Sakbihs and Polyagency

The Architectural Causes of Human Activities in the Cochuah Region, Quintana Roo, Mexico

Johan Normark

Most archaeological theories state that we should primarily study the human agent or social structure behind materiality. In this article it is proposed that we should focus on the effects that *polyagents* (materialities and immaterialities) have brought about in past social networks. By creating a biography of a polyagent it is hoped that we can reconstruct the way in which architecture has affected past environment and human behaviour and intentions. Causeways or *sakbihs* are one such category of polyagents found throughout the Maya Lowlands. Their relationships with agriculture, water and climate in the Cochuah region, Quintana Roo, Mexico, are discussed.

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THE PROBLEM OF PAST SOCIAL PRACTICE

Agency and practice theories of various sorts (Bourdieu 1977, 1990; Giddens 1979, 1984; Ortner 1984; Sahlins 1981) have gained popularity in archaeology during the past two decades (Barrett & Fewster 2000; Cornell & Fahlander 2002; Dobres & Robb 2000; Dornan 2002; Gillespie 2001; Shanks & Tilley 1987; Smith 2001). However, there is a common lack of a clear definition of what a practice really is on the operational level. I define a *practice* in an archaeological perspective, as what a human agent did in relation to materiality in a temporal and spatial setting. Each practice cannot be the same at various locations and times, since the past agent had both experience and anticipations at every stage where we find archaeological data (Gell 1998; Husserl 1991). A practice can thus never be the same in itself. There is always a *differance* that is dependent on time (Cornell 2000; Hägglund 2002; Wood 1989). The essence of a practice is thus problematic since a practice can always be performed by the same *agent*, the same *patient* (receiver of agency) and in the same spatial location, but never in the same temporal setting. The critical problem in defining a practice is thus time.

Although several authors have attacked the problem of time in archaeology, they tend to focus on the long term (Golden 2002; Gosden 1994; McGlade 1999;

Murray 1999; Thomas 1996). They do not discuss whether time consists of an endless series of discontinuous *instants* (Bachelard 2000a, 2000b), or whether it is just one continuous *duration* (Bergson 1999). To me, Bachelard's isolated instant has more relevance for our understanding of the archaeological record, since I argue that a practice ends at the instant moment when an object leaves the relationship with the human agent. The past practice is beyond an archaeological *event horizon* (Normark 2004).

If an unknown cause or practice of a visible artifact produced the latter, we have a connection between practice and artifact. However, if the instant separates cause from effect and causation is non-linear in the long run, we cannot assume the cause from a linear causal perspective or that cause and effect are related to each other. To avoid this dilemma we must turn things round and look at what the visible cause is and after that relate it to possible effect(s). Something other than the past and now invisible human agent must thus be set as the cause.

POLYAGENCY

The instant separates the object from the preceding subject, and the temporal and spatial setting of the practice. It is the agency of the object that remains after the event horizon that also existed before the instant.

Like actor-network-related theorists (Knappett 2002; Latour 1999; Pickering 1995; Pickering 1997; Rachel 1994; Schiffer 1999), who argue that social relations consist of humans and non-human *actants*, Gell defines an *agent* as anything or anyone "who causes events to happen in their vicinity" (Gell 1998:16). Agency is relational, since an agent always has a patient and vice versa (Gell 1998:22). Gell distinguishes "primary" agents (intentional beings) from "secondary" agents (objects) "through which primary agents distribute their agency in the causal milieu" (Gell 1998:20). For example, a living human being (primary agent) used an axe (secondary agent) to cut down a tree (patient).

However, we never find this primary agent in the archaeological record, and we thus need to elaborate upon the secondary agent's causative abilities. I choose to call this ability *polyagency* to separate it from human agency. This concept has two meanings. (1) It focuses on different agents, both material and immaterial. As a collective group they will be called polyagents rather than actants (as the latter term neglect immateriality). (2) Each polyagent has a plurality of poly-agencies depending on its dialectic relationship with other polyagents within a social network. Humans are both polyagents and agents.

I therefore propose a radical shift in the cause-reaction-effect relationship in archaeology. This change will set materiality as causative polyagents (primarily as secondary polyagents) and past humans as both primary agents and patients. I believe that we will have a more diverging and open past future in which practices took different forms, since the future was not given in advance. In the traditional use, archaeologists try to find one cause of a practice, since it is believed that the past is determined as it has already happened, a realisation of a predetermined

possibility. This is not how the archaeological record was formed. The future was open and a cause could have had different effects, depending on our ontological approach to the effect (Normark 2004). By viewing materiality as containing polyagency, we shall also have a bridge to the past human agency. In this case, materiality is both a known cause and a known effect and the human agent can be likened to an invisible catalyst or reaction, which helps the artifact to get from one state to another or prevents it from doing so (Fig. 1). It really does not matter if the human was a primary agent or a patient in this context, as the polyagent (materiality) would have reactive effects in both directions (Ingthorsson 2002). For example, the axe affected both the tree and the human.

Polyagency is a relationship associated with the artifact, but not found in any particular part of the object, since a broken object still has polyagency, but not the same as before, as this polyagency is a dialectic relationship with other polyagents (Normark 2004). The material objects are related to the past corporeal human agents since they were manufactured and used by humans. Being a polyagent, an object is an *index* of the manufacturer's and user's agency (Gell

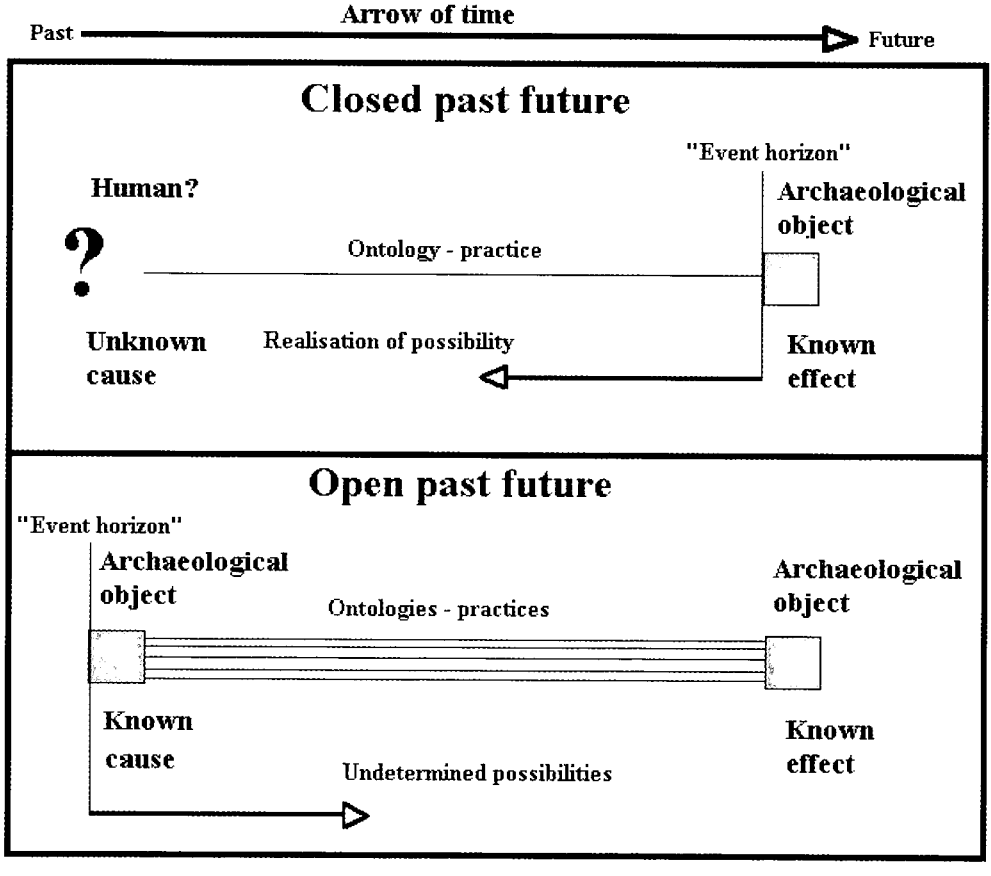

Fig. 1. Different ways of seeing the past future.

1998), and the agent's *iconic* and *discursive* order (Aijmer 2001), derived from specific socialisation processes (Zizek 1989). The index is the outcome and/or instrument of social agency. The iconic order consists of iconic codes which people deal with without being able to express them in words. Different iconic codes among people result in their being affected by polyagents in different ways.

It is through human agency, the corporeal body and memory that polyagents can be reproduced. Agents reproduced, anticipated, repeated or copied what had been done by themselves or by others to form the material categories that we locate distributed in time and space. Husserl's protention (anticipation) and retention (memory) concept as it is modified by Gell (1998) can be useful in this process.

What we have in the archaeological record is the agent's or a social formation's *œuvre* as temporal distributed polyagents (Gell 1998). By œuvre, Gell (1998:241) means the agents' total productions in life distributed in time and space. I will add utilization of objects as well. However, in the archaeological record these polyagents would only reflect small portions of the agents' lives at certain points in time. The polyagents are indexes of events when the human agency brought them into existence or modified them during use. This relationship between agent and polyagent can be seen as a temporal series of materiality that relate to a *thread* or a structurating positivity which can be found at other locations as well but are perhaps connected with other *fibres* of structurating practices (Cornell & Fahlander 2002).

People manufacture what they know from their socialisation process and the polyagents are therefore not different from other polyagents. This is related to the *principle of least difference* (Gell 1998:257). Thus, a ceramicist manufactured a vessel by copying what others had done before him or her. However, the *prototype* for the new vessel was when it was manufactured the index of another copy by an earlier agent. This led to the reproduction of the iconic order which became more persistent through time than instantaneous practices and the fragmented memories (Bachelard 2000a). Thus it is polyagents that influences people to reproduce certain polyagents, the iconic order and discourses each time a new polyagent is produced. A polyagent is also a prototype for a future polyagent and may be related to other series of structurating practices and even other iconic orders or discourses. Thus, certain forms of distributed polyagents have the ability to influence the human agent's behaviour in both "routine" and radical ways, not originally intended.

The capability of a polyagent to influence its surroundings is always present and the polyagent thus gains a biography of events throughout its existence (Gosden & Marshall 1999; Holtorf 1998; Kopytoff 1986). Once this biography is understood and the object's relations to human agents have been investigated, we can begin to see other effects in the causal milieu of this relationship. Only then should we use the practice theories to investigate other ontologies than the iconic one, such as a discursive order and a *realist* order (Aijmer 2001). Direct historical

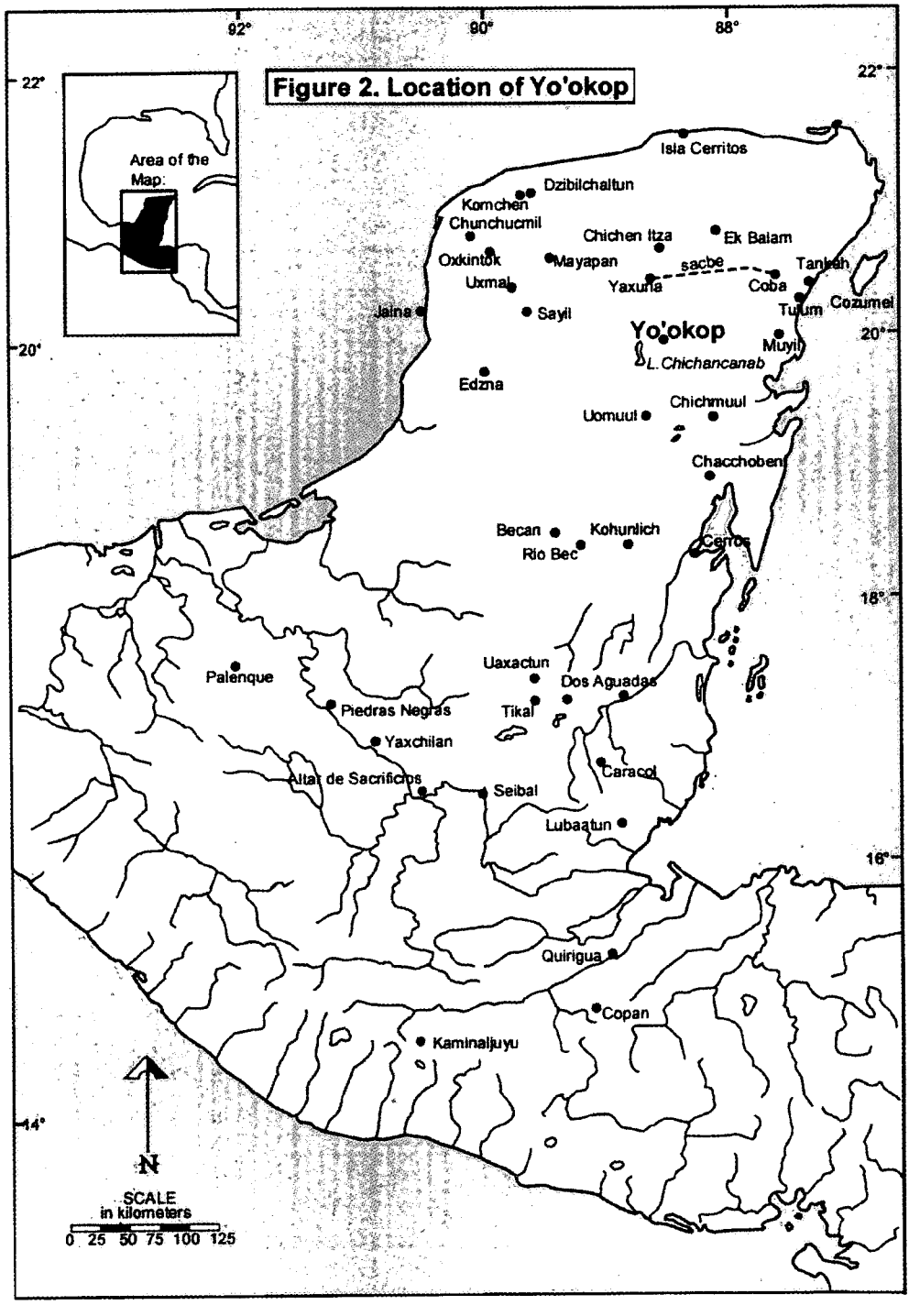

Fig. 2. The Maya area (Shaw 2002:3).

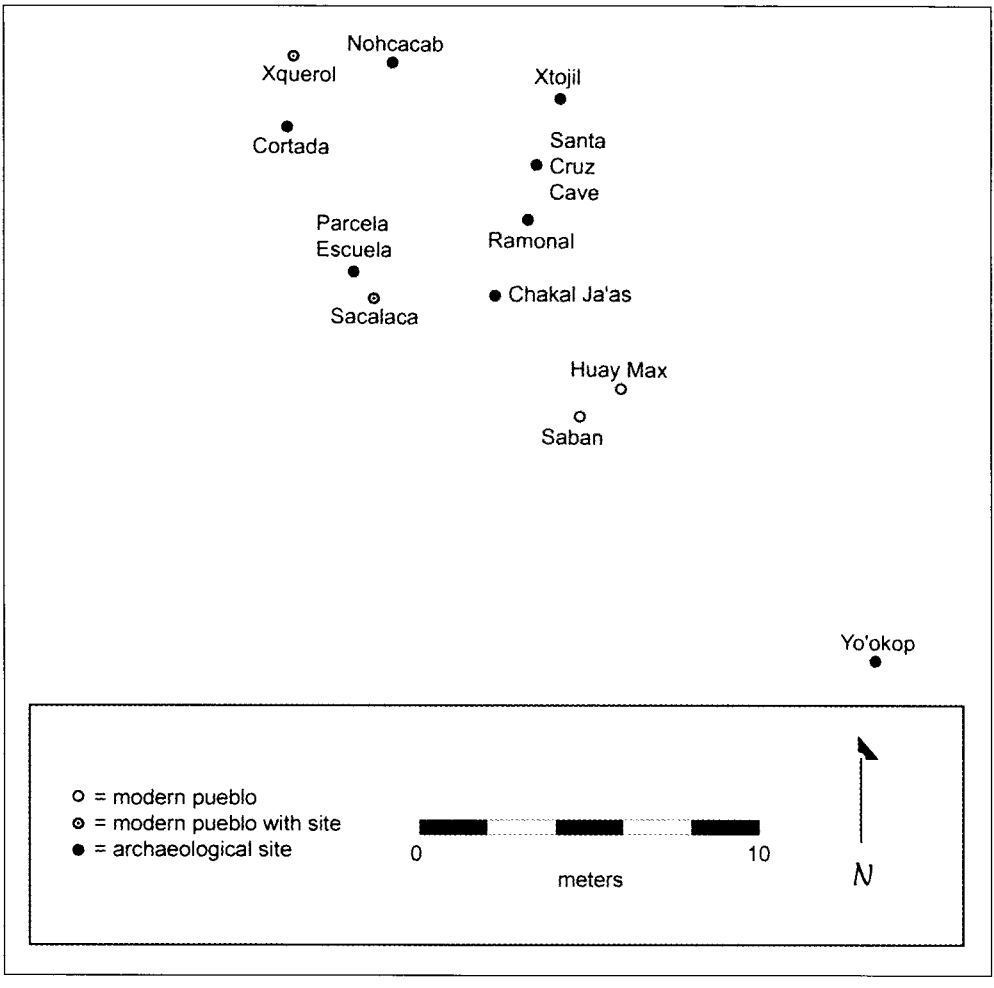

Fig. 3. Investigated part of the Cochuah region (Shaw 2003b:2).

and ethnographical analogies, which are often used in Maya studies, can be important in the iconic order and the realist order, as the first one relates to polyagency and unconscious notions of the world which have a long-term existence, just as the realist order relates to geology, biology, etc. The discursive order is more time- and space-specific and should thus be treated with greater care.

Sakbihs (causeways)

One category of distributed polyagents with complex biographies are the Maya causeways, *sakbihs* (better known as *sacbes,* "white roads"), which are found within and between sites in the Maya area (Fig. 2). I shall regard all sakbihs as one polyagent distributed in time and space that enacted practices among different polyagents.

To limit this study, I shall focus on the relationship between causeways,

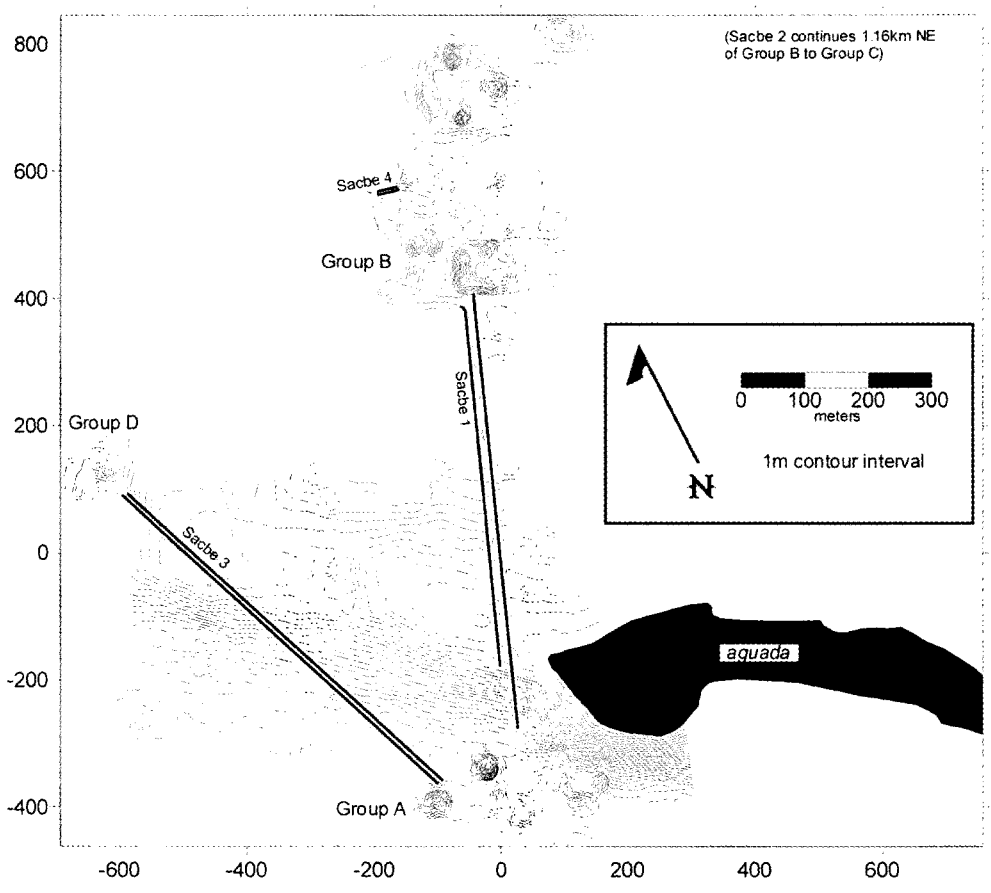

Fig. 4. Yo'okop (Shaw 2002:2).

agriculture and water management in the light of recent climatological research. However, I depart from those macro-level perspectives, as my interest does not lie in the ecological or political trajectory from the Terminal Classic to the Postclassic. My emphasis will be the dialectic relationship between polyagents, detectable in the sites' layout, activity patterns and stratigraphy.

I shall be using one main example of a site with causeways in this text. This is Yo'okop in the Cochuah region in Quintana Roo, Mexico (Fig. 3 and 4). Additional data from the same region, such as the sakbih between Xquerol and Ichmul (Normark 2003b), will enhance some of the interpretations. At Yo'okop there is evidence of a settlement change during the Terminal Classic (A.D. 800-1000) which may relate to drier conditions during the "Classic Maya collapse" (Hodell *et al.* 1995). However, the major part of the site's causeway system was constructed around this time. Parts of these four causeways covered flat areas, which otherwise could have been used for agricultural purposes. Some studies have indicated a relation between increased architectural coverage, reduced soil fertility and soil

erosion (Rice 1993). A causeway may thus be one of several causes of changes in agricultural produce. One can wonder whether the causeways cross-cut fertile soil at a time when it was most needed or whether the soil was no longer productive because of drier conditions. On the other hand, the sakbihs could have helped to direct water, something noticed at other sites (Scarborough 1993; Scarborough *et al.* 1995).

In discussing these and related topics, I shall not separate the different ontologies (iconic, discursive and realist). They are mixed to emphasize the complexity of the archaeological record and to show that causeways had and still have multiple effects in the causal milieu.

RESOURCES

I shall give a short resume of the critical resources that the sakbihs are related to in this article. What I particularly want to emphasize is the drought hypotheses that have gained popularity in recent years. As will become apparent, sakbihs and other architectural features are important in such discussions, as they may have initiated unintended outcomes of social practices rarely discussed in Maya studies. The sakbihs themselves came to direct the courses of human behaviour.

Agriculture

Classic period farming in the Lowlands consisted of several different techniques. Traces of house gardening, short-fallow infield, long-fallow outfield, terraces, dams, canals, raised fields and drainage systems have all been found at different sites. The variability depended on climate patterns, the parent material of the soil, workability, root zone, drainage, slope and erosion (Fedick 1995).

There is some evidence for large-scale, agricultural techniques around centres. Healy and others (1983) found evidence for intensively used terraces near Caracol in Belize. Extended causeways at this site sometimes relate to these intensively utilised, agricultural areas. Hills were sometimes cut away to form the sakbihs (Chase & Chase 2001). Terraces have in other places been found on sloping areas, where they served as retaining walls to catch washed-down, fertile soil. Fedick argues that terraces were constructed to consolidate the most fertile land resources when uplands became more densely populated (Fedick 1994:124). No such terrace is known at Yo'okop, although parts of the area between sakbih 1 and the *aguada*, the site's only large water source, were levelled to create a building area. However, slopewash since this time may obscure any terraces on this the steepest slope at the site. It is still the most likely place to find terraces as the aguada must have been protected. It is also possible that sakbih 3 may have helped to retain soil from the slope to the west

However, it has been argued by some researchers that, since the agriculture in the Lowlands included a mixture of techniques in small units adapted to econiches, this would argue against centralized management (Demarest 2000). It was important to have several non-contiguous plots in different edaphic places to min-

imize risks, such as powerful local rain (McAnany 1995:79). Farmsteads were dispersed, since they utilized fields between the households (Drennan 1988). Numerous, small, storage facilities, rather than a few large or centralized ones, may be the explanation for the weakness of Late Classic political formations (Tourtellot 1993:223).

The settlement pattern makes it possible that the farmers relied on swidden agriculture (Rice 1993:33). Family-based, agricultural production tends to be seen as the cause of population growth, which in turn intensifies agriculture (Johnston 2003). Some researchers believe that intensified agriculture such as kitchen gardens and nearby infields close to the household, was the general form of agriculture (Tourtellot 1993:222). High phosphate levels in vacant spaces around house mounds in the hinterland of Xunantunich may be indications of this kind of agriculture (Robin 1999). The largest tracts of open spaces and fertile soil at Sayil were close to the elite houses. Small garden plots were probably owned by commoners (Smyth *et al.* 1995:339-341). *Kancab* soils (deep-red and fertile soils) tend to be found between buildings (Isendahl 2002:74). This kind of agriculture seems to have been practised in the flat areas at Yo'okop, since the settlement reflects a "garden city" pattern (Johnstone 2002:11).

Water and climatic change

If the agriculture had a decentralising effect, water was a centralising force in the Maya area, owing to its karstic geology, where little surface water exists. Where we have higher concentrations of settlement in the Maya area, we also find high concentrations of "natural" or constructed water sources. Water sources were used by the elite to secure and maintain their power through rituals (Scarborough 1998:151-152). Among modern Tzotzil (Vogt 1969), water-holes are also the basis for the social organisation. Since archaeological sites often lie near natural or constructed, water sources, this was likely to have been an important organisational feature in the past as well (Davis-Salazar 2001).

The largest sites in the Southern and Northern Maya Lowlands grew up in areas where surface water was rare, particularly during the dry season (Lucero 2002). The landscape was modified to take advantage of this resource and use it in man-made *aguadas*, *chultuns* or natural *cenotes* (sinkholes) through an intricate network of plazas, stairs, culverts and causeways. Water was used for drinking and for pot irrigation in the site cores (Scarborough 1993). The aguadas were in many cases quarries sealed off by plastering. The quarries had been in use for procuring building material for the monumental architecture (Scarborough 1998:139).

Water for the aguadas depended on rain run-off. Some recent hypotheses concerning the "Classic Maya collapse" emphasize drought as a critical cause. Regional droughts can last for many years or decades, but they may also be local phenomena. Droughts may also be marked by long, cold spells, which disturb plant growth (Gill 1994). According to colonial records, as much as 50 per cent

Fig. 5. The aguada at Yo'okop. Photo: Justine Shaw.

of the population died during some extreme conditions and droughts. Famine caused warfare and/or led to the abandonment of settlements (Gunn *et al.* 2002:80).

Central in this discussion is a sediment core from Lake Chichancanab, near Yo'okop. This core showed long-term shifts in the availability of moisture during the Holocene (Covich & Stuiver 1974; Covich 1970; Curtis & Hodell 1996; Hodell *et al.* 2001; Hodell *et al.* 1995). A drying trend reached its peak between A.D. 800 and 1000 and corresponded in time with the Terminal Classic "collapse" (Brenner *et al.* 2002:149). The Terminal Classic climatic shifts may have made it impossible to gain sufficient moisture for agricultural activities (Shaw 2001a:9).

It is thus reasonable to argue that the sizes and layouts of sites fluctuated with known climatic changes. Yo'okop lacks cenotes or Prehispanic wells and has only one water source, which is an aguada that lacks direct contact with the water table (Fig. 5). This means that the occupation of the site would have been vulnerable during droughts, since it needed a regular local rainfall to refill. Cenotes do not have the same problem, since they rely on fresh water within the limestone substrate (Robles Ramos 1958; Tamayo & West 1964; Ward & Wilson 1976, 1985; West 1964; Wilson 1980).

Terminal Classic settlements at Yo'okop may have been located further away from the aguada than earlier settlement as a response to the need to cultivate more aguada-area land which needed pot irrigation. Since the land north of the aguada is the lowest at the site, crops came closer to the water table. Shaw believes it is possible that the aguada at Yo'okop was enlarged to increase the water-catchment area and provide construction material for the adjacent monumental Group A, which was begun by the Late Formative, and the sakbihs constructed during the Terminal Classic (Shaw 2001a:11).

Once the sakbihs began to be constructed, they affected the iconic, the discursive and the realist orders at the site. Agricultural practices therefore changed through time. No farming practices are always the same and as farmers in the social formation gained experience and could anticipate, they adapted to changing conditions. The œuvre of generations of farmers and constructors continued to exist after the depopulation of the sites, which ultimately changed the whole landscape surrounding centres.

We need to define the object of the study, our portion of the social formation's œuvre, before we can see its interaction with other polyagents.

DEFINING THE DISTRIBUTED POLYAGENT OF CAUSEWAYS

Mayanists have developed different approaches to the classification of sakbihs. Most derive from the causeways' dimensions. The width of sakbihs varied between less than 3 m up to 80 m, and from a few metres to 99 km in length, and from a few centimetres to 7 m in height.

It is generally believed that a long-lasting function of a sakbih was to delimit sacred space or define the extent of the sacred domain. In modern rituals, cardinal locations are joined by a perimeter which makes it possible to distinguish what is inside or outside (Hanks 1990:302). These locations are usually defined by the movement of the sun. Causeways aligned in certain directions may relate to the movement of rain and astronomical objects, solstices and equinoxes. These alignments may have had some significance for ceremonies related to the calendar. The Milky Way was the *axis mundi* or the world tree, which united different levels of the cosmos (Freidel *et al.* 1993). It is also called *saqi b'e* ("white road") by the modern K'iche' (Tedlock 1992a:229). The contemporary Tzotzil call the Milky Way the "road of rain" (Vogt 1976). This may represent an aesthetic trope, related to all ontological orders, and shared by a larger populace, since the celestial environment is similar across a larger area and over time (Reese-Taylor & Koontz 2001). However, such symbolic/cosmological interpretations assume the human as the agent; my approach is to set polyagents at the front.

Ancient and native road terminology may give some insights into the use and function of causeways and how they should be defined (Bolles & Folan 2001; Keller 2001). This is not of major concern in this article. However, David Stuart has recently found evidence for the *Ch'olt'ian* word sakbih for the causeway between Coba and Yaxuná (Houston, personal communication, 2003). The word sakbih consists of two parts: *sak* (white, constructed, pure) and *bih* (road) (Montgomery 2002). The bih glyph is known as the quincunx pattern (Fig. 6 top), which we also find in glyphs relating to time, such as some forms of the *k'in* glyph (Coe & van Stone 2001: 47). Since k'in was the same as the sun, it is possible that the quincunx was associated with the sun's daily path (the ecliptic) and the quadripartite world. The bih glyph may also relate to a ruler's ear flares, as can be seen in the iconography. The ruler may thus be seen as an index of the sakbih prototype, which he may very well have initiated the construction of. Another version of the bih glyph is in the shape of a footprint (Fig. 6 bottom). Footprints are also found in other iconographical contexts in the Maya and Aztec area, relating to walking or movement (Miller & Taube 1993:113).

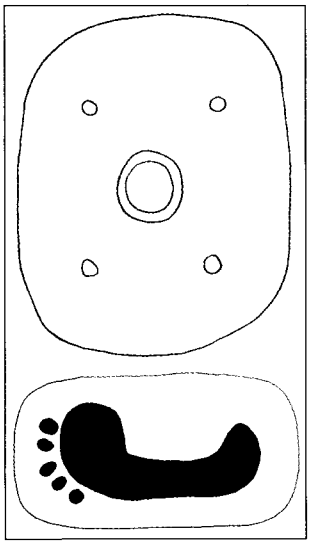

Fig. 6 top. Quincunx version of the bih glyph. Bottom: Foot print version of the bih glyph. Drawings: Johan Normark.

Archaeological definitions

There are three archaeological ways of classifying causeways: overall site layout, morphology and length. Examples of the site-layout approach include linear and extended causeways between two intra-site groups, as at Yo'okop, or between a larger centre and a smaller centre as between Ichmul and Xquerol (Normark 2003b). Some Late and Terminal Classic, northern sites show a cruciform *sakbihs* pattern (Bey III *et al.* 1997:239). Another pattern is formed by the architecture at Sayil, which was stringed along a sakbih (Tourtellot *et al.* 1992:94). Sites such as Chichen Itza (Cobos & Winemiller 2001), Caracol (Chase & Chase 2001) and Calakmul (Folan *et al.* 2001) had sakbihs that ran off in radial directions, similar to the spokes of a wheel. The site-layout approach looks at the whole pattern rather than the single polyagent which is my primary concern, as I focus on the dialectic relationship between polyagents.

The morphology of causeways may or may not include road-beds, curbs, pavements, sidewalls (parapets) and/or drainage culverts. A sakbih ended or began at different kinds of termini, such as ramps, temples, plazas, quarries, cenotes and caves. Sakbihs also varied on the account of the nature of the terrain, such as topography, surface conditions, hydrology, avoidance of valuable agricultural land and accessibility of construction areas to labourers (Trombold 1991:4). Some sakbihs were elevated and lacked parapets, such as that at Yo'okop. Some of these were partly constructed to protect travellers from waterlogged areas (Bolles & Folan 2001:306). Another form of causeway has parapets where water may have been channelled, such as those at El Pilar in Belize (Ford *et al.* 2001:18; Normark 2003a). Thus, the morphology is too varied and would be difficult to use for classification.

The length of the causeway is generally used to categorize the sakbihs. However, this contradicts modern Yucatec practice, which mainly categorizes roads by width rather than by length, in that the vegetation cover of a route seems to be important (Hanks 1990:311). However, length is a good way of categorizing causeways, since it reflects the spatial extent of some form of social integration and interaction among local polyagents. Shaw has proposed a three-level category: local intra-site, core-outlier intra-site and inter-site (Shaw 2001b:262).

The first and most common category of sakbihs links major architectural groups in a high-density portion of a site core and is less than 1 km long. The length may relate to the distance that people usually travelled in a day or in ritual processions. It may also be the distance over which a certain form of political control could be exerted (Shaw 2001b:265). These are exemplified by sakbihs 1, 3 and 4 at Yo'okop.

The second category is between 1 and 5 km long and links peripheral loci in a less densely populated area to the core. This is exemplified by sakbih 2 at Yo'okop and the causeway between Ichmul and Xquerol (Normark 2003b). The third category includes causeways more than 5 km long which connected different sites that may have been independent or vassals. This category has not been

found in the Cochuah region, but is exemplified by the Coba-Yaxuná sakbih (Folan 1983).

A problem with most classifications is that they assume the importance of overall-site layout for our understanding of each single causeway. They do not take account of the timing of road and site construction. A larger causeway network may have changed over time, this is best exemplified by Caracol, who show different periods of expansion of their extended causeway networks (Chase & Chase 1996). Other examples include Coba and Chichen Itza (Cobos & Winemiller 2001)

So what are the distributed parts of the polyagent we call sakbih? As no sakbih conforms to a definite, overall, ground pattern, it may be misleading to call the sakbihs roads, since this automatically associates them with the western concept of a road. To include as many features as possible within this serial category of a distributed polyagent, I will have a simple definition which is: *long, linear, constructed feature used for separating, connecting and communicating between various points* (Fig. 7).

A BIOGRAPHY OF SAKBIHS

Causeways and ballcourts have been used to indicate the integration and centralization of larger and factional populations, whereas ancestral shrines have been seen as the resistance to such centralizations (Fox & Cook 1996). Ringle (1999) argues the opposite; sakbihs and ballcourts were examples of decentralisation and pyramids were part of a centralisation of the collectivity. These macro-scale perspectives of causeways generalize all known sakbihs as having one function and they see a linear causation between the need for or resistance to centralization and the material effect of a causeway network.

Fig. 7. Sakbih 3 at Yo'okop. Photo: Justine Shaw.

Although I disagree with such approaches, I do believe that centralization and decentralization are major issues in the causeways' biographies. That subject is beyond the scope of this article, but the general idea is that water management seems to have been a set of centralizing practices whereas farming practices would have been decentralising. This tension in power relationships within certain *arenas of power* (kingship vs. kinship (McAnany 1995)) can be seen as a long-lasting element that was difficult to change, a *structurating positivity* (Cornell & Fahlander 2002) that affected the way in which causeways were laid out. However, it is important to understand that the very materiality of the causeway may have affected this positivity as well. The presence of an extended causeway network, as at Caracol, made the centralization of agriculture easier than at sites without causeways, as they facilitated interaction between polyagents at greater distance.

To simply suggest that a sakbih affected people is not enough. The interaction was dependent on the agent(s)' iconic order(s) and in what stage of the biography the sakbih was in. As the discursive order among human agents differed, they also had different interactions with sakbihs. The sakbih under construction affected agents in different ways than during its re-use. The following biography should not be seen in the linear sense in which it is presented. Some parts of the sakbih could both be under construction, in use, abandoned and re-used at the same time.

Construction

Old material forms affected the way in which the human agents formed new material shapes and site layouts and how people interacted. Whatever the intentions in constructing a causeway were, it was most likely that older causeways at one site or at neighbouring sites were the prototype(s) of a new, causeway-construction project. For example, as a reflection of Gell's principle of least difference, the inhabitants of Labna seem to have copied the basic civic plan of their larger neighbour Sayil. Such patterns also relate to the pattern of regional power relationships (Ashmore & Sabloff 2002:208) and a shared iconic order.

Dry materials, good working conditions and the off season of agricultural activities made it possible to construct buildings and causeways (Abrams 1994:43). The short and unfinished sakbih 4 at Yo'okop seems to have been constructed of at least two sections. This may represent either a construction pause or mean that it was constructed by at least two working parties. It is not unlikely that the causeway was constructed by the inhabitants of the two groups that were connected (Shaw 2001a:27). A similar pattern has been found at Xunantunich in Belize (Keller 1994). The layout of other architectural features probably had effects on the discussion of where to put the sakbih.

The construction of a sakbih was similar to that of a house foundation or a platform. The ground was cleared of humus and debris down to the natural subsurface, which led to the removal of soil. Since sakbih 1 and 3 at Yo'okop are partially built on slopes where the soil was thin, that would have created fewer problems for future agriculture. It is another matter in the flat and moist areas

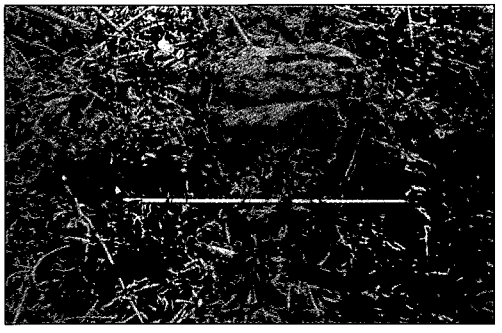

Fig. 8. Edge of sakbih 1. Photo: Justine Shaw.

where large portions of sakbih 1 are located.

Stones lined the edges and stone was graded to fine gravel on top of the causeway (Fig. 8). Then ballast for a road bed of either rock, packed soil or a mixture of soil and shell fill was laid. The sakbihs were then usually covered by large amounts of *sascab* (white lime) or plaster (Folan 1991; Keller 1994).

The construction of causeways, plazas and monumental buildings required large amounts of plaster, since it could not be re-used, as masonry could (Abrams 1994:73). The production of plaster needed firewood, which has been one explanation for the deforestation at several sites. The construction had environmental effects, although the deforestation for the purpose of manufacturing plaster has been exaggerated, according to Abrams & Rue (1988).

However, the need for plaster during a short and intensive period of construction during the Terminal Classic could have had critical effects at one locale already under stress from drier conditions. Shaw argues that deforestation led to anthropogenic climate change. The local climate became warmer and drier when trees were removed. Temperatures rose and evapotranspiration decreased. The humanly created microclimatic changes, different farming techniques, water management and resource availability made some sites more vulnerable than others (Shaw 2003a).

The plastering of causeways and plazas at Yo'okop may thus have had some critical effects on the local climate. The reflective white surfaces of plazas and causeways would also have increased the temperature. Thus the construction of a sakbih caused an increased deforestation at a time when drier climatic conditions prevailed. The intention behind the sakbih may have been to create symbolic "water roads" (Lorenzen 2003), but the outcome was just the opposite. Construction ultimately caused depopulation and changes in the realist order.

The deforestation also led to accelerated soil and nutrient loss through erosion. The increasing number of architectural features, the social formation's total œuvre, increased the removal of soil and downhill deposition (Rice 1993:29). Soil removal owing to increased coverage of inhabited areas may have been one cause of the later depopulation, although several households were constructed on what today is bedrock. This may have affected the political stability of some sites (Abrams & Rue 1988:377; Wiseman 1983:151ff). This would have been an issue at Yo'okop. Group A lies 30 m above the aguada, which has been silted up by downhill deposition in modern times, affecting the site's only known, major water source.

Use

There was a multitude of possible uses in relation to the sakbihs. A causeway tied places together, but at the same time it was a place for travelling. Causeways themselves are seldom discussed; it has been more important to focus on the points they connect. In this sense, the causeway was a liminal place, between better-known and important places, but still part of the settlement.

There is a vertical symbolism in connection with roads among the contemporary Yucatec. A person walking along a road or path is said to be *yoo' b'eh*, "over road". This is the opposite of *yáanal k'aás,* "under forest". If a road reaches a landmark, it is said to "*rise*" to it (Hanks 1990:311). Interesting here is the association between verticality and roads. If similar iconic codes mixed with past discourses existed in the Terminal Classic they may have related to the layout of Yo'okop, where most sakbihs lie at a lower elevation than the monumental architecture. To get to the temples, in Group A in particular, one had to *rise* up the ramp to get there. This may relate the causeways to the watery region of the Underworld.

Houston and Taube (2000:281) claim that they have found evidence for echoes and vibrant sounds in the iconography and suggest an increasing awareness of the acoustics of buildings. Sound usually travels over plazas and up or down stairways. As the sakbihs led up to architecture on a higher elevation, this may have affected the hearing of other people's doings at a far greater distance. This may have been effective in ritual processions related to water and agriculture.

The contemporary Yucatec distinguish between *noh b'eh*, "open road" (lit. great road), and *ek'b'eh* "rough trail" (lit. black, dark road). The "open roads" are more or less straight and open and provide visibility for long distances. The "rough trails" are less open. The word *ek'* (black, dirty) may indicate that the path is made darker by vegetation than on the open and cleared road (Hanks 1990:311). As a contrast, the white surface of the cleared sakbihs made them visible during darkness, which means that people could have travelled when sight was less good. Darkness as something immaterial may thus also have been an polyagent that made people act differently. Deforestation made the area surrounding the sakbih less dark as well.

The enduring walk on the sakbih may have had less impact on the human agent's practices, as he or she probably anticipated his or her goals or destinations. Causeways that led to a familiar place may also have filled the agents with mixed feelings. Once on the sakbih, the agents formed a series of people (Fahlander 2003), connected with each other by their relation to the sakbih. On the other hand, the instantaneous entrance or exit of a sakbih, from or to a lower terrain beside the sakbih, broke this series and led to the entrance to or exit from another conceptually different area, which may have had unexpected effects on the practice that followed, such as in a farming area or at a water source.

A critical effect of my definition of the causeways was how they both united and set boundaries in the architectural- and agricultural landscape. Sakbihs have

been seen by some as cooperative structures by which communication between sites was facilitated. In this way, causeways may have maintained a uniform identity as they integrated the population (Chase & Chase 2001:280).

Although causeways united some places, they also distanced and separated other places and people. Kurjack and Andrews (1976) argue that sakbihs were a form of boundary maintenance and may therefore have been a response to political or military threats. Long and wide, inter-site causeways, such as those at Chichen Itza or Caracol, extended to smaller sites. These large cities were centres of large political entities and the causeways may thus be indications of political and/or martial use (Freidel *et al.* 1993; Hassig 1991:22). Causeways not only directed people's movements and intentions but also affected discourses among their users as the roads at such politically important sites were the manifestation of power, the indexes of their ruler, and a way for him to exercise control. However, in a way, the sakbih controlled the ruler, making him or his assistants unable to perform certain forms of practices outside the causeway.

Boundary maintenance was related to land and water rights. *Yax chibal uai ti lum*, "first founding lineage of the land", reflects the very idea of land rights in the Yucatec area. Land close to houses was also close to the ancestral tombs. The largest, Classic Period buildings were the ones built on older, Late Formative Period buildings (McAnany 1995:65, 97), manifesting an ancestral connection. Such traces have been found at Yo'okop during test-pit excavations in the sakbih 1 terminus at Group B, and Group B's Central and North Acropolis.

A concept which relates to the deities of land and water who live in caves in the Maya area is *Kab Ch'een*, "earth-cave", which refers to the land or property of rulers, heads of the most prominent lineage (Houston 2000:173). A well-known, royal title is *b'akab*, which may mean either "top of the earth" or "hill-top", the person who controlled temples (and sakbihs?) and agricultural terrain (Houston *et al.* forthcoming).

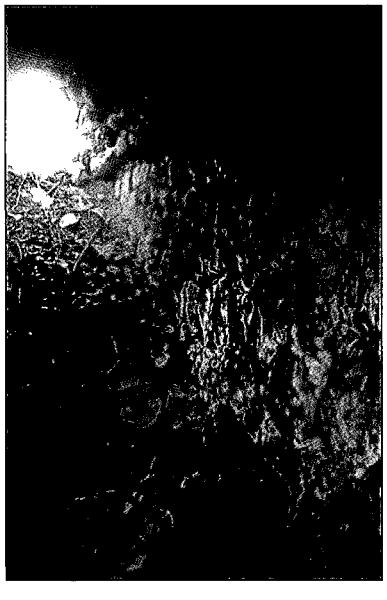

Fig. 9. Subterranean passage under Sakbih 2 at Yo'okop. Photo: Christopher Lloyd.

Causeways could also function by setting up certain limits and *barrios* within a site, such as between sakbih 1 and 3 at Yo'okop. There are also other kinds of "roads" which may have reflected the boundary-maintenance aspect of social organization, such as "lineages" or "houses". For example, the sakbihs at Chunchucmil are joined by *callejuelas*, which are wide streets between boundary walls (Dahlin 2000). At least at that site, there was no physical obstacle to entering a causeway from the streets.

This may otherwise have been an issue if some sakbihs functioned as Aztec royal causeways did, where only certain people could have walked or been carried (Hirth 1992:212ff). Thus a long sakbih could have been an obstacle and boundary for commoners or others not allowed to travel on the causeway, at least at certain times. Once the causeways had been laid out, they governed further construction projects, causing constraints for later practices.

Sakbih 2 at Yo'okop has a 3 m high and 12 m long subterranean passage. It could have been used for channelling water (Fig. 9) (Lloyd 2002:25), but I believe that it is too large for that. However, so far we cannot say whether the passage was part of an earlier building incorporated into the road and whether the passage was then sealed off or whether the passage was part of the whole construction project. In any case, whether there was a passage or not when the sakbih was in use during the Terminal Classic Period affected people's actions, assuming that the possible passage was for human traffic, that is. Either they could pass under the road or they could not. If they could not, then they may have had to walk round the whole sakbih and Group C to get to the other side, unless there were stairs across the sakbih that have not been located yet. Roads may thus have served as intra-site boundaries as well. This may have been the case with the Ichmul-Xquerol sakbih. However, near its terminus in Xquerol, there is a long step that may have been used to enter the sakbih (Normark 2003b).

Today, processions are made to mark the limits of the land that the lineage or the town owns. Among the modern highland Kiché, ritual processions and visits to different sacred places where the ancestors "sleep" take place according to a calendar order (Tedlock 1992b). In the 1930s, the village of Chan Kom was said to be divided into quadrants by four roads leading inward. The perceived world, village and milpa were seen as squares with the four corners located in the cardinal directions and one central point. Wooden crosses were raised at four of the entrances, the corners of the village, and the centre consisted of a cenote. In reality, there were seven paths that entered the village from no particular cardinal direction (Redfield & Villa Rojas 1962:114). These corners were visited in ritual processions.

The Lowland kings were probably involved in similar, ritualized, framing activities in which property boundaries were marked off. The hieroglyphic stairway at Seibal indicates that Ruler 4 of Dos Pilas went through a ritual route to establish boundaries by performing a ritual at Seibal and two days later at Tamarindito (McAnany 1995:87-90). Sakbihs and less formal roads were probably used for these activities. Reese argues that in the planning of the Late Formative site of Cerros, structures and causeways were arranged so that transitions from one location to another took place at a single performance venue where rituals dramatized the creation story by moving between mythical points/places (Reese 1996:173-181). An aesthetic trope reflecting a mixture of the discursive, realist and iconic orders may have permeated the social formation in which the creation story manifested the land and water rights in rituals.

Several sites have sakbihs connected with some sort of water source. Chichen Itza has a causeway connecting the sacred cenote with the Great Plaza (Cobos & Winemiller 2001). The site of El Naranjal in the Yalahau region has sakbihs linking major architectural groups to water-related features such as caves, wells and wetlands (Lorenzen 1999). There is a shrine at the end of a one km long sakbih. Lorenzen believes that this was a water shrine, as it lies north-east of the site core and near a wetland area. Lorenzen (2003) has proposed the idea that the rain gods (*chaaks*) resided in the north-east, according to the Yucatec cosmological plan. This may also have been the case at Yo'okop where Group C lies to the north-east of the site core (Shaw *et al.* 2000). However, there are no known water sources near this group.

Another building at Yo'okop may have been associated with water. Structure S5E1-1 may have collected water in the raised moat of the structure and in a nearby sunken plaza there may be an example of the high- and low-water shrines found in the contemporary highlands. In these communities, mountain water is brought from the high-water shrines to purify the low-water shrines (Wren *et al.* 2001:103). Sakbihs may have been used in such ceremonies as Schwake (2000:99) argues for the sakbih at X-ual-canil in western Belize, which lies near a small aguada.

The leaders of Yo'okop probably increased their ritual activities in response to drought (Shaw *et al.* 2000:9). Causeways seem to have been central in this development. Some causeways were probably part of these ritual processions and this may be one reason why the sakbihs at Yo'okop were constructed at this time when drier conditions prevailed (Shaw 2001a). These activities were perhaps similar to the ceremonial processions in Postclassic Yucatán, where *Zuhuy ha* or virgin water was collected from sacred-cave pools by persons who impersonated the rain god Chaak. They carried the water back to the village in a ritual procession which re-enacted Chaak's movements across the eastern sky as he sent the rains over the milpa (Lorenzen 1999:102). Sakbihs at other sites are from earlier periods and may have had other functions.

Shorter sakbihs were more likely to have functioned within a water-management system. The site-core causeways at Tikal and Cerros were also used as dams and at Coba and El Mirador they were used as dikes (Bolles & Folan 2001: 299; Folan 1983:83). Water collected on Plaza Copal at El Pilar in western Belize probably ran into a nearby aguada and down a ramp onto a 30 m wide causeway (Fig. 10). The causeway had parapets and this arrangement made it possible for water to flow down to the low-lying areas. There are breaks in

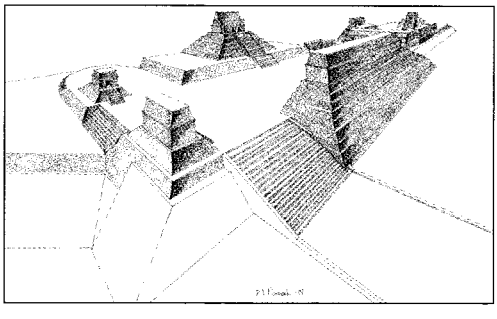

Fig. 10. Bryan & Murphy Causeway at El Pilar. Drawing by Johan Normark.

the parapet where the causeway flattens out and today these are outlets for water. No excavation has yet been undertaken to investigate these breaks, but they are related to large households. Such households would have benefited from the water supply. However, we cannot yet say whether the houses are older or younger than the sakbih (Ford *et al.* 2001:17-18; Normark 2003a). Although no aguadas have been found near the breaks at El Pilar, the breaks may relate to water- and soil-management systems on the house-lot-gardening level. Modifications of the limestone bedrock at other places are known to have been used to facilitate drainage of excess moisture during rain and were used to retain moisture during drier periods (Lohse & Findlay 2000:175).

The sakbihs at Yo'okop show no water-channelling function; although sakbih 1 is near the aguada, it lacks parapets. However, an unintended outcome of sakbih 3 is not only that it probably accumulates soil along its western side, but also that the road blocks off subterranean water drainage as it percolates from the higher elevation in the west to the lower east. This results in a higher degree of moisture on the western side of the sakbih. Modern milperos say that it is better to farm on this side than on the drier, eastern side (Dave Johnstone, personal communication, 2003). This was most likely not the intention of the builders and we should therefore not always look at the initial intentions of past agents or the "meaning" or function of the sakbihs, as the unintended effects may be just as important. This effect may have been noted early on and this use of the sakbih became more enduring than the processions that it was probably constructed for.

The constructed road would extend the indices of past constructors, users and decision makers' agencies and œuvre beyond their deaths to have unintended repercussions at another time and in another space. As a polyagent, the sakbih would outlive the human polyagent, forming and maintaining an iconic order and initiating discursive practices.

Abandonment

Changing alliance networks may have led to the abandonment of some inter-site, causeway segments as other sites became important. However, the abandonment of causeways was usually related to the depopulation of the settlement. There were many different reasons for this, but most important for this article was the combination of deforestation and drought. Curtis *et al.* (1996) argue that, although the Northern Lowlands are drier than the Southern Lowlands, the southern area was more severely affected by droughts since the water table lay at deeper levels and thus relied more on surface-water reservoirs. Many sites in the Northern Lowlands, with the exception of the Puuc region, had access to water through cenotes and lakes (Curtis *et al.* 1998; Shaw 2001a).

Deforestation initiated soil erosion, which led to soil-nutrient depletion. This resulted in the silting up of *rejolladas*, *bajos*, *aguadas* and lakes (Dunning *et al.* 1997). It is likely that the Classic Period aguadas in the Southern Lowlands silted up owing to the collapse of the royal power, maybe as a result of war and a

succeeding lack of centralised maintenance. Yo'okop had a substantial Postclassic population, but the site was affected by depopulation by the end of the Terminal Classic Period and several structures may have fallen out of use since the Postclassic architecture break with old patterns (Shaw 2001a).

The boundaries created by sakbihs changed people's behaviour, and discursively there may have been disagreement and conflicts within and between social groups. Warfare is known to have occurred on roads (Bolles & Folan 2001). However, few sites were connected by formal roads, making it logistically more difficult to send an army (Martin 2001). Yo'okop's Group B has fortifications that indicate that the site was under attack during the Terminal Classic Period. Since some sites were abandoned after war, the partial destruction of architecture was aimed at destroying the index of the king or maybe the entire community (Houston & Taube 2000). Metaphorically, to cut a site's "road" was to end its destiny (Keller 2001).

How did the abandonment of the original use of a sakbih affect agriculture? Once the plaster cracked and was eroded away, the causeway consisted only of rubble, making it difficult to walk upon. Re-growth of forest is rapid and thick and unless a central organisation maintained the sakbih, no one would have bothered to clear the whole width, owing to the cost of labour investment. There was, thus, no longer a feasible formal route to a milpa or other important features necessary for subsistence or to ancestral shrines. However, sakbih 3 at Yo'okop may still have been important for agriculture after the site had been depopulated.

The later re-growth of forest around centres may be attributed to a wetter climate in the early Postclassic (Brenner *et al.* 2002:147). The modern forest is the result of a forest recovered from past farming activities, since most of the forest had been transformed into a savannah-like landscape which may have been contemporaneous with the drier climate (Brenner *et al.* 2002:145).

Sakbihs may not have been forgotten by the remaining population. They may have been incorporated in myths or as the remains of pre-sunrise beings (Hamann 2002). They were probably still part of the same iconic order, but the discourses concerning them changed over time.

Re-use

Once a causeway had been constructed, it became an important feature which people sometimes continued to use. Some Yucatec causeways may have been used by the Spaniards and may be the foundations of colonial and modern causeways which may explain why so few regional causeways are known (Shaw 2001:262). At Late Classic Nakbé in Guatemala (Hansen 1998), people built structures upon the early Late Formative causeway and this may indicate that if the causeway was in use, the whole original width was not in use. Years of neglect may be an answer to the question of why the causeway was not re-used.

There is some evidence of the re-use of causeways at Yo'okop during the Postclassic. Postclassic shrines were built on sakbih 1 at Yo'okop. These shrines

Fig. 11. Modern quarrying of the sakbih between Ichmul and Xquerol. Photo: Johan Normark.

were related to water and fertility (Lorenzen 2003; Normark 2003c). These structures may have been part of the same iconic order as before, but of different discursive orders, since they break old patterns.

Causeways could also be used for quarrying construction material for later constructions such as modern roads or albarradas, low-lying walls without mortar, as seen at Xquerol (Fig. 11) (Normark 2003b). There are also albarradas lying on top of sakbih 2 at Yo'okop (Lloyd 2002:21). Their function has not yet been determined but they were probably used for cattle management, indicating a new colonial or modern resource and land-use and a changed economy. Such albarradas sometimes incorporate ruins, such as sakbihs, in defining contemporary land rights, such as those between *solares*.

Another important use is that the monumental architecture is full of limestone, which in a deteriorated state can be good for growing certain crops. The soil type called *kaccab*, develops on ruins. The stones in the soil contain humidity after precipitation and this is suitable for slow-growing maize (Isendahl 2002:68). Past households created large quantities of soil nutrients which make modern milpa architecture suitable in areas of dense architecture (Ibid 2002:183). This most likely does not include sakbihs.

As a distributed polyagent re-used at a later stage, sakbihs may still be seen as one polyagent, even though their interaction with new human agents with similar iconic codes resulted in disparate practices. The sakbihs might have triggered old iconic codes and practices within new realist conditions such as a drier climate.

FINAL THOUGHTS

By viewing sakbihs as part of a distributed polyagent with its own polyagency, we can relate them to both causes and effects in ancient settlements seldom pointed out by researchers. The causation is not always linear and we would be better off not to claim direct causation over the long term. A non-linear causation also fits the scattered remains we have of the past. The causal chains between constructing a causeway and the effect of drought or increased fertility are not direct. The emphasis in this article has thus not been on the long-term or the "grand history" but rather on the immediate effects between architecture and human agent(s) from the perspective of different ontological orders (iconic, discursive and realist).

By attributing polyagency to materiality, we can describe changes from different ontologies by anchoring them in a realist order of the physical presence of the sakbih in our present and not in a past "social formation" or "human agent" of the unknown. I have tried to show that the iconic order (polyagency), discursive

order (social practices and ideologies) and realist order (the physical bodies of polyagents, climate, soil, and water) should be merged into one ontology of ontologies. To reach this point we have to liberate the polyagents from abstractions not available in the polyagents themselves, since they are separated from us by the past instant(s) or event horizon(s). An indexical polyagency that is not located in the polyagents themselves but in the relation that it has to human agents will be the foundation for those other interpretations in which we can attribute symbolism and political importance to causeways.

Once we have the agent-patient relationship in a biography of the causeways figured out, we can compare different sites and see how the practices related to other practices at certain structuration levels and in certain arenas of power (Wolf 1994). This has been out beyond the scope of this article, but some general statements have been made here.

Sakbihs may have created influences in other arenas as well. They may even be prototypes for other polyagents, such as iconography or epigraphy or the use of metaphors in language, creating new social practices not present before. The causeways themselves had an important impact on the social formation once they had been constructed. Once they had been constructed by social practice or discourse, they governed social practice themselves, largely without the intention of the human agents. The sakbihs could thus be seen as the part of the environment that was constructed, maintained, used, connected, inhibited, prohibited and abandoned by polyagents.

Agricultural practices were thus affected by the causeway's construction, use, abandonment and re-use. Traces of this can be found in deforestation to supply the need of plaster, the white surface reflecting heat and raising temperature, boundary maintenance, accumulation of soil and moisture, etc. All these different effects and practices sakbihs initiated, created an œuvre that still affects contemporary agents such as milperos, tourists and archaeologists, although our iconic orders and discourses may be very dissimilar in relation to the sakbihs. The sakbihs are the indices not only of Prehispanic peoples but also of contemporary users. The unintended outcomes of past practices led to drought or greater moisture. Contemporary reconstruction of sakbihs may lead to more tourists visiting a site and contributing to other environmental problems. As polyagents, the sakbihs will continue to affect human practice even in the future.

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