (**a**) Bivariate plot of Lhat comparing left and right femora; (**b**) univariate plot of Lhat comparing all femora; (**c**) map of femora and temporals; (**d**) bivariate plot Lhat comparing femora and temporals

where the confidence envelope is centered (Rosenberg and Anderson, 2011). In PASSaGE, negative values below the lower confidence limit demonstrate a statistically significant aggregated (or clustered) pattern while positive values above the upper confidence limit (CL) demonstrate a statistically significant regular pattern. Given the exploratory nature of the statistical study of the Zacpetén mass grave, we selected an alpha level of 0.05 for the two-tailed analysis.

We employed Ripley's *K* analysis to identify evidence of intentional manipulation of the remains by side or element, or evidence of previous articulation that was disturbed by taphonomic processes. Thus, the analysis included mapping of individual elements, a univariate Ripley's *K* analysis of each element, and bivariate Ripley's *K* analyses, generally based on side. Additionally, we conducted by element comparisons that were relevant to the research problem. This focused on identifying evidence of articulation within long bones (e.g., right ulnae and right radii, left ulna and left radii, radii and humeri) and evidence of clustering of crania versus long bones.

Individual long bones showed a pattern of limited aggregation at low distance scales (e.g., below 0.4 m) with aggregation increasing with distance (Fig. 4a). This pattern of association could be termed weak-followed-by-strong aggregation. The Lhat trend line is outside of the confidence interval and is shown descending, which indicates increasing or stronger aggregation at greater distance scales. The femora exhibited the weak-followed-by-strong aggregation pattern and the bivariate comparison by side shows almost no variation from the univariate graph (Fig. 4b). The femora exhibited no differences in spatial association based on side, nor did the humeri, tibiae, and fibulae.

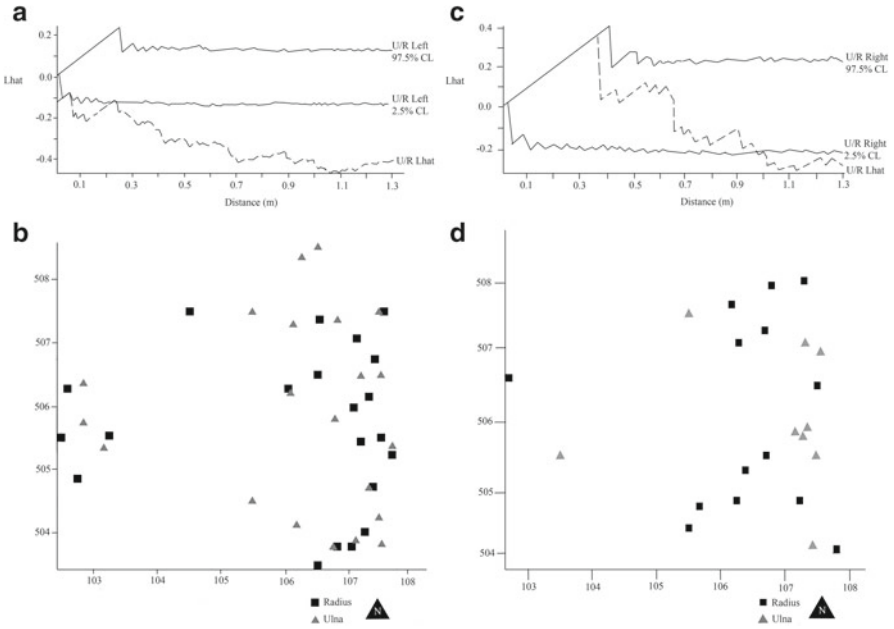

Fig. 5 (**a**) Bivariate plot of Lhat comparing left ulnae and radii; (**b**) map of left ulnae and radii; (**c**) bivariate plot of Lhat comparing right ulnae and radii; (**d**) map of right ulnae and radii

Element-by-element comparisons identified that cranial bones (as measured by the temporals) were predominantly aggregated in the northeast corner of the mass grave (Fig. 4c). Large numbers of long bones, such as femora, were just to the southwest. Although distributions of the two elements overlap and come into close contact (between N506 and N506.5; Fig. 4c), for the most part, they can be separated visually in clusters. The Ripley's *K* analysis showed this clustering at low distance scales (0–0.15 m) and then CSR at distance scales up to 1.4 m (Fig. 4d). Above 1.4 m, aggregation was present. This pattern fit the visual examination of Fig. 4c in which the visually evident clusters of femora and temporals approached 2.0 m in size.

Element-by-element comparisons also identified some evidence of paired bones in the grave, specifically the left ulnae and radii. The bivariate Ripley's *K* analysis indicated the jagged Lhat line running near and crossing the lower confidence interval just above 0.2 m (Fig. 5a), demonstrating slight aggregation and then increasing aggregation with distances up to 1.08 m. Left ulnae and left radii would be paired or near each other if the forearm was articulated during burial. In fact, a map shows a limited amount of pairings (Fig. 5b) among left forearm bones, suggesting some articulation may have been present, although none was noted during excavation. This patterning is consistent with pairing of some elements that had articulation during burial or that the bones were interred in pairs. It is likely that some bones separated slightly during the postdepositional period.

The right ulnae and right radii exhibited a differing pattern than the left. At low distance scales, the Lhat estimator ran along the confidence limit signifying CSR but trended toward a weakly regular pattern (Fig. 5c). From 0.35 m to 0.98 m, CSR was evident with weak clustering from 0.98 m to 1.28 m, at which point the statistic reached the limits of estimation. This pattern was consistent with the map, which showed few right radii in close proximity to the right ulnae (Fig. 5d). At larger distance scales, the elements clustered by side, particularly right radii ($n=6$) in the southeastern part of the mass grave (E105.5–E107.25).

In summary, the Ripley's *K* analysis illuminated four aspects of spatial distribution within the grave. First, most individual long bones reflect a weak-followed-by-strong aggregation as spatial intervals increased for both the univariate and bivariate analyses. This indicates that individual elements were not placed in bundles or pairs with like elements when interred (e.g., femora were not placed with other femora) and that they were not significantly regularly spaced at any interval. Second, there was a difference in large-scale clustering of cranial elements (based on the temporal) and long bones (based on the femora). The crania seem to have been placed in the northeast corner of the feature while most long bones were located farther south. This confirms the fact, suggested by quantification and excavation observations, that the remains were not completely articulated when interred. It also confirms the scenario that the spatial distribution of the remains was manipulated intentionally. However, the analysis also suggested that some of the remains, specifically the left radii and ulnae, may have been articulated when interred. This pattern may reflect skeletal articulation that was attenuated by the conditions of deposition and commingling, but nonetheless was detectable statistically. Finally, the analysis indicated the absence of right radii and ulnae aggregation at small and mid-scale distance. The large-scale clustering of the right radii and right ulnae, and difference between the right and left forearm bones, reflected intentional manipulation of these bones within the mass grave. A pattern such as this is unlikely to arise randomly and the scale of disarticulation of the right forearm elements was the result of a form of intentional fragmentation and manipulation.

The omission of right forearm bones and their spatial distribution implied cognizance and intentional action on the part of the grave's creators. We argue that this was consistent with left/right symbolism seen elsewhere in the Maya region. Joel Palka (2002) and others (Houston et al., 2006; Stuart, 2002) have demonstrated that the left side was associated with subordinate status and sacrificial victims in the Maya area, while the right was associated with superordinate status. Thus, the skeletal element representation and spatial distribution were consistent with an attempt to desecrate the individuals in the grave by associating them with the left side. On the basis of these data, the most likely scenario to account for the creation of Op. 1000 is that the Kowoj made it when they took control of the site and desecrated the remains of the previous occupants. This may have involved sacrifice, desecration of war dead, or exhumation of enemy ancestors or some combination of the three (Duncan & Schwarz, in review).

Discussion

Here, we have demonstrated statistically that bodies were intentionally fragmented and manipulated on the basis of side and element in a commingled secondary context. The remains reflected desecration and the radiocarbon dates of the grave clearly linked the grave with the emergence of the Kowoj as a political force in the Petén lakes region. The act of making the graves in part dislodged the previous occupants' ties to the respective sites. However, the Kowoj did not simply violate enemies' bodies. They presumably could have desecrated enemy bodies in a host of ways up to and including throwing them in the lake. They chose to keep them and place parts of different people in a disorganized fashion in the corner of the principal civic ceremonial center of the site to make a public symbol from enemy remains. The motivation for doing so stems in part from several specific characteristics of Maya bodies. The first such characteristic is permeability. The remains in the grave were potentially harmful by virtue of their permeability. The evidence for this is that the remains were wrapped in a white layer to seal in the potency and that a taboo was associated with the deposit. Previous research has shown that wrapping materials in layers of white (Wagner, 2006), whether it was white textiles that enveloped sacred bundles (Stenzel, 1968; Wagner, 2006) or white limestone marl for architecture and graves (see Duncan, in review for a recent discussion; Reilly 2006; Wagner, 2006), was a way to ritually seal in spiritually potent essences. Wrapping media in white marl following termination was particularly important when the Maya continued to live around the terminated media (Wagner, 2006). This seems to be particularly relevant to the case of Op. 1000. Layers 8, 5, and 3 were all white limestone and were placed under and over the grave layer in Op. 1000. Additionally, the creation and sealing of the grave were the last acts in the depression, even though Op. 1000 had been targeted for over 1,000 years for ritual use (Duncan & Schwarz, in review). The Kowoj continued to use the architectural complex surrounding Op. 1000 after the grave was created though, suggesting that there was a taboo associated with the feature. Houston et al. (2006) suggest that Colonial Tzotzil speakers referred to secrets as having been buried, and a similar sentiment may have applied to the mass grave in the context of this taboo. Thus, the remains seem to reflect a permeability that was threatening to the Kowoj after the grave was made.

Partibility is the second aspect of Maya bodies manifest in the grave. The emphasis on the left side of the body and the removal of the right forearm bones and maxillary molars reflects specific differences within the skeleton, though it is unclear what particular essences (emically speaking) were found in the right or left side. The mouth, on the other hand, was clearly associated with *ik'*, as described above, and thus targeting it for violence may have been associated with denying the deceased passage to a flowery paradise after death.

In the context of fragmentation theory, accumulation is the grouping of sets of objects or individuals into a larger set. The grave clearly is an accumulation in the strict sense but not of whole bodies, and thus does not reflect accumulation as originally described by Chapman (Chapman, 2000; Chapman & Gaydarska, 2007). Chapman (2010, p. 33) defines recombination as "the creation of a hybrid body by

the placing of part of one human body in juxtaposition to that of part of the body of another human of different age/sex or another species." Op. 1000 may be consistent with this idea, but we suggest that the notion of agglomeration (a heap or cluster of disparate elements) better captures the characteristics of the grave in Op. 1000 than recombination because of the disorganized nature of the grave. Bodies are normally not shown touching one another in Maya iconography, and the placement of people's bodies in a collective grave clearly would have been an insult (Houston et al., 2006). Additionally, these researchers have argued that the lowest form of victimhood was anonymous victimhood, and thus, the agglomeration of the previously separate people into an unnamed mass grave would have been a singular degradation. This is not to say that the Kowoj did not know who were in the grave, just that victims' individual identities were not publically commemorated. It is likely that the Kowoj (and their enemies) knew exactly who were in the grave, and their specific bodies were targeted for violence and commemoration of that violence as a group. Finally, Cecelia Klein (1982) has argued that in the Maya worldview, the heavens were perceived as an orderly tapestry, while the underworld was perceived as disorderly, and thus, the disorganization of the grave may have been a form of insult in and of itself. The grave, then, reflects a process of agglomeration, which stems from permeable and relational bodies' potential be melded into one collective unit. The grave makers not only disrupted the previous occupants' claim to the site but used their bodies to create a collective, public, and enduring monument to their defeat and humiliation at the center of the civic-ceremonial core of the site.

The distinction of accumulation and agglomeration raises the question of whether or not the grave implies enchainment of the missing remains. The missing right arm bones and teeth are perfectly consistent with the scenario of trophy taking, which would have linked the deceased from whom trophies were taken and those who took and owned the trophies. Currently, there is no established method for identifying trophy taking in commingled secondary contexts on the basis of missing elements, and ultimately, we cannot know what happened to them. However, the possibility exists that the right forearm bones were exchanged and thus could have enchained the Kowoj with both the living and the dead.

To conclude, one ongoing challenge for contemporary bioarchaeologists is to engage non-individualized views of the body. In this chapter, we used a Ripley's *K* analysis of a Maya mass grave to consider, empirically, whether or not the bodies in the grave were fragmented and manipulated intentionally. Doing so permitted the identification of multiple aspects and processes associated with Maya embodiment and highlighted the fact that spatial analyses, particularly when considered in light of historical and political context, can shed light on aspects of non-individualized bodies in an empirically rigorous fashion.

Acknowledgments We would like to thank the editors for inviting our participation. All of the members of Proyecto Maya Colonial, in particular Drs. Prudence M. Rice, Don Rice, and Leslie Cecil, were particularly helpful throughout the various stages of this work. We would like to thank the faculty and students of Centro Universitario del Petén (CUDEP) in Guatemala, notably Lics. Rómulo Sánchez Polo, Rolando Torres, Ivo Romero, Mara Reyes, Edy Barrios, Aura Soto, and Tierso Morales, for their valuable contributions to this project. Timothy Pugh provided data from

a test trench. This project could not have been possible without cooperation of IDAEH in Guatemala, in particular Lics. Boris Aguilar and Sheila Flores. Several conversations with Drs. Andrew Scherer, Gabriel Wrobel, Vera Tiesler, Andrea Cucina, and Rosaura Yépez about Maya bodies were particularly helpful as this manuscript was being written. Drs. Andrew Scherer and Melissa Schrift gave particularly constructive peer reviews of this manuscript. Dr. Della Cook gave similarly constructive comments and encouragement regarding an earlier version of this paper. Carmen Arendt and Felix A. Duncan provided unflagging support, for which W. N. D. is most grateful. Funding was provided in part by NSF doctoral dissertation improvement grant BCS 0125311. Any remaining errors are solely ours.

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