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GRINDING MATERIAL AT CHINKULTIC, CHIAPAS

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The present work will present in a general manner the grinding materials and their by-products recovered throughout the Chinkultic Archaeological Project. This research integrates a larger investigation which includes other grinding collections from the region, in the pursuit of elaborating a typological classification of the Eastern Chiapas Highlands. This region comprises mainly the valleys of Comitán, La Trinitaria, and the lacustrine area of Montebello (Navarrete 1975:11). Chinkultic is located on the borders of the Montebello National Park, 33 km away from the road that connects Comitán with that tourist center in the township of La Trinitaria (Figure 1).

The artifacts examined correspond to different field seasons (1976 to 2002), and were originated in the rubble of 11 structures whose locations were distributed in three groups, as follows:

- E-1 and E-4 in Group A, where the high part of the group is located.

- E-13, E-14, E-16, E-19 and E-20 in Group B, located in the lower, flat area and occupying the central portion on the opposite side of the Yubnaranjo River.

- Finally, E-22 (Ballgame), E-23, E-27 and the *rancho* El Rincón in Group C, on the southwest end of the site, respectively (Figure 2).

- The material from the El Rincón ranch and from La Bolsa was considered after a surface sample presently in possession of its owners. The latter corresponds to the common lands of the Miguel Hidalgo district.

The tools that are the subject of this study chronologically correspond to the Late Classic period (400-900 AD), and comprise the ceramic phases of Chanujabab and Yobnajab (Ball 1980:6).

ANALYSIS OF THE MATERIAL

During the classification of materials, several research works regarding grinding tools conducted at sites close to the area were consulted: Chiapa de Corzo (Lee 1969), Paso de la Amada (Ceja 1978), Aquiles Serdán (Ruiz Aguilar 1981), La Libertad (Clark 1988). Other classification criteria were also considered, such as: García Cook (1967, 1982), Nelken (1968), and Castañeda (1976), which –although they do not correspond to our study area- are considered to be important for the methodology applied and their systematic arrangement.

A concrete and practical proposal to facilitate the handling of the material started primarily with a techno-economical approach. In other words, the point of departure was the raw material used in the elaboration of tools, sorting in groups, *a grosso modo* (macroscopic analysis) the different types of rocks. This simple action of sorting out one resource from the other was immediately expected to create a first hierarchical level of classification, giving the corresponding raw materials their due importance.

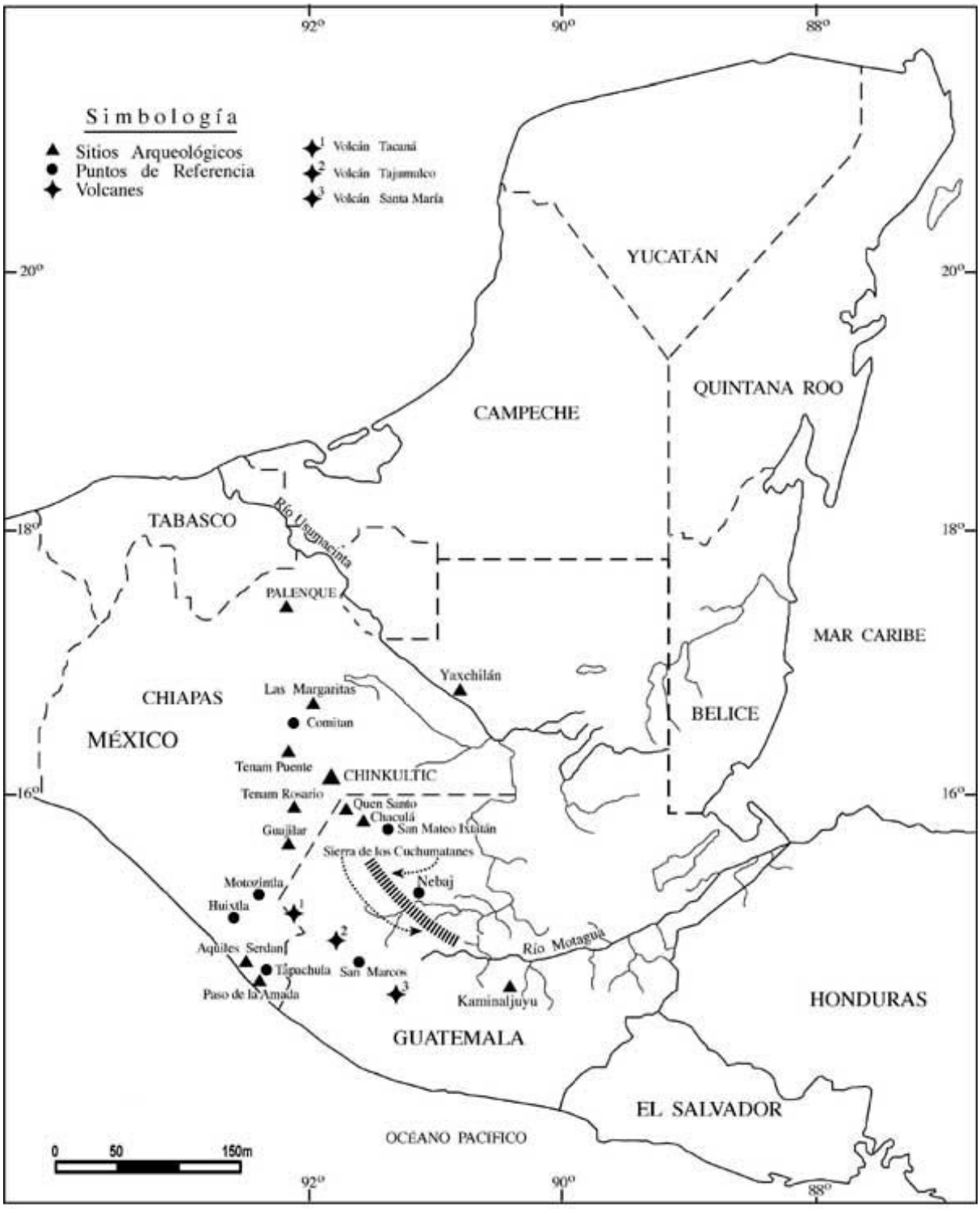

Figure 1. Map showing the localization of Cinkultic and other sites of reference.

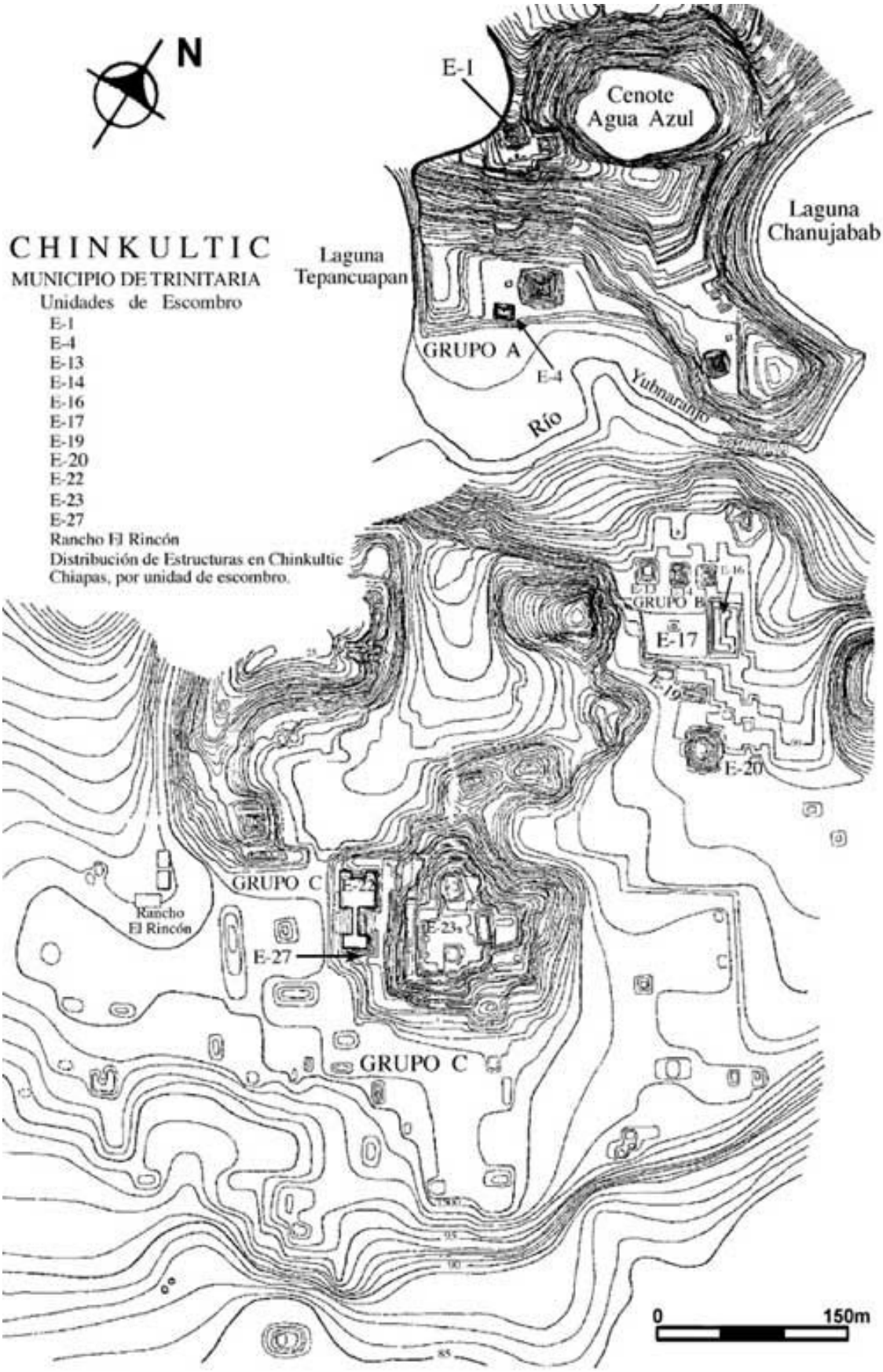

Figure 2. Plan of Chinkultic, Chiapas.

The analysis will derive several possibilities that are to be examined:

- The way how resources were obtained and if they originated in the region or brought from elsewhere.
- Their transportation or carrying to the work place.
- The manufacturing technique used.
- If the finished product was taken someplace else.

This kind of study will make it possible to reconstruct, or in its defect to infer, the economy to which a specific social group was subjected to, in time and space.

It was by keeping this in mind that tools were grouped according to their generic function or use as follows: cut-percussion and wear. The categories were integrated after their function and generic form. However, and due to the limited size of the sample regarding some of its components, it was not possible at this time to define types, a task that will be accomplished once the sample is enhanced with other collections from the Chiapas Highlands.

Before specifically focusing on our study subject, it would be convenient to outline some basics regarding the manufacture of these artifacts. The manufacturing techniques used are basically percussion, cut, and wear, and each one of them shows differences in the way work was accomplished, which were widely discussed by Lorenzo (1965), Mirambell and Lorenzo (1974), and Clark (1988), among others.

From the point of view of technology, it is common knowledge that all instruments undergo different manufacturing processes. First, they are hewn from the original block to obtain a preform, and then the same working technique or a different one follow, in order to achieve the shape and finishing required. There was an erroneous generalization which consisted in considering that both the function and the manufacturing technique were one and the same thing. One clear example is the grinding material –grinding stones, *manos*, mortars, pestles, etc-, whose wear was commonly attributed to the original manufacture, without taking in consideration the wear caused by use.

Today, the grinding implements are elaborated and finished by means of the technique of carving through direct percussion, and pecking, like in Chamula, a town located in the Chiapas Highlands (Pozas 1959:100). In the case of Guatemala, there are also quarries and domestic workshops at: Malacatancito in Huehuetenango, Nahuala in Sololá, and Palencia, in the department of Guatemala, where a similar working technique is observed (Ruiz Aguilar, n.d.).

In this way, just one single class will exist: the carved one. This will be divided in sub-classes, according to the finishing technique used. These finishing techniques or modes are applied depending on the raw material used for the manufacture of the different tools, as well as on the implements required to accomplish such a work

(Ruiz Aguilar 1988:572). In this case, the main working techniques were: percussion through pecking, wearing through abrasion, and occasionally, polishing, and they were very clearly distinguished from one another.

In the course of this work 191 artifacts were classified in general, 144 of which correspond to grinding implements represented by the following categories: grinding stones, *manos*, pestles, and anvils. The rest is integrated by different instruments: strikers, polishers, macerators, scrapers, "tablets", polished axes, composite artifacts and miscellanea (Figure 3). The composite artifacts include one single specimen consisting of a chisel/polisher, while the miscellaneous ones include: spheres, one stone figurine and one decoration material, the specific function of which is unknown.

Categories	**Milpa Surface**	**Bag Material**	**Group A**	**Group B**	**Group C**	**Total**	**%**
Metates	3	1		22	24	50	26.17
Manos		2	2	33	54	91	47.64
Pestles					1	1	.52
Anvils	1				1	1	1.04
Strikers				5	4	9	4.71
Polishers		2	1	3	6	12	6.28
Macerators				1	1	2	1.04
Smoothing tools		1		1	2	4	2.09
"Tablets"				2	3	5	2.61
Polished axes		2		1	7	10	5.23
Composite Articles							
Chisel/polisher		1				1	.52
Miscellaneous							
Mats					2	2	1.04
Stone figure					1	1	.52
Decoration Material					1	1	.52
TOTAL	**4**	**9**	**3**	**68**	**107**	**191**	
%	**2.09**	**4.71**	**1.57**	**35.6**	**56.02**	**99.9**	

Figure 3. Numeric presence and percentage of lithic artifacts per rubble unit, Chinkultic, Chiapas.

As to the raw material, artifacts were finally comprised in three groups, according to their order of geological classification: igneous, sedimentary and metamorphic rocks. The first include basalt, tuff, andesite, diorite and granite; the second, gravel, lime stones with variants, conglomerates, quartz-sandstone, and dolomite. Among the metamorphic there are: phyllite, shale, and plumbate. There is also quarta, which was separated for being an essential component element of many eruptive, sedimentary and metamorphic rocks (Figure 4).

According to the tests accomplished, the instruments that proved significant for their frequency in this timeframe are represented by: grinding *manos* 46.64% and grinding stones 26.17%, which outnumber the other artifacts studied (Figure 5). The most frequent artifacts shall be described belos, mentioning at a general level the more relevant technological characteristics.

Category / Raw Material	Metates	Manos	Pestles	Anvils	Strikers	Polishers	Macerators	Finishing tools	Tablets	Polished axes	Composite chisel/polisher artifact	Misceláneos: Spheres	Misceláneos: Stone figure	Misceláneos: Decoration material	Sum	% per Raw Material
IGNEOUS																
Basalt	6	21	1			3	1	1		4					37	19.37
Tuffs	28	37		2	4	3	1		1	1				1	78	40.83
Andesite	2	1													3	1.57
Diorite		4							2			2			8	4.18
Granite	1	5								1					7	3.66
%															133	69.63
SEDIMENTARY																
Sandstone	3	8			1			1	1						14	7.32
Limestone		1				1							1		3	1.57
Wockstone	1	1				2		1			1				6	3.14
Conglomerate	4	3													7	3.66
Quartz-Arenite	1	3			4										8	4.18
Dolomite		1				1									2	1.04
%															40	20.94
METAMORPHIC																
Phyllite	2					1			1	2					6	3.14
Schist	1														1	0.52
Slate						1									1	0.52
%															8	4.18
Quartz	1	6						1							8	4.18
Undetermined										2					2	1.04
Total	50	91	1	2	9	12	2	4	5	10	1	2	1	1	191	99.9

Figure 4. Numeric and percentage presence of lithic artifacts in general, by raw material and category. Chinkultic, Chiapas.

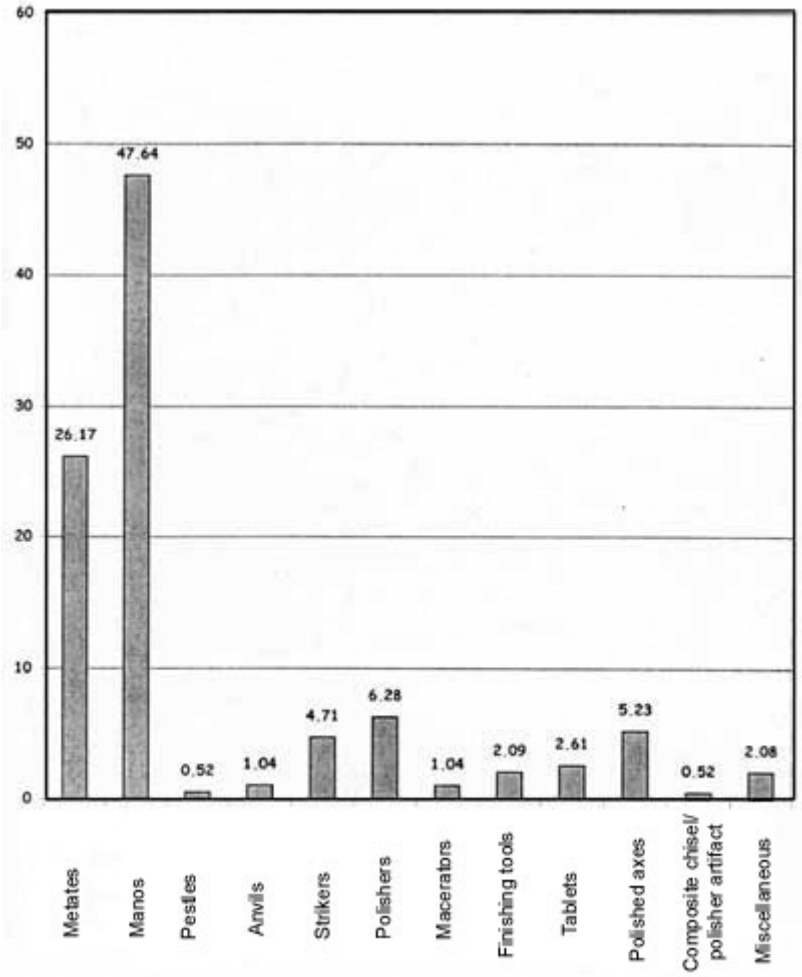

Figure 5. Chart of lithic artifacts, Chinkultic, Chiapas.

MANOS

This category comprises the active agents in the specific function of grinding (García Gook 1982), and includes 91 samples which were split in four different groups, as follows: 41 long *manos*, 14 short *manos*, 32 undetermined fragments, and 4 composite ones.

The group of long *manos*

It groups the *manos* whose length is at least that of the width of the grinding stone with which they were used, and which occasionally exceed such width. In general, these implements were used with open sided grinding stones, and moreover, their size implies the use of both hands to accomplish the grinding work. It is worth mentioning that the grooving present in the *manos* as a consequence of use, are seen in a transversal position with respect to the longitudinal axis. Therefore, the more worn out area corresponds to that which was in contact with the grinding surface of the utensil. For the time being, five different types have been tentatively identified: the ellipsoidal, quadrangular, rectangular, oval, and circular ones.

The group of short *manos*

It includes those that because of their size can only be manipulated with one hand. Just like the preceding ones, they show linear signs of use in a transversal sense in regard to the longitudinal axis of the artifact. Very probably, these *manos* were used with close-sided grinding stones, for better fulfilling the function of wearing by grinding. According to their transversal cut, four types were defined: the ellipsoidal, quadrangular, rectangular, and oval ones.

The group of the undefined fragments

As shown by their names, these are partial, imprecise and vague fractions, without any definable regular geometric shape, making it impossible to establish which was the longitudinal axis or the transversal section, and thus, making them unfit to be assigned any established group. Nevertheless, some of their sides show traits of use by wear.

The group of composite artifacts

This group comprises those *manos* that fulfilled a double function. In this case there are four objects that besides, were used as *manos*: the *mano/*striker, and the *mano/* scraper.

Evidently, the best represented group in this category is that of the long *manos* with 45.05%, compared to the short ones that represent 15.38% and the composite ones with 4.39%. However, it is clear that the undetermined fragments are abundant, representing 35.16%.

GRINDING STONES

These are the utensils that perform the passive part of grinding, and which together with the *mano* as the active feature, form an integral unit. These implements allow for the transformation of eatable or non-eatable materials, through crushing, thrashing and fine grinding, with the purpose of obtaining different products that are to be used in different ways. As noted by Castañeda (1976:29), the traits of use observed in the grinding stones are produced by a constant movement of to-and-fro, easily identified by the flutes that are marked in the stone in the longitudinal sense of the artifact, in addition to the polishing or smoothing of the surface used to grind, which increases according to the time during which it was used. In other words, the more extended the use, the more the wear observed.

In this respect, and currently, only few studies have been accomplished to observe the different alteration patterns that these implements have undergone. Nelken (1968:59), for example, who examined several grinding collections based on numeric indexes with the purpose of ascertaining the degree of wear, states: *"Actually, it seems difficult to calculate a formula for the loss of substance, as of the wear of the working faces of some grinding stones, but it would be interesting to discover –in the*

absence of a mathematical reasoning- some empirical formula, by multiplying observations and morphometric analyses".

It should be noted that an analysis of that kind is applicable only in complete samples that include the integral unit, grinding stone and *mano*. However, truth is work is more frequently accomplished with scattered fragments, making it difficult to ascertain the passive and active degree of wear suffered by the instruments.

This category includes 50 specimens, classified according to the form of their sides. They correspond to the group of the open-sided ones, which feature an open grinding surface and offer the entire dorsal area to be used. They were in turn divided into two types: the apodal ones and those with a support.

Apodal grinding stones

There are 43 specimens which, as indicated by their names, are clearly those who lack a support and are held up directly on the dorsal part, base or support of the utensil. As to their generic form, most of them feature an oval plan, as they have no corners and the entire perimeter constitutes a curved line, though not a fully circular one (Figure 6a).

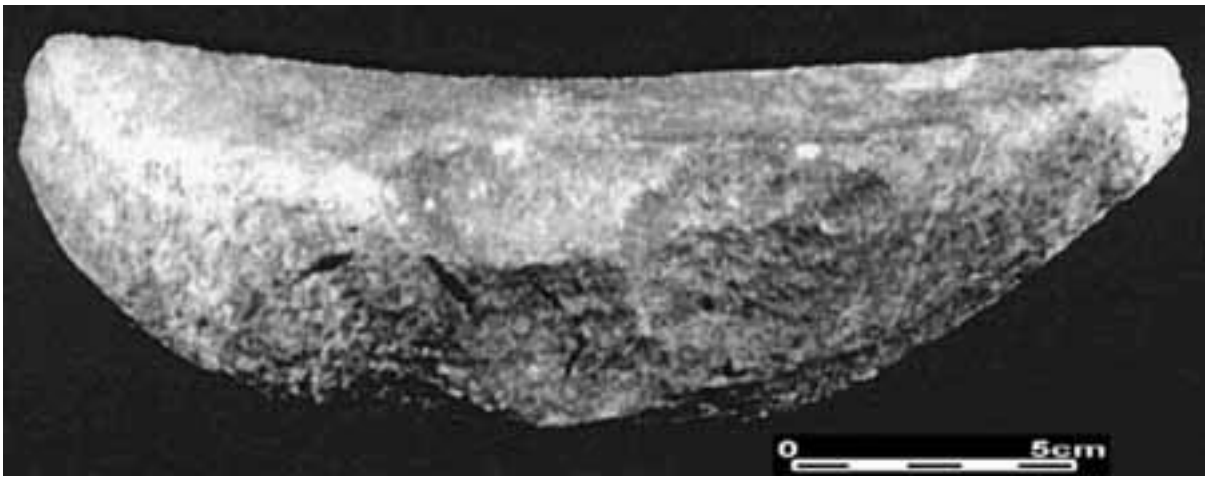

Figure 6. a) Grinding stone of the apodal type.

As to the technological characteristics, it was observed that they lack a good finishing in both their faces (dorsal and ventral), and that apparently they were worked and hewn from irregular blocks or rocks, using the technique of percussion through pecking, until the necessary form for being used was obtained. In this sense, Bonfil's comment (1962:62) in his essay about man in Sudzal, Yucatan, is interesting: *"There is also a grinding stone which at times is merely an irregular block polished on one of its sides, and at times is a finely carved artifact with three legs".*

Today, in Quechula, not only the prehispanic grinding stones found in growing fields are being reused, but also, natural stones found in the rivers are adapted, whenever they exhibit characteristics that are similar to those of a grinding stone, making them suitable to perform as grinding stones (Navarrete and Lee n.d.).

Grinding stones with supports

They are integrated only by seven specimens that have been provided with supports. However, as they consist of fragments where only one support or traces of it could be observed, it is not possible to clearly establish whether they were bipod, tripod or tetrapodal supports, except for one surface collected complete grinding stone with three supports. Due to the paucity of samples with supports, no detailed classification was elaborated in relation to their forms (Figure 6b).

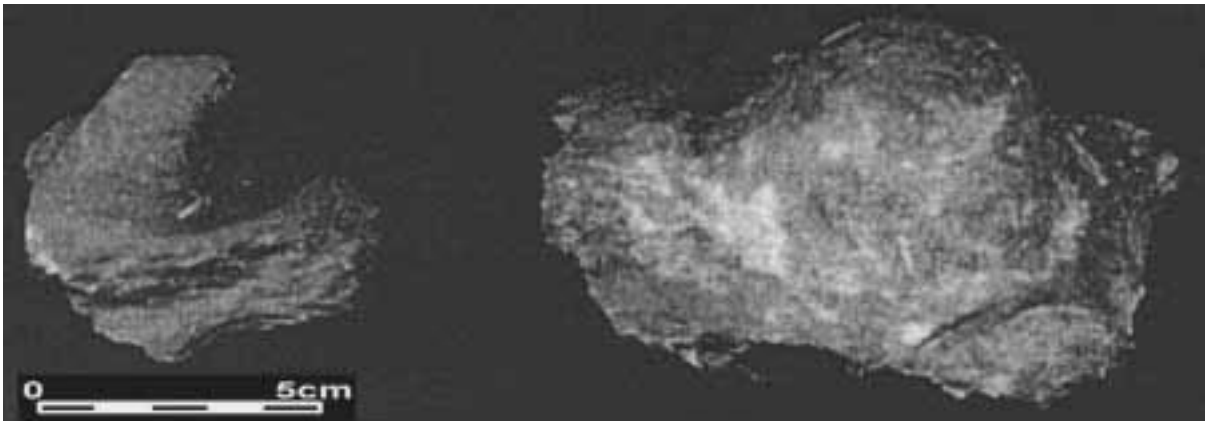

Figure 6. b) Grinding stone with supports.

In short, the most common type is the apodal one, represented by 86%, compared to those with supports, with 14%. The presence of grinding stones of the apodal type is reflected as well in other localities, varying in temporality and resources used: Salcaja (Lothrop 1936); Zaculeu, Kankyak phase (Woodbury and Trik 1953); Chiapa de Corzo, Francesa-Istmo phases (Lee 1969); Paso de la Amada, Barra phase (Ceja 1978); Aquiles Serdán, Barra-Ocós and Cuadros phases (Ruiz Aguilar 1981); Ucanha, in Yucatan, from the Preclassic to the Postclassic period (Maldonado 1984); Tlatilco (Lorenzo 1965); and Tehuacan in Puebla (MacNeish *et al.* 1967), in the entire sequence.

POLISHERS

They include 12 specimens which were probably used for smoothing and polishing pottery pieces. Similar artifacts have been reported in several archaeological sites, comprising almost the entire chronologic sequence from the Preclassic to the Postclassic period: Chiapa de Corzo in Chiapas (Lee 1969); Muna and Dzibilchaltun in Yucatan (Andrews and Rovner 1973); Colha in Belize (Eaton 1991); and Tlatilco in the Mexican Altiplano (Lorenzo 1965). Currently, potters from Amatenango in Chiapas use quartzite pebbles for burnishing, to provide the final finishing to the pieces they manufacture (Clark 1988).

The material examined shows that both the forms and the raw materials vary. Most of them have one or more “polished” smooth surfaces, ex-profeso modified by use, suggesting they were frequently employed. There are two outstanding pieces in the

collection, triangular in shape, polished on their three sides, and elaborated with a limestone variety known as wockstone (Cabrera, personal communication 2004). However, it is probable that these were objects with a multiple function not known so far.

POLISHED AXES

They include only ten specimens, seven of which could be sorted, while the remaining ones were fragments. The main function of an axe is to cut through percussion, so it is probable that axes were used in a number of different activities, from cutting down trees to decapitation, as it is clearly shown in the Dresden and Madrid Codices (Ruiz Aguilar 2001; Villacorta and Villacorta 1977). However, axes may have had other additional uses, such as carving and sculpting stone and wood, and they may have been useful for masonry works.

The material recovered made it possible to differentiate two groups: the Centered ones, and the Composite ones.

- The Centered ones were taken from García Cook (1982:100), who defines them according to the position of the cutting edge –major functional part- with respect to the complete body of the artifact. They are represented by six specimens with the cutting section at the center of both faces.

- The Composite ones are those that fulfilled more than one function. This one is integrated by one single sample that worked first as an axe, and then when it fractured, as a polisher and scraper.

In general, these artifacts have been reported in several sites within the Maya area: Uaxactun, in the Tepeu phase (Kidder 1947); Chiapa de Corzo during the Dili, Francesa, and Maravillas phases (Agrinier 1964); La Libertad, in Chiapas, for the Middle Preclassic period (Clark 1988), and Santa Rosa, Chiapas (Delgado 1965). The instruments described here are elaborated with different raw materials with the predominance if igneous rocks, specifically basalt altered into serpentine, chlorite and epidote.

STRIKERS

This category includes nine specimens. In archaeological literature they are also known as hammers, and just like the polishers and grinders, they have not been given the importance they deserve. In this case it is difficult to elaborate a typological classification because they were not deliberately manufactured, but instead, they were natural stones selected for having certain attributes: size, weight, and hardness. These qualities depend on the work to be accomplished, and therefore, they may be found in different types of rocks. In the sample, igneous rocks (tuffs), sedimentary rocks, and pebbles (quartz-sandstone) were used. These implements were finally differentiated as of the traces of bruises and marks of blows on their

surfaces; evidently, these pieces were found in many places, but they were not paid too much attention.

Other artifacts associated with grinding implements and poorly represented are the pestles and anvils. Pestles are represented by just one complete specimen elaborated in basalt. This type of instruments has been insufficiently documented, perhaps because they were not found frequently enough, or perhaps because they were not recorded as such. This is why there is not a detailed study that may lead to a formal typology. Nevertheless, there are works that have tried to differentiate them for their generic shape. Such is the case in the Pánuco region (Ekholm 1944) and Tehuacán in Puebla (MacNeish *et al.* 1967), where they were described as bell-shaped *(con forma de campana)*. For the Nopalera Cave in Hidalgo, García Cook (1967-1982) describes them as having an inverted "T" shape. Given their morphology, one could think that they resemble the so-called dog-bones *(huesos de perro)*, long and narrow, with a flattened end, and which tend to be oval in the cross section; in this case, the distal part shows wear and polishing. Unfortunately, no analogous specimen was found in the Maya area for comparison, but there is no doubt that these utensils originated way back in time and have continued to our days.

As to anvils, there are two specimens elaborated with igneous rocks (tuffs). In general, rocks or relatively flat stones were used, showing different forms. In this case they have a semi-circular and circular plan; their dorsal surface exhibits marks of bruises and pecking, but they do not necessarily have a good finishing. It is feasible that these artifacts were used as passive agents, for accomplishing lapidary works or for profiling other tools. They have been frequently found in contexts of domestic debris since the Preclassic and up to the Late Classic period.

RAW MATERIAL

According to the first classification, the more frequently used materials were the igneous rocks with 69.63% over the sedimentary ones with 20.94% and the metamorphic ones with 4.18%. The first have a predominance of tuffs, 40.83%, and basalt, 19.37%, which is considered to be significant given the size of the sample and the absence of those resources at a local level. The paucity of native raw materials of a sedimentary and metamorphic origin in the region is surprising, as shown in the chart (Figure 7).

In Jiménez Salas' view (1984:33), the distribution of igneous and metamorphic rocks in Chiapas is mostly concentrated in the southern and central part of the territory: *"they primarily belong to the so-called Granitic Massif of Chiapas, considered to be the basal platform of the region, which seems to have undergone subsequent reactivation and intrusions".* Such intrusions are made evident in the materials used, of the andesitic, rhyolitic, tufa and dacitic type, which cover large extensions in several areas within the territory.

As to the metamorphic rocks, some of them correspond to basalt (gneisses and schists), while others like the schists, marbles, phyllites, slates, etc., are mainly

derived from sedimentary rocks by contact and regional metamorphism (Jiménez Salas 1984). For the above, it could be said that the Chiapas Highlands are formed by different types of rocks, which were selected and used by the communities of the region.

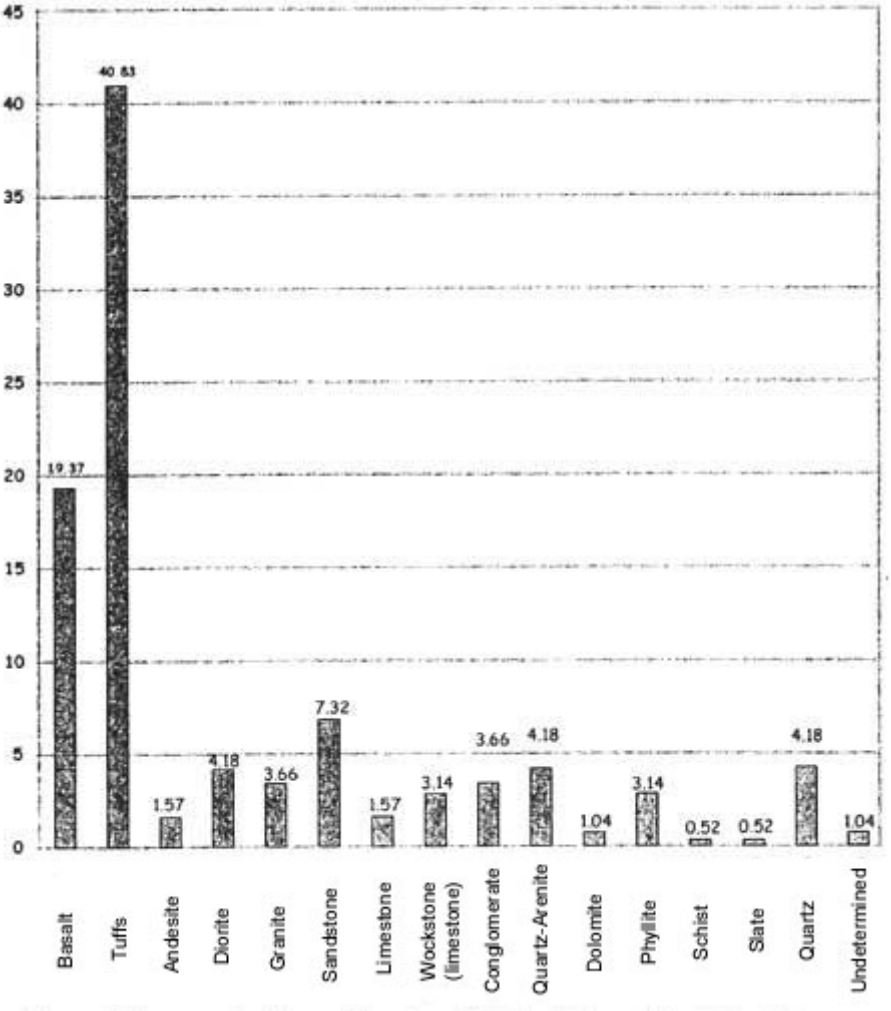

Figure 7. Chart of lithic artifacts, Chinkultic, Chiapas.

CONSIDERATIONS

For now, the data provided by the technological analysis have made it possible to clearly notice the presence of two groups of artifacts. The first is basically formed by grinding utensils represented by: grinding stones, *manos*, pestles and anvils. The second includes those instruments that had different uses, such as: striking, cutting, polishing, macerating, smoothing, etc. This latter assemblage is quantitatively insufficient for a type definition.

It is clear that the first group shows a significantly higher frequency of 79.39%, when compared to 24.60% of the second one. In the first, there is a numerical predominance of *manos* in relation to grinding stones, which may mean that not only a *mano* was used as a grinding stone. It should be taken into account that these

objects perform as active agents, and consequently, it is probable that they may become worn out or fractured before the grinding stones do, being no longer functional and therefore substituted. This accounts for the greater abundance of *manos* over the grinding stones. In turn, the absence of the latter may be a consequence of having been reused as construction refill. Maldonado (1984) provides a particularly significant piece of information, when he says that in some places in Yucatán *"the manos are reused to be buried again in their new, modern dwelling, with the purpose of providing the house with a soul".* Consequently, it ought to be considered that they were placed there not only to accomplish the function of debris, but that instead, they were feasibly linked to the cosmovision and ideology of the ancient Maya.

The second group has a remarkable presence of polishers, polished axes and strikers. Polishers exhibit more than one smooth surface worn out by permanent rubbing, but no modifications, except for the case of two triangular artifacts, heavily polished on the three sides, which were possibly used in other works related to smoothening soft materials, perhaps skin or leather.

The second case –polished axes- includes tools deliberately elaborated, considered to be instruments of general utility due to their multiple functions in different activities. Despite the small size of the sample, it could be said that those with the smaller dimensions were used as chisels and gouges, while those with a larger size were possibly used to perform difficult and heavy tasks, such as cutting trees or construction works.

In the third group –strikers- it was not possible to find a single pattern with traces of use that would allow us to sort them out in types. Nonetheless, the river pebbles, hard quartz-sandstone rocks, and not intensively used, prevailed. It is clear that most polishers and strikers found in Chinkultic were not worked ex-profeso, and therefore, they were considered to be natural tools that were briefly used and then discarded.

In short, it may be said that the Chinkultic grinding collection and its by-products are of common use, essentially of a utilitarian, daily life nature, and typical of domestic contexts of debris.

About the resources used in Chinkultic, it may be said at a general level that they are not local. The relevance of this sample has to do with the larger affluence of tuffs and basalt, thus implying that some form of transportation involving routes of exchange and commerce must have existed. The presence at the site of a high percentage of igneous rocks (specifically tuffs, basalt and andesite), suggests the possibility that they were acquired in the vicinities of Guatemala, as these materials are abundant in the area. The area in question is integrated by several volcanic systems, among which the closest ones are those at Tacaná, Tajumulco and Santa María. It is probable that some grinding stones and *manos* were brought from the Guatemalan Altiplano, from several major production centers –Malacatancito in Huehuetenango, Nahuala in Sololá, and Ixchiguan in San Marcos- to be later distributed in different localities in the Chiapas Highlands.

In our view, it is important to consider several common traits among the few materials recovered, as this would be of help to establish a background and clues to be followed in regard to the variability of resources, productivity and the exploitation thereof, as no doubt the analyses conducted will yield the immediate relationships among the communities or archaeological centers located in the region.

Finally, Chinkultic shows there was exchange or commerce with local, interregional and long distance markets, which possibly played a crucial role in prehispanic communication routes across the Chiapas Highlands.

REFERENCES

Agrinier, Pierre

1964 *The Archaeological Burials at Chiapa de Corzo and their Furniture.* New World Archaeological Foundation, No. 16, Brigham Young University, Provo.

Andrews, E.W., and Irving Rovner

1973 Two Mason's Tool Kits from Muna and Dzibilchaltun, Yucatan. In *Archaeological Evidence on Social Stratification and Commerce in the Northern Maya Lowlands* (edited by Margaret A.L. Harrison and Robert Wauchop). Middle American Research Institute, Publication 31, Tulane University, New Orleans.

Ball, Joseph W.

1980 The Archaeological Ceramics of Chinkultic, Chiapas, Mexico. Papers of the New World Archaeological Foundation, No. 43, Brigham Young University, Provo.

Bonfil, B., Guillermo

1962 Diagnóstico sobre el hombre en Sudzal, Yucatán: Un ensayo de antropología. Departamento de Investigaciones Antropológicas, Instituto Nacional de Antropología e Historia, México.

Castañeda, S. Hilda

1976 *Utensilios de molienda de Teotihuacan.* Tesis de Maestría, Escuela Nacional de Antropología e Historia, México.

Ceja, Jorge Fausto

1977 *Paso de la Amada (Un sitio Preclásico temprano en el Soconusco).* Bachelor's Dissertation, Universidad de Xalapa, Veracruz.

Clark, E. John

1988 *The Lithic ARtifacts of La Libertad, Chiapas, México: An Economic Perspective.* New World Archaeological Foundation, No. 52. Brigham Young University, Provo.

Delgado, Agustín
1963 *Archaeological Research at Santa Rosa, Chiapas, and the Region of Tehuantepec.* New World Archaeological Foundation, Nos. 17 and 18 (Publication 13), Brigham Young University, Provo, Utah.

Eaton, D. Jack
1991 Tools of Ancient Maya Builders. In *Maya Stone Tools: Selected Papers from the Second Maya Lithic Conference* (edited by Thomas R. Hester and Harry J. Shafer), pp. 219-228. Monographs in World Archaeology No. 1, University of Texas at San Antonio.

Ekholm, G.F.
1944 *Excavations at Tampico and Panuco in the Huasteca, Mexico.* American Museum of Natural History, Anthropology, Paper 38, New York.

García Cook, Angel
1967-82 *Análisis Tipológico de Artefactos.* Colección Científica de Arqueología, No. 116, Instituto Nacional de Antropología e Historia, México.

Jiménez Salas, Oscar
1984 *Bosquejo geológico del área de San Cristóbal Las Casas, Chiapas.* Cuaderno de Trabajo, No. 25, Departamento de Prehistoria, Instituto Nacional de Antropología e Historia, México.

Kidder, Alfred V.
1947 *The Artifacts of Uaxactún, Guatemala.* Carnegie Institution of Washington, Publication 576, Washington, D.C.

Lorenzo, José Luis
1964 *Tlatilco. Los Artefactos.* Instituto Nacional de Antropología e Historia, México.

Lothrop, Samuel K.
1936 *The Artifacts of Chiapa de Corzo, Chiapas, México.* New World Archaeological Foundation, No. 26. Brigham Young University, Provo.

MacNeish S., Richard, Antoinette Nelken-Terner and Irmgard W. Johnson
1967 *The Prehistory of the Tehuacan Valley, Nonceramic Artifacts*. University of Texas Press, Austin.

Maldonado,Rubén
1984 Implementos de Molienda en Ucanha, un sitio Maya del Norte de Yucatán. In *XVII Mesa Redonda, 1981, Investigaciones Recientes en el Área Maya,* tomo II, pp. 117-127, Sociedad Mexicana de Antropología, San Cristóbal de Las Casas, Chiapas.

Mirambell, Lorena, and José Luis Lorenzo
1974 *Apuntes para la Arqueología. Materiales Líticos Arqueológicos: Generalidades. Consideraciones sobre la Industria Lítica.* Cuadernos de Trabajo No. 4. Departamento de Prehistoria, Instituto Nacional de Antropología e Historia, México.

Navarrete, Carlos
1975 Chinkultic (Chiapas); trabajos realizados en 1975. *Boletín del INAH,* Segunda época, No. 15. Instituto Nacional de Antropología e Historia, México.

Navarrete, Carlos, and Thomas A. Lee
n.d. Quechula, un puerto fluvial sobre el Grijalva. Introducción a la Arqueología Zoque del Postclásico, Instituto de Investigaciones Antropológicas, UNAM, México.

Nelken-Terner, Antoinette
1968 *Los implementos de molienda prehispánicos. Ensayo metodológico.* Masters Thesis, Escuela Nacional de Antropología e Historia, México.

Pozas, Ricardo
1959 *Chamula: Un pueblo indio de los Altos de Chiapas.* Memorias del Instituto Nacional Indigenista, Vol. 8, México.

Ruiz Aguilar, María Elena
1981 Estudio preliminar de la lítica de Aquiles Serdán, Chiapas. *Revista Mexicana de Estudios Antropológicos,* Tomo XXVII (2): 13-26, México.

1989 Instrumentos líticos procedentes de un basurero, Tikal, Petén. In *Memorias del Segundo Coloquio Internacional de Mayistas, 1987,* Vol. I, pp. 569-602. Centro de Estudios Mayas, Instituto de Investigaciones Filológicas, UNAM, México.

2001 Análisis del material lítico de Chakanbakan, Tierras Bajas del Sur de Quintana Roo, México. *Anales de Antropología* 35: 233-272, Instituto de Investigaciones Antropológicas, UNAM, México.

n.d. Una visión etno-histórica de canteros, canterías y hacedores de piedras de moler en las Tierras Altas Mayas. Instituto de Investigaciones Antropológicas, UNAM, Mexico.

Villacorta, Antonio, y Carlos A. Villacorta
1977 *Códices Mayas.* Second Edition, Guatemala.

Woodbury, Richard and Aubrey Trik
1953 *The Ruins of Zaculeu, Guatemala.* The William Byrd Press, Richmond.