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# Were they used as tools? An exploratory functional study of abraded potsherds from two pre-colonial sites on the island of Guadeloupe, northern Lesser Antilles

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**ABSTRACT.—Abraded potsherds from Caribbean archaeological sites have rounded, square or oval shapes due to human modification. Microscopic analysis of traces of wear was performed on the abraded potsherds from two sites on Guadeloupe, Anse à la Gourde and Morel. Explorative experiments proved the sherds to be very effective for pottery production but considerably less functional for other activities. High power use wear analysis of the archaeological sherds has revealed identifiable traces of wear that are interpreted to have been due to scraping leather hard clay. The application of high power use wear analysis to broken sherds has rarely been done before and indicates that broken sherds, rather than being discarded, had a second life as tools.**

**KEYWORDS.—Caribbean archaeology, pottery, manufacturing tools, use wear analysis**

## INTRODUCTION

Many sites in the Caribbean islands[3] yield abraded potsherds, characterized by rounded, square or oval shapes that are due to intentional modification. They display one or more heavily abraded edges. The worn appearance cannot be attributed to a taphonomic origin because the abrasion is very localized and limited to one or two edges. Moreover, sherds with fresh breaks have been found in the immediate proximity of the abraded sherds. It is suggested that these sherds were recycled after the vessel was discarded.

The potsherds discussed in this paper derive from two settlement sites, Anse à la Gourde and Morel on Guadeloupe, northern Lesser Antilles (Figs. 1-4). The potsherds are obtained from midden contexts in both cases and belong to the Saladoid and post-Saladoid series dating roughly between 400 B.C. and A.D. 1400. Research of comparable pottery fragments reported at the Late Classic Maya site of K'axob suggested that the potsherds were used as tools for the shaping and finishing of vessels (López Varela et al. 2002). This functional inference was made through low power analysis of traces of wear by means of a stereomicroscope and their effectiveness as tools was studied through experimentation. This approach has now been extended by incorporating a wider range of experiments and by using a high power approach towards use wear analysis.

## CERAMIC SEQUENCE OF THE LESSER ANTILLES

Ceramics are estimated to make up approximately 90% of the artifacts in Ceramic Age sites in the Caribbean (Rouse 1977).

[3]Abraded sherds have been encountered in many sites in Guadeloupe, Saba and St. Lucia excavated by Hofman and Hoogland. After the completion of this analysis we received two abraded sherds from William Keegan and Betsy Carlson from the Río Tanama site (AR-39) from the municipality of Arecibo in western Puerto Rico. These sherds also indicate that the use of pottery tools was widespread in the pre-colonial Caribbean.

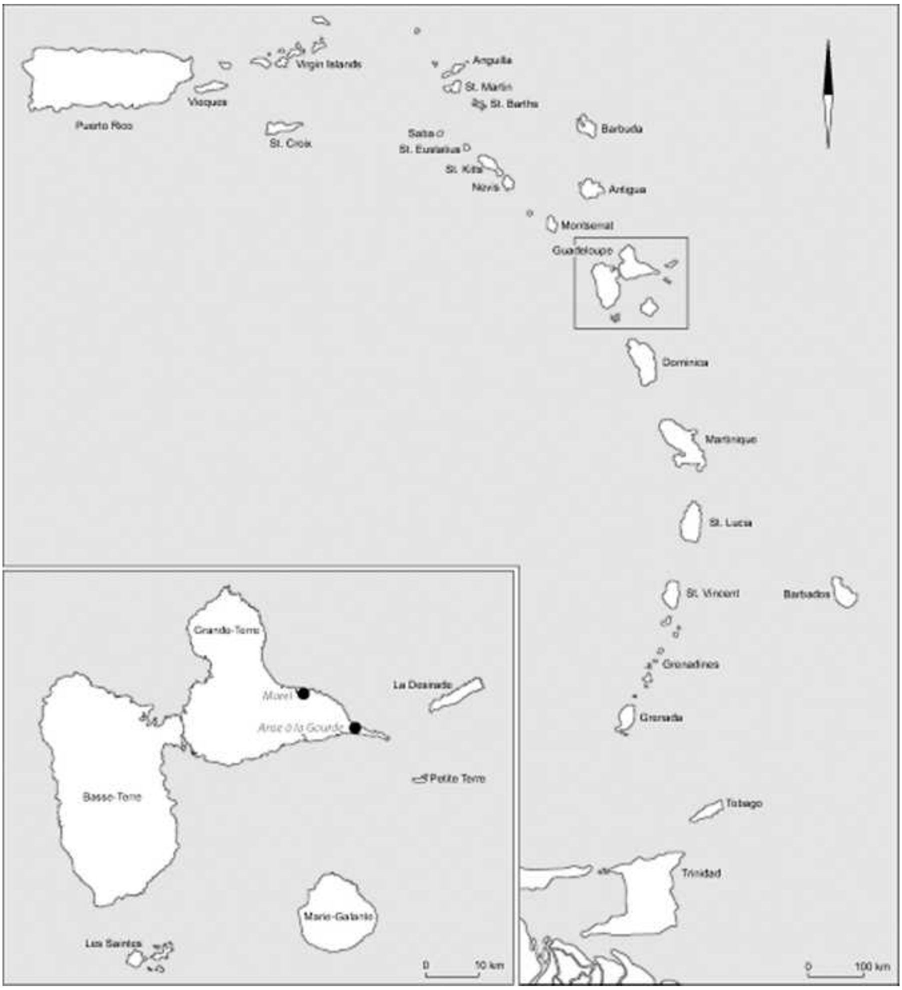


FIG. 1. Map of the Lesser Antilles with Grande-Terre, Guadeloupe highlighted. The sites of Morel and Anse à la Gourde are located in the north-eastern part of Grande-Terre (Map by Medy Oberendorff).

The vast majority of the ceramics in the Caribbean originates from settlement sites, most often from midden contexts, and to a lesser extent from ceremonial sites, caves or special activity sites. Ceramic assemblages from these sites include numerous sherds from broken vessels, figurines, griddles, pot stands, incense burners, spindle whorls, clay disks, body stamps and a small number of miscellaneous clay objects. Spindle whorls and clay disks are often secondary used potsherds. Other materials, which were probably of prime importance such as wood, cotton, and feathers are more susceptible to deterioration in this area and are seldom preserved. Thus it is not surprising that the cultural developments in this region have been described on the basis of pottery.

The Ceramic Age is represented by a number of series and sub-series defined in a culture-chronological framework established by Irving Rouse (Rouse 1964, 1986; 1992). Series and subseries are defined by a group of styles, complexes or wares related throughout space and time that are known to have descended from one common ancestor. Each style or complex is defined by a unique set of attributes of material, shape and/or decoration (Rouse 1964, 1972, 1989).

FIG. 2. Ceramic tools from Anse à la Gourde, Guadeloupe (photograph by Annelou van Gijn).

FIG. 3. Worn tools from Morel, Guadeloupe (photographs by Annelou van Gijn).

Saladoid ceramics were introduced to Puerto Rico and the northern Lesser Antilles around 400 B.C. from the mainland of South America, in a first instance probably bypassing the islands of the southern Lesser Antilles (Hofman and Hoogland 2004; Hofman *et al.* 2006a).

The Ceramic Age in the Lesser Antilles can be subdivided into three periods. During the first period (approximately 400 B.C.-A.D. 600/850), the Saladoid series dominates with a well-defined Cedrosan subseries and a less well-defined so-called Huecan subseries. The second period dates from A.D. 600/850 to 1200, and is characterized by a Troumassoid series. The former can be divided into a Mamoran, Troumassan and Suazan subseries (Rouse and Faber Morse 1995). The third period extends from A.D. 1200 to 1492 and is characterized by the Suazan Troumassoid subseries and a number of individual complexes (i.e. Cayo complex, Morne Cybèle complex) in the southern Lesser Antilles and the Chican Ostionoid subseries in the northern Leewards (Hofman and Hoogland 2004; Petersen et al. 2004; Rouse 1992; Rouse and Faber Morse 1995).

## *Manufacturing Techniques of the Pottery from Morel and Anse à la Gourde*

During the last decade the study of ceramic technology has been accorded increased attention. Most of these studies have focused on paste recipes and temper materials (Arts 1999; Carini 1991; Cox O'Connor and Smith 2001; Donahue et al. 1990; Goodwin 1979; Hofman et al. 1993; Petersen and Watters 1991; Reed and Petersen 1999; Van As and Jacobs 1992; Walter 1991) but others have investigated the intrinsic aspects as how pottery was made in the past (Bonnissent 1995; Bloo 1997; Curet 1997; Fuess 2000; Harris 1995; Hofman 1993, 1999; Hofman and Jacobs 2000/2001, 2004; Jacobson 2002; Van As and Jacobs 1992).

Recently, a series of experiments have been carried out by the Ceramic Laboratory and the Laboratory for Artefact Studies, both of Leiden University, to examine the different stages of pottery production and

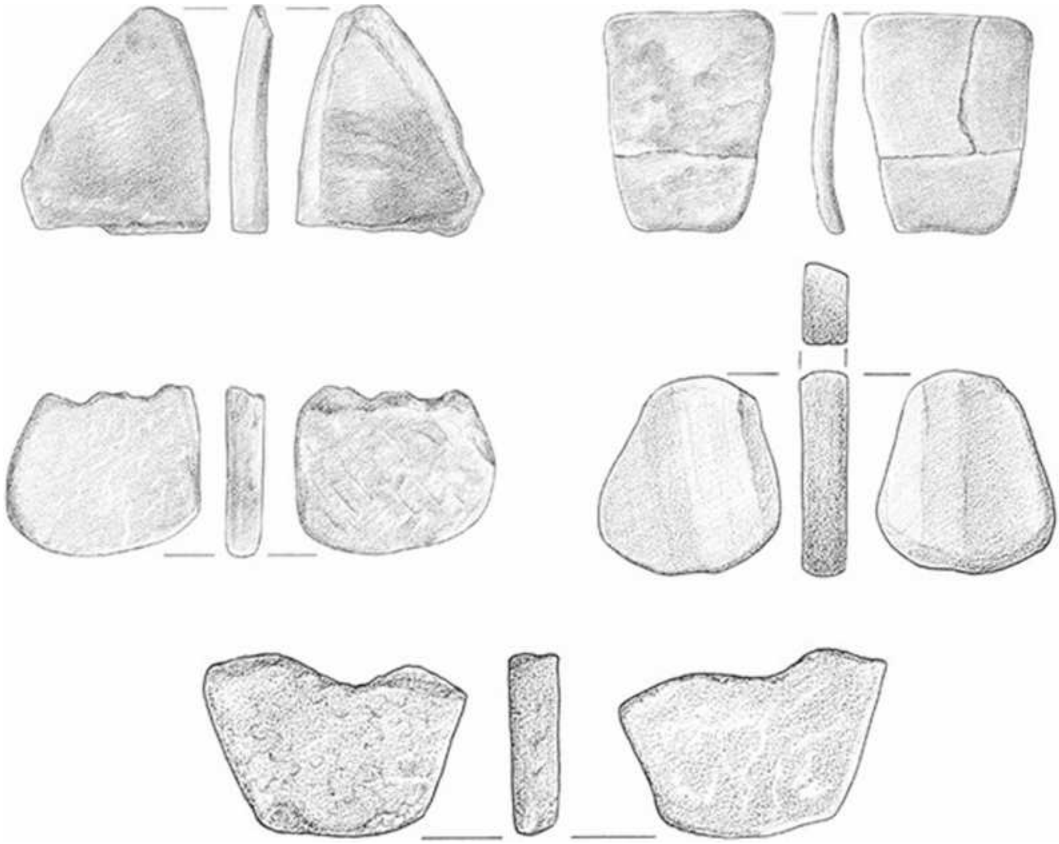

FIG. 4. Ceramic tools from Morel (illustrations drafted by E. Van Driel).

the range of possible tools for pottery manufacture available to the potters during pre-colonial times. Experiments were carried out to understand the various steps in the manufacturing process of the Morel and Anse à la Gourde pottery (Hofman and Jacobs 2000/2001:17-35). Other, as yet unpublished experiments, were performed with tool replicas made of flint, stone, shell, coral, bone, and pottery sherds. An attempt was made to assess the roles that tools of various raw materials could have played in the different stages of pottery production.

Ethnoarchaeological observations in the islands as well as on the South American mainland provide an important source of additional information that can help to conceptualize pottery production, techniques and tool use in traditional Amerindian society (Duin 2000/2001; Harris 1995; Hofman and Bright 2004; Van Bel 1995; Vredenbregt 2002; 2004). Such studies are believed to closely approximate the organisation of pottery production and sociocultural behavior of the Ceramic Age societies in the Caribbean (Hofman and Jacobs 2000/2001; Hofman et al. 2006). This information has been very useful in experimental context (Briels 2004; Hofman and Jacobs 2000/2001; Hofman et al. 2006b; Lammers-Keysers in prep.).

The pottery in the studied sites is handmade and fired in an open fire under partially controlled oxidizing and neutral conditions at temperatures reaching 800°C (Hofman and Jacobs 2000/2001). Manufacturing techniques include coiling, flattening, slab building, pinching and moulding. These techniques have not only been used side by side, but also in combination with each other. The technological study and experiments suggest that in a number of cases molds probably were used during the first stage of production (Hofman and Jacobs 2000/2001). The mold served as a support for the soft clay and made it possible, despite the softness of the clay, to obtain rather thin, large and standardized vessels. The advantages of molding, compared to coil building, are that this technique is less time-consuming and that even poor clay-sand mixtures can be used. In comparison with coiling it is easier to make a vessel with moulds. Experiments have shown that these moulds could have been made from calabash or gourd (*Cresentia cujete*; [see also Carini 1991:31; Hofman 1993:163; Hofman and Jacobs 2000/2001]). When a calabash is scraped clean, it gets light, dry and porous and therefore becomes very suitable to serve as a mould. The leatherhard clay can be removed easily from the calabash; due to its porosity, the clay will dry rather quickly and then shrink and separately from the mold. In addition to calabash, ceramic molds probably also were used. These are, however, hardly recognizable in the archaeological record because they can be mistaken for utilitarian dish-shaped vessels.

Experiments have demonstrated that bivalve shells (e.g., *Codakia orbicularis*) are very effective for the subsequent shaping process (Lammers-Keijsers in prep.). Results from these experiments demonstrated that shells are useful for removing the excess clay during vessel construction in a leather-hard stage.

Decorating techniques include excising, impressing, scratching, appliqué and painting. The first three have been applied to obtain different modes of incision depending on the drying condition of the clay. Painting includes monochrome-red, bichrome white-on-red or polychrome painting. Scratching, smoothing, burnishing and polishing are the most common finishing techniques. These techniques have technological advantages but in some cases may also have been applied solely to embellish the vessel surface. Tools, made of flint, stone, coral and bone probably were used during finishing and decorating the vessel (e.g., spatulas, primes, polishing stones). These hand-held tools may be used to incise, impress and scratch the surface of a vessel. There is always the possibility that a tool might have had multiple functions (Hofman and Jacobs 2000/2001; Kelly 2003). In this paper we focus on tools made of sherds from broken vessels that probably were used in similar ways.

Yet many of the tools used for pottery production would be very difficult to recognize in an archaeological context. Wooden rolling sticks and calabash molds and scrapers, for example, are expected to have been used during the preparation phase of the clay and the shaping process (Fig. 5). These would not have been preserved in most archaeological contexts. Nevertheless, tools made of shell, coral and flint frequently survive in archaeological deposits.

## *Use-Wear Analysis: Methodology*

Until the mid 1970s the functional interpretation of prehistoric tools was frequently based on analogies with known, present-day tool types. Semenov (1964) was the first to systematically explore the function of stone, bone and antler implements. His experiments showed that recognizable traces of wear resulted from use. These wear traces varied in appearance depending on the contact material worked and the motion exerted. They include edge removals, edge rounding and abrasion, polish and striations, all features that can be studied by means of a microscope. On the basis of the pioneering work of Semenov, two approaches to functional analysis developed in the 1970s: those based on inferences from macroscopic features of wear observed by stereomicroscopy, and those based on inferences from features only observable with high magnifications using an incident light microscope. The first approach is generally referred to as low power analysis, the second as high power analysis (for an overview see Odell 2001 and Van Gijn 1990). In the last fifteen years these approaches often were used in combination, and were supplemented by residue analysis (e.g., Briels 2004; Fullagar 1998; Nieuwenhuis 2006).

Until about five years ago use-wear analysis predominantly was directed at flint tools, certainly within Europe, although elsewhere in the world tools of shell (Barton and White 1993) or bone and antler (Lemoine 1994) were studied as well, for the most part by means of the low power approach (Bartone and Crock 1991; Lundberg 1985; Walker 1980, 1983). The wear trace analysis of flint implements is now relatively well established. We are reasonably well acquainted with the limits of inference, the range and extent of taphonomic agents (Levi-Sala 1986; Plisson and Mauger 1988) and other methodological limitations of the method (for an overview see Odell 2001). When the number of instances in which a match occurs between experimental and archaeological traces is high we can assume that our experimental programs are relevant. Wear trace analysis of tools made of materials other than flint is in its infancy. Methodological procedures have not yet been extensively established, the range of traces that can be distinguished has not yet been fully explored and the extent to which taphonomic modifications hamper analysis has not always been addressed. However, it is very clear that wear traces can be distinguished on tools made of "other" materials (e.g., Kelly 2003, 2004; Lammers-Keijsers 1999; Lopez Varela et al. 2002; Van Gijn 2005; Van Gijn et al. 2006). Initially much of this research was done by means of the low power approach, based on the premise that, for example, pottery is too coarse grained to allow use wear polish to develop. It is now becoming increasingly clear that polish is visible on more coarse grained raw materials like hard stone (Van Gijn and Houkes 2006), coral (Kelly 2003, 2004; Kelly and Van Gijn 2006) and pottery sherds.

The methods of use-wear analysis, both the low and the high power approach, rely on experimentation to obtain a reference collection of experimental wear traces. The characteristics of these experimental wear traces can subsequently be compared to the traces seen on archaeological implements. When these traces show sufficient similarities in terms of polish characteristics, abrasive features and edge removals, we can infer that the function of the archaeological tool was the same as the experimental one. However, it can never be fully excluded that the same combination of wear traces was caused by an activity not yet addressed experimentally. This pertains even more for the "other" materials for which an extensive reference collection is not yet available. The present research should be viewed in this light. The experimental reference collection does not totally cover the possible range of activities to which sherds can be put to use. Also, not all relevant variables have been explored, the most relevant of which are the hardness of the sherds, the kind and size of temper and the type of clay.

The techniques and procedures used for this analysis conform to the standard practice at the Laboratory for Artefact Studies (Van Gijn 1990). Stereomicroscopes fitted with both oblique and incident light and with magnifications of 10× to 160× allow the examination of the rounding, abrasion and larger striations (low power method). Traces of residue are also best localized by means of a stereomicroscope. In order to examine use-wear polish and smaller striations, the sherds also were studied with a metallographic microscope at magnifications up to 560x (high power method). Cleaning of the experimental implements was done in an ultrasonic tank and was kept to a minimum so as not to damage the sherds.

## EXPERIMENTS WITH SHERDS AS TOOLS

A total of 22 experiments tested the use of ceramic sherds with pottery manufacturing, another seven evaluated their performance on other contact materials. These experiments build on the experience gained with replications of the ceramic tools found at the Late Classic K'axob Maya site in Belize (Lopez-Varela et al. 2002). In order to obtain sherds comparable in technological features to the archaeological context, we decided to perform some of the experiments with archaeological sherds originating from Caribbean midden deposits. This material was chosen because it had the same fabric characteristics as the probable tools and therefore, comparable abrasive properties. Normally this is not a preferable situation because of the theoretically possible scenario of using a sherd that already has been used in the past, resulting in wear traces that overlap. However, by selecting and breaking the archaeological sherds very carefully, we feel confident that this problem was avoided. Also, prior to their experimental use all tools were examined by microscope in order to ensure that the sherds were in mint condition. Two ceramic artifacts were intentionally abraded on a slab of sandstone to give the sherd a more regular edge prior to use.

*Using sherds for pottery manufacture*

For the experiments in pottery production, we selected potsherds of a rather small size that could be held easily. The smaller the tool the higher the pressure it exerts and the more effective the tool is. Furthermore, attention was paid to the intended shape of the vessel because the tool has to fit the curve of the vessel profile. It is evident that different tool shapes are required for different parts of the vessel. Therefore, during the selection of the experimental potsherds it was tried to obtain a diversity of shapes (i.e. triangular, square, rectangular, rounded).

A total of 22 experiments were conducted, involving various steps in the pottery-making process (Figure 5-6a-b). These experiments were carried out to observe

FIG. 5. Experiment: scraping the clay with a calabash tool (photograph by Loe Jacobs).

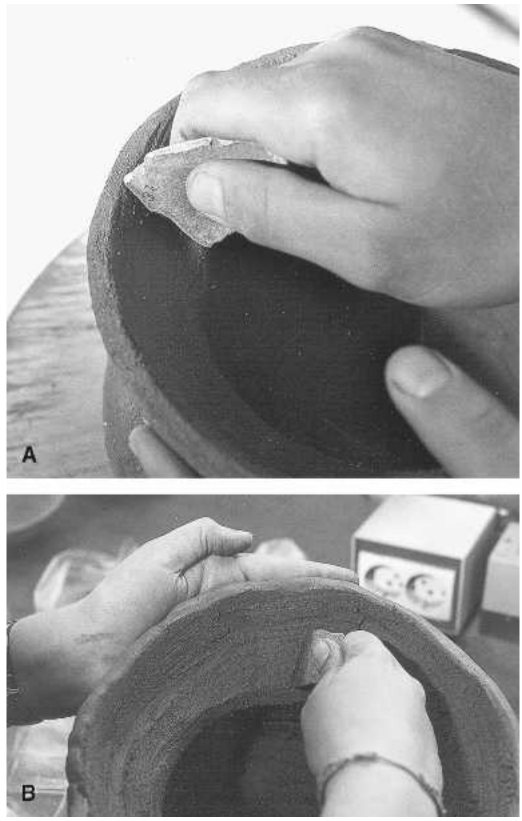


FIG. 6a-b: Experiments: scraping the clay with a ceramic tool (photograph by Loe Jacbos).

the formation of diagnostic traces on the experimental sherds as a result of smearing, scraping, pressing and smoothing the clay in several dry stages of the paste. Most experimental tools were used for only one task (e.g., scraping leather-hard clay in one direction, polishing the surface), while two were used for the entire process of smearing, scraping, pressing and smoothing. Two were used for engraving in leather-hard clay, two for boring leather-hard clay, and three for polishing the surface. The clay body of the vessels was prepared from commercially available clay with temper material added to create a paste more comparable to the pre-colonial clays. This is important because, apart from the plastic condition of the clay, the size, shape and type of the inclusions influence the abrasive qualities of the paste.

The experimental vessels were built using the coiling technique. The base was made by pressing the clay in a mold made of pottery or calabash. Alternatively, the base part was made by flattening out clay between the hands (Hofman and Jacobs 2000/2001). Because the potsherds in the experiments were used not only for scraping in the final stages of the shaping process, but also during construction of the vessel wall when the clay was still soft, the abrasive quality of the paste on the potsherds could be observed in several stages of clay condition. No tools other than the experimental potsherds were used during the shaping and finishing process of the vessels. All tools were effective, although it is clear that the softer archaeological tools are less suitable for polishing the surface than the recently baked counterparts. Scraping the leather-hard surface seems to be the application that results in abraded edges that most closely resemble some of the archaeological artifacts. Polishing the edge of the tool on sandstone before use makes the tool more effective because it develops a smooth surface with which to polish. Such a surface, however, also is achieved through use due to the abrasiveness of the leather-hard clay. If we compare these results to the K'axob study, it is clear that the relative hardness of the sherds determines their suitability for different tasks. The sherds used in the K'axob study were fired at higher temperatures. They were therefore harder and less easy to break during experimental use. These sherds turn out to be effective for boring clay in leather-hard condition and also for incising and engraving a dried vessel (for a detailed description of these experiments, see López Varela et al. 2002).

*Using pottery sherds for other activities*

Although it was hypothesized that the ceramic tools were used in the process of pottery production, a small number of experiments were conducted with different contact materials such as skin and plants. Three pieces were used for cleaning rabbit skin (for 15, 90 and 150 minutes respectively), and one was used for the cleaning of roe deer skin (15 minutes). It was noted that the sherds were not very appropriate tools to work hide because the edge quickly was covered in grease that had to be taken away continuously to keep the edge even somewhat effective. It was possible to scrape off grease, especially when a rough edge was used, but the tool did not grip the remnants enough to be removed very well. Furthermore, even after 150 minutes of use the relatively limited deterioration of the used edge of the sherd did not resemble the abraded edges of the archaeological pieces. In fact, the amount of wear was virtually undetectable.

Two sherds were used to scrape wood. One experiment involved the debarking and subsequent polishing of campeche (40 minutes per task), while another experiment was aimed at debarking fresh willow (50 minutes). The campeche, a tropical hardwood, proved to be especially hard to work using a ceramic tool. It crushed and broke the edge of the sherd immediately upon contact. It was thus extremely difficult to debark the wood, even though a very hard, experimental sherd was used. Debarking the willow was easier, but sharper tools are more effective for this task. Even debarking by hand is easier than using a pottery tool. One piece of pottery was used to flatten fresh reed for five minutes in order to make the fibres supple. Clear traces of abrasion are visible, as well as a bright polish with transverse directionality, and the task could be carried out quite effectively, suggesting that more experiments should be done to examine similar patterns of use wear. Another edge of the same tool was used to peel yam, and although the effectiveness was more or less satisfactory, there are many artifacts present in Caribbean sites, such as bivalve shells, that are much more suitable for this activity. It should be noted that the tools used on wood and plant material involved sherds of experimental vessels made at the Leiden Ceramic Laboratory. They were fired at higher temperatures and were far less brittle and much sharper than the archaeological sherds from the midden deposits used for the experiments with pottery production.

The experiments indicate that ceramic

tools are not appropriate for a great variety of tasks. Harder contact materials such as wood, bone and shell, cannot be worked effectively. Still, ceramic tools clearly are very effective in pottery production. Preliminary experiments on plants suggest that sherds could have played a role in processing soft plants. More experiments with processing plants need to be done. However, it is unlikely that this activity caused the severe rounding and abrasion displayed on the archaeological sherds. The experiments also made clear that the use of sherds for pottery manufacturing produced clear wear traces that could be distinguished by microscope in the form of rounding and faceting of the edge.

## Analysis of the Archaeological Sherds

Thirty-eight possible implements from Morel were examined for the presence of wear, as were 17 from Anse à la Gourde. The Morel tools probably have been affected to some extent by wave action, as evidenced by extensive cracking of the surface. However, several potsherds were sufficiently preserved to allow them to be analyzed by stereomicroscope. High power microscopy, allowing for a more detailed statement about contact materials, was possible in only one case. The tools from Anse à la Gourde were in better condition because much of the original sherd surface had remained intact. Only three of the 17 tools examined were considered too weathered for examination by means of high power microscopy.

### *Anse à la Gourde*

Microscopic analysis of the abraded sherds from Anse à la Gourde did not reveal any traces of manufacture. Although it is assumed that the sherds were to some extent modified by breaking them intentionally or by rubbing them on a slab of sandstone or coral, there is no evidence for this type of modification. Three completely rounded pieces were found whose shape suggests intentional modification, but it cannot be excluded that the rounding is completely due to extensive use. Apart from the three artifacts that were too abraded for analysis, all sherds display traces of use such as polish, striations and severe edge rounding. The polish is located on the edge, not on the outer and inner surface of the sherd. The latter are too severely affected by scratches due to trampling, overlying deposits and possibly even the manufacturing processes of the original vessel. The edges are completely rounded, and in some cases also displaying a facet. Most edges have a U-shaped cross-section. Incidentally, the dorsal aspect of the sherd was harder than the ventral, causing an overhanging, asymmetrical cross-section. The polish was smooth and bright, and distributed in patches all along the rounded edges displaying a distinct directionality (Figure 7). The polish follows every indentation of the edge, indicating a soft and pliable contact material. The abrasion and the well-developed polish indicate that a very abrasive contact material was used. The polish resembles experimental traces resulting from scraping clay. Experimental clay working tools display the same striations and polish directionality, caused by the fragments of temper in the clay, as seen on the archaeological counterparts.

It is therefore argued that the rounded sherds found at Anse à la Gourde were likely used as tools. There are no indications for intentional modification, as these would have been worn away by subsequent use. The polish and striations, as well as the heavily abraded edge, indicate that we are probably dealing with implements used in the process of pottery production. More specifically, the tools were employed on different sides to scrape leather-hard clay, smoothing the inside and possibly even the outside of the vessels.

### *Morel*

As mentioned above, the material from Morel was preserved less well than that of Anse à la Gourde. All sherds displayed a cracked surface, making a high power analysis of the polishes virtually impossible. However, the abrasion and the gen-

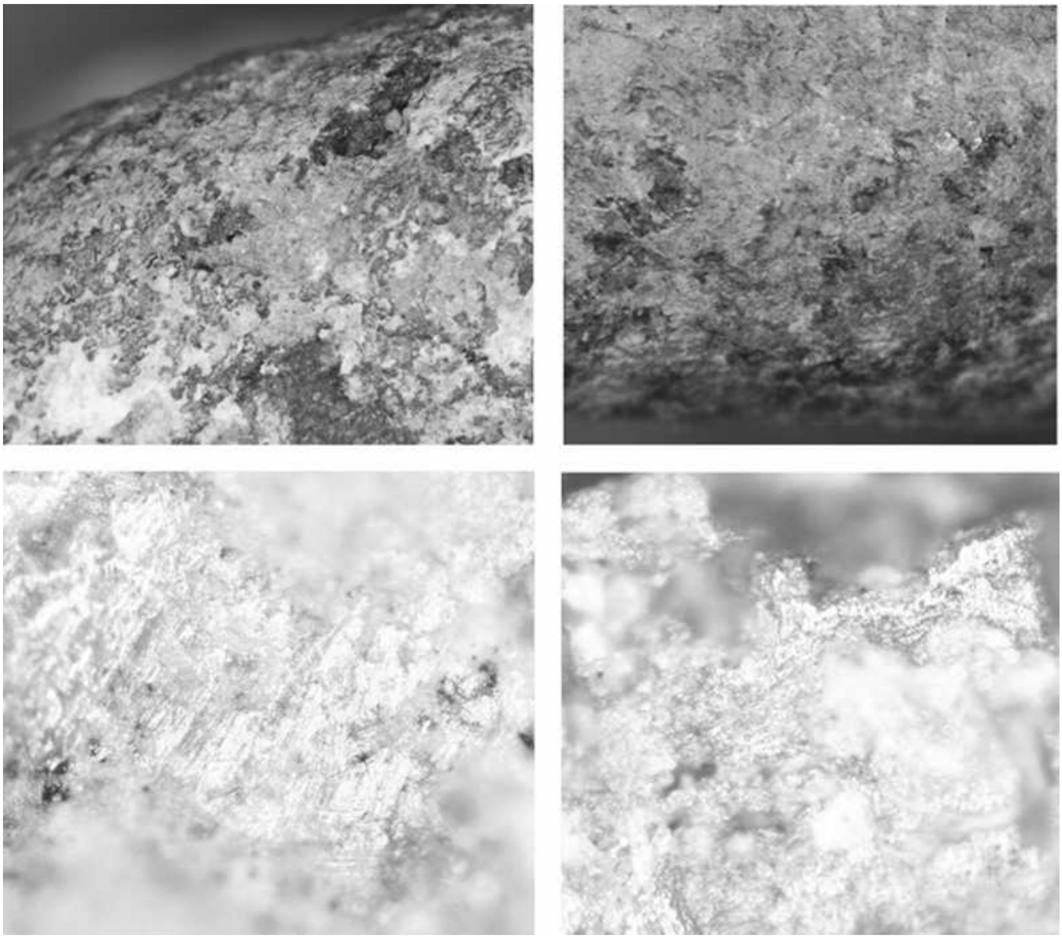

FIG. 7. Traces on ceramic tools from Anse à la Gourde. Top photographs taken by stereomicroscope (10×) of tool 21 (left) and tool 9 (right). Bottom photographs taken by incident light microscope (200X) of tool 3 (left) and tool 14 (right). Note the striations in the polish (photographs by Annelou van Gijn).

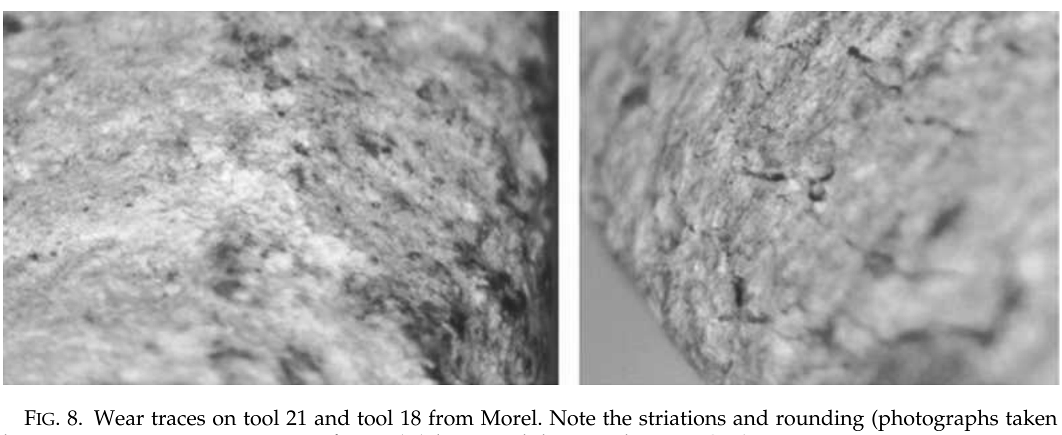

FIG. 8. Wear traces on tool 21 and tool 18 from Morel. Note the striations and rounding (photographs taken by stereomicroscope at 10× magnification) (photograph by Annelou van Gijn).

eral shape of the tools had remained intact so several sherds could still be examined by stereomicroscope. A total of 16 artifacts displayed traces of having been used, all in a transverse motion. The edges were abraded and striations were sometimes visible, in one case the same kind of smooth and bright polish with transverse directionality seen on the Anse à la Gourde implements was observed (Figure 8). There does, however, seem to be more variation in the way the edges are abraded than seen on the tools from Anse à la Gourde. Four different types of abraded edges can be distinguished: 1. asymmetrically rounded edges; 2. symmetrically worn edges with a square cross-section; 3. symmetrically worn edges with U-shaped cross-sections and 4. faceted edges. The asymmetrically abraded edges display wear that is very similar to experimental pieces used to scrape clay (Figure 9). Rounding is most pronounced on one side of the sherd and the angle between the two aspects is usually around 80 degrees. The striations are located on the edge itself, suggesting that the tool was held at quite a high angle to the clay surface. Most likely, however, this asymmetry is due to differential hardness of the two surfaces of the sherd, causing one surface to wear in a more rounded fashion. This is suggested by the observation that the resistant aspect sometimes overhangs the rest of the edge. Differential wear also may be due to always using the sherd in one particular way, whereas the symmetrically worn

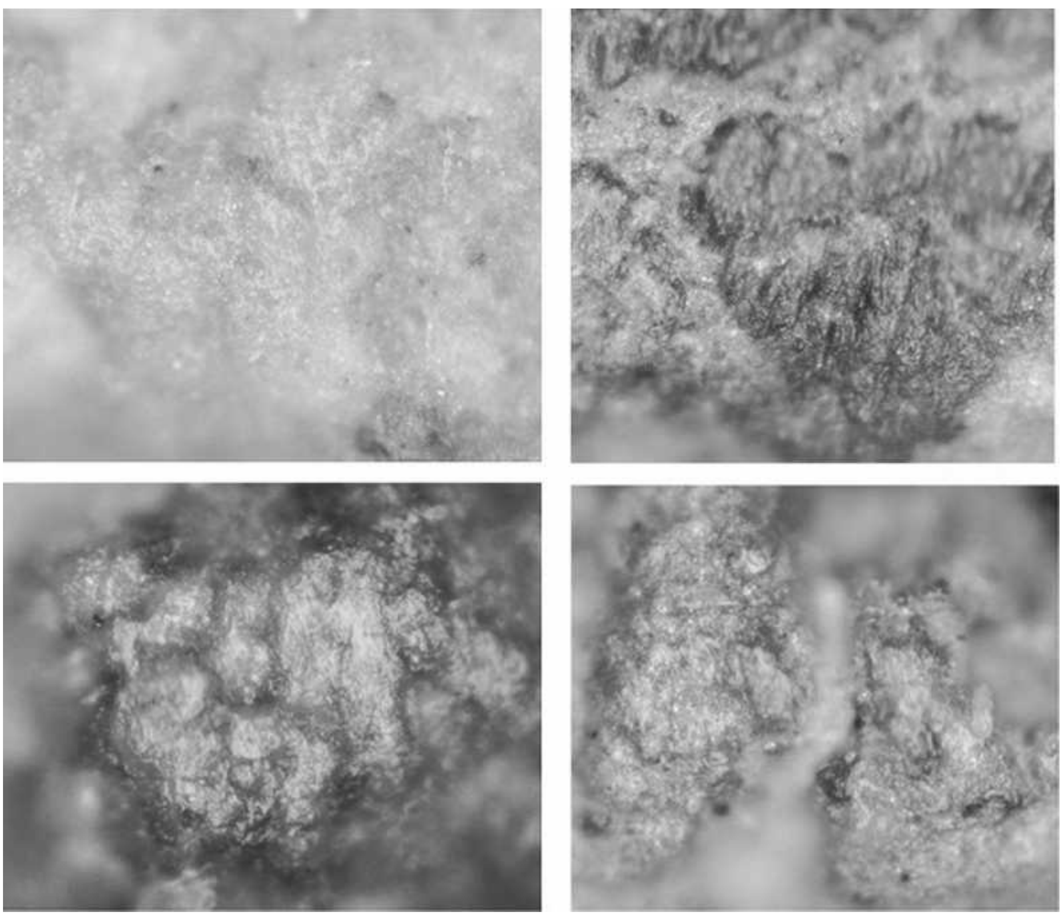

FIG. 9. Wear traces on experimental clay scraping tools (photographs taken by incident light microscope 200×) (photograph by Annelou van Gijn).

implements were used on both sides and for perhaps a longer time. The U-shaped cross-section seems to be confined to the softer, more easily abraded sherds and the square cross-section to the more resistant sherds. Lastly, the facetted variety may be related to scraping clay in leather-hard condition because the increased hardness of the clay wears the edge in facets rather than rounding it.

Based on our observations the abraded sherds from Morel should be considered tools as well, most likely for use in pottery manufacture. The larger variety of edge shapes displayed by the Morel sherds is partially linked to different use, and also to the differential hardness of the sherds. The facetted variety indicates that the sherds also were used on clay that already was quite hard (leather-hard), something that was not observed on the Anse à la Gourde sherds. However, the characteristic polish indicative of pottery scraping was found on only one sherd, with the others too poorly preserved to observe polishes.

## Discussion and Conclusions

The use of pottery tools for the manufacture of ceramic vessels recently has come to light in the study of Late Classic K'axob Maya pottery from Belize by López Varela, van Gijn, and Jacobs (Lopez Varela et al. 2002). In that study the tools were clearly intentionally shaped and revealed a remarkable resemblance to the toolkit of a modern potter. Low power analysis of the wear traces on the archaeological tools confirmed this interpretation. The identification of similar potsherds in Caribbean sites has led us to postulate comparable use of these sherds in the manufacturing process of pottery. However, compared to the K'axob tools, where the tools were associated with pottery kilns, all of the implements at Anse à la Gourde and Morel came from midden contexts. Caribbean tools are also much larger, although they still have a basically geometrical or at least regular shape, indicating that they are not simply potsherds. The contextual evidence for the sherds from Anse à la Gourde and Morel was therefore less suggestive than at K'axob. For this reason, the experimental program was broadened to include the use of sherds for other tasks than pottery manufacturing.

A large number of the abraded sherds both from Morel and Anse à la Gourde were undoubtedly used as tools. They display characteristic rounding as well as striations and polish. Such traces cannot be attributed to anything but intentional use. The sherds that could be interpreted as tools were all used in a scraping motion. The contact material must have been quite soft and pliable and at the same time abrasive. Experiments have shown that ceramic tools, even sherds fired at high temperatures, are not resistant enough to work the harder contact materials such as wood or bone. Hide working is almost impossible with a ceramic tool, and cutting motions are generally not feasible because the edge is simply not sharp enough. This leaves us with clay and soft plants as possible contact materials, but the plant material is probably not abrasive enough to cause the regularly rounded and abraded edges. Moreover, the experimental traces from different activities within the pottery production process bear a striking resemblance to the traces on the archaeological implements. This applies especially to the asymmetrically rounded pieces that most likely were used for scraping clay. However, the three other types of angled rounding seen on several Morel tools have not been experimentally reproduced. Whether these tools served in the pottery production process is likely, but not certain until further experimentation is done.

The relatively small number of pottery tools in ceramic assemblages and their relatively strong abrasion suggest that they must have been used in combination with tools made from other materials. In this way it may be possible to reconstruct a prehistoric pottery production tool kit (see Van Gijn et al. 2006). Presently, a series of experiments is being carried out to further assess the functionality of implements made from different raw materials in various stages of pottery production. Attention will also be paid to the angle worked (gesture), in order to assess the meaning of the different types of rounding displayed by the ceramic tools. A detailed study of the manufacturing traces seen on sherds resulting from the use of different tools will also be an integral part to this program.

In sum, technological and functional studies have so far received insufficient attention in pottery studies in the Caribbean. Technology is a significant parameter because it involves the entire sequence of operations of the manufacturing process. As such, it is deeply embedded in the sociocultural realms of society. Techniques are regarded to be primarily dependent on the personal choices of the potter and the social and cultural environment in which they participate (see also Lemonnier 1986, 1993; Stark 1998). Looking at pottery production from a more holistic perspective, in which tool use and microscopic analysis are a part, can reveal the technological interdependence of various tools and techniques. In the case of the pottery tools from Anse à la Gourde and Morel, such an approach has demonstrated the flexibility of the prehistoric tool users who chose tools suitable for the task at hand, sometimes in ways unexpected from an *etic* perspective. By applying a more holistic perspective, the study of ceramics can evolve from serving as a tool for establishing local chronologies or for determining the spatial organization of regional developments to one putting pottery production in a wider socio-cultural and economic context.

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