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REDUCTION TECHNIQUES FOR POLYHEDRIC CORES IN PIEDRAS NEGRAS, GUATEMALA

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In the Classic Maya city of Piedras Negras, located in the northwestern Central Lowlands along the Usumacinta River, the ancient Maya used a variety of ways to produce obsidian prismatic blades. In fact, some of these techniques were not discussed in archaeological literature, and they have had no implications for the understanding of the practice of obsidian works and the role played by lithic workers in Maya society. This paper examines some of the associated technologies, particularly those regarding the reduction of a polyhedric core on one of its faces, or flat core of obsidian. As a conclusion, we now have several possible social and economical implications associated to this technique.

POLYHEDRIC CORE TECHNIQUES

Although there are no partially reduced polyhedric cores in Piedras Negras, there are exhausted cores and prismatic blades that allow for partially reconstructing the basic technology used at the site throughout time. Some of these technologies were replicated through experimentation by the author and other lithic analysts (Clark and Bryant 1997; Hintzman 2000; Wilke 1996). The three polyhedric cores reduction techniques may be characterized by:

- A simple reduction core worked on one of its faces, or flat core (Figure 1a).
- Circular reduction of a polyhedric core, or cylindrical core (Figure 1b).
- Bullet core reduction (Figure 1c).

All these technologies are probably connected, in the sense that they represent different stages in the process of reduction, depending on how much the cutter wishes to reduce any given core (i.e. flat core > polyhedric core > bullet core; see below). However, since it has been corroborated that the cylindrical and flat cores have separate trajectories, this possibility should not be ruled out.

The exhausted or weakened cores in residential contexts and ritual deposits are used to recreate the possible trajectory of the more common polyhedral core in that place. Work will be initiated by outlining the percussion technique used to adjust the precision of the polyhedral core obtained at the place. Then it will continue with that which apparently is the most common form of prismatic blade obtained from a reduction core at Piedras Negras, that of the flat core technique.

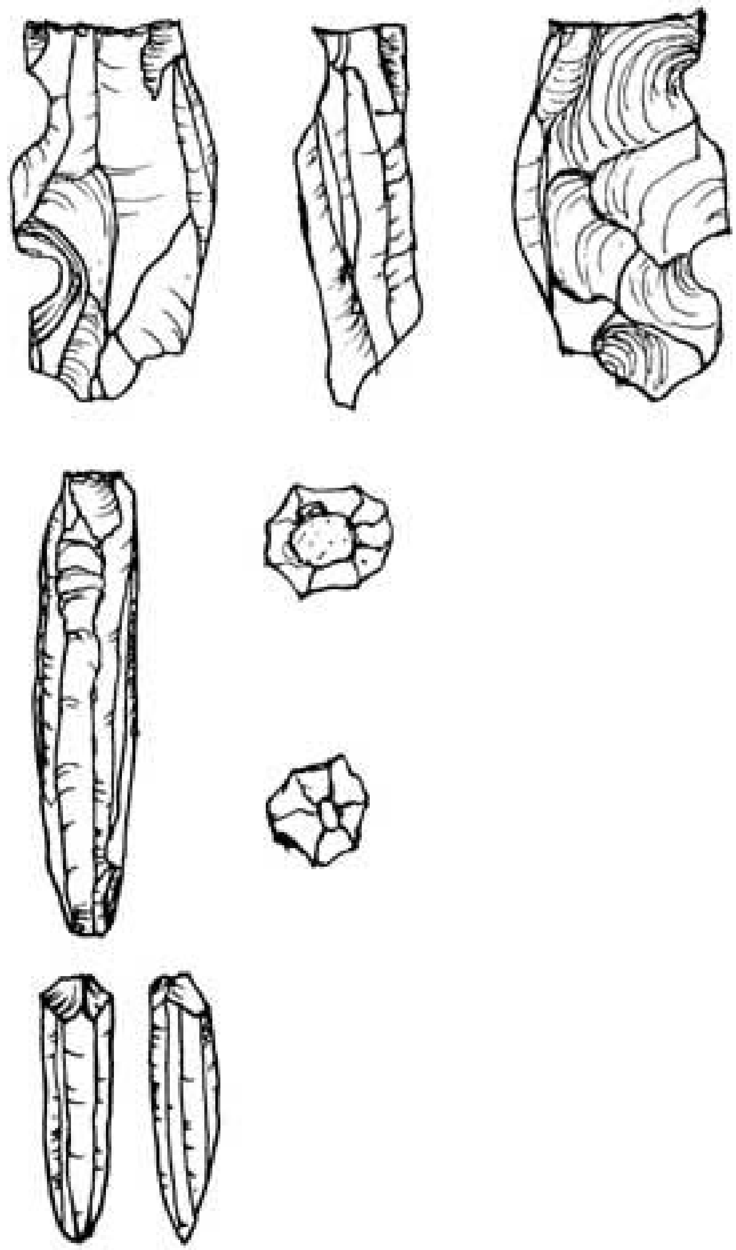

Figure 1. Obsidian artefacts.

PREPARATION OF THE FLAT CORE THROUGH PERCUSSION

Considering that most percussion used in the storage deposits rarely exceeds a length of 10 cm, and that the dorsal surface often seems to be older because of the percussion scars, it is probable that many of the cores at Piedras Negras were extracted with a coarse, small, and polyhedric shape. It is not known whether these cores were directly extracted from the quarry or whether they were exchanged over the line. Approximately, 96% of all the obsidian artifacts seem to have been manufactured with materials from El Chayal, in the Guatemalan Highlands, and apart from several reduction flakes and blades from San Martín Jilotepeque, no cores from other sources such as Ixtepeque were imported (Hruby 1999).

Subsequently, these cores were reduced through percussion by cutters from Piedras Negras, to adjust the faces of the imported cores. However, eccentrics and obsidian debitage suggest that the cores were systematically prepared, and that the particular types of series 1 and series 2 of the percussion flakes and blades had fulfilled specific functions in the process of preparation of the polyhedric cores of El Chayal for their reduction to the flat style.

The cutters of Piedras Negras seem to have had a special preference in the morphology of the core and a lack of original percussion scars in the face worked before they initiated the prismatic blade production process.

The first percussion flakes and blades were removed to level the face of the core, which frequently had undulations, bark, and ends that overlapped the face of the imported core since its initial extraction from the quarry at El Chayal. Whenever possible, blades were removed to create a straight face in the final distal part of the core. If the blade ended badly before reaching the distal side of the core, the cutters of Piedras Negras removed the distal flakes and blades to conclude the adjustment. The use of these distal flakes is a deviation of Clark and Bryant's (1997) description, as the purpose of the removal was not necessarily, as discussed, to correct the error. This kind of flakes could be removed on both faces of the preparation and reduction of the polyhedric core because the cutters concentrated on creating a uniform surface with which the pressure flakes were removed.

Other types of percussion flakes appear to be unique for the preparation of worked cores in one of its faces. These can be initial flakes and blades or either those that were removed after the pressure reduction. They include thick percussion blades taken from the side of the core, wide flakes removed from the back of the core, and rejuvenation flakes taken from the lower parts of the distal side of the core.

In some cases, one of the core faces was reduces through pressure and then the percussion flakes were removed from the sides of the core that were not leveled at the beginning. These flakes and blades present dorsal surfaces with old pressure and percussion scars. The result of these reduction techniques are exhausted cores with an oval to lenticular shape, seen in profile, with one side reduced through pressure and the other one showing the original scars of percussion (Figure 1a).

These reduction techniques of flat cores, which are still to be properly examined through experimentation, may be considered a combination of the "Aztec method" described by Clark, and the stabilization method discussed by Wilke (1996) and Hintzman (2000). The "Aztec method" requires that cutters sit on the floor and stabilize the core with their feet on the ground, while the Wilke and Hintzman methods require wooden stakes or the construction of a wooden stabilizer.

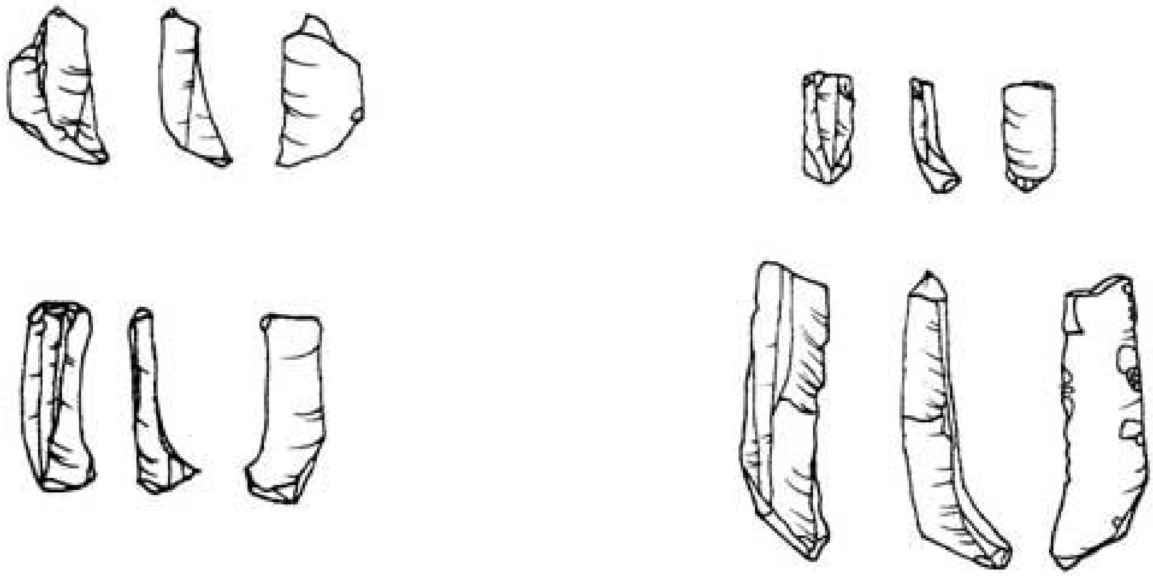

Figure 2. Obsidian artifacts.

The sides of the core are not easily exploited because they may result in small blades with an *autre passe* ending, due to the shape of the core at its distal end (Figure 2). This type of ending not only removes much of the core, but is also the cause of cracks. In this way, distal rejuvenation or a better maintenance play a significant role in the reduction of flat cores. The distal rejuvenation prepares the distal end for the stability of the core, but it simultaneously eliminates the possibility of *autre passe* endings. The distal rejuvenation flakes (Figure 3) were often removed diagonally from the distal end of the core, while the distal rejuvenation blades were removed from the curved end of the core's distal portion. Seated on a gradin, the cutter could use his feet to stabilize the core. For this kind of reduction, cutters could also sit on a bench. The kind of stabilization discussed by the "Aztec method" may be hard to achieve in highly prepared stucco surface, like plazas.

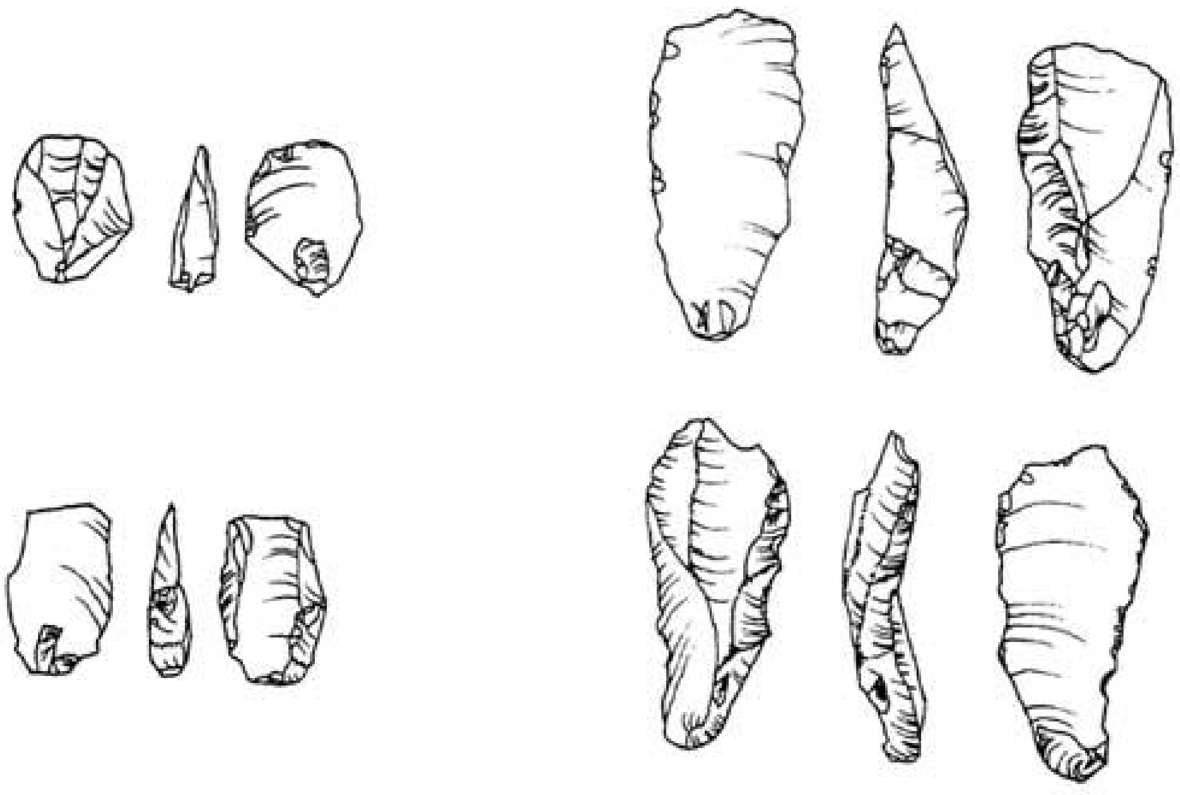

Figure 3. Obsidian artifacts.

While the removal of a prismatic blade from a core may be considered to be a difficult task to accomplish, it does not mean that it is the most important or the hardest part in the production of a complete prismatic blade. Therefore, the preparation of the core, the platform and the preservation of the core, take a much longer time and require practice and skills on the side of cutters. Cores exported from El Chayal show frequent irregular scars, incipient cones in the platform, bark residues, poorly prepared platforms, ash inclusions and other inconsistencies which could pose additional problems to the stone cutters of Piedras Negras.

In this way, removing the initial precision flakes and blades to regulate the core, represent the more important steps in the process of blade manufacturing. An error in this phase could damage the volume of the core and bring down the number of blades produced. The obsidian eccentrics, as well as these initial flakes and blades, were the most common specimens used in Piedras Negras.

Once the core is prepared, it is stabilized on the floor by means of the feet (Clark 1982), with a wooden apparel (Hintzman 2000; Wilke 1996) or with the technique described herein. The pressure implement was made of some kind of bone or horn (examples of both were found in archaeological contexts), and once the cores were stabilized, the blades were removed. Although this may have been a one-person process, it is possible that other individuals helped in the stabilization of the core and of the pressure implement. Because most platforms in Piedras Negras were slightly polished and small preparation flakes were removed, the cutters must have periodically repaired the platform of the core out of their place of reduction.

If an error occurred, like a fracture close to the platform or a deficient finishing (i.e. a hinge finishing) on the face of the core, cutters would turn to a potentially risky process to rectify the error (Figures 3a and 4d). In Piedras Negras, this procedure comprised:

- A platform rejuvenated on its face or simply by a flake or large plank.
- The errors were removed with a percussion blade.
- Distal rejuvenation, though often through a simple procedure instead of the two procedures described by Clark and Bryant (1997:116).
- Medial rejuvenation using a pressure object.
- A rare event of lateral rejuvenation.

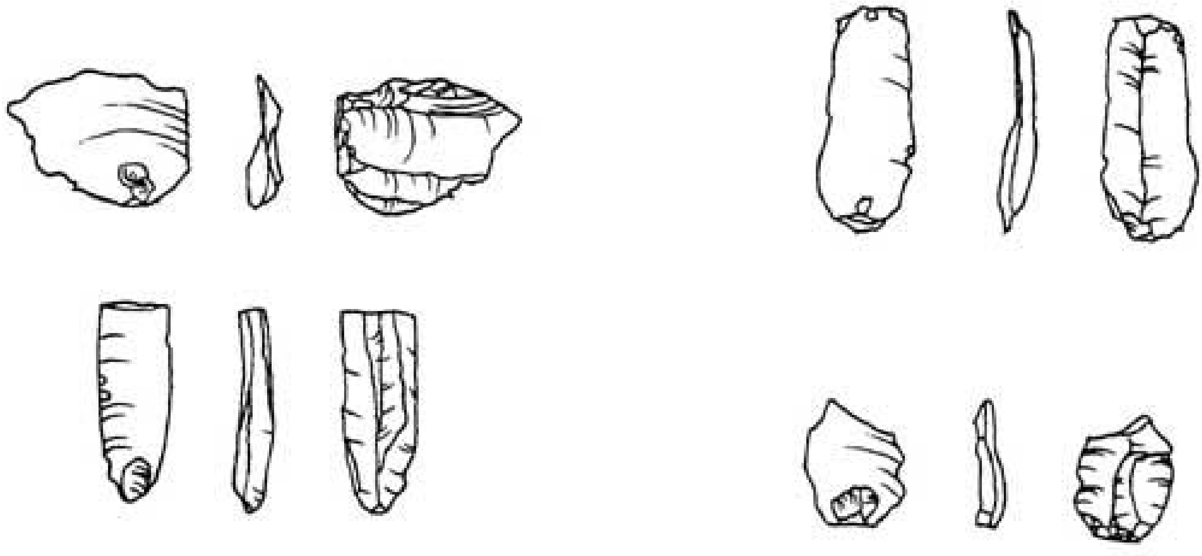

Figure 4. Obsidian artifacts.

The rejuvenating distal flakes may also have the effect of regulating the phase of the core and preventing an *autre passe* ending or crack. There are no definite examples of distal rejuvenation flakes fit to be used to eliminate errors from the core faces at Piedras Negras. Figure 3c very clearly shows that the focus was placed on transforming the distal side of the core, and not merely the face. While blades removed from the front face of the core did not tend to have an *autre passe* ending, the sides of the core have a bending in the distal side and a noticeable crest apt for this kind of ending. A modification on the distal end not only brings down the possibility of error, but also allows for the stabilization of the core without risking blades to impact the bottom of the supporting surface. This kind of distal modification results in rings of reversed force on the distal sides of some pressure blades.

This entire rejuvenating process represents a moment of danger in the useful life of a core, and the event is to define whether the core will in fact be used in subsequent productions of blades or not. These types of debitage produced by rejuvenation are also found in royal deposits, together with exhausted cores, first and second blade series, and the third extremely thin blade series, possibly used for inflicting self-sacrifices (Clark and Bryant 1997, Fig. 5). These types of blades and flakes were as well of a symbolic nature and revealed the significance of the production process in several eccentric deposits like gods.

A different kind of core is the cylindrical one. This type of core has been found in residential contexts as well as in elite deposits, and possibly represents their own trajectory. It is known that these cores were supported by extended phases devoted to the reduction of cores, probably stabilized with the feet or with a leverage system (Clark 1982; Wilke 1996). In the minor phases of core reduction, they could be also held with the hands, as shown by other analysts of lithics. If the trajectory of the polyhedric core is considered as a different technology, it should likewise be considered as a simple final phase in the reduction of flat cores. The way how the core is finished will possibly depend on the requirements of the given deposit.

Finally, there are micro-cores or *bullet cores*, which produce micro-blades (Hintzman 2000). These cores were so small that it was not possible to stabilize them with the fee. This type of core was never included in elite deposits, but instead, it was usually present in residential contexts. A significant percentage of them are present in the nearby periphery of the site center (Kovak and Webster). It is probable that these small cores were initially produced with polyhedric cores previously rejuvenated through bipolar techniques.

IMPLICATIONS OF THE ORGANIZATION AND PRODUCTION OF FLAT CORES

The variety of technologies used in obsidian works during the Late Classic period is evident, though they may have been related with one another. The technologies used in the flat cores may be the result of the poor original preparation of the core through percussion, though it slightly represents a tradition in the Lowlands during the Early Classic period and maybe earlier. As suggested by the Cancuen images, the technologies used in the flat cores were not only present in the Early Classic period, but they seem to have constituted a phenomenon that extended throughout time.

Recent investigations at the Cerro de los Muertos Park in Kaminaljuyu, suggest that among the technologies used, that of the flat cores was not common as a general reduction technique in the Highlands. Only a small number of flat cores were reported in the Early Classic deposit of Ojo de Agua published by Clark and Bryant (1997). On the other hand, there was evidence of flat core production in deposits at Belize. In spite of this, the technique of removing the distal side (i.e. distal truncation) discussed by Hintzman (2000:40) was absent in Piedras Negras.

This pattern suggests that the technologies of the polyhedric cores vary even within the frame of the Lowlands, while local traditions possibly emerged throughout time. For example, the large cores never reached sites like Piedras Negras; on the contrary, they did reach Tikal, and even the variety in the size of the cores may have affected the development of local technologies. It should be noted that the technologies of the polyhedric cores passed from generation to generation for centuries. The lack of obsidian in the Lowlands may have prevented independent invention and mastery in the use of the technologies, the latter of which was achieved through a transmission of knowledge during the Preclassic period, when they were introduced.

The amount of imported cores in sites like Piedras Negras was very limited, each year. A low rank in core production may have increased the value not only of blades but also of the blade cutters' work. Blades were used for a variety of purposes, such as food processing and the production of crafts. Also, blades played a major role in ritual activities, and the production of blades and eccentrics was crucial in elite rituals. Should this be the case, the production of blades may have been a significant social event that probably involved public performances.

The technique of the flat core enabled the lithic cutter to produce blades in highly prepared surfaces, such as stuccoed benches in residential areas, or in the stairways of public buildings. Although it is true that the relative rarity of the blades in Piedras Negras probably increased their exchange value, they were not merely considered to be simple utilitarian objects, as actually, the production process had also benefited from an enhanced prestige. They were very precious imported goods, but distributed among all in society. Therefore, the obsidian blades reached beyond the limits of mere status.

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