This paper will discuss some of the potential avenues for research into the manufacture, use, and exchange of stone in the archaeological record. Ground stone will not be dealt with directly, despite the fact that a large number of ground stone objects have been recovered from the northern littoral of South America and from the Greater and Lesser Antilles (for examples, see Harris, this volume and Osgood 1942, plate 2 for descriptions of grinding stones; on polishers see Nieves de Galicia, this volume and Tabio 1966, lamina V; for pebble edge-grinders see Willey 1971:366; for hatchets and axes see Chanlatte-Baik, this volume and Goodwin & Walker 1975, plate 16). Although not the subject of this contribution, ground stone is mentioned here because some of the techniques described below for chipped stone may also be applicable to the initial shaping stages of ground stone manufacture. Likewise, it is important to note that in many cases ground and chipped stone tools were used to perform the same activities. Finally, my discussion of lithic exchange is applicable to all stone artifacts.

TECHNOLOGY

The interpretation of chipped stone objects may in many cases be unclear. For instance, a lithic artifact may represent any of a number of stages of reduction common to a variety of technologies. Some possibilities include:

- a finish tool,
- an unfinished tool, such as a blank or preform (see Crabtree 1972, p. 42, 85): these may have been lost and the tool never completed, or cached for future work, or broken during manufacture and discarded,
- a cobble with just a few flakes removed (to test its flaking properties) and then abandoned,
- lithic shatter resulting from the knapping process,
- debitage, or waste flakes from tool manufacture: these may be utilized or unutilized, (Crabtree 1972, p. 58),
- resharpened or reworked implements, whose original form is not readily apparent,
- exhausted cores, which may have been retouched and/or utilized (for hammerstones, shredders, scraper planes, etc.),
- core rejuvenation flakes, which sometimes imply a specific of technology, such as blade manufacture (Crabtree 1972, p. 89, Hester, Jack, & Heizer 1971, p. 49),
- tool resharpening flakes, from adzes, scrapers, chisels, etc.
These carry edge-damage which can be analyzed for tool function (Frison 1968, Shafer 1970, p. 76). Almost all of these categories may be retouched and/or utilized if the shape of the artifact and the properties of the raw material permit.

Careful recovery and analysis of chipped stone allows the archaeologist to reconstruct past modes of stone tool technology, even when examples of the end result of the manufacturing process are absent. Even small lithic collections may merit analysis. In order to realize the potential of lithic technological analysis, one must have at hand evidence of all stages of manufacture deposited at a particular locus. Therefore, it is of utmost importance to sift all excavated materials through a small mesh screen. Only in this manner will small resharpening flakes and tiny pressure retouch flakes be recovered. Not only is the quantity of recovered lithic artifacts important: it is critical to have representative samples of all the different varieties of debris and of retouched objects, and in accurate proportions. Without this information the lithic analyst is at a disadvantage in trying to infer the techniques and procedures represented by the stone tools he/she has collected.

In some cases, lithic manufacturing workshops can be identified archaeologically (see Chanlatte-Baik and Walker, this volume; also Tabo and Guarch 1966 concerning Saboruco, Cuba; and Bullen & Sleight 1963 on Krum Bay, St. Thomas). Lithic workshops may not have associated ceramics. However, this does not necessarily mean that they predate the local appearance of pottery in an area, only that they were not residential loci inhabited by pottery using peoples. Like quarries, specialized lithic manufacturing sites may have been used over millennia (e.g., from Archaic through historic times).

Workshops indicate where stone tools were produced, but do not necessarily show where or how they were used. In fact, the recovery of finished tools may be rare at workshop areas. Through analysis of manufacturing debris at these workshops one can determine the nature of the finished product(s). Also, it is of interest to determine whether a knapping zone represents the manufacturing of a variety of stone objects - possibly the entire range of tools used by a group - or is an area of productive specialization where manufactures of only a single tool type took place (e.g., blades, adzes, choppers). The appearance of stone tool types which require considerable knapping skill may imply the emergence of artisans specializing in the manufacture of these tools. If this is the case, we want to determine whether these artisans were also involved in basic subsistence activities, or whether they were supported by their neighbors, for whom they supplied stone tools. The degree of prehistoric productive specialization and its organization on the community level are subjects of increasing importance in understanding the social and political organization and the exchange systems of past societies (Michels 1976, Peebles & Kus 1977, Irwin 1978).

As an aid in reconstructing lithic technologies, I will describe several examples of reduction strategies which have been reconstructed
by lithic analysts working with non-Caribbean assemblages. These examples include the manufacture of bifaces, flake tools, and prismatic blades. (For descriptions of bipolar reduction sequences, see Walker, this volume; also Binford & Quimby 1963 and Honea 1965). These examples certainly do not cover all possible manufacturing techniques; they are used as illustrations.

The flow chart for each technology illustrates the types of stone artifacts that are produced at each stage in the manufacture of a specific product. Using these data, it may be possible to distinguish between a workshop where partial reduction was performed (e.g., rough-out or finishing) and a knapping area where the entire reduction sequence is represented.

**BIFACE MANUFACTURE**

1. **Stage 1: rough-out**
   - large & medium sized hammerstones
   - 1. large, thick flakes
     - a) first removed have high % dorsal cortex; later flakes have less cortex
     - b) well developed bulbs of force
   - 2. small flakes
   - 3. shatter

2. **Stage 2: thinning & shaping**
   - medium hammerstones, and antler billets
   - thinning flakes: characterized by:
     - a) relative length (they travel at least half way across core surface)
     - b) relatively thin, to remove bumps & any remaining cortex (Newcomer 1971)
     - c) lateral & distal margins are feathered
     - d) less pronounced bulb
     - e) scars of previous skimming flakes apparent on dorsal surfaces

partially reduced core, or blank

UQ8
f) thinning flakes often are curved in profile

g) junction of platform with ventral surface is often lipped (Crabtree 1972, pp. 44, 74-75)

h) ground platforms (Sheets 1973).

Stage 3: finishing

1. small, thin flakes, following ridges, ground platforms
2. in some cases pressure flakes, with
   a) ground platforms
   b) scalar & elongated shapes
   c) flat flakes
   d) very thin
   (Crabtree 1972 pp. 72, 14-17; Semenov 1964, pp. 64, 55-66).

Note that the first stage (rough-out) yields the smallest number of flakes, but by far the greatest weight in lithic debitage. Stages 2 and 3 are accomplished by removal of approximately equal numbers of flakes, but stage 2 debitage is larger and weighs more than debitage resulting from the final, finishing stage (Newcomer 1971).

FLAKE TOOL MANUFACTURE

When a sufficient number of artifacts is available it is useful to attempt the reconstruction of stone nodules. This is done by piecing together the debitage resulting from knapping activities. Such reconstructions aid in the determination of the sequence of stone tool production, and enable us to determine the order in which flakes were removed (Newcomer 1971, Oakley 1972:54-55, Cahen, Keeley, and Van Noten 1979).
FLAKE TOOL MANUFACTURE

hammerstones  

large & medium hammerstones

Stage 1: core preparation

flakes removed, same as for Stage 1 of biface manufacture, described above

prepared flake core

Stage 2: flake removal

hammerstones of various sizes, antler billets

1. useable flakes large enough to be modified into retouched tools (scrapers, points, drills, etc.)
2. flakes suitable for use without retouch (cutting & scraping tools)
3.debitage suitable neither for retouch nor utilization
4. shatter
5. (platforms on 1-3 may be ground)
6. on the average, these flakes will not have curved profiles, nor pronounced lips

exhausted flake core

Stage 3: finished flake tools

small hammerstones, antler percussors, pressure flakers

1. flakes unifacially retouched (scrapers, planes, adzes, burins) see Shafer 1970 for a discussion of unifacial retouch
2. flakes bifacially retouched (for example, into drills, points, knives, etc.) See Oakley 1972:50-58, and Bordes 1968.
3. unretouched flakes ready for use, as knives, scrapers, gravers, etc.

retouch flakes, including pressure flakes
Analysis of debitage from flake tool manufacture can indicate the types of tools produced. The range of these tool types is an indicator of manufacturing specialization in stone working.

BLADE TOOL MANUFACTURE

Crabtree defines a blade as a 'specialized' flake with parallel or subparallel lateral edges; the length being equal to, or more than twice the width... Blades are associated with a prepared core and blade technique; blades are not random flakes' (Crabtree 1972, p. 42, 43, 47, & 55). Blades can be used without modification, but they are often retouched and can be made into a large number of tool types.

### Cobble

#### Step 1: blade core preparation

<table>
<thead>
<tr>
<th>Large &amp; medium-sized hammerstones</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. there may be a hemisphere shaped cobble, split to create a flat platform (Sheets 1975)</td>
<td></td>
</tr>
<tr>
<td>2. skimming flakes for platform flattening</td>
<td></td>
</tr>
<tr>
<td>3. large decortication and shaping flakes</td>
<td></td>
</tr>
<tr>
<td>4. small flakes</td>
<td></td>
</tr>
<tr>
<td>5. shatter</td>
<td></td>
</tr>
<tr>
<td>6. small retouch flakes removed from along a ridge, to form a crest in preparation for removal of the first blade</td>
<td></td>
</tr>
<tr>
<td>7. crested 'ridge blade' or lamé crête (see Crabtree 1972, p. 43, 72; and Hester, Jack &amp; Heizer 1971)</td>
<td></td>
</tr>
<tr>
<td>8. large percussion blades (may be used unmodified or may serve as blanks for adzes, points, etc.)</td>
<td></td>
</tr>
</tbody>
</table>

#### Stage 2: prismatic blade removal

<table>
<thead>
<tr>
<th>Pressure tool (Crabtree 1968)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. prismatic blades</td>
<td></td>
</tr>
<tr>
<td>2. core tablets &amp; other platform rejuvenation</td>
<td></td>
</tr>
<tr>
<td>Aborted cores and exhausted cores; platforms</td>
<td></td>
</tr>
</tbody>
</table>
flakes (Hester, Jack & Heizer 1971)
3. core recovery flakes
   (i.e., attempts to remove 'mistakes' or materials left on the core when a blade terminates before reaching the core's distal end)
4. plunging blades or out-repasses (Hester 1973, fig. 7, and Crabtree 1972, p. 80)

Stage 3: finished blade tools

1. unretouched prismatic blades (ready for use as knives, perforators, etc.)
2. unifacially retouched blades: ex. plano-convex daggers (cited by Lundberg, this volume, and in Rovner 1976), also burins, knives
3. bifacially retouched blades (worked into projectile points, knives, drills, gravers, etc.)

Retouch flakes, burin spalls, pressure flakes, notching flakes

Tool resharpening flakes are also important in the study of lithic technology. The reworking and resharpening of finished tools are activities often not performed in the same places where the tools were originally manufactured. These activities are more likely to take place in the locus of use or in residential areas where tools are stored. Resharpening flakes are valuable in that they contain information on the techniques of removal of worn or damaged edges (see Shafer 1970, 1976). Aside from the edge damage often found on resharpening flakes, the frequency of resharpening episodes is an indication of the degree to which a tool type is 'curated' (Binford 1972) (that is, its importance to its owner, and the relative availability of equivalents or replacements).

In sum, the technological study of a chipped stone assemblage is a valuable aid in the reconstruction of the prehistoric way of life it represents; the variety of tools made and used by a group, their place of manufacture, and the degree of specialization in tool production. In addition, the sheer amount of knapping debris might indicate whether tools were being produced for local consumption, or for export to other areas.
FUNCTION

The importance of determining the prehistoric function(s) of chipped stone tools from archaeological contexts has long been recognized. Functional studies of stone tools are potentially invaluable aids in the reconstruction of special activity sites and in the explication of specialized craft manufacturing loci within complex societies (Flannery 1976).

Archaeological tool function has been inferred in a variety of ways:

a) the general morphology of the specimens, including working edge angles. See Nieves de Galicia and Harris, this volume for examples of this approach.

b) raw material suitability for specific tasks. For example, such attributes as surface texture, edge sharpness, and material strength must be taken into consideration. Quartzite and vesicular basalt have rough textures suitable for food grinding; but the microcrystalline structures of obsidian and chalcedony preclude use of these materials as metates, manos or mortars. Likewise, fine grained obsidian is desirable for cutting and slicing because of the sharp edges found on flaked tools made of this substance; on the other hand, obsidian is far too brittle to withstand the severe battering incurred during chopping or adzing.

c) ethnographic analogy to extant users of stone tools and ethnohistoric accounts of native practices. M. I. Gullick's description (this volume) of Carib cassava graters studded with quartz teeth is an example of an ethnographic account dealing with the use of stone.

d) the distribution and variability of utilized edge damage, including microflake scars, edge abrasion, and striations. Chanlatte-Baik (this volume) bases functional assignations on this type of evidence.

e) microscopically observed traces of use, usually in the form of striations, pitting, or abrasive polishes, which may be compared to experimentally-produced wear (or published descriptions thereof) on tool replicas utilized for specific tasks under controlled experimental conditions. Ranere's (1975) experimental work in replicating andesite and chalcedony woodworking tools, and his subsequent examination of the edge damage observed after utilization is an example. In another case, Davis (1975) manufactured a number of obsidian chips which he inserted into grater boards, used them to process manioc, and then compared the resultant edge damage with prehistoric artifacts for which a similar function had been hypothesized. Davis' analysis and wear pattern descriptions should interest those working in areas of cassava cultivation.
Members of this Congress are also beginning to undertake this type of functional research. See contributions by Walker and by Lundberg (this volume) for applications to lithic materials from St. Kitts and the Virgin Islands.

In the event that method d) or e) is chosen, a functional analysis can proceed on a level of either high or low intensity. A high intensity functional study is, of necessity, time consuming and is best carried out with high power microscopy (over 100x if possible). In many cases, experimental replication and tool use is called for in order to obtain experimental wear patterns which match those expected for a particular archaeological assemblage. In addition, multivariate statistics such as discriminant analysis (Dixon, ed. 1975) are valuable in assigning artifacts to known functional categories (Lewenstein 1978). This type of in-depth analysis is relatively new in lithic research, but promises eventually to result in the identification of activities performed in the past with stone tools.

A low-intensity study is more appropriate, however, when time and funding for lithic analysis are limited, or when initial field study will be backed up subsequently by investigation in greater detail. Preliminary analysis can also help determine whether further experimental replications of tool use are warranted. A low-intensity lithic study involves the identification of use-wear with low level magnification (40x if possible, or if not, with the aid of a hand lens). Each tool should be first scanned for any evidence of utilization. When present, the use-wear observed on each tool should be compared with published experimental wear pattern 'standards.' General functional designations can be made relatively quickly, without the aid of complicated statistical techniques.

A functional lithic analysis must first of all determine which tool edges were utilized. Regularity or patterning of microflake scars (and other use-wear) distinguish utilized tools from non-utilized lithic artifacts that have been subjected to trampling and other post-depositional damage by human or natural agents (Tringham 1974, pp. 192-3).

The determination of mode of tool use is somewhat more difficult. Nevertheless, analyses of experimentally utilized tools have yielded wear pattern descriptions which correspond to some modes of use.

Choppers and axes have been examined for characteristic wear patterns. A composite sketch of the utilized chopping edge includes the following features:

- an edge angle of approximately 45°;
- an edge usually symmetrical in profile;
- use damage on both dorsal and ventral sides of the chopping edge;
- several superimposed rows of microflake scars; the smallest and closest to the edge often have hinge or
step terminations; these give the edge a 'battered'
look;
- striae, when present, occur slightly diagonal to the bit
edge (Semenov 1964:122-134, Keller 1965:502-507, Ranere
1975:199).

Adzes, on the other hand, have an asymmetrical profile, and
an average edge angle of about 65°. Use-wear is predomi­
nantly unifacial, consisting of microflaking (including many
hinge fracture scars). Also, tiny grooves and fine lines may
be seen on the front face, as well as striations parallel to
the long axis of the adze (Semenov 1964:122-134, Gould,
Kostner & Sontz 1971).

Cutting and sawing activities are best performed with tools
with acute edge angles, usually between 20 - 50°. Use-damage
from cutting is bifacial. Microflaking is usually present;
sometimes polish and striae parallel to the cutting edge may
also be detected, even at low magnification (Semenov 1964:
101-107, Keller 1965:504-507, Tringham, et al. 1974:188,

Scraping tools generally have steep edges, frequently with
angles over 45°. Most microflake scars are found on one side
only, usually on the dorsal side. If striations are visible,
they occur perpendicular to the scraping edge, on the ventral
side only. Heavy edge abrasion (or rounding of the edge) may
result from extensive use (Semenov 1964:85-93, Keller 1965:
Dome-shaped 'scraper planes' are a sub-type within the
general scraper category. (cf. Hester, Gilbow & Albee 1973
and Ranere 1975 for a discussion of the morphology, use, and
edge damage of scraper planes.)

Whittling knives are often made on blades. They exhibit
heavy edge abrasion and large overlapping flake scars along
the side of the tool opposite that in contact with the
material worked. In some cases polish and striae occur
perpendicular to or diagonal to the edge along the ventral
side (Semenov 1964:107-113, Keller 1965:504-509, Lewenstein
1978).

Clearly, the examples cited above are an incomplete listing of the
possible modes of use known to prehistoric peoples. Nevertheless, I
hope that these edge damage descriptions may be of use in the func­
tional sorting of lithic artifacts; and that they may stimulate
additional research in this area.
The Workpiece

In addition to a tool's mode of use, we also want to be able to identify the material being processed (the contact material). This is the most difficult task of all. Some success in this regard has been achieved with the identification of 'sickle sheen' or silica gloss, a distinctive polish observed on hoes and flint blades used for reaping siliceous grains and wild grasses (Witthoft 1955). This polish is visible without magnification.

Recent experimental studies are identifying additional contact materials from the distinctive polishes that form on stone tools used to process them. Wood, bone, hide and meat polish can be identified on tools by microscopic inspection at 200x (Keeley 1977, Keeley Newcomer 1977). Unfortunately, most analysts do not have available the equipment necessary to study these polishes.

However, even if the exact substance cannot be pinpointed, in most cases it is possible to determine the relative hardness of the material processed, once the mode of use has been determined (Tringham 1974, Stafford 1977, Lewenstein 1978). For example, edge damage which results from use on a soft material is made up of small feather microflake scars; the harder the material processed the larger the scars removed, and the higher the incidence of 'stepped' fractures (Tringham 1974, Odell & Odell-Vereecken 1980; also Crabtree 1972, p. 63 for illustrations of feather and scalar terminations).

Specialization

Functional analysis can solve the mysteries of prehistoric tool use. Not only can we determine the types of activities carried out at a site, but also whether any specialization was going on. The spatial distribution of activities using stone tools may be interpreted as to whether each household (or village) was performing every task, or whether some activities were carried out exclusively by a few specialists within a community (or in only one village within an area). A functional study of chipped stone may also be important in determining the nature of procurement or processing activities that were performed prehistorically at non-residential sites (for example, at low density lithic scatters).

EXCHANGE

There is enormous variation in lithic raw material availability within the Caribbean, as is evident from reading the contributions in this volume. Quartz, basalt, diorite, arkose, chert, crystallized calcite, andesite, obsidian, peridot, serpentine, and flint are some lithic materials recovered in the Caribbean (Chanlatte-Baik, Harris,
and Walker, this volume). If the source areas of the different stone types are known, then it should be possible to study exchange on islands, between islands and between ecological zones.

Plog (1977) has suggested a number of variables which he considers to be 'critical structural characteristics' of any exchange network.

1. Content: This is the range of materials being exchanged; quarried rock, partially finished tools (blanks), or finished items.
2. Magnitude refers to the quantity of goods of various types.
3. Diversity: How many different types of stone categories of tools or blanks were involved?
4. Size: What is the size of the territory over which this exchange was taking place?
5. Temporal duration: For what periods of time did the exchange occur? In the case of stone, chronological information must come from C-14 dates or association with seriated ceramics, rather than from the lithic artifacts themselves. When preceramic or aceramic sites are involved, durational information is more difficult to come by.
6. Directionality: Goods may travel from point A to point B, from point B to point A, or both. In some cases it may be possible to document flow of lithic materials from A to B, but not from B to A. This may be because non-lithic, or perishable items were being exchanged for stone, or because the two loci were involved in a larger 'delayed-reciprocal' network of exchange, wherein goods from A passed to B, goods from B went on to C, goods from C went to D, and finally, items produced at D were passed on to A. (cf. Sahlins 1972 and Dalton 1977 for discussions of the kula and potlatch 'delayed-reciprocal' exchanges).
7. Symmetry: Directionality is only the presence/absence measure of the flow of goods. Symmetry refers to the amount of goods flowing from point A to point B relative to the amount flowing in the opposite direction.
8. Centralization: To what extent do substantially greater quantities of lithic raw materials occur in the archaeological record at some few (non-quarry) loci?
9. Complexity: This refers to variations in symmetry, directionality, centralization, and diversity over the entire territory involved in an exchange network. In a simple network there is little variability in the patterns of exchange. The more complex the exchange system, the more variable the exchange patterns linking the individual loci (Plog 1977).

Given the ecological and resource diversity within the Caribbean region, and the fact that the area is made up of topographic units
(islands) which are separated from each other by large expanses of sea, it is useful to seek examples of exchange networks in regions that are similar in geographic and ecological setting. Polynesia, where considerable ethnographic and archaeological research has been conducted, is one such area. Within Polynesia the Hawaiian Islands offer a well documented example of a group of tropical islands which are characterized by high environmental diversity; this makes them ideal for consideration as analogous to the Caribbean area (Earle 1977). A careful examination of the Hawaiian data may prove beneficial in constructing models of Caribbean trade networks.

Service (1962) believes that, over time, a sedentary population exploiting an area of great ecological diversity will become increasingly complex in its political organization. According to this scenario, the pattern of resource distribution leads to economic specialization. Eventually, this gives rise to an emerging chiefdom, which functions as an efficient vehicle for distributing goods among locally specialized communities. The existence of chiefdoms in Hawaii beginning around A.D. 1400 is well documented (Sahlins 1958, Earle 1977, Saxe 1977, Peebles & Kus 1977). The chiefdom level of organization may have been attained also in NW Venezuela and on some of the Caribbean islands, perhaps as early as Period IV (Willey 1971:360-394).

What kinds of exchange are associated with chiefdoms? For Hawaii two different types of exchange were observed; direct barter, and the redistribution of goods channeled through the chiefly hierarchy. Lithic items may be exchanged in both types of trade. The function, as well as the physical setting of these two phenomena are not the same.

Despite ecological diversity Hawaiian communities were organized for maximum self-sufficiency, so as to minimize interdependence between villages. This does not mean that inter-community exchange did not exist. The distribution of certain desirable items, such as stone and various woods, was highly localized. These goods were exchanged via direct barter at trade 'fairs,' at which representatives of the chief were often present, not to control the trading, but only as arbitrators of disputes and as tax collectors (Earle 1977).

In addition to exchange by direct barter, officials of the Hawaiian chiefdoms were involved in massive mobilizations of goods which they extracted from every community within their hegemony. This tribute was redistributed periodically at large feasts and other ceremonies, which took place several times a year. Earle (1977) describes three primary applications for the tribute collected periodically in pre-contact Hawaii:

1) Support of the elite segment of society; that is, the chief's family and retainers,

2) Establishment and maintenance of political alliances required by intensive intra- and intergroup competition, and

3) Capital investment in projects such as irrigation and terracing.
How will the types of exchange associated with chiefdoms be represented in the archaeological record, especially with regard to chipped stone artifacts? Naturally, the study of lithic exchange networks calls for regional data or, at least, data from several sites within the network.

Non-re redistributive exchange will be considered first. Barter may take place by means of a trading chain also know as 'down-the-line' exchange (Renfrew 1975). Let us examine a trading chain which begins at point A, near a lithic quarry, and which includes several villages (B-E), located at successively greater distances from the stone source. Since community A is located close to the quarry it will have an abundance of this local resource. Some of the stone mined at the quarry by A may be traded to nearby village B, which is situated farther than A from the quarry. Lithic material may be traded as nodules, or in the form of decorticated nodules (i.e., blanks). Exchange of blanks is often chosen because a) flawed nodules can be detected during decortication and discarded prior to transport, and b) removal of the cortex reduces the weight of stone without significantly reducing the amount of stone suitable for knapping. In this way transport costs are minimized. Village B will receive less of this particular stone than village A, but B may nevertheless trade a portion of what it has obtained to village C, located farther 'down-the-line' than B or A. This pattern continues for subsequent communities, each one farther from the stone source than the village from which it receives the stone. Each successive village ends up with a smaller amount of the stone than the previous village. Thus, the amount of the lithic raw material declines exponentially with distance from the source of the stone (Renfrew 1975). At some point in this chain, a village will not have very much of this stone, and will not be willing to barter any with the next village (E) down the line. Because no stone of this type reaches E, none will be recovered archaeologically at that locus.

Communities may also barter for finished stone implements. This may take place within a trading chain, or through exchange between trading partners, on either the individual or the village level. When tool exchange occurs between trading partners it may sometimes be identified archaeologically, if the knapping loci can be found. These manufacturing zones will identify the suppliers of the stone tools. The recipients of the finished products are detectable by the presence at other loci of broken and used tools, and resharpening flakes, and by the absence at these loci of manufacturing debitage corresponding to given tool types.

The redistribution of goods channeled through a chiefly hierarchy includes the flow of finished lithic artifacts and stone raw materials that will subsequently be flaked into tools. The chief and his stewards amass large quantities of goods, which are stored near the headquarters of the paramount chief prior to ceremonial redistribution. Cached lithic and other products can be identified archaeologically, by their quantity, and by the presence of storage facilities associated with ceremonial mounds and the remains of sumptuous residences.
Some high status products, like feathers, jade and elaborate ornaments tend to remain in the possession of the chief and his retinue. Other goods, such as food, woods and lithic materials, are essential to all levels of the society; these tend to filter down through the social system. A larger proportion of the redistributed items are retained by persons in close geographic (and kin) proximity to the chief. The products of ceremonial redistribution can be represented spatially by a fall-off in density in all directions with increased distance from the residence of the chief, except (in the case of stone) for a) concentrations of stone in close proximity to quarries, and b) high frequencies of chipping debris at stone tool manufacturing workshops.

It was noted above that some of the goods collected as tribute will be used to initiate and strengthen alliances with neighbors, and to placate strong competitors who may be plotting to usurp the authority of the paramount chief (or chiefs of equal rank). This type of exchange will complicate the spatial distribution of goods already discussed. When lithic artifacts are redistributed by the chief to his counterparts in another area, the raw material type may be sufficient to document the origin and the direction of flow. When the flow of goods includes finished tools, the techniques of manufacture, and stylistic considerations must also be studied in order to identify the manufacturing loci of these items.

CONCLUDING REMARKS

I hope that this discussion of exchange in Polynesia will be of some utility for the study of Caribbean lithic distributions. The literature from Australia and Melanesia offers another example of a regional island setting for which sufficient archaeological and ethnographic work has been directed toward (lithic) exchange; in this case toward the understanding of less complex, tribal, groups.

Not all aspects of stone tools were covered in this paper. I have restricted my comments to considerations of lithic technology, function, and exchange, because of the potential of these analytical approaches for supplementing ceramic and architectural data in archaeological research. Lithic analysis has the potential for contributing to the understanding of prehistoric subsistence activities, and of non-subsistence production (including the manufacture of many perishable goods). The distribution of stone artifacts has also been shown to be an indicator of economic and political makeup of past societies. Archaeologists working in the Caribbean can benefit greatly from a more intensive study of chipped stone recovered from this region. I hope that I have kindled some interest in this topic, and that my observations on lithic analysis suggest approaches that will be of use to members of this Congress.
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Editor's Note: Although it may seem presumptuous for an outsider to Caribbean archaeology to comment on research conducted in this region, some observations on the status and potential of lithic analysis may be of interest. Therefore, I am exercising the prerogative of an editor to summarize, discuss implications, and offer suggestions concerning stone tool manufacture, function, and the exchange of lithic implements and raw materials. I hope that the references cited will be of interest to members of the Society. Whenever possible, I have cited periodicals and books that are readily available. One exception is the reference to S. A. Semenov, PREHISTORIC TECHNOLOGY which, I believe, is out of print, but which hopefully can be obtained from any university library.