

LITHICOLOGY AND PREHISTORIC ANTHROPOLOGY: ESSAYS IN HONOR OF DON CRABTREE
A Contribution of the NSF Flintknapping School Fellows, 1969-1974

Edited by Ruthann Knudson, with foreward by Earl H. Swanson, Jr.

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Preliminary Abstracts
January 31, 1975

BASS, QUENTIN, II (Asheboro, North Carolina)

Replication of the Savannah River projectile point of piedmont North Carolina

Savannah River projectile points are large, broad stemmed bifacial tools typical of the Late Archaic of piedmont North Carolina. Most of these points have been manufactured from "Carolina Slate," which is not a slate but instead is an igneous Cambrian rock highly variable in crystalline size and chemical composition. The almost limitless varieties in which this "slate" occurs support a number of implications for understanding techniques of knapping and the feasibility of thermal alteration.

Debitage and scars on the points themselves reflect manufacture by some means of percussion. Fabrication or simulation of the points by means of a hammerstone, antler billet, and indirect percussion has been attempted. Use of indirect percussion appears to most closely approximate the finished points. Use of hammerstone and billet appear to most closely approximate the unfinished bifaces. Experimental thermal alteration of the "slate" has resulted in no visual change in the material, but a significant increase in its workability by percussion.

BENFER, ALICE N. (University of Missouri-Columbia)

A technological comparison of experimental and archeological prismatic blades and cores, or, can you judge a blade by its maker?

A series of obsidian prismatic blades and cores produced by Don Crabtree from 1962-1974 is compared to whole blades, blade fragments, and cores excavated from domestic structures at the site of Tula, Hidalgo, Mexico (900-1200 AD). Crabtree's experimentally produced blades (principally using blades from Teotihuacan as models) are similar to the Tula specimens in attributes such as overall size and outline, width, thickness, and platform shape. The 2 samples differ, however, in many other attributes, among them platform preparation, bulbar contour, type of blade termination, and type and distribution of fissures. From the analysis of these and other attributes relevant to blade manufacture, I will specify how Crabtree's experimental blades differ from the archeological specimens. In addition, I present a general model for prismatic blade production based on these quantified and reproducible attributes, which can be further tested and refined with other Mesoamerican blade and core assemblages.

BLITZER, HARRIETT (Indiana University) - one of the following 2 topics

(1) Chipped stone implements as grave goods in the Late Bronze Age in Greece

For selected members of society during the Late Bronze Age in Greece, burial consisted of interment in a tholos tomb along with numerous grave goods (kterismata). During the 400 year span of this "Mycenaean" age, gold and silver, pottery, bronzes, gems, and chipped stone implements were consistently included in these burials.

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One particular form of chipped stone implement is found most frequently. The herzform or "heart-shaped" arrowhead, which is, in effect, a hollow-base point made by delicate pressure flaking, occurs in tholos tombs from central through southern Greece. The technical excellence of these points is unequalled by implements found in domestic contexts.

The distribution of these points will be examined, and the commonality of form and manufacture will be studied, in order to determine if these is indeed a cultural uniformity during the Late Bronze Age to be seen in this aspect of Mycenaean culture.

(2) Development of the denticulate blade tool in Bronze Age Greece

Although the term "Bronze Age" suggests the availability of a general supply of metal tools, such was not the case in the period that goes by that name in Greece (ca. 3000-1200 BC). In evidence from the earliest written sources, Linear B tablets (of the thirteenth century BC), there are hints that at least during the Late Bronze Age, the use and preparation of metals was a limited and controlled activity. With stone tools, the matter was undoubtedly different.

Viewing the Bronze Age in Greece as a cultural interface between the purely prehistoric and historic ranges of time, it is significant that we appear to find a particularly flourishing chipped stone industry in the variety of stone tools from Bronze Age sites throughout Greece. This study will test the hypothesis that during the latter period, we may see a reversal of the prehistoric trends toward localization of cultural adaptation to the environment. Instead, there is a developing trend toward increasing cultural commonality and specific commonality in the techniques of manufacture employed for chipped stone tools. To this end, the development of the denticulated blade tools will be traced at 4 sites from the southwest region of Greece: Pylos, Nichoria, Malthi, and Olympia. A fifth Bronze Age site, Hagios Stephanos, in southeastern Greece, will serve as an extra-regional control. Materials (flint, chert, and obsidian), sources for these materials, and techniques of manufacture will be examined.

FAGAN, JOHN L. (U.S. Corps of Engineers, Portland, Oregon)

An analysis of breakage patterns in projectile points

This paper will consist of an analysis of projectile point fractures that occurred during experimental manufacture and use. Experimentally fractured projectile points will be compared to archeological specimens in an attempt to examine certain aspects of human behavior. Characteristic breakage patterns will be identified and specific activities reconstructed through a comparative analysis of both recent and ancient fragmentary lithic specimens.

FAULKNER, ALARIC (University of Wisconsin-Oshkosh)

Flintworking mechanics: fracture forms and processes

Fracture of brittle materials suitable for flintworking depends not only on the magnitude of applied stress, but the manner in which this stress is applied. Under different loading conditions, these substances can be made to break in several mechanically distinct ways, which often can be discerned from the morphology of the break. By examining the contours of the fracture and the

orientation of radial striations, undulations, and similar flake scar features, it is possible to identify breaks that result from thermal expansion, uniaxial compression, bending, end shock, torsion, and point loading. Consideration of these fracture mechanisms can yield information valuable to functional and technological interpretation of lithic assemblages, and can aid in distinguishing between natural flaking and man-made chipping debris.

FLENNIKEN, J. JEFFREY (Arkansas Archeological Survey, Fayetteville)

Experiments in the use of abraders in flintknapping: a suggested classification of their wear patterns

In an attempt to provide a utilizational classification of aboriginal flintknapping abraders, laboratory experimentation was conducted to establish abraded categories and to define abraded attributes common to each category. Based upon the experimental use of abraders in flintknapping, there are 3 general categories of such use: (1) parallel, (2) perpendicular, and (3) oblique to the edge of a flaked stone tool. Abraders in each of the 3 categories exhibited identifiable wear attributes characteristic of the methods by which they were used.

GOODYEAR, ALBERT C. (Institute of Archaeology and Anthropology, Columbia, South Carolina)

Cultural formation processes of lithic remains in zones of wood procurement: an example from the Sonoran Desert of Arizona

Archeologists have long been interested in obtaining statistically reliable samples of technological remains associated with resource zones of primary procurement. Research was conducted on mountain slopes in southern Arizona in an effort to sample lithic remains in a manner that would allow sound behavioral reconstructions to be formulated in terms of wood extraction and modification. Quantified vegetation studies of wood-producing arboreals were also undertaken in order to evaluate probable exploitation relationships between technologies and target species. The procedures of probability sampling used to derive technological and ecological records are discussed. Models of cultural formation processes of lithic remains are offered in an effort to increase the reliability of behavioral inferences, and one trial law is offered. Factor analysis is used to elicit behavioral structure as it co-varies with 3 separate vegetation zones of relevant arboreal species. The nomothetic relationships of data gathered from the Sonoran Desert of southern Arizona with other potentially recognized environmental conditions of wool exploitation are considered.

GUNN, JOEL, and WILLIAM WORTH (University of Pittsburgh)

Knapper variance: physical and psychological dimensions of variability in flint working

Previous experiments with a group of flintknappers have shown that individuals can be distinguished by their characteristic knapping idiosyncrasies. The project described in this paper undertakes a refinement of idiosyncratic style analysis, namely, the determination of how much variability can be expected if an individual is attempting to reproduce a given type of tool. Incorporated into the study is an explicit attempt to determine salient psychological-cognitive

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variables inherent in the knapping process, or in other words, the elements of idial style. This effort is informed by a previously untested quality control model suggested in earlier papers.

JOHNSON, L. LEWIS (Vassar College)

"Plus ça change, plus la meme chose": an examination of flintknapping experiments to 1950

Two lines of flintknappers have existed at least since the nineteenth century: those who knap for information and those who knap for love or money. The former have rarely taken advantage of the knowledge of the latter, although there are occasional exceptions. The nineteenth century reports on flintknapping are primarily involved in demonstrating the possibility of chipping stone with stone or wood, and in describing and duplicating ethnographic examples. In the early 1900s, the major effort was expended in proving and disproving the human origins of eoliths, the peak of this activity in both Old and New Worlds falling in 1913. In the 1920s and '30s, the emphasis changed to the replication of specific industries "in order to clarify obscure points related to manufacture." There were also well designed experiments in use and brief mentions of the work of non-academic knappers. The 1940s culminated in François Bordes' massive comparative study of knapping techniques and in a lecture/demonstration of knapping techniques by Louis B. Leakey.

KATZ, PAUL R. (Texas Tech University, Lubbock)

An analysis of Kansas City Hopewell chipped stone technology

The basic task set forth in this paper is the elucidation of the chipped stone technological practices of the Hopewellian-related developments, dated between AD 1-500, in the Kansas City area. These lithic data will complement existing analytical results concerned with ceramics, faunal and floral exploitation, settlement pattern, and activities.

To structure this analysis and to provide a consistency to the resulting data that will permit intra- and inter-site comparisons, a general framework for any chipped stone technological process will be initially developed.

It is anticipated that the framework will provide some degree of standardization, and thus comparability of results, in future analyses of chipped stone assemblages in complexes not necessarily related in time or space. It is also hoped that the general inability to employ lithic debitage for cultural identifications and interpretations will be partially alleviated by the availability of such a general framework.

KNUDSON, RUTHANN (University of Idaho, Moscow)

Behavioral interpretations, cultural models, and archeological stone tool assemblages

Lithicology may be defined as the scientific study of stone tools, and incorporates many facets, e.g., tool simulation and replication. tool use experiments, ethnographic description of tool production and use, fracture mechanics, lithologic identification of resources, attribute analysis of an archeological assemblage. It is based on contributions from white-coated laboratory technicians, field school students, and hunters who make their

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own tool kits. All of these people provide data and insights into the operation of cultural systems, and such information needs to be organized within a theoretical model for full exploitation. This paper is a review of the goals of archeology and the possible contributions of lithicology to those ends, and the methods presently or potentially available to make such contributions.

MORLAN, RICHARD E. (Archaeological Survey of Canada, Ottawa) and ROBSON BONNICHSEN (University of Maine, Orono)

Experiments in lithic technology: Two northern Japanese microcores

Abstract not available.

MUTO, GUY R. (Washington State University, Moscow)

A proposed model for idiocultural analysis of chipped stone implements

A graphic and conceptual model is presented for cultural and individual analysis of chipped stone implements. Suggested means of separation of technological traditions at both the cultural and individual level are shown. Some particular data from the Columbia Plateau are incorporated as illustrative of its operation. The model is presented as an heuristic device to elicit comment and criticism relevant to its predictive and descriptive power.

PURDY, BARBARA A. (University of Florida, Gainesville)

A processual analysis of projectile point manufacture

From a lithic workshop site in Marion County, Florida, 1950 preforms, broken in various stages of production, were studied to determine processes involved in projectile point manufacture.

This type of inductive investigation not only provides valuable information about traditional habits of particular groups at specific points in time and space, but permits generalizations about the patterned, predictable behavior of man as a social animal regardless of the task to be undertaken and completed.

ROSENTHAL, ELEANORE-JANE (University of Arizona, Tucson)

Aboriginal flaking of shell in Sierra Pinacate

Analysis of prehistoric and historic artifact collections from the Sierra Pinacate region of northwestern Sonora, Mexico, has established the presence of a long tradition of working bivalve shell. Replication experiments suggest that the absence of fine cryptocrystalline stone in this volcanic desert encouraged the application of percussion techniques to the production of shell tools. The innovative result was a unique assemblage of scrapers, gouges, and knives. The association of flaked shell and stone tools began in the San Dieguito complex of pre-Altithermal times and continued through the historic Sand Papago occupation of the Pinacate. Both San Dieguito and later Amargosa tools are either unifacially or bifacially flaked, but percussion techniques are applied only to unifacial bead blank production prior to grinding and perforating in historic contexts. Percussion flaking of shell as an alternative strategy of tool manufacture permitted wide utilization of Pinacate resources despite the difficulties inherent in this harsh desert environment.

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ROVNER, IRWIN (Western Michigan University, Kalamazoo)

Maya obsidian core-blade technology, chronology, and trade

Three distinct obsidian blade manufacturing techniques were identified in lithic collections from major Maya Lowland sites. Their appearance is consecutive providing an important diagnostic sequence that, however, does not appear at any of the possible obsidian source areas. Available data as to source area manufacturing techniques and the distribution of distinctive obsidian color types from known quarries are correlated with the Lowland Maya import sequence. A trade index factor, based on blade population average width and width variance, is plotted for Lowland sites to indicate direction of trade and specific routes used. The resulting pattern of fluctuating trade routes and source areas is then correlated to major changes and events in Maya prehistory.

SHEETS, PAYSON (University of Colorado, Boulder)

Variation in the behavioral structuring of lithic industries

Considerable variation was noted recently in applying the behavioral models approach to lithic manufacturing in a stratified society (the Maya), a ranked society (Barriles Chiefdom, western Panama), and an egalitarian society (Yokuts, California). Behavioral models can be devised with a high degree of fit with data from the complex end of the spectrum, but the same approach at the other end of the continuum was notable for its failure. The assumption that lithic behavioral structuring occurs at the societal level to the same degree in different cultures is rejected, and an hypothesis is devised to test the degree to which variation in lithic expertise might contribute to explaining the variable success of the models approach. The results indicate a high frequency of errors (15%-18% hinge fractures) in bifacial obsidian reduction with the Yokuts, and a low error rate in Maya bifacial obsidian reduction (4% hinge fractures). This is interpreted as the degree of occupational specialization directly correlating with socioeconomic complexity, thereby facilitating more rigorous structuring of manufacturing behavior in complex societies. Further explanation of the variation in intra-societal manufacturing behavior was encountered in the ethnoarchaeological literature as well as in the ethnographic and theoretical literature on non-Western economic systems.

SHELLEY, PHILLIP H. (Washington State University, Pullman)

Lithic reduction/manufacturing systems and selectivity in an archaeological sample from Ungalaqliq, western Alaska

After presenting the theoretical and methodological framework employed in this research, an intensive description of the lithic reduction/manufacturing debris of an aboriginal sample from a prehistoric Norton karigi (men's communal structure) is provided in both subjective and quantitative statements. In light of this, some possible reduction/manufacturing systems that may have been employed are proposed.

Some questions concerning selectivity for certain morphological types of flakes and relationships of source material to the reduction/manufacturing systems employed are also approached.

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In conclusion, the relationships of the Norton culture to other archaeologically known western Arctic cultures are examined and some statements and questions concerning the usefulness of this type of approach are presented.

SNEED, PAUL G. (Archaeological Sites Advisory Board, Victoria, British Columbia)
Anasazi adaptations and lithic analyses: some Cedar Mesa project experiments

It has been observed for a number of years that some rather profound changes in subsistence-settlement systems occurred in the Anasazi province of the Southwest between Early Basketmaker II and Early Pueblo times. Some researchers propose that the BM II adaptation was primarily based on hunting-gathering while the later Pueblo subsistence-settlement system was based predominantly on farming. From this proposition, a suite of specific hypotheses can be advanced concerning tool-facility production, environmental exploitation, and settlement pattern changes through time.

This paper describes some methods employed and a few results obtained in an ongoing study of Anasazi ecological adaptation and cultural evolution. Observation and collection of cultural and environmental data were done employing probability sampling techniques in a survey of the Cedar Mesa region of southeastern Utah during 1972 and 1973.

The focus in this study is the distribution of a series of "utilizational" lithic tool classes, believed to be reflective of subsistence activities, from selected sample areas on Cedar Mesa. A battery of R and Q mode computer-assisted multivariate analyses of both intrasite and intersite artifact distributions were carried out and reported. Using these methods, it is possible to group tool classes into "tool kits" and sites into groups representing specified activities.

The results of these analyses will be used, along with natural environmental data and appropriate ethnographic analogies, in an effort to model the changing subsistence-settlement systems on Cedar Mesa.

STATHAM, WILLIAM P. (Idaho State University Museum, Pocatello)
A consideration of knapping tools and flake characteristics

There are some aspects concerning the techniques employed by the aboriginal flintworker that are not now, but that may be, readily discernible with a good deal of study and special knowledge. This information, when known, should enable archaeologists to accurately define the technique used and to further discuss the continuity or change of a given technique through time and space. This study will involve a consideration of the flake characteristics that are produced by fabricators of different hardness. The study will identify the minimum number of flake characteristics that reveal the hardness of the fabricator used to produce sample flakes. The data will be organized in a useful manner--like a botanical key--so that they can be employed by the field archaeologist. This should be an initial step toward bridging the gap between experimental studies and field archaeology.

STOTHERT, KAREN E. (Fordham University, Bronx, New York)

A method for the analysis of technologically simple stonework

The failure of archeologists to deal with the simplest variety of stonework has weakened the description and creative comparison of archeological complexes. In this paper technologically simple stonework is defined as the product of the removal of flakes from relatively unprepared cores, and a method for the description of such stoneworking is proposed. The method is based on the idea that the ancient manufacturing procedures can be reconstructed from flakes and cores by technological analysis.

To accomplish the reconstruction of precise knapping behavior and in order to isolate the particular cultural behavior represented by a population of flakes, the general production sequence that results in technologically simple flakes is schematized, and areas of analysis are defined on the basis of an understanding of how flake attributes are the results of technical behavior. Since it is impossible to identify diagnostic attribute clusters by inspection, counts and measurements are used to arrive at statements about populations of flakes in respect to each area of analytic concern.

To test the method, 12 assemblages of technologically simple flakes from several prehistoric cultures of coastal Ecuador were described and compared. This test leads to 2 conclusions: (1) that technologically simple stonework is pattern^{ed} enough for populations of flakes produced by one group of knappers to be distinct from assemblages produced by other cultures, and (2) closely related groups of knappers produced assemblages of flakes that are similar to each other, suggesting that the analysis of technologically simple flakes can yield information of interest to prehistorians.

TSIRK, ARE (New York University)

Remarks on mechanics and the study of flaked stone tools

After a theoretical statement on the possible role of mechanics in anthropological studies, it is suggested that an understanding of the mechanics of flaking may be important in such studies. Experimental and theoretical studies, as well as micro- and macromechanics (i.e., continuum mechanics) approaches, must be complementary for a better understanding of the mechanics of flaking. The nature of continuum mechanics models for the study of flaking of stone tools is discussed with an articulation of the variables. The present difficulties and some of the future possibilities of such models are considered as well. Some mechanical interpretations of flaking are reviewed critically, and some problems in the mechanics of flaking for future study are pointed out.