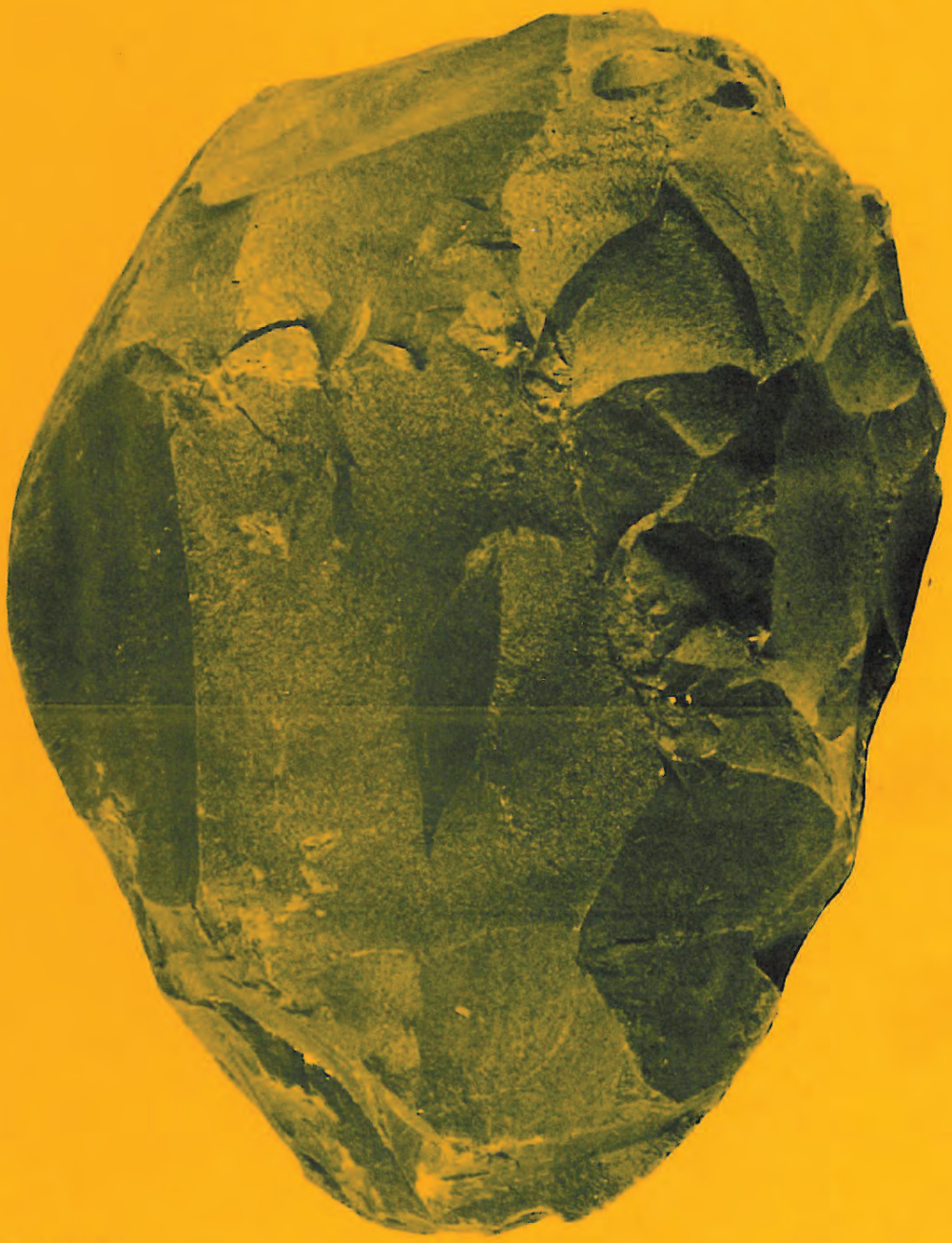
THE WYOMING ARCHAEOLOGIST



SEPT. 1970

VOL. XIII NO. 3

The WYOMING ARCHAEOLOGIST is published quarterly by the Wyoming State Archaeological Society, Grant H. Willson, Editor. Address manuscripts and news items for publication to: The Editor, 1915 East 15th Street, Cheyenne, Wyoming 82001.

NOTE: Membership period is from January through December and includes all issues published during current year regardless of the month the subscription commences. All subscriptions expire with the Winter issue and renewals are due the first of January each year.

NOTE: If you move or have a change of address, please notify the Executive Secretary, P. O. Box 122, Cheyenne, Wyoming 82001. Your WYOMING ARCHAEOLOGIST will not be forwarded unless a payment of 50¢ is received for return and forwarding postage.

NOTE: Checks for Chapter subscriptions and renewals should be sent to the Chapter Secretary involved. All other checks, subscriptions and renewals should be addressed to: Milford Hanson, Route #1 - Box 171, Cody, Wyoming 82414. Correspondence and orders for back issues should be addressed to Lou Steege, P. O. Box 122, Cheyenne, Wyoming 82001.

. . . . . .

MEMBERSHIP RENEWAL NOTICE
WYOMING ARCHAEOLOGICAL SOCIETY, INC.

_____ Individual Associate Membership @ $3.00 per year.

_____ Single Active Membership @ $3.50 per year. _____ Chapter Name.

_____ Family Active Membership @ $5.00 per year. _____ Chapter Name.

_____ Institutional Membership @ $5.00 per year.

_____ Other Membership, including: $10.00 Supporting, Yearly
(Circle One) $20.00 Contributing, Yearly

Please make your checks payable to WYOMING ARCHAEOLOGICAL SOCIETY, INC.

Name _____

Address _____

City _____ State _____ Zip Code _____

APPENDIX III

SEPTEMBER ISSUE CONTENTS

EDITOR'S NOTES

We are deeply indebted to John Witthoft for permission to reprint "The Teshoa" so ably written by his deceased wife. Originally printed in THE PENNSYLVANIA ARCHAEOLOGIST, this fine paper clearly shows the need for a more careful study of these coarse tools which so often are discarded as unimportant by the amateur. And, because of the tremendous number of aboriginal quarry sites in Wyoming it is so easy to dismiss them as mere quarry blanks. Yet, their total absence in one area coupled with an overwhelming abundance in another may be highly significant to the question of the antiquity of man in the new world.

John and Frances were greatly interested in the area around Fort Bridger where chopper-scraper sites occur in profusion. A fact first publicized by our own pioneer archaeologist Dr. Renaud from Denver University who in the early 1930's conducted the first archaeological surveys of the high plains area and who also believed that these choppers indicated great antiquity. Unfortunately it is still true that these surface finds meet none of the archaeological control standards necessary for the proof of antiquity.

We will also reprint "A History of Gunflints" by John Witthoft, who was for many years State Archaeologist for Pennsylvania. Because very few of us, I am sure, could tell the difference between this important flint tool and the simple thumb scraper which it so closely resembles. Lou "Lucky Eye" Steege tells me he has found two such flints and there could be many more hidden in our scraper collections.

I am soliciting a report on our very informative fall meeting at the University. Hopefully, those who taped most of the meeting will provide a manuscript for the December Archaeologist. Hopefully.....very hopefully.

CHAPTER NEWS

FREMONT COUNTY CHAPTER

The Flintstones recently completed a project for the newly-opened Riverton Museum. Under the direction of Jim Adams, and assisted by Ken Johnson and Mary Sucke, they arranged a display of all types of surface finds that can be found in the immediate area of Riverton, Wyoming. Members of the club donated or loaned typical projectile points from each of the cultures that inhabited the Riverton area. Legends with name, culture period, age and type site were prepared for each point. They were arranged from oldest to most recent. On some of the more rare points, replicas were purchased from the Denver Museum of Natural History. A covering legend for the layman museum visitor was written, describing the various prehistorical cultures inhabiting the Riverton environs. Besides the projectile points, some of the larger artifacts of different cultures are displayed. There has been much favorable comment on the exhibit's educational value.

Mary Sucke

NORTHERN BIG HORN BASIN CHAPTER

On behalf of the Big Horn Basin Chapter, I would like to take this opportunity to thank all of those persons who attended our Summer Meeting for their help in making the meeting one of the most successful in the history of the Wyoming Archaeological Society. At our banquet Saturday night, we fed nearly 200 people, which we considered to be a tremendous turnout. The weather was perfect and the site was at its usual beautiful best. Entertainment was provided by Bob Edgar, who presented a very fine shooting exhibition, and by the Buffalo Bill Dollies, a local dancing group who spread good will and fun wherever they go. The drawing for the Bob Edgar painting was won by Mrs. Yolanda Hall of Cody. She had had her heart set on winning, and was absolutely delighted to learn of her good fortune.

We were honored to have several distringuished guests with us, including Dr. George Frison, Dr. Tom Brockmann and Helen Schuster of the Department of Anthropology, University of Wyoming; Dr. Preston Holder and Dr. Dale Henning, Department of Anthropology, University of Nebraska; and Dr. Gary Wright of the Case Western Reserve. People of this calibre are so beneficial to our meetings in that they share their wealth of knowledge and we all gain understanding.

The Dead Indian Site is closed for the present time. The Big Horn Basin Chapter feels privileged to have been able to participate in the excavation of this site. The artifacts which were recovered are to remain with the chapter, and will be

put on permanent display somewhere in our area very soon. The exact location will be announced as soon as it is decided so that any of you traveling through our area will be able to see the material. We would like to make note of the persons participating in the excavation and to thank them for their labors. Participants were Mr. and Mrs. Bob Burns, Bob Edgar, Mr. and Mrs. Milford Hanson, Hal Lee, Walt and Ray Nelson, Sam Quick, Mr. and Mrs. Danny J. Smith, Alice Stafford, Jean Steiner, Rachel Gentle, Mr. and Mrs. Gene Smith, Dr. and Mrs. Ronald Young, Mr. and Mrs. Bob Ellis, all of Cody; Mr. and Mrs. Delbert Burrell, Mr. and Mrs. Charles Slaughterbeck, Mr. and Mrs. Joe Tyrrell, Mr. and Mrs. Albert Ungefug, Mr. and Mrs. Ken Enes, all of Lovell; Mr. and Mrs. Tom Van Wagoner, Mr. and Mrs. Mitch Mahoney, all of Powell; and Mr. Ron Brown of Billings Montana. The Billings Archaeological Society made two trips to the site to help with the excavation, also.

In closing, there are some thoughts which might be brought forth concerning the importance of these state meetings. Those of us who have attended state meetings realize the benefits which we have gained from our participation in the Society on the state level. The state meetingd afford us an opportunity to learn more about our mutual interest. We are able to exchange ideas and discuss new theories. We are able to observe techniques used on other sites around the state and to see material recovered from these sites. We are able to view some of the outstanding collections which have been built over the years through individual effort. We are kept aware of activities in other parts of the state and are able to discuss these activities with the persons who are actually involved. And, perhaps most important of all, we have an opportunity to meet new people on a common ground, and everyone of them is a potential friend whom you'll look forward to seeing again at other state meetings. If you are one of us who has been unable to attend a state meeting until now, let us see you at our next state meeting. You'll enjoy it, and you'll come away looking forward to the next.

Sharon K. Smith

THE TESHOA, A SHOSHONEAN WOMAN'S KNIFE: A STUDY OF AMERICAN INDIAN CHOPPER INDUSTRIES *

By Frances Eyman

ABSTRACT: The evidence for, the nature of, as well as the circumstances surrounding a simple stone tool type called the Teshoa are reviewed. Various aspects are explored in some detail including: distribution through time and space, possible relationships and derivations from comparable materials in the Old World, uses and contexts (both ethnographic and archaeological) throughout North America, methods whereby this kind of tool can be manufactured, classification of choppers and teshoa, other kinds of tools similar to Teshoa, as well as the opinions and errors of others on the general subject of Teshoa; in presenting these facets of "the Teshoa problems," the intent, as a whole, is to increase our comprehension of the antiquity, the hows and whys of Teshoa.

INTRODUCTION

Stone age tools include many implements which were beautifully adapted to their functions, but which require close study for us to understand their principles. Some stone tools are elaborately formed, and their importance is readily apparent to us. Others are of so simple a form that they are easily confused with natural objects. These are of great interest to the archaeologist because part of the record of the past is lost if crude tools are not recognized. Simple tools may be the most significant objects in a site, since they may have been used for purposes very basic to the life of the people. The teshoa is a good example of an often overlooked but basic artifact in many specific American Indian cultures. The teshoa is one category within the great class of secondary tools which served fundamental purposes. In addition, implements within this category also lent themselves to the manufacture of tertiary tools.

The teshoa was first seen and noted as a tool used by Indian women. Joseph Leidy, the paleontologist of Philadelphia, observed its manufacture and use among the Shoshone of Wyoming in the 1870's. When a woman needed a knife for butchering and skin dressing, she selected two quartzite cobblestones from the nearest stream; she then used one as an anvil to knock a large spall from the other. When the edge of the teshoa had done its job, it could be discarded, and a new one could quickly be made whenever it was needed. Many teshoa were resharpened, however. The beauty of the tool lies in its simplicity and in its perfect adaption to its work. Proper material was always near at hand. Like many other simple inventions, the teshoa is an ideal tool. It seems strange that it was used by only some tribes, and that many Indian peoples made elaborate bifacial flint knives that did the job no better. Leidy (1872: 651-53) first described the teshoa in 1872 and labeled it with a Shoshone name. Knowledge of the tool has since been extended by archaeological studies, and we now know a little about its history and geographical distribution.

*Reprinted from "Pennsylvania Archaeologist", Vol. 34, Oct., 1968, Nos. 3-4

There are certain functional details that distinguish the teshoa from other flake tools. It was frequently made from quartzite, but other granular stones were used. It is a split or spall struck from a cobblestone. Its edge is thin and acute. The cutting edge is formed by the intersection of a split surface with the rind of a cobble.

The rind on cobblestones has formed through centuries or millenia of chemical interaction between a cobble and its stream environment. Cobblestones are somewhat porous and have many tiny spaces and cracks which are normally filled with water from the stream or from the gravel-bars on which they lie. The water has minute quantities of silica, iron salts, and other minerals dissolved in it. When a stone is exposed to the air, its contained moisture evaporates, and the stone serves as a wick to draw up more water from its wet substrata as its upper portions dry. The water, as it evaporates from the surface of the stone, leaves its dissolved minerals behind; this process gradually fills every tiny space near the surface with chalcedony and other materials. As a consequence of such a concentration of secondary quartz in the surface, the rind is dense, homogeneous, and tough, even though the core may be porous, fissured, and brittle. The edge of the teshoa, formed in the rind, is flint-hard and file-tough, even though the body of the teshoa may be weak and not be hard.

The teshoa is a lens-shaped knife, its more curved face formed by a portion of the surface of its parent cobble, its flatter face formed by a split or a flaked surface. It was first used without retouch because of the physical structure of boulder-rind; one might say that it has been case-hardened by nature. The edges of teshoa sometimes show wear from abrasion against grit or dirt; wear patterns suggest a variety of uses for the tool (Fig. 6). They often show the breaking away of the edge during use since the stone is brittle and the edge is easily wrenched off (Fig. 2 d, 5 f). Some examples are chipped to a remade edge. Retouch is usually upon the split face of the tool, removing flakes from the unaltered stone within the cobble, conserving the rind and forming a new edge in the rind.

Some teshoa were made by such massive blows that the cobble was shattered, producing some eccentric forms among the flakes. In other cases, teshoa were struck one after another from the same platform, producing tools with more than one primary flake scar. Nevertheless, these infrequent variants still show the major functional detail of the teshoa, that is formation of the cutting edge in the rind of a stream-cobble. This is the most diagnostic feature, and it reflects sound mechanical principles.

Because the teshoa is a simple tool, it has rarely been noted by collectors, is scarcely seen in relic cabinets, and has often been discarded in the field by the archaeologist. Our knowledge of the distribution of this tool is poor; since we are handicapped by bad sampling in most regions, we have only been able to work out the bold outlines of the occurrence of teshoa.

The most important specimens are those which were collected from women who were actually using them. The only teshoa that I have seen which were accompanied by precise data, came from the Shoshone prior to 1900. The five examples which are illustrated (Fig. 1 a-c, 7) are the type and co-types; these examples were collected by Leidy (1872) and were in his possession at the time of his 1872 article. Tools of exactly this same kind were probably in normal use among other peoples of the Interior Basin and northwestern Plains within the nineteenth century, but no observer noted them or preserved examples.

Stewart Cudlin visited a number of western tribes during 1900, spending some time with peoples of the Interior Basin and the Plateau. He collected teshoa from the Wind River Shoshone near Lander, Wyoming, and from the Bannock of Fort Hall Agency in Idaho. His specimens were apparently not in use at the time that he obtained them. They were obviously recovered for him by Indians who had discarded them just a few years before when butchering and hide working had become obsolete with lack of access to game (Culin 1901: 13, 87). The most retouched of his specimens are illustracted (Fig. 1 d, e).

A WARNING ABOUT NAMES FOR TOOLS

Most of the names which we employ for archaeological tool types are not terms which describe use, but are rather to be taken only as long-used titles or catchwords. They are signals designed to catch the eye of the reader, words which have long had conventional use and are rather devoid of functional implications.

These terms continue to appear in our writings only because they have been long-used and have come to be a sort of shorthand. Celt, scraper, chopper, are all terms of this sort, and there are many others. A chopper is not a tool that was used for chopping; it is a massive bevel-edged chipped tool, generally used for some kind of scraping, planing, or shaping by whittling. A chopping tool is a related massive hand-tool; its cutting edge is not beveled and was shaped by chipping from both faces of the tool. A scraper is a diminutive tool with a beveled working edge or end, in many cases used as a chisel or plane for shaving hard materials to a desired shape. The terms remain in use with the general understanding that they are mere labels rather than descriptive terms.

I attempt to follow the rules of priority in names for artifact types. There are several opinions about this. Some students feel that a new functional name should be assigned to a type when it is published and studied, with little attention to earlier terminology. Functional terminologies lead to several complications. Similar tools served different cultures. Multiple function tools are common. Our knowledge of use for most types is so slight that functional terms are guesses. The literature is full of the fossils of earlier guesses.

FIGURE 1

Ethnographic teshoa and a miniature chopper. a, a dark grey quartzite teshoa; its grip (at the top of the drawing) has been dulled by battering. Heyden Survey Cat. No. 486/78, Academy of Natural Sciences of Philadelphia Cat. No. 9293, University Museum Cat. No. L-84-995. The specimen is labeled, in Leidy's hand: "Near Ft. Bridger Wyoming Terr. Dr. Jos. Leidy".; b, a dark grey quartzite teshoa. Heyden Survey Cat. No. 486/78, Academy Cat. No. 9292, University Museum Cat. No. L-84-994. Same label on specimen as "a". The Academy exhibit case label reads: " 'Teshoa', Implements used by the Shoshone and Ute Indians for dressing skins, Dr. Joseph Leidy. Near Fort Bridger, Wyoming". The University Museum catalog card reads: " 'Teshoa', Wyom. near Fort Bridger. Shoshone or Ute broken 'cobble-stones' used as skin dressers."; c, a grey quartzite teshoa. University Museum Cat. No. 2080. Gift of Hiram Corson, collected by Dr. Joseph Leidy. The specimen is labeled "Te sho alt from the Shoshone camp of Indians near Fort Bridger used to clean hides with. D.K.C."; d, a large teshoa from a well-rinded cobblestone of pale reddish quartzite. The upper, butt end of the tool has been given a dulling retouch. Collected from the Bannock of Fort Hall Reservation, Idaho, by Stewart Culin in 1900. University Museum Cat. No. 37052, field no. 256. This specimen is one of five, found in the yards of Bannock houses where they had recently been discarded. This example, which shows resharpening by massive flaking and two stages of later re-edging, has the final edge battered as though struck against bone in butchering; flakes struck from the cortex face were probably a result of accidental damage; a hanging hinge-fracture may be noted in the drawing. Culin recorded the Bannock name Te-sho-ni-gam for these tools; e, a grey quartzite teshoa collected from the Shoshone of Wind River, Wyoming, by Stewart Culin in 1900. The cutting edge shows extensive resharpening. University Museum Cat. No. 36811, field no. 1; f, miniature chopper or scraper made upon a rinded pebble of brown chert, collected from the Arapaho near the Canadian River in Oklahoma before 1910 by Amos Gottschall. This tool, along with six natural stream pebbles, was enclosed in a tortoise-shell paint cup; the cup and its contents, representing a bundle-complex, probably was used in healing. We believe that the miniature chopper was an archaeological object, found at some unknown spot during the widespread wanderings of the Arapaho. However, it is a unique artifact, and it may have been an heirloom from an earlier stage in Arapaho culture history. Academy Cat. No. 17510, specimen now on loan to the University Museum.

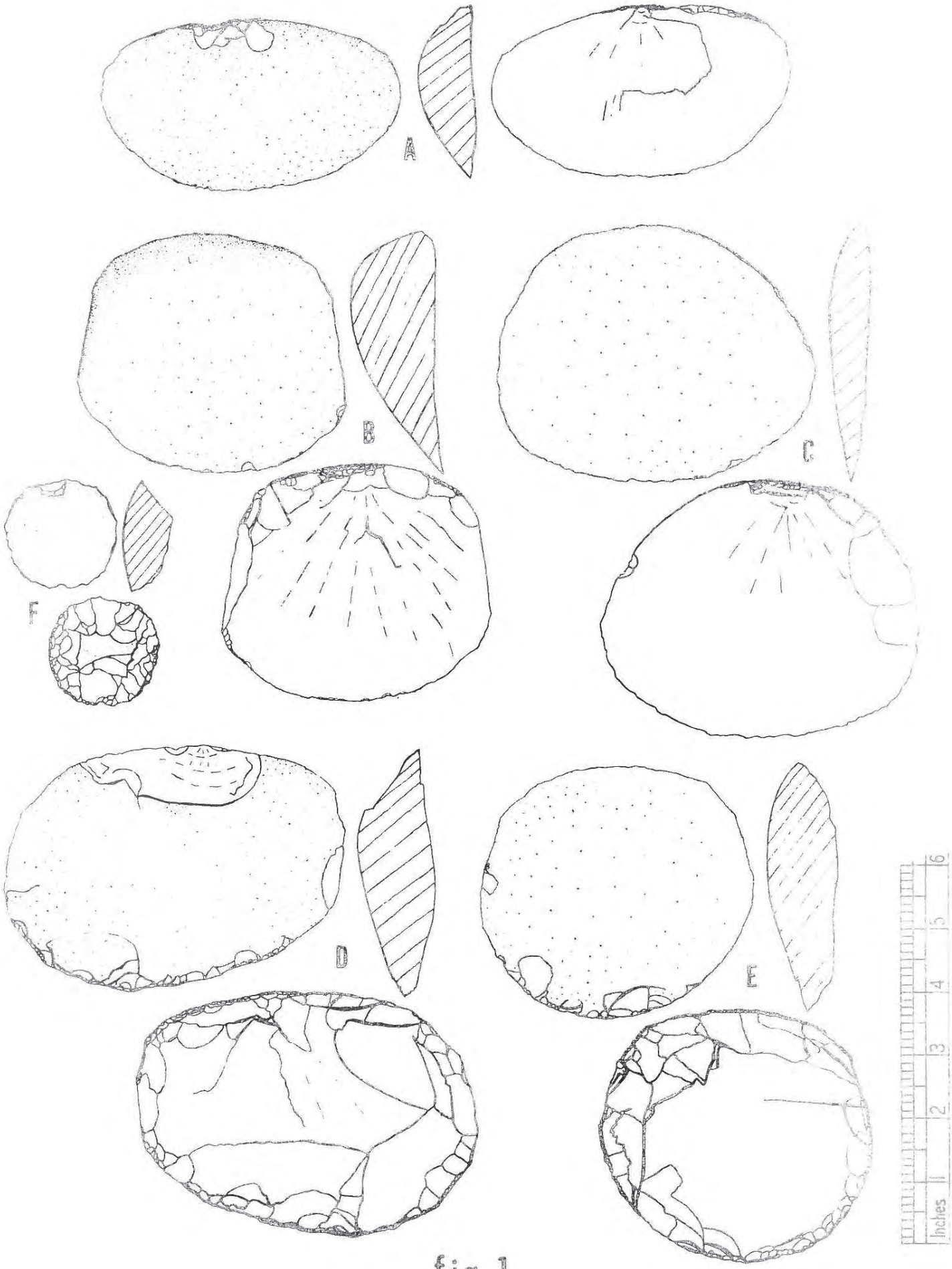


fig 1

On the other hand, attention to priority requires that names once coined subsequently must be used in a completely arbitrary manner whether their functional identification was originally in error or not. Functional names of today often become the arbitrary names of tomorrow as technologies are better studied and earlier theories of function are overthrown. At any rate, one must in each case define what one means when it comes to the use of a name for a tool.

Since the term teshoa was the first name used for a specific type of cortex --- flake tool, I continue to use it in accord with Leidy's original definition. Since the word carries no suggestion of function in English, it has some advantages, for teshoa were multi-purpose tools and they also had different uses in different areas. Because of all this, I use the terms chopper, chopping tool, Clactonian flake, and other technical names in a very conservative manner, hoping thus to introduce a little confusion and complexity as possible into the already-variable American terminology.

ORIGIN OF THE WORD TESHOA

Both the typological concept of the teshoa and the use of the native name have met surprising resistance among local collectors in the East and among some western archaeologists. A linguistic objection, often heard in conversations, was finally presented to a meeting of the Eastern States Archaeological Federation at Princeton, New Jersey, on November 7, 1965. Following a report by Herbert Kraft on the teshoa and other stone tools from Munsee sites, Harold Huscher of the River Basin Surveys (Smithsonian Institution) objected to the term teshoa. In his public statement he maintained that the term teshoa was a corruption of an Athabascan word tci-tho, a word which meant any broad edged tool, and that the term was inappropriate because it was really based upon a blunder by Leidy.

The name and function of the so-called tci-tho are explored in another section of my present paper, and the term can readily be dismissed. The significance of the term teshoa in the Shoshone language still requires examination.

Shoshonean uses one term for a steel knife, variously recorded as wig, weah, wih, whih, and wihita (Schmidt-Wartemberg 1889: 91; Ballow 1880-81: 91; St. Clair 1902: 164). Comanche uses the same word (Detrick and Pow ho neet 1894: 91). The word for a stone knife is a different term, recorded as tossawi (Fort Hall Shoshone) and tocawig (Washakie band of Shoshone, Gatschet 1888: 10; Schmidt-Wartemberg 1889: 88). These are variants of the term teshoa. They seem to involve the root tsekah or tcikaa, "to cut" (Gebow 1868: 13; St. Clair 1902: 116). Culin, on his catalogue cards, records a variant teshonigram for the teshoa which he collected from Bannock informants. A comanche term for scraper is recorded as titseehtivaa, and may be related. Shoshone words for scrapers are divergent,

but we don't know which kind of skin-working tool was associated with them. Dikun and tissep occur (Schmidt-Wartemberg 1889: 91; Ballow 1880-81: 91), probably as names for a bone tool.

Thus some form of the word teshoa is apparently a widespread Shoshonean term for cutting tool specifically linked by data with ethnographic specimens to a boulder cortex-flake used as both a knife and scraper. Dr. Sven Liljeblad, who is carrying on extensive studies of the Shoshone language, has kindly provided me with a record of the term from the speech of the Shoshone of Wind River Reservation, Wyoming. The term is tóssawìhì, meaning "white knife," and is compounded from the terms tósabìty, "white," and wíhì, "knife". The term is remembered as the name for a quartzite or chalcendony boulder chip tool.

ARCHAEOLOGICAL TESHOA FROM WESTERN NORTH AMERICA

The more ancient history of the teshoa is not clear. They are widespread in Early Desert Culture contexts from the American Southwest, the Intermontane Region, and California, yet we do not know their abundance, nor have they received enough technological study (Jennings and Norbeck 1955). Many examples probably have been discarded in the field. Available data suggested that they have been used in the far West for nine thousand years.

Teshoa have a wide distribution west of the Continental Divide. The lower Colorado River drainage system is an area with massive tools of Early Desert Culture types, including teshoa and resharpened teshoa which analysts have allocated to the Malpais Industry (Rogers 1939: 17-18, Plates 3-4). The age of the Malpais Industry is unknown, and there is some question about its status as a single complex. Rogers (1939: 21) considered it the earliest of desert cultures.

The Cordilleran Tradition or Old Cordilleran Culture of the Northwest is an assemblage of lanceolate projectile points (Cascade and Lerma types) with various choppers and other edged tools (Butler 1961, 1965). Some have questioned the cultural unity of this tradition and the validity of the application of the name Cordilleran to assemblages in many parts of North and South America (Daugherty 1962: 148-49). Others have suggested that it might derive from a very ancient bifacial core and flake handaxe tradition which came from the Old World, with large handaxes, Clactonian flake tools, tortoise cores, and large parallel-sided flake tools that stood as a base for the Old Cordilleran Culture (Swanson 1962: 152-3). At any rate, the problems of this tradition or culture center about problems that relate to the American chopper industries, with much speculation about relationships but little study of or publication concerning the heavy tools which are fundamental to the problems. More field and laboratory study and less sweeping reconstruction is required (Butler 1965).

One site in British Columbia which pertains to the Old Cordilleran Culture contained a Lerma Point associated with a chopper and a teshoa, and a radio-carbon date of 8150±310 years (Borden 1960: 107-18). Such sites correspond to the deepest levels of bison drive sites in the interior. Butler (1961: 65) notes that "The ubiquitous pebble scraper, found in most of the later complexes in the Pacific Northwest, was evidently first introduced in the Old Cordilleran Culture".

TESHOA FROM THE FAR NORTHWEST

Archaeological teshoa from the southwestern Yukon have been described as split pebble choppers (MacNeish 1964: 422, Fig. 92, nos. 2,6). On the basis of 86 examples from excavated contexts (three of them are of uncertain type), they are interpreted as having been an Asiatic introduction in the Kluane Horizon at about 8,000 B.C. (ibid. 328-29, 377, 378, 442). Their peak is in the Champagne Horizon at about 6,000 B.C., but they persist into the Taye Lake Horizon at about 2,000 B.C. (ibid. 436, 442). They are found along with choppers made on cobbles, but these choppers are interpreted as representing an even earlier Asiatic introduction from the Upper Paleolithic of the Trans-Baikal dated to about 16,000 B.C.; nevertheless in the same way they too persisted until the Taye Lake Horizon (ibid. 377-78, 436, 439, 441). MacNeish notes that cobble choppers are not widespread in the far Northwest. However, his chopper samples are small and the early data seem somewhat ambiguous. The Yukon sample also includes two scraper planes made from split pebbles, from the Kluane Horizon; these appear to be resharpened teshoa, their edges freshened by drawing flakes from their split faces in order to maintain the cortex at the cutting edge (ibid. 429). Teshoa cores are not represented, unless they are included among pebble choppers.

The British Mountain Complex is the oldest stratigraphic unit found in the Firth River Delta of Yukon Territory (MacNeish 1956: 92-93, 95, 102; 1959b: 44-46, 55, 60). Its age is variously estimated between 10,000 and 20,000 years (Wilmsen 1964:342). It consists of chopping tools (bifacially flaked from cobbles) and tools made upon flakes from chert cobbles. These include side-scrapers, end-scrapers, burins on flakes, hooked gravers, unifacially-flaked leaf-shaped tools, a few blade-like flakes, and a few bifacial tools which are thought to show incipient fluting (MacNeish 1959a: 10-11; 1959b: 45-46). Certain sites with a similar inventory of flint tools, such as Kogruk in northern Alaska, lack chopping tools (Campbell 1961).

MacNeish sees the roots of the Cordilleran Tradition in the British Mountain assemblage where he also associates these roots with early stages in the immigration of Asiatic peoples. The British Mountain Horizon is followed by the Flint Creek Phase at about 8,000 years ago (MacNeish 1959a: 11; 1959b: 45-46, 55, 61). He considers Flint Creek an early member of the Cordilleran Tradition, with

scraper planes, large pebble side and end scrapers, slab choppers, and points like the Cascade, Lerma, Milnesand, Angostura, and Plainview types. Lacking adequate illustration and description of the tool types, it is difficult to understand precisely what some of the tools made from cobbles are.

TESHOA AS BUTCHERING TOOLS ON THE NORTHWESTERN PLAINS

Teshoa of the northwestern Plains are best known in context from the sites of bison drives. These are marked by accumulations of bone under low cliffs where bison were driven over a "jump" and the injured animals killed. Deep stratified accumulations of bone and soil formed at good drive-sites contain records of thousands of years of Plains pre-history (Hurt 1964).

The more spectacular drive sites were mined commercially as a source for bone meal and other products. Several of the operations were watched and studied, but sampling was inadequate and the collections do not contain teshoa or other tools made from cobbles (Brown 1932). Controlled excavations and adequate sampling at these sites are very recent developments (Forbis 1960a: 149-50; 1960b).

Teshoa appear at all levels in the drive sites. Of particular interest is their survival into the lastest horizons. Thomas Kehoe very kindly has loaned me all of the cobblestone tools from the Gull Lake Bison Drive Site in Saskatchewan. A full report on this industry will be published as part of the Gull Lake site report. In my present study, I have considered only specimens from upper levels and from the surface of the site, dating between 1300 A.D. and 1800 A.D. The tools made from cobbles are associated here with pottery and with small arrow-points of several Plains types (Kehoe 1966). The largest sample is from the surface, since more area was exposed there than in any of the deeper trenches. Junius Bird also kindly loaned me critical specimens from several sites in Alberta, some of them from contexts that suggest a considerable antiquity. I have utilized only his recent specimens in the present paper. However, I cannot yet see any distinctions between tools of cobblestone from recent contexts and those from the oldest horizons of that region.

The arrowpoints of the last stage were delicately pressure-flaked from glassy flints and petrified wood, and are minute, most of them ranging between three-eights and three-fourths of an inch in length. Similar tiny points are well-known from many other Plains areas as arrowpoints for the bison hunt. Most collectors call them "bird points". Actually, they were ideally adapted to deep penetration into a large animal, and have been found deeply imbedded in bison bone. They represent the fundamental stone-working industry of the men, and they present a remarkable contrast to the tools broken from cobblestones, which probably represent the lithic industry of the women. One could scarcely imagine two more

dissimilar industries being carried on within the same community as parts of the same culture, yet they are associated so intimately in so many sites, and both have been collected from the same tribal groups in their last stage of survival, that there is no question of their association. In a similar way the finest of Neolithic pressure flaking is paired with a coarse percussion industry which resembles some of the oldest complexes of the Old World Paleolithic.

Samples from the recent levels of the Gull Lake Site, and those from a drive site in the Porcupine Hills of Saskatchewan which was studied by Junius Bird, show a wide variation and a high degree of adaptability in cobblestone industries. I have selected and drawn specimens which show the range of forms in these samples (Figs. 2-4). The types grade into one another in a manner that permits classification but that provides all sorts of intergrades between types. Teshoa grade into choppers, and choppers grade into cores. Teshoa grade into choppers made on Clactonian flakes, and flake tools grade into sharpening flakes struck from the edges of choppers and teshoa.

As I have studied these tools, I have been impressed with their variety, and with the variety of resharpening patterns and of use marks which they bear. There are a variety of tool types included within the cobblestone fragments, and they must have served several purposes. On my drawing of wear types (Fig. 6), I show six varieties of teshoa use; all of these occur in the bison drive sites, as well as in other samples I have handled. I have come to feel that the ethnographic teshoa was an impoverished survival, that it represents only the most central and fundamental part of the chopper complex that persisted after 1870. In earlier times, the teshoa was but one unit in a far more complicated industry of choppers, flake tools, and cortex flakes.

As far as I know, every American chopper complex includes teshoa. They are conspicuous in samples from western Canada. Many of them were discarded after their first use, without any resharpening and generally without any sign of wear. Others were resharpened once or several times and the most reused ones grade into choppers (Fig. 3c). Chopping tools as such do not seem to be represented, but some teshoa show an inverse resharpening that has altered them to choppers (Fig. 2h). Some of the chips derived from the resharpening of teshoa and choppers were probably used as knives (Fig. 3e, 4b, e). However, some Clactonian flakes were not resharpening flakes, but were struck from cores for use as knives (Fig 4 d). Some of these were resharpened into miniature choppers (Fig. 4 a, c). Each series includes cores made from cobblestones (Fig. 4 f, g). These lack any working edge, and only would have been flaked down in this way each as a source for chips.

The somewhat arbitrary typological definition of these types is useful for summarizing an industry, and is especially useful for comparisons. However, these types are artifical and they poorly represent the concepts of the people who made the tools.

The actual industry of cutting tools broken out of cobblestones is more rich, more diverse, more adaptive, and more flexible than are our typological concepts. Once we have organized these tools within a rigid typology, and have studied the typological groups, we then can look beyond typology and begin to glimpse the outlines of a technology wherein the raw material is exploited in many ways and in the most efficient manner for the production of basic tools. Teshoa, chopper, flake knife, and core are all parts of a technological continuity, of an adaptive manner of working stone tools out of cobblestones by means of a variety of patterns that accord with the characteristics of the stone and the needs of the moment. Association of all parts of this continuum within the same in situ levels of a bison drive shows their essential unity, yet we still are puzzled as to the specific function of each variety of tool within the butchering and hideworking technology. Among our most pressing needs are much larger and better documented samples to work with and both a continuation and an emphasis upon the study of such aspects of the chopper complexes as wear-marks.

THE TESHOA AS A CLUE TO WESTERN GREAT PLAINS PREHISTORY

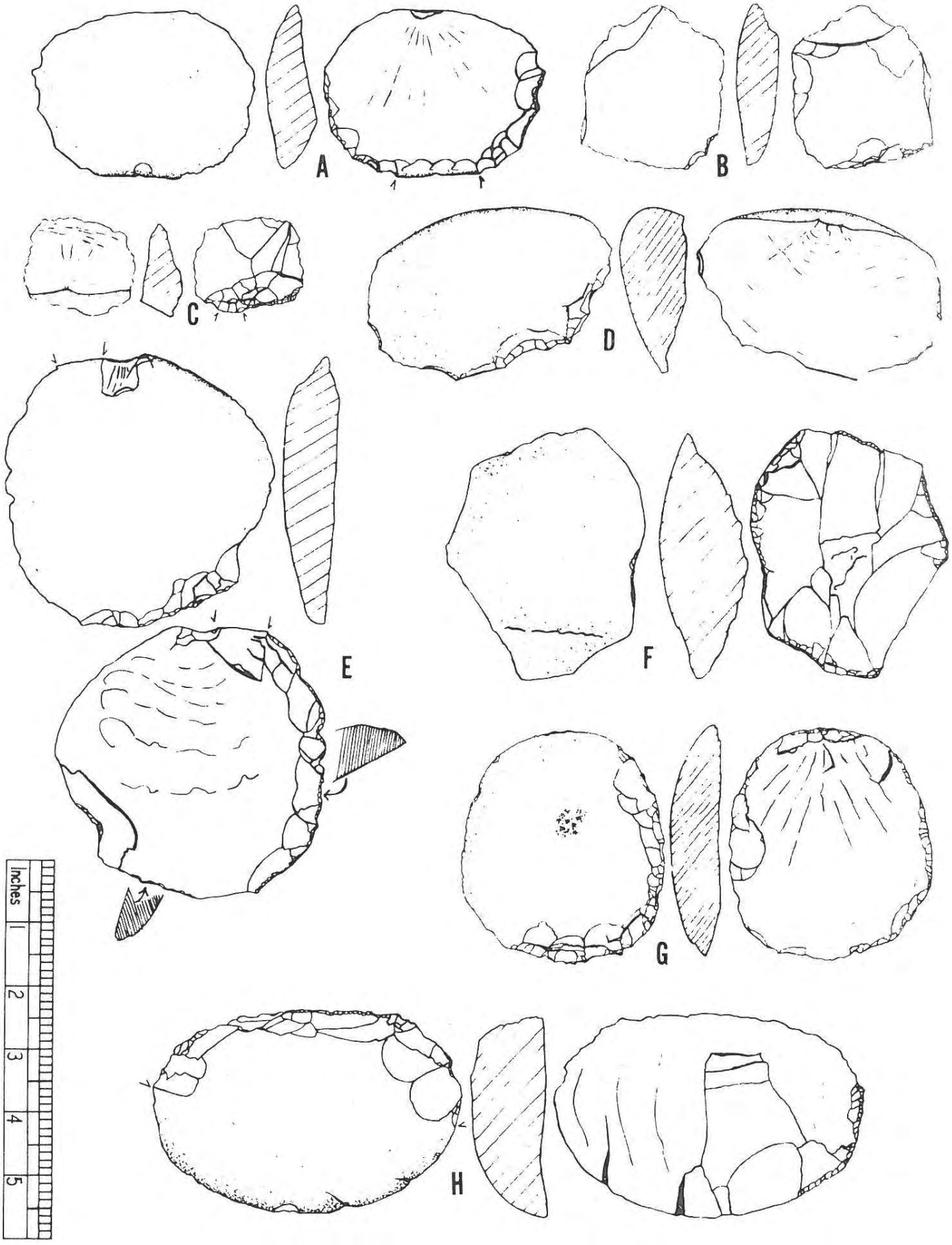
The only ethnographic records of the teshoa are from northern and eastern Shoshonean peoples. These are the groups that participated most fully in Plains Indian cultural patterns of the nineteenth century. It is thus unclear whether other Shoshonean peoples who did not participate in Plains culture, but who were desert gatherers, knew and used the teshoa. It is also unclear whether other tribes of the western Plains made these kinds of tools from cobbles. If the whole pattern of distribution could be worked out from the study of documented historic sites, it might be possible to learn more about the prehistoric locations and range of Plains tribes.

There appear to be serious problems of discontinuity between the archaeological cultures and the ethnography for many sections of the Intermontane and of the Plains. Some of the discontinuity is due to population shifts beyond the frontier; the historic movements of Cheyenne, Crow, Dakota, and other recent immigrants into the Plains from the east are examples of this. Others, such as the recent shifts of the Arapaho and Apache, are due to the movement of Plains peoples under pressure from invaders. It is suspected that some of the Shoshonean peoples once occupied a larger region than they have in recent times, and that in distribution they once extended far out onto the northern Plains.

Julian Steward worked for many years with the ethnology of Intermontane peoples, and attempted a broad historical reconstruction of the roots of their cultures, correlating ethnographic data with archaeological information from the area (Steward 1940). He concluded that the gathering cultures of these peoples could not be interpreted as the recent survival of very ancient and primitive cultures of

FIGURE 2

Recent archaeological teshoa from the surface of the Gull Lake Bison Drive Site, Saskatchewan. a, a teshoa struck from a rinded cobble of banded yellow-grey quartzite. The lower edge, between the half arrows, is much worn. The tool had been resharpened with a slight normal retouch, then worn, and finally the area outside of the half arrows was resharpened by a second round of normal retouch. Wear is strongly developed; edges are rounded without any faceting, and there are slight diffuse scratches which are mainly across the edge, with a few lengthwise and random scratches. Collections of the Saskatchewan Museum of Natural History, Cat. No. Eaod-1/2693; b, a small teshoa struck from a rinded cobble of yellow-grey quartzite; this specimen has a steeply resharpened edge which is shown at the bottom of the drawing. Cat. N. Eaod-1/2726; c, a resharpening flake struck from the edge of a blue-grey quartzite teshoa. The tool had already gone through several stages of resharpening when this flake was removed. The remnant of a rounded worn edge is preserved between half arrows at the bottom of the drawing; adjacent parts of the edge had already been resharpened by fine retouch prior to the massive resharpening which produced this specimen. Cat. No. Eaod-1/2737; d, a teshoa struck from a rinded cobble of yellow quartzite; a moderate inverse retouch is present. It was highly damaged in use; the cutting edges have been wrenched or snapped off producing the contour seen at the lower end of the section-drawing. Cat. No. Eaod-1/2691; e, a large teshoa struck from a pinkish red cobble with a strong rind. The tool has different kinds of resharpening and wear on different edges; it also has been slightly burned, especially on the split surface. At the top, adjacent to the major bulb of percussion, a small remnant of an earlier edge is strongly worn to a rounded edge; there are a few striae across the edge. The side adjacent to the worn area has been given a moderate normal retouch in two stages; it also shows scant traces of wear lengthwise on the edge from use as a knife. The lower edge has been given a steep inverse retouch; a final minute resharpening produced an obtuse scraping edge. Both faces of the tool show slight overall wear with scant random scratches from the hand; there is diffuse random scratching near the edges of the tool; these indicate it was used both as a knife and a paring tool. Cat. No. Eaod-1/2/204; f, a much-resharpened teshoa struck from a rinded cobble of blue-grey quartzite. The edge has been reshaped by removal of large flakes producing a somewhat sinuous, chopper-like edge. This edge has been resharpened later by a fine retouch. The edges show no traces of wear. Cat. No. Eaod-1/2684; g, a teshoa struck from a rinded cobble of yellowish quartzite. Half of the circumference has been given a strong inverse retouch in two stages. Other parts of the edge show a slight normal retouch. One cortex area is scarred by use as a hammer or anvil; this teshoa probably was used to resharpen another teshoa or chopper. Cat. No. Eaod-1/2685; h, a teshoa or chopper struck from a rinded cobble of yellow-grey quartzite. Several cracks in the stone as shown toward the lower edge of the drawing were already present in the cobble. The lower edge, between the half arrows, is worn to a rounded, dulled edge; a few random scratches are present. The upper edge is steep but remains sharp and unworn; it has been given a chopper-like inverse retouch in two stages. This probably represents a specialized working edge rather than dulling of a handle-area. Cat. No. Eaod-1/2683.


A
B
C
D
E
F
G
H
Inches
1
2
3
4
5

an archaic type, but had come into existence in response to the limitations and demands of Interior Basin ecology. The Intermontane cultures drew upon the techniques of each of the surrounding areas; contributions to them were in the form of what was most useful to their adaptation to a scrub and desert environment. Earlier archaeological cultures of the area were horticultural and evidence shows in part that they shared in the Anasazi culture of the Southwest by way of influences from it, and in part in life-ways such as those of the farming Yuman tribes. In later times about 1200 A.D., the Intermontane cultures ceased to farm. They then shifted toward a gathering economy that was adapted to their environment. In making this shift, they also adapted new tools and techniques from each area about them.

A more recent synthesis for the region (Jennings and Norbeck 1955) stands in disagreement with Steward. These authorities see an ancient Early Desert Culture as the ancestor to many of the later types of adaption within the Interior Basin and throughout the Southwest in general, with the Ute and Shoshone carrying much of the Early Desert Culture on into recent times. They see the older agricultural patterns, the Puebloid ceramics and other traits as being grafted onto the old desert pattern at times, sloughed off by it at others. They do not, however, answer the question: why is there a strong discontinuity between the sedentary archaeological peoples so prominent in the past of the Intermontane and the modern Ute and Shoshone in so far as basketry types, pottery types, stone tools, agriculture and vegetal food gathering and preparation techniques are concerned. The ethnographic cultures of the area are much like local cultures must have been several thousand years ago, but very unlike the cultures of several centuries ago. All of the Shoshone were pottery using cultures, but their pottery was not like that found at the older farming settlements known to us through the archaeology of the same areas.

In applying the direct historical approach to archaeology in recent decades, students interested in the Plains Indians have identified the late prehistoric cultures of known tribal groups and have begun to follow their prehistory backward in time. Mandan, Hidatsa, Arikara, and other Prairie peoples are best known. Elements of late prehistoric Athabascan cultures, such as the Dismal River Complex of Nebraska and nearby areas, have been identified and studied. We badly need comparable knowledge of Shoshone and Ute groups, of Comanche, Kiowa, Blackfoot, and many other Plains tribes. Until we can follow the ethnographic cultures back into prehistoric times we scarcely can untangle the recent history of tribal shifts on the Plains. Up to the present time, as far as I know, none of the protohistoric complexes that have been equated with an ethnographic people include a teshoa or chopper industry.

For example, none of the Athabascan complexes known from the ground (in their archaeological contexts), whether in Alaska, Nebraska, or New Mexico include

FIGURE 3

Recent archaeological teshoa and choppers from the surfaces of the Gull Lake and Porcupine Hills Bison Drive Sites. a, a teshoa of brown quartzite that was struck from a cobble with a chalky pebble-rind. Two stages of resharpening are apparent, but the tool may have been reduced in size by still earlier chipping. Saskatchewan Museum of Natural History, Cat. No. Eaod-1/2687; b, a much-resharpened teshoa or chopper that was struck from a rinded cobble of grey quartzite. This tool was resharpened at least three times; massive chips struck off of the split face of the tool ended in hinge fractures that left a hump which gives this used-up tool a peculiar core-like appearance. Cat. No. Eaod-1/2742; c, a thick teshoa or chopper made from a rinded cobble of yellow-grey quartzite. It has been highly resharpened, and all edges seem to have been used and reworked. Cat. No. Eaod-1/2681; d, a small teshoa, apparently broken and much resharpened, struck from a rinded cobble of dull-red argillite. Cat. No. Eaod-1/2699; e, a Clactonian flake struck from a rinded cobble of grey quartzite, with rinded surface as striking platform. The secondary flaking shown on the righthand drawing was part of the cobble-edge prior to the removal of this flake. Although this flake may have been used as a knife, it shows no wear, and is believed to be a resharpening flake struck from the edge of a chopper. Cat. No. Eaod-1/623/6; f, a miniature chopper or scraper made on a quartered pebble of rinded black flint. This odd little tool is the smallest chopper-like tool made on a rinded pebble so far noted in samples from bison drive sites. Cat. No. Eaod-1/2696; g, a chopper made upon a rinded cobble of grey quartzite. One of 13 specimens collected by Junius B. Bird from the surface of a bison drive site in the Porcupine Hills, 13 miles south of Macleod, Alberta. American Museum of Natural History, Cat. No. 20.2/3272; h, a chopper made upon a rinded flat cobble of grey-black siltstone; this chopper is scarred on one face because it was used as a hammer or anvil in flaking stone. It is one of two choppers showing secondary hammer-use collected from the surface of the same site by Dr. Bird. Cat. No. 20.2/3271; i, a pointed chopper or "proto-handaxe" made on a rinded cobble of grey quartzite with blackish streaks. On each side of the point is a concave unifacial cutting edge; each of these shows several stages of delicate resharpening that were effected after removal of the large shaping flakes. The edges are in part obtuse, a consequence of the last stage of resharpening which was itself apparently unsuccessful in actually forming a sharp edge; the final edge is unworn. Surface of the Gull Lake Site, Saskatchewan Museum No. Eaod-1/2686.

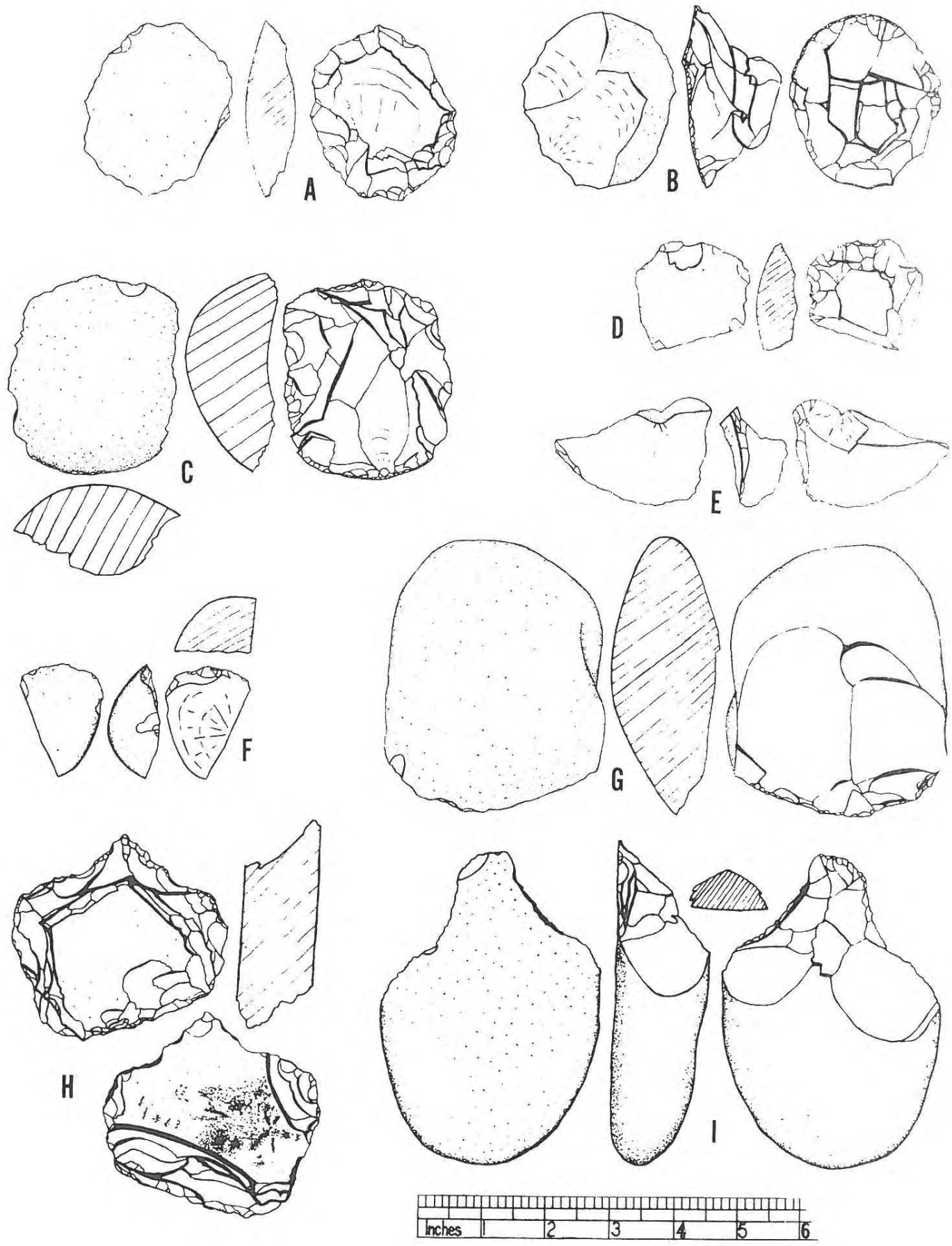

A
B
C
D
E
F
G
H
I
Inches
1
2
3
4
5
6

FIGURE 4

Tools and cores made from quartzite cobbles from recent archaeological cultures of western Canada. a, a knife with a single stage of normal retouch on its cutting edge; this tool was made upon a large Clactonian flake struck from a rinded grey quartzite cobble. The rind of the cobble was the striking platform, and rind was not exploited to form a working edge. Collected by Junius B. Bird from the surface of the bison drive site in the Porcupine Hills, Alberta. American Museum of Natural History Cat. No. 20.2/3277; b, a Clactonian flake of dark grey quartzite that was struck from a rinded cobble. The rind served as the platform. Its edges are unworn, so that it may have been a waste flake left from shaping a cobble; it is, nevertheless, more likely a flake knife. Gull Lake Site, Saskatchewan Museum of Natural History Cat. No. Eaod-1/645/17; c, a knife or scraper made upon a large Clactonian flake of grey quartzite; no traces of cortex are present. The outline of the striking platform, which was not on a cortex, is drawn above the view to the left. The cutting edge, which is unworn, has been given a moderately steep inverse retouch. Cat. No. Eaod-1/2/205; d, a knife or side scraper made upon a broad Clactonian flake of cream-colored quartzite. The working edge has been given a slight but steep inverse retouch. Cat. No. Eaod-1/2682; e, a Clactonian flake struck from a rinded cobble of dark grey quartzite. It was either a flake knife or a waste flake struck off in shaping a chopper. Cat. No. Eaod-1/1337, from zones 6, 7, 8 of square 26R20 within the latest stage in the Gull Lake Sites. (the only non-surface specimen illustrated); f, a core, or possibly a broken-up chopper, formed from a rinded cobble of dull-red argillite. This object is probably a discarded nucleus from which flake-tools had been struck. Cat. No. Eaod-1/2698; g, the nucleus of a large core made on a rinded cobblestone of blue-grey quartzite. This nucleus shows three striking platforms; each is drawn on one of the three edge-views of the specimen; flakes also have been drawn from the sharp tip of the nucleus, where a fourth platform probably has been eliminated. This specimen served as source material for flake knives; it was not a tool itself. It is the most elaborate nucleus so far noted from a bison drive site. Cat. No. Eaod-1/2725; h, a teshoa or chopper with sinuous resharpened edges of the style generally seen on choppers; this specimen was struck from a rinded cobble of red and white quartzite with an exceptionally thick white rind. A highly resharpened specimen, its edges show no traces of wear. Collected by Dr. Bird from the surface of the bison drive site in the Porcupine Hills. American Museum Cat. No. 20.2/3279; i, a teshoa which has been reused as a chipping hammer; its whole periphery has been battered away by hammering. The hammer scar-ring is similar to that which occurs on hammers from flint workshops. Collected by Dr. Bird from a ridge-edge site on the farm of William Holden, a half mile south of the town of Spirit River, Peace River District, Alberta. American Museum of Natural History, Cat. No. 20.2/3108. The teshoa had been struck from a rinded cobble of plain brown quartzite.

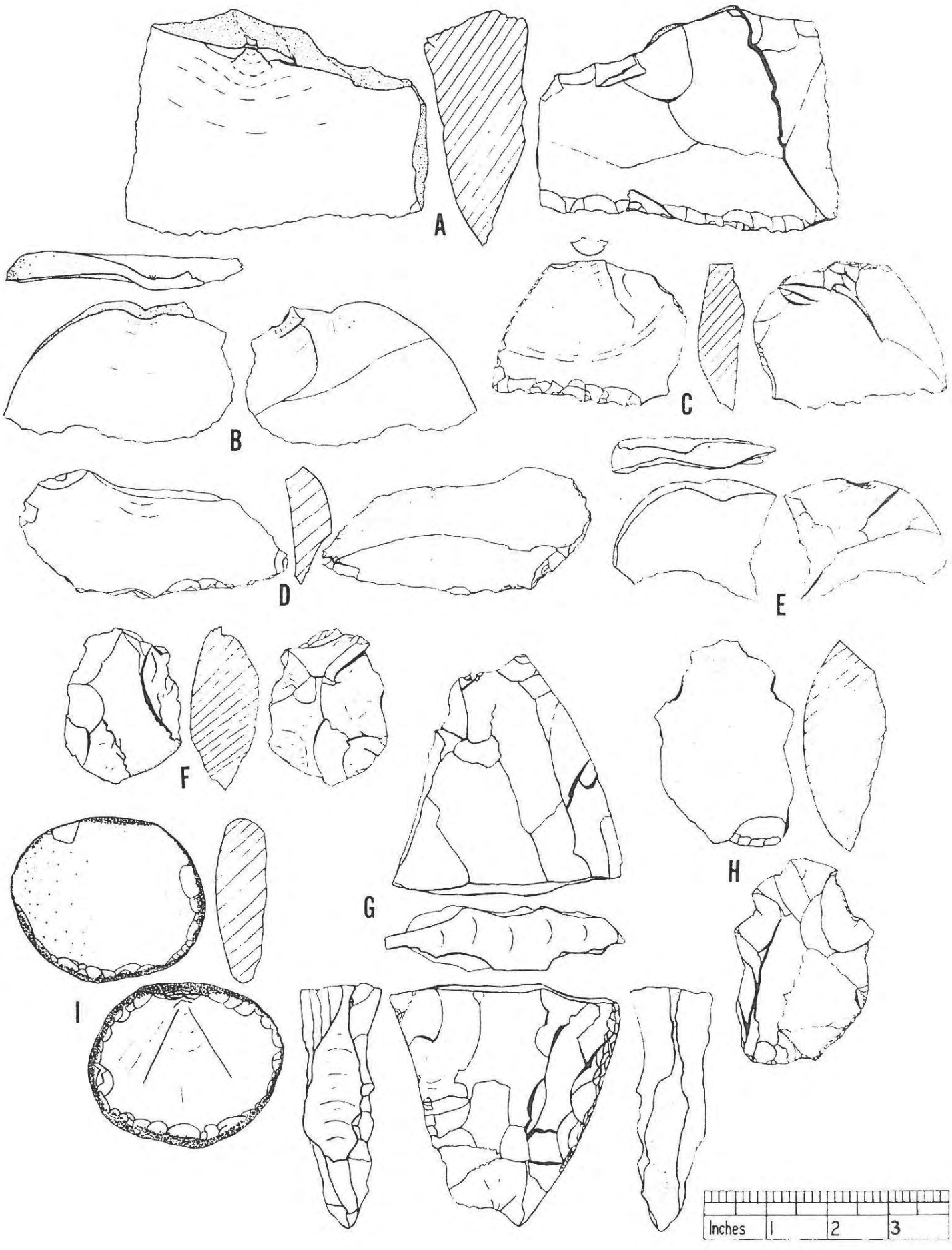
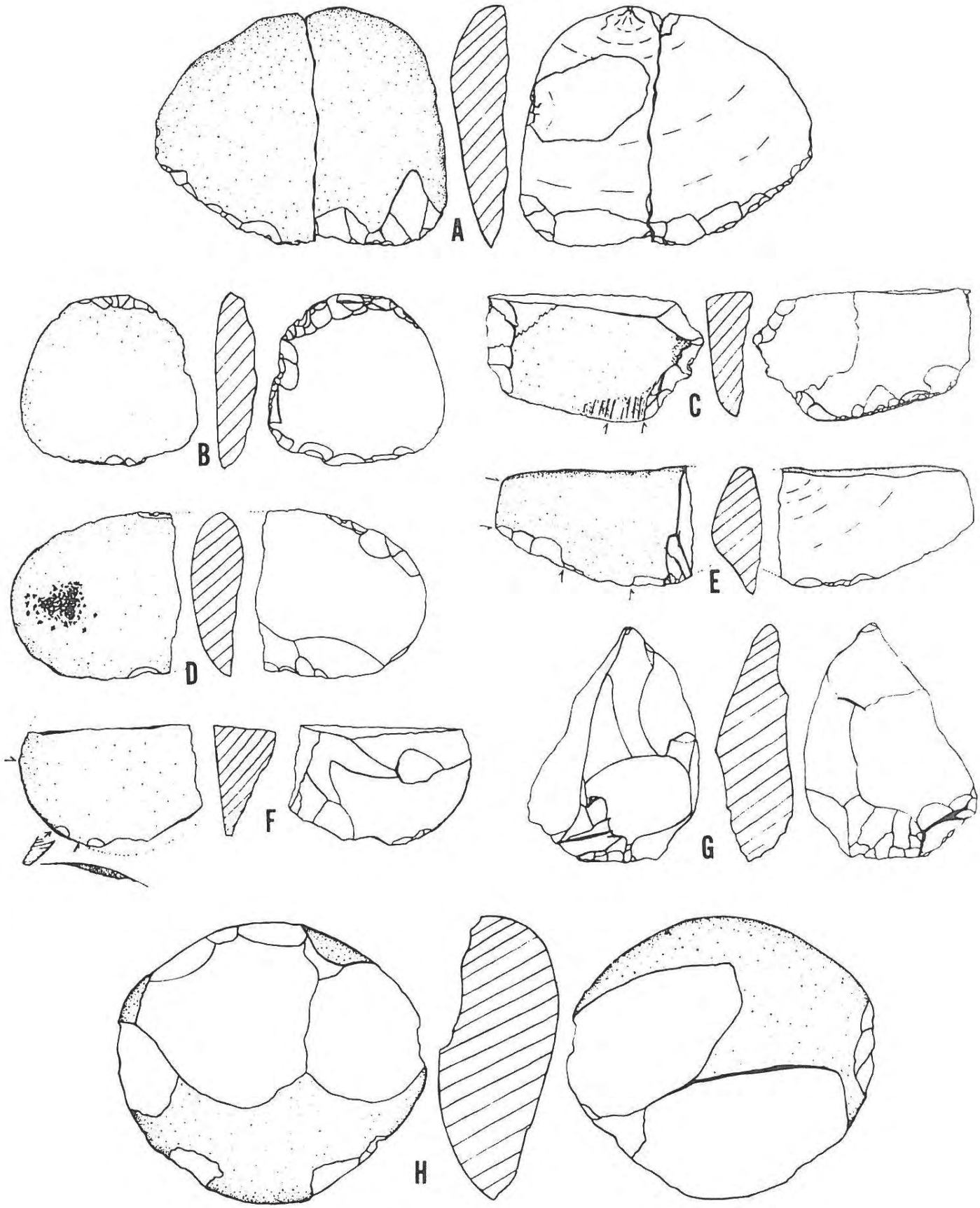

A
B
C
D
E
F
G
H
I
Inches
1
2
3

FIGURE 5

Teshoa of the Protohistoric Lenape from the upper level of the Samuel Overpeck Site, Kintnersville, Bucks County, Penn. a, a teshoa of grey quartzite made from a moderately-rinded boulder of Canadian glacial stone; it was found as two halves in a pit which contained 60 hammerstones, burned cobbles, anvils, and other teshoa fragments. The slight normal retouch probably represents resharpening. The inverse retouch may be damage effected as a bi-product of the work activity which broke the tool into halves. Penn. State Museum, Cat. No. 36Bu5/31; b, a teshoa struck from a slightly-rinded cobblestone of grey-black siltstone. It shows a slight normal retouch on the split face of the tool. Pa. State Museum Cat. No. 36Bu5/31; c, a piece of teshoa struck from a moderately rinded cobble of a diabase. It shows a slight normal retouch on the split face which has obliterated most of the earlier edge-wear. Surviving areas of edge wear are located between half-arrows on the drawing. The cortex close to the edge has been nearly worn through by work. It shows striae or work-traces that are nearly perpendicular to the edge; these indicate that the tool was used at a low angle to pare away the surface of the work. This artifact became much worn before it was resharpened and finally discarded. Pa. State Museum Cat. No. 36Bu5/90; d, half of a teshoa struck from a slightly rinded basalt pebble with a reddish cortex. The upper or handle part has been dulled by chipping. The lower, cutting edge shows slight resharpening. The cortex face is scarred from use as a hammer or anvil in chipping stone. Pa. State Museum Cat. No. 36Bu5/1C; e, a teshoa struck from a slightly rinded cobble of andesite. Cutting edges are slightly resharpened; wear which was not chipped away is preserved between the two half-arrows of the drawing. Striae (use-marks) on the edges and adjacent faces are slight and diffuse; they are roughly parallel to the edge of the tool, lengthwise, and thus show that this specimen was used as a knife. Pa. State Museum Cat. No. 36Bu5/1B; f, fragment of a teshoa struck from a well-rinded cobble of grey Canadian quartzite. About half of the working edge has been broken away by wrenching; its previous outline is indicated on the drawing by a dotted line. The tool has been re-edged by drawing long flat flakes. Wear following this resharpening is depicted as a separate detail. The tool was used against a soft material which strongly wore the edge to a rounded facet at an angle of 70 degrees to the plane of the tool, the rind having been closest to the work. Striae cross the worn and rounded edge at right angles to the axis of the edge itself. The convex wear of the edge indicates that the object which was worked was soft and yielding such as a fresh hide would be. Both faces of the tool show slight and diffuse wear from the fingers of the user. Pa. State Museum Cat. No. 36Bu5/1F; g, a core-chopper or chopping tool of hornfels ("argillite"). The lower surface of the cutting end (the one which is less beveled) shows hinged step-like flake scars, suggesting that these scars were the result of accidental damage to a chopper-edge. The tool is black and slightly weathered, one of our most recent examples of the "argillite" choppers of the Delaware Valley. Pa. State Museum Cat. No. 36Bu5/1D. h, a teshoa-core of moderately rinded yellowish-white sandstone. Four teshoa of small size have been struck from this thin oval pebble, and more scars from other blows are shown. Pa. State Museum Cat. No. 36Bu5/1D.


A
B
C
D
E
F
G
H
Inches
1
2
3
4
5

any teshoa or chopper industry, but many of them do emphasize finely-made bifacial knives. Until Shoshonean archaeology is better known*, it is not possible to compare the ceramics and stone tools recovered from bison drive sites with Shoshone industries. However, the conspicuous importance of teshoa and choppers in Montana and southern Alberta and Saskatchewan in association with ceramic complexes does suggest a vast former extension of the northern Shoshone upon the high plains. Such questions as this could at least be approached through broad studies of protohistoric sites by the technique of the direct historical approach.

CHOPPERS IN PAWNEE ARCHAEOLOGY

Chopper industries may occur as part of the tool kits of some of the sedentary Prairie tribes. Since the archaeology of the Pawnee is the best-known, we have limited our study to the Pawnee sequence. The Pawnee chopper industry shows a peculiar and significant distribution in time. The following survey is based mainly upon survey samples and excavated series in the collections of the Nebraska State Historical Society at Lincoln.

Choppers and a few resharpened teshoa have been found on the floors of historic Pawnee houses, but none are recorded as having been parts of the grave. Lots of such domestic and skin-working tools were frequently buried with Pawnee women. The choppers are unifacial tools roughly four inches in diameter which were made from split sandstone cobbles (usually Dakota Sandstone, rarely outcrop blocks of Bijoux Sandstone, and rarely quartzite cobbles). They do not utilize rind as part of the working edge, except in the case of rare teshoa. Local collectors refer to the choppers as "tanners" and "skin scrapers". None of the specimens examined showed any apparent wear-traces.

The Grand Pawnee village of 1820-45 (25Pk1, on the W. S. Headley farm, 3 miles southeast of Clarks, Polk County, Nebraska) was burned by the Delaware in 1832 and rebuilt in 1833, and was visited by the First Regiment of Dragoons in 1844; it was shortly after abandoned because of a massacre perpetrated by Dakota raiders in 1843 and the removal of Federal military protection in 1845. Approximately thirty choppers from house floors represent the last kind of chipped stone tool made by the Pawnee. The site to which the inhabitants of Clarks village moved, where these people later were joined by all of the other Pawnee tribal remnants, has no choppers or any other native industry (25Nc20, the sprawling village at Genoa, Nance County, Nebraska, which was abandoned in 1874 when the Pawnee removed

* Too true -- what is there in Shoshonean sites that shows teshoa use? One squaw seen by Leidy does not establish a trait. She may have had other tribal association.
(Editorial observation by John L. Cotter.)

to live with the Wichita in Indian Territory).

The William Tichacek Site at Linwood, Butler County, Nebraska (25Bu1) yielded trade goods that date from 1770 to 1820, and represents the village occupied by the Grand Pawnee prior to the settlement at Clarks. (The Linwood site also includes some graves of later date, not pertaining to this settlement.) John Champe's excavation program of 1939 revealed burned houses with shattered burned human skeletal material, grouped about an earth ring enclosing a ritual area, with a cemetery located on a nearby hill. Flint tools were scarcely present, but more than ten rough choppers were found on house floors.

Other Pawnee towns of the same stage have similar industries associated with them. The Hill Site (25Wb†1, near Red Cloud, Webster County, Nebraska) was the Republican Pawnee town visited by Zebulon Pike in 1806; it apparently was occupied until later than 1830. Flint tools are rare or absent, but sandstone choppers are abundant. Small samples from other sites of the same stage include choppers.

Tool samples from Pawnee sites of the early eighteenth century show a slightly different pattern. A site near Bellwood, Butler County, Nebraska (25Bu2), excavated by Waldo Wedel in 1936, contained pre-1800 glass beads and more conservative ceramic and lithic technologies. Fourteen choppers were found on the surface of the site; two of these are resharpened teshoa utilizing the rind as the new cutting edge. Twenty-one choppers were found during excavation, fourteen of them on the floor of house 1, which had been burned. The people here were still making many tools of flint, however, and the types are those of the earlier Lower Loup Complex (triangular arrow points, bifacial bipointed knives, end-scrapers on blades). Choppers here are intermixed with a surviving native flint technology.

The Lower Loup Complex of central Nebraska is the protohistoric ancestor of Pawnee; this is demonstrated by ceramic relationships and by the transitions through dated sites of Lower Loup non-ceramic traits into those of documented Pawnee towns. Some Lower Loup sites contain rare objects of European manufacture; brass earrings, brass jingling cones, small pieces of cut-up chain mail armor, and a few blue glass beads of an early type that is believed to date to about 1600 A.D. The stone tools of Lower Loup sites represent a sophisticated and highly skilled flint technology. Major tool types are small triangular arrow-points, end-scrapers made on blades, and bifacial lanceolate bi-pointed knives which become diamond-shaped knives with four beveled cutting edges through much re-edging. Some of the lanceolate knives show use as stone-saws or bone-saws. Thin sheets of chalcedony from the Black Hills also had knife-edges chipped on them. This flint technology shows close relationships to that of early Mandan sites and to those of other peoples of Caddoan speech in Oklahoma and Arkansas. It also is closely related to the lithic tradition of the Upper Republican

Complex, which is earlier than Lower Loup, and which is thought, on the basis of ceramic relationships, to be the ancestor of Lower Loup. Upper Republican shows even closer relationships to Oklahoma Caddoan sites and to early Mandan than does Lower Loup.

The most striking features of Lower Loup and Upper Republican lithic industries are the total absence of choppers, teshoa, and any other massive stone tools that might be related to them, and the strength of blade industries and of refined bifacial flaking on chalcedonies and fine-grained flints. Protohistoric and prehistoric Pawnee Industries do not include any possible ancestor for the historic Pawnee chopper industry.

The Pawnee sequence thus provides us with the first instance wherein we see a chopper industry appear as a new element alongside a refined flint technology that eventually survives as the only lithic technology after the refined flint technology died out. It would appear that the Pawnee chopper industry was a new invention or innovation which came into existence with the decay of older Pawnee technology, and that the Pawnee began to make choppers as they lost the skills needed to work flint in prehistoric styles. Pawnee choppers seem to be debased stone tools which came into existence as the degenerate craft products of a culture being eroded away on the frontier. It is possible that the tool type was introduced into Pawnee culture from peoples of the far western Plains, but the rarity of Pawnee teshoa and the matter of rind-utilization suggests that Pawnee choppers have no relationship to the teshoa-chopper complexes of the northwestern Plains or to those of the Interior Basin. These particular Pawnee tools seem to me to be the last degenerate product of a stone-age technology.

TESHOA OF THE ARCTIC COAST

Cortex-flakes which had been struck from boulders were in use as hide-defleshing tools among the Eskimo of the Egedesminde District of West Greenland as late as 1918 (Birket-Smith 1958). Two ethnographic teshoa and three archaeological examples are illustrated. Birket-Smith points out the rarity of archaeological specimens from the eastern Arctic; those illustrated are the only examples he was able to locate. He suggests that slabs of slate may generally have served the same purpose; in addition boulder-chip scrapers may have been present but if so, these may have been overlooked by archaeologists because of their insignificant appearance.

These rare tools seem to be variants of the ulu. In coastal collections from the western Arctic which I have examined, only three cortex-flake tools were noted. They are of chert, lack an indurated rind, and do not show wear. Ulus of chipped stone (along with more usual ones of slate, copper, and steel) also occur. These

as is the case with Eskimo cortex-flake tools, need further study.

TESHOA IN PENNSYLVANIA ARCHAEOLOGY

Stray teshoa have been noted on many Archaic sites of the Middle Atlantic Slope. Nevertheless, we have only one large documented sample from precisely dated contexts. These come from the Overpeck Site at Kintnersville, Pennsylvania, the key Lenape site. Henry Mercer dug a few test pits here in 1892, and decided against excavation. A stratigraphic excavation was conducted by John Witthoft, Richard S. MacNeish, and Albert Spaulding in 1947, revealing three periods of occupation cleanly stratified and separated from one another (Witthoft n.d.).

The upper level is purely a Lenape village site that ended about 1550 A.D.; this level contained a few European-made objects from the earliest stage of the fur trade. The middle level represents an earlier stage of the same late prehistoric culture prior to 1500 A.D. Teshoa were found in abundance in both levels. A deeper level at the site, representing an Early Woodland occupation prior to 500 B.C., produced scant material.

The Overpeck Site is now being removed through quarrying operations for molding sand. The Forks of the Delaware Chapter, of the Society for Pennsylvania Archaeology, has carried on a salvage excavation for three years under Witthoft's direction, and our knowledge of the site has expanded. At the present time, more than 300 teshoa found in late Lenape contexts are available from the site, along with a series of cores (cobbles from which teshoa have been removed). This collection includes a small number of tools that exhibit worn edges and usemarks which indicate their functions. Typical forms may be seen in Figure 5. Teshoa and flint flakes were the knives and scrapers used by the Lenape, and no other kinds of knives or scrapers are found in Lenape levels at Overpeck. Current studies of Munsee sites in the upper Delaware Valley show clearly that the same situation holds true there, with an identical teshoa industry as the only complex of butchering tools (Kraft 1965). Late prehistoric sites of the northern Delmarva Peninsula actually contain a comparable teshoa industry although this is not indicated in the literature.

Throughout this region of known protohistoric teshoa industries, although they are not mentioned in recent literature and adequate documented samples are not available, teshoa are similarly important in earlier Woodland complexes as well as in late, middle, and early Archaic components. Teshoa do not occur, however, in Susquehannock, Shenk's Ferry, Iroquois, New York Oawsco, Clemson's Island or other late prehistoric cultures to the west and north. These cultures have specialized flint tools instead of teshoa. Where teshoa are seen in areas outside of their protohistoric distribution, they have to do with older cultures; there they do occur in some abundance, especially in Archaic contexts.

Large crude tools chipped from cobblestones and from blocks of other granular rock were central to an early controversy about the antiquity of man in the Delaware Valley. C. C. Abbott and other students found heavy choppers, chopping tools, and teshoa, mainly in fact deriving from Archaic culture stages, which they interpreted as being paleolithic implements. Their opponents claimed that the crude tools of the area were either debris and discards resulting from the manufacture of conventional artifacts or the casual tools of recent Indians, pointing in addition to ethnographic occurrences of the teshoa as evidence against paleolithic age (Mercer 1892). In light of modern knowledge, neither side seems justified. Recognition of the Archaic stage was long delayed by acceptance of Mercer's negative judgment. Abbott's failure to recognize Archaic cultural assemblages for what they were gave a false picture of vast rather than moderate antiquity for early tool types and was prejudicial to later studies of American culture history. Neither side realized the importance of technology or chronology in the study of fundamental tool types.

THE SIGNIFICANCE OF TESHOA IN THE EASTERN WOODLANDS

It appears that the Lenape teshoa may be a survival from the chopper industries of Early Archaic times dating prior to 6,000 years ago. These industries seem to have dwindled and died away through time, being used by fewer communities in each age until they had their only historic survival among the Delaware Indians. If this interpretation is correct, the teshoa is a remarkable archaism in Delaware culture.

In their total distribution in ancient sites, teshoa show a significant pattern. They occur in the East, the western Great Lakes area, and the far West, but not in most of the Mississippi Basin at any time in the known past. East of the Allegheny Front and west of the Prairies represents the area of broken distribution for the teshoa. The same broken distribution also holds for choppers, quartzite industries, and Clactonian flake industries. The cultural traditions represented by large, non-flint hand tools were wide-spread in eastern and western regions in ancient times. Since then areas of distribution have continuously shrunk, until they come up into very recent times only in the Lenape and Shoshone regions.

These industries, which represent a chopper tradition, have connected with them certain problems of origin and relationship that cannot yet be solved. John Witthoft, in his studies of Paleo-Indian and Archaic lithic industries, has offered a body of hypothesis and inference that is as yet untested.

The oldest sites known to him are Paleo-Indian, with no trace of a chopper industry; these emphasize a blade tradition in flint which he compares to the Aurignacian and Gravetian of Europe (Witthoft 1954: 271). He suggests that early Paleo-Indian

technologies were carried from the Eurasiatic steppelands over the Pleistocene tundra by immigrant bands of hunters and that these technologies as found in the New World were derived from Siberian complexes of the earliest Upper Paleolithic. Such cultures have not yet been discovered in Siberia, but if found, would be earlier than the Siberian complex best known from Mal'lta (Witthoft 1952: 493-94). He sees Paleo-Indian as a tradition tightly bound to specific ecological niches; tundra and steppe. He sees the New World fluted spearpoint as one element in a complex of flint knives, planes, scrapers, and other cutting tools which present some parallels to the so-called Proto-Solutrean sites of eastern Europe and of England. This particular tradition stands in marked contrast to early Eastern Archaic and to other complexes in a chopper tradition. (Witthoft 1952, 1954, 1956, 1959, 1961, 1962, 1965: 5-6, 15).

Witthoft offers several other themes in these papers; all however are interwoven into a complex fabric. I shall try to pick this net apart since I must return to his hypothesis in my conclusions. His other themes include: the genealogy of the Plains Archaic cultures of the continental interior; the distinct genesis of eastern Archaic and of western desert cultures; a group of inferences based upon the contrasting nature of these traditions as he views them.

He notes the absence of choppers, cobblestone flake tools, or quartzite industries in the Ohio and Mississippi valleys. The earliest Archaic of that area (i.e., the earliest cultures with granular stone grinding or mulling tools) is of Plains Archaic tradition, one or another of the industries that used to be called Yuma. They are all transparent descendents, through a number of stages in their flint technologies, of Paleo-Indian cultural ancestors. Through convergence and cultural interchange, the Interior Valley Archaic cultures gradually come to resemble late Archaic cultures of the East, but they never participate in the chopper tradition or come to use aphanitic rocks as flaking materials. The central region, like that of the Plains, has many evidences of Early Plains Archaic or Terminal Paleo-Indian (whichever term one might prefer) sites dating later than 10,000 years ago.

The early Archaic, east of the mountains, is like earliest Cochise among the Desert cultures. Core-choppers and flake tools in Clactonain style made of quartzite, felsite, basalt, and hornfels predominate, while flint tools and delicate bifacial artifacts are exceptional. Within the area of the early Eastern Archaic, there is a great poverty of Plains Archaic types, and the technologies of the early Archaic (Plains Archaic) of the Interior Valley are missing. Therefore, the Early Archaic of the East, and the Early Desert cultures of the West, were the contemporaries of closing Paleo-Indian (better called Plains Archaic) of the intervening regions. Witthoft believes two unrelated traditions were in different ecological settings in North America 10,000 years ago: delicate flint industries in the interior, massive chopper industries to their east and west. The Plains Archaic sites coincide with Prairie ecology; the chopper sites correlate with forest and desert environments.

He belives that late Paleo-Indian or Plains Archaic sites are missing from the East because the tundra and steppe environments of the Pleistocene had given way to forests, pushing the Paleo-Indian hunters to the westward and permitting their replacement by people of another tradition and ecological adaptation who had been prior residents of the southern-most Appalachian forests.

Since the earliest eastern Archiac complexes include the strongest chopper-core and Clactonian flake industries, they cannot be derived from Paleo-Indian, which included neither. Later Archaic complexes show a decaying chopper-tradition that ended in most areas by Late Archaic times. Witthoft projects these seriations into the past and postulates a still earlier forest tradition which he calls proto-Archaic. This postulated tradition, not yet demonstrated to have existed in any areas, was both earlier than Paleo-Indian and contemporary with it. It is postulated as a necessary ancestor to the Early Archaic of the East and to the Early Desert cultures, both of which show strong technological contrasts to Paleo-Indian technologies. One industry which actually may represent a proto-Archaic stage has recently been recognized in Alabama (Josselyn and Lively 1965).

From this, it seems apparent that he is looking for two primary migrations into North America in early times. The first, presumably during the Würm 1 - Würm 2 interstadial of approximately 50,000 years ago, had a chopper technology in granular rocks associated with it that had its closest affinities to the Middle Paleolithic cultures of southern Asia (de Terra 1939: 116-17). The second, during the Würm 2 or Wisconsin 1 glaciation, followed game herds over periglacial tundras from Siberia into Alaska, then down into the present United States along glacial margins. The first, Proto-archaic, was a gathering and hunting culture adapted to the forests and their margins; its index-tool was the chopper. The second, Paleo-Indian, was a very specialized culture based upon the hunting of steppe and tundra mammals, with a refined flint industry; its indices were the fluted spear-point and the prismatic blade tool (Green 1963: 163-64).

He feels that these two unrelated cultures lived in distinct ecological realms during glacial times, neither one having the technology and diverse knowledge of environment necessary to live in the regions occupied by the other. With the close of glacial times, communities of both traditions came to borrow tool types and know-how from one another, and even to merge. On the open Plains, the Paleo-Indian tradition was the major ancestor of later cultures; in the Eastern Woodlands, Proto-Archaic cultures constituted the fundamental ancestor, with Paleo-Indian traditions contributing only a small amount to the technological heritage. With still later developments in the evolution of Archaic cultures, diffusion of technological details tended to blend out strong inter-areal distinctions in the basic technologies.

BOULDER CHIP TOOLS OF THE WESTERN GREAT LAKES

Ethnological and archaeological studies indicate a long-standing relationship between the cultures of the western Great Lakes and those of the northeastern Woodlands. Early quartzite industries of the Lake Michigan region are like those of eastern Pennsylvania rather than like anything on the upper Ohio or Lake Erie. One excellent technological study has been made of a group of tools made of diabase cobblestones from sites on ancient beach-levels near Benton, Illinois (Phillips 1898). The age of the industry is uncertain. Phillips does not indicate whether the boulders were rinded. He describes use-marks which show the utilization of cortex-flakes as knives, as planning tools, as hide-cleaning tools and as hones, indicating that a cortex-flake of diabase was the generalized cutting tool within at least one Great Lakes technology.

Along with teshoa or cortex-flake knives, he found a small series of notched axes and chopping tools modified from large cortex flakes, some of them edged by grinding. This series is reminiscent of some primitive Archaic industries of the Middle Atlantic Slope. Few cores were used as tools; the great majority, among tools which showed use, were simple cortex-flakes. A small number were further elaborated by notching and grinding.

CHOPPERS AND TESHOA IN SOUTH AMERICA

Chopper industries based upon cobblestones of basalt, quartzite, and other granular rocks are conspicuous in many parts of South America, especially in western and southern areas. They have long been the center of controversial interpretations. Valid information concerning their age, contexts, and distribution has come slowly, and conflicting views regarding their history have not been resolved. Only a portion of their chronicle can be outlined, yet this serves to pinpoint the same problems that they raise in North America.

We cannot hope to solve these classic problems of South American archaeology easily, nor can I do more here than outline those details that are known with some certainty. I am especially indebted to Junius Bird of the American Museum of Natural History in New York City for access to his collections and ideas. Dr. Bird's sophisticated sampling and his refined stratigraphic excavations provide the few reliable insights into the contexts of South American chopper industries that are available. His samples and his dated contexts provide a remarkable story indicating the persistence of teshoa and choppers through more than ten thousand years of prehistory in South America.

South American chopper complexes present us with the same knotty problem of classification as those in North America. Tools range from simple teshoa without retouch, through those involving various stages of retouch, through choppers, resharpened choppers, and cores; they form a continuous series which defies rigid classification in terms of typological pigeonholes. As one puzzles over these

series with their great variety, one has the subjective feeling that one is dealing with a variety of basic tools, and with a rich and adaptive technology which solved many functional problems in a simple, direct, and efficient manner.

The oldest dated cultures of South America are those discovered by Bird (1938) in the deepest strata of several shelters located in southernmost South America. Stemmed flint projectile points and a chopper industry based on cobblestones occurred as distinct industries within the same culture between 10,000 and 11,000 years ago. This is older than any date recorded for a chopper or teshoa in North America. This in itself suggests how much we still have to learn about early chopper industries.

Bird's work in the coastal sites of northern Chile provided large samples of choppers and related tools from stratigraphic cuts and also from the surfaces of other well-excavated sites. The chopper industries of this area, which, prior to Bird's work had been interpreted as being paleolithic tools of great antiquity, were found to be part of the technology of an agricultural but pre-ceramic people who occupied large fishing and farming towns between 4,000 and 5,000 years ago. The collections of implements based upon cobblestones from these sites present many difficult problems as to their usage, typology (which were choppers, which were cores?), and their relationships. We have here, nevertheless, one of the few instances where adequate descriptions and illustrations of a chopper industry have been published (Bird 1943: 209-10, 237-40, 242, 257-59, 266, 276; 1965).

Bird's data suggested that the chopper complex extended up into ceramic horizons, but his original evidence was not entirely secure. Its survival into later ceramic times has now, however, been demonstrated. Dr. Edward P. Lanning, now of Columbia University, has found a teshoa series in datable ceramic contexts at Jaguay on the north coast of Peru between Canete and Chincha. They are contemporaneous with phases Ocucaje 9 and 10 of the Ica Valley, that date to about the time of Christ (collections of the Robert H. Lowie Museum at Berkeley, California). The specimens which I handled were teshoa without retouch, struck from rinded pebbles of fine grained granitic rocks of varied igneous and metamorphic origin. Dr. Lanning found some of these tools with fish scales still adhering to them suggesting that the cleaning of fish was one of their functions.

One of the more recent papers involving a summary of interpretations and ideas about the antiquity of man in the Americas throws the whole burden upon chopper complexes without defining or describing them other than to say that they constitute "a low level of stone-working technology similar to that of the Lower Paleolithic stage in the Old World" (Krieger 1964a: 42). Krieger offers the term "Protolithic" for a conjectural earliest stage in American archaeology, older than bifacial stone projectile points and any of the refined flint technologies. He adopted the term from the work of the Austrian archaeologist of Argentina, Oswald

Menghin (1957), who used the term with a different typological definition. Krieger also uses the term "Protoarchaic" to stand for the early Archaic of the eastern United States and the Early Desert Cultures of our Southwest; these are chopper-with-projectile-point complexes which in the past have been called Early Archaic, whereas "Protoarchaic" used to be a term for what Krieger now calls the "Protolithic." The reader who penetrates the confusion in names assigned to culture stages gains little, for he is then lost in vaster confusions of typology and chronology.

Whether we turn to North or to South America, this study presents us with strange quandaries. Krieger sees complexes of great antiquity in chopper collections from many areas. Bird's series from northern Chile, one of the best documented in the Americas, with good samples from the built-up strata of village mounds, is thought to have little if any connection with the other artifacts of the strata in which it had been found. The chopper series that Bird found there is considered to be representative of a very ancient pre-projectile point culture. Krieger hardly could base his own thesis upon a poorer foundation.

In this connection, one of Krieger's North American complexes within his Protolithic designation comes from a site at which I worked under the direction of Douglas Byers and Wendell S. Hadlock. The lower level of the Smith Site at Ellsworth Falls, Maine, is listed as the Kelly Focus and is considered a member of the Protolithic (Krieger 1964a: 43-44). The complex of the Kelly Focus includes heavy flake tools and core-choppers of felsite, along with a bifacially-flaked leaf-shaped projectile point or knife. It is an Early Archaic industry and is not related to a pre-projectile point horizon (Byers 1959: 247-49).

What I consider to be pseudo-logical classification for stone tools is offered in another recent paper by Krieger (1964b). There is in it an attempt to equate local collector's terminology for choppers in one area with the terminology of other areas, but little attention is paid to the world literature or to matters of priority in terminology. The article also expresses pessimism with technological studies but voices faith in the mechanical operations of simple typology. Tools are listed under four categories: unifacial flake tools taken from coares, bifacial tools, tools which show no preferance for either style, and tools made upon cobblestones. Each of our own chopper complexes includes tool types which fall within all four of Krieger's classes, depending upon the state to which the tool was resharpened.

The useless status of such a priori classifications, which are essentially clerical exercises, is revealed by Krieger's definition of the teshoa. The entry is second in his list of flake tools (Krieger 1964b: 176) with no cross-reference under his list of tools made from cobblestones: "Teshoa flake (has a more or less semicircular edge which is naturally sharp and cannot be made sharper by edge chipping: a Ute word first used by M. J. Rogers)."

The site of Taltal in northern Chile always has been central to any discussion of

ancient cultures in South America (Oyarzún 1917). The area has produced vast collections of tools made from non-flint cobblestones, including teshoa, choppers, chopping tools, proto-handaxes, Clactonian flake tools, and cores in every imaginable variety. Oyarzún believed that all of the stages of the Old World Paleolithic were included in this industry. Krieger (1964: 51), accepts Taltal as a very ancient site, despite Junius Bird's work at Taltal and Bird's association of the stone industry with a sedentary agricultural and fishing culture of the third millenium B. C. Based upon my own examination of Bird's specimens from Taltal, I believe that Oyarzún's published and described specimens were highly selected and give no sound picture of the industry as a whole; I feel that the site is another member of a widespread chopper industry that has been best studied at other Chilean sites excavated by Bird.

Max Uhle conducted a brief excavation near Taltal in 1916 and produced that same year a report of his field observations (Uhle 1916). He apparently never was able to continue the laboratory analysis of his collections from this site, so that only the preliminary report is available along with a history of amateur interest at Taltal.

Augusto Capdeville originally collected from the sites near Taltal. He gave a sample of crude stone tools to Ricardo E. Latcham, who published a premature notice concerning the presence of Paleolithic tools. Señor Capdeville also gave samples to Aureliano Oyarzún, who presented a paper on them to a scientific congress in Washington in 1915 (Oyarzún 1917). His paper was delayed in publication and was thought to have been lost, so it was also published in Chile with new photographs of the same specimens (Oyarzún 1916). Uhle's reports on Taltal appeared in the same publication. At a later date two dissenting articles by Capdeville appeared (1921, 1922).

Uhle went to Taltal at the request of Oyarzún, where he made ten test-cuts and a larger strata cut in one of the several sites where Capdeville had collected. The site was selected for excavation because it showed the least disturbance of existing ing stratigraphy. Uhle drew no sweeping conclusions, but he described the field situation and compared its components to those from other sites.

He found four strata. A maximum total thickness of slightly more than a meter was involved; the lowest of the strata (when present) rested upon bedrock. The lowest stratum consisted of ashes, and its stone artifact contact was indeterminant. It did, however, include sub-circular fish hooks made of shell (Oyarzún 1917: Fig. 9). These shell fish hooks now link this horizon to Junius Bird's Huaca Prieta Site of the third millenium B. C.

The second layer (from the base) was composed of yellow sand. Like the first, it was not continuous, and in many areas the third stratum rested directly upon

bedrock. The third stratum was a village level with clay from wattle and daub house construction mixed into its midden. Uhle found that chopping tools which resembled hand axes were found in this zone, rather than in the deeper levels, and that bits of woolen thread, fragments of cat-tail aprons and bundles of edible kelp, were also preserved in this stratum. The fourth or top layer was made up of mixed midden soils, and contained bifacial projectile points of chalcedony and other glassy stones not represented in the types or materials found in the three deeper strata. A few potsherds were found on the surface.

Uhle compared these artifacts with lithic industries and with other aspects of higher Indian civilizations. He felt that the industries at Taltal were more ancient than those of the then known early stages in the development of the civilizations; he saw a relationship to Proto-Nazca and to early sites at Tiahuanaco. He felt that Taltal was somehow an early stage in the heritage or tradition of what eventually became the higher civilizations of South America. The crude stone tools probably should be dismissed as paleoliths, not because of their typology but because of their contexts within the stratified site near Taltal. The important question that remained unanswered had to do with whether the paleolithic tools at Taltal arose by independent invention and as such were unrelated to those of Europe. Technological evolution through the many stages of the stone age could have gone on at a different rate in the New World so that the sequence which represents at least half a million years in Europe might have been compressed into a few recent millenia within New World contexts. Thus Uhle left the question of the culture stage represented by the crude tools open and hoped for more study of the problem.

THE SO-CALLED TCI-THO OF THE ALASKAN INDIANS

Boulder chip tools found in Alaska show slight resemblances to teshoa, but at the same time they raise several problems which can only be answered by refined technological and distributional studies. They are usually called tci-tho, an Athabascan name recorded from the upper Tanana dialect by Froelich Rainey (1939: 360, 365, 368, 378). They differ from teshoa in several ways in that: they are often made from slatey cobbles; the tools themselves frequently are slabs split from the center of the cobble rather than cortex flakes; the rind is not exploited in forming their edges; generally the tools, rather than being edged, are battered to a thick, blunted edge adapted to leather softening; often they are precisely dulled to a circular outline.

Other boulder chip tools have been described as tci-tho from several Kobuk River sites (Giddings 1952: 80-82). Discoidal tools of slate or schist, they were made from boulder chips. These particular examples generally are chipped or ground on both faces to give them a sharp cutting edge and to shape them to circular form.

They are related to the Eskimo ulu. Boulder chip scrapers are used like Eskimo ulus to pare and finish skins by peoples on the middle Yukon (de Laguna 1947: 127-128). She notes that boulder chip tools are found associated with every stage of Kachemak Bay Eskimo as well as at sites of pre-Russian Indian cultures.

The tci-tho peculiar to the Yukon recently has been described as a sheet-like piece of stone, often split from a cobble of shale, sandstone, or schist, and chipped to a circular outline. Edges have been battered to dull them and to give them a rough sand-paper like surface. Their main use is in defatting, "stripping", and softening a piece of leather after it has been chemically treated with a tanning material (Johnson and Raup 1964: 139, 142, 151).

Tci-tho are found in the ruins of recent Athabascan camps (Johnson and Raup 1964: 168, 173, 178, 185). In MacNeish's (1964: 432, 435) excavated sample of 77, the greatest concentration (29) came from the Bennett Lake Horizon, his most recent complex which persisted from about 1,000 A.D. to recent times. Others of this sample are thinly scattered in associations with earlier horizons extending back to the Little Arm Horizon of about 5,000 B. C. (Mac Neish 1964: 426). He considers them an Asiatic introduction which appeared along with elements of the Northwest Microblade Tradition of Mesolithic cast (MacNeish 1959a: 13; 1959b: 49, 62; 1964: 368-69, 379).

Having surveyed recent statements on the "chi-tho" (tci-tho) and on the subject of Athabascan tanning, I find them contradictory. One must go back to the pioneer student of Déné language and culture to solve the "chi-tho" (tci-tho) problem. The Reverend Father A. G. Morice spent many years among the northern peoples as a missionary; he spoke their languages, and published numerous articles on Déné linguistics and culture. His articles, little read today, were based upon linguistic insight and upon many years of firsthand observations. He offers the fullest detail in his discussions of northern forest life as he knew it in an earlier age.

In the first place, Morice demonstrates that the term chi-tho (tci-tho) is not the name for the tool but is merely the name for the rock from which the tool was made. In his studies of Athabascan dialects, he noted a feature of this language family which also became apparent to later students. Athabascan tongues are complex polysynthetic languages, filled with unexpected difficulties of grammar and morphology. At the same time, within each dialect, Athabascan has a simple basic vocabulary of mono-syllabic roots for fundamental ideas and objects. Even though each dialect may construct its sentences by utilizing elaborate local idioms that make speech unintelligible to the speakers of other dialects, each one also includes a group of simple roots that never change, are not involved in grammatical elaboration, and that remain the same in every dialect. Morice thought these simple terms that did not vary were a relic of the original mother tongue of

all Athabascan dialects. Be that as it may, the words for stone (tci) and for water (tho) are among the simple universal Déné vocabulary (Morice 1889-90: 181-82). Thus in all northern Athabascan dialects, tci-tho means "stone-water", a cobble-stone. This is also true in Navaho, where tse is "stone" and tqo is "water". Tsetso is cobble or river boulder (the Franciscan Friars 1910: 50-55, 63-64). Navaho informants tell me that tso means either "water" or "river", depending upon the length of the vowel.

Morice gives us a full account of Athabascan skin-dressing and tanning. Each stage is described separately along with a discussion of its specific tools; because of this method of presentation, the author does not provide a connected narrative of the tanning process. Slickstones or stone scrapers are used to soften leather after tanning (Morice 1893: 49-51), and they are therefore, in the jargon of the modern tanyard, crutching tools that are made by splitting a pebble and dulling any sharp edges by battering. The stone tool is then hafted into the split end of a long, heavy stick, thus closely resembling the modern tanner's crutch. Among the Athabascans the handle is often discarded and the stone tip carried along when a camp is moved. The tool is called pe-altzeh, "thing for scraping" in Carrier, and tse-tqel, "stone-broad" in Beaver dialect.

Thus the tool which has been described as the tci-tho used by Alaskan natives is unrelated, historically or technologically, to the teshoa. Its terminology should be reformed to a better accordance with the rules of priority in nomenclature and to a better correspondence with the facts of Athabascan speech. It should be called a tse-tqel or a pe-altzeh, if native terminology is preferred; a crutching tool if a functional name is desired.

BOULDER CHIPS USED AS SLATE SAWS

Frederica de Laguna's large sample of boulder chips and related tools from Kachemak is a valuable technological series (de Laguna 1934: 60-62). Worn examples were interpreted as saws used to work slate; this conclusion has been substantiated by microscopic study of wear traces on the edges and faces of her specimens in the collections of the University Museum at the University of Pennsylvania.

Kachemak boulder chips were struck from beach cobbles of fine-grained, non-slatey rocks, primarily dolerite and greywacke. The beach cobbles were not weathered nor had they developed an indurated rind so that their surfaces are no harder or tougher than their interiors. Some show slight thickening of the edge by fine retouch and battering. All specimens which show wear have long parallel lengthwise scratches upon the edge and adjacent faces indicating that a sawing rather than a cutting, scraping, or planning motion was involved in their use (see Fig. 6, type 8).

FIGURE 6

Schematic drawing showing types of wear that appear on teshoa and similar tools. Each type of wear and use mark is numbered on the plate. The sketches of cross-section of edge and those of scratches across the worn edge are magnified about 20 times and the patterns are exaggerated. The schema of teshoa in use are less than half size. In each case, the arrow indicates the direction of tool use. From the forms of the teshoa, as well as from our general knowledge of North American Indian motor habits, it would appear that the tools were drawn toward the mechanic rather than pushed outward as craftsmen of European derivation tend to do. Each type of wear and of inferred use pattern is numbered on the drawing. Several types of use may be seen on a single tool, however. Type 1, the long axis of the tool has been perpendicular to a hard, unyielding surface, and striations accumulated during use are at right angles to the plane of the tool because they developed upon a flat wear facet. This type of wear would develop with the scraping of dried rawhide or the working of wood or bone. It is the most common wear type on Lenape teshoa; Type 2, the wear is the same as in Type 1, except that the facet of wear is at a slant to the axis to the tool, indicating that the tool was probably used to scrape rawhide, wood, or bone at a high angle. This is the most common wear type on recent archaeological teshoa from western Canada; Type 3, the tool has been used for paring or whittling, so that there is no worn facet upon the edge; nevertheless the edge is rounded with striae at right angles to the edge, and some of the scratches run a half-inch or more up onto the face of the tool; the cortex adjacent to the edge is diffusely worn. This wear type is uncommon but present in all samples from the Lenape and from the recent archaeological samples of western Canada. Primary use probably was in fleshing fresh hides; Type 4, this form of wear is somewhat like that of Type 1, except that the tool has been used against a soft, yielding surface, such as a freshly removed hide. This wear is infrequent but always present in samples from the Lenape and from recent archaeological samples from western Canada. Like Type 3, it is less apt to develop than other types of wear because the tool was used to clean fresh hides which had collected few grit particles; Type 5, this is like Type 2 except that the tool is held so that it is oblique to the work being done; resulting striae are not at right angles to the edge of the tool. Most specimens like that sketched show wear from right-handed use; a few have scratches which run from lower right to upper left, indicating a left-handed motor habit. Wear of Type 5 suggests that the tool was used for heavier work than that of Type 2. This wear pattern is especially obvious and frequent on ancient teshoa from western Canada; Type 6, this kind of teshoa has been used for slitting or cutting soft tissues; a few scratches are made on its flat surfaces by grit particles caught against its surface. This type of wear is not conspicuous because evidences of it are not readily developed; even so it has been noted in each sample, generally in combination with other types of wear; Type 7, the stone tip of a northern Athabascan leather-crutching tool (a so-called tci-tho). These are sometimes but rarely made upon cortex-flakes from boulders which resemble teshoa. The tool is blunt-edged and was deliberately dulled. When used, it is pushed and twisted against the tanned hide to soften and smooth the hide. Some

of the scant scratches present are across the edge, others are at various angles because of the rotational motions of the tool-edge; Type 8, a cortex flake used as a stone saw to slit shale or jade. Quartz particles within the tool serve as a sort of sand-paper to cut a groove into the work. Grit caught between the tool and the work put lengthwise scratches upon the tool and cut away the faces of the tool in a series of microscopic steps. The cuts upon the tool are perfectly parallel to one another. Few specimens show wear so advanced as that which has been drawn.

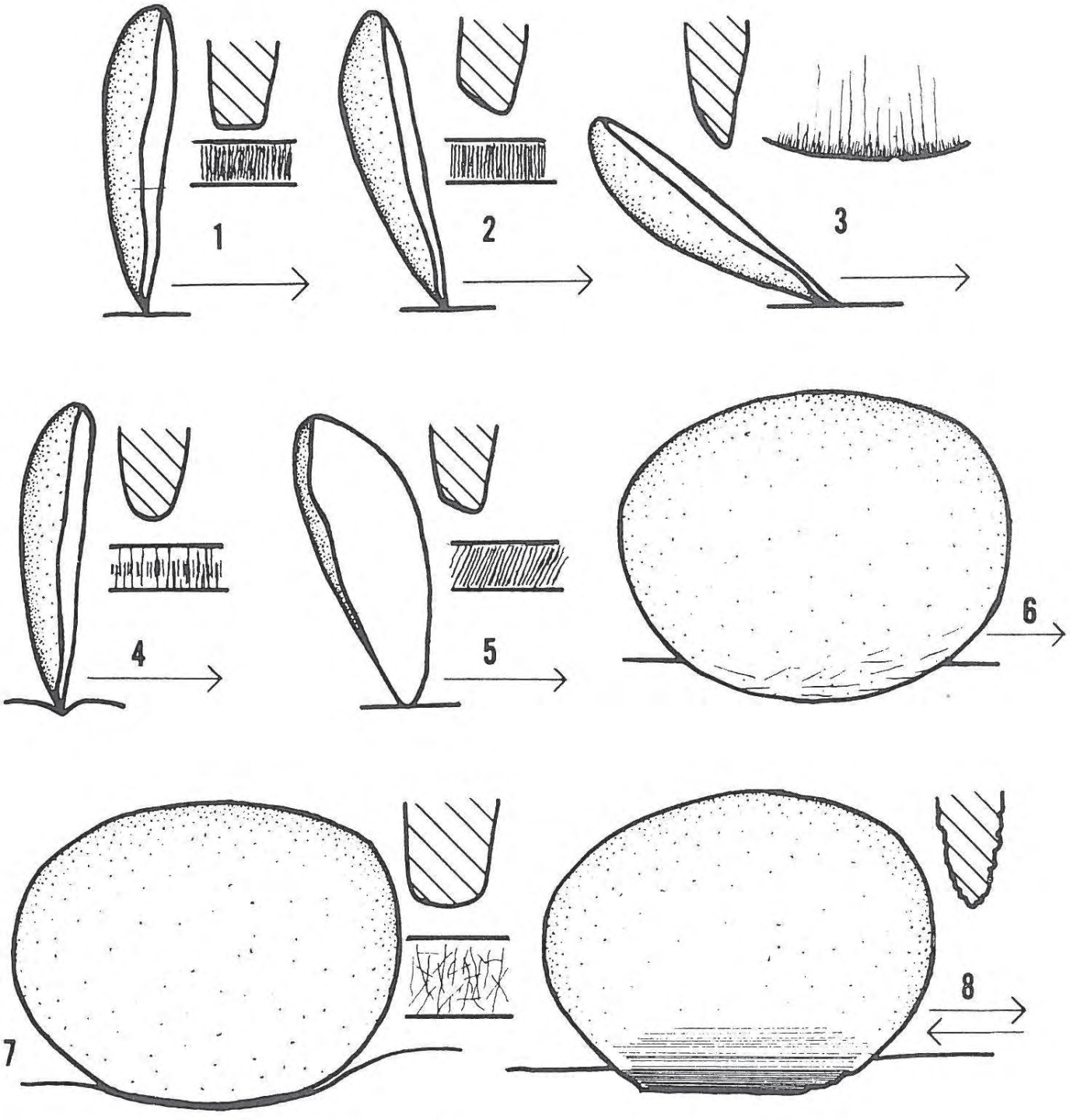


fig 6

Some of the split faces show wear with many fine scratches in random directions and arcs as though the face had been used as a grinding implement in honing slate tools to shape. The boulder chips intergrade with other types of stone saws once used in working slate at the same site. At one end of the series are unworn and apparently unused boulder chips. At the other extreme are thin slabs of hornblend schist with flat worn surfaces and much-abraded sawing edges. All of these are adapted in form and material to the precise sawing and grinding of stone into tools.

Large samples such as de Laguna's collection rarely have been preserved, yet they are essential for technological study with refined microscopy. Without this, we can scarcely penetrate beyond typology and begin to untangle questions about culture history. Too often critical samples have been discarded in the field, having been taken for mere broken rocks.

Alaskan boulder chips appear to include several distinct tools which pertain to different cultures and time intervals. They involve several distinct technologies and form parts of unrelated chapters in culture history. Further technological studies of Alaskan series are needed that pay particular attention to use-marks.

The distribution of different types of boulder chip tools cannot yet be mapped, partially because of large areal gaps in sampling. In some cases certain types have been recorded but their typology and wear-patterns have not been described. Fresh study of the actual specimens is necessary to distinguish between specimens that are teshoa, ulus, slate saws, leather-softening tools, and objects belonging to still other industries. Thus for many areas in North and South America we know only of the presence of cortex-flake tools struck from cobbles, but we are not able to interpret them.

TESHOA AND CHOPPERS IN ASIA

Only American samples are available for study within a vast scattering distribution of several types of chopper industries through both continents and at many different time levels. The absence of related cortex-flake tools from several parts of the Old World is surprising, since the simplicity and the efficiency of the teshoa would suggest its independent invention at many different times and places. Boulder chip tools have been reported from the late Neolithic of the Chukchi Peninsula where they may have been used as slate saws (Okladnikov and Nekrasov 1962: 549-50).

Boulder-chip tools which apparently conform to all the details of American teshoa and choppers are known from the middle and later parts of the Upper Paleolithic of Siberia, in the drainage system of the upper Yenisei River. These local Asian cultures, best known at Afontova Mountain, were divergent from the Upper Paleolithic of Europe, and were separated from them by a natural barrier, the great outwash plain of western Siberia. As compared to European industries of the same

stage, they show a weakly developed blade and core tradition, few burins, many tools based upon random flakes together with heavy choppers and other tool types which are reminiscent of the Middle Paleolithic of southern Asia.

Cortex-flakes struck from diorite cobbles are important at the Afontova Mountain Site. One published example has been subjected to good microscopic study concerning its wear-marks. It had been resharpened by chipping away the split face of the tool, in this way preserving the cortex at the edges. Its edges are worn to a rounded rather than faceted dullness and there are striae running across the edge (Fig. 6, Type 4). The use-marks are interpreted as evidence that this tool was used in skin-dressing, especially having to do with the cleaning of inner surfaces of fresh hides (Seminov 1964: 89, 91).

American interpretations of the archaeology of Siberia include some confusing and contradictory statements. I attempt to avoid these, and will base my discussion on those few articles which I believe represent the most competent American summaries of Russian data. These studies indicate that in this area the known stages of the Upper Paleolithic include crude blade industries with prismatic cores formed from flint pebbles as well as tools on free flakes that somewhat resemble Mousterian tools (Okladnikov 1961; Michael 1958: 34-36). The early industry here, such as that at Mal'lta, does not show true Mousterian features; it has many blades, and does not include choppers made on cobblestones. Later sites are characterized by tools in a pseudo-Mousterian style, discoidal cores, choppers made on cobbles and teshoa. Archaic features in both earlier and later sites have been exaggerated in contrasting them to the Upper Paleolithic of France which also includes many pseudo-Mousterian flint tools. The upper Paleolithic of Austria includes a larger proportion of pseudo-Mousterian tools that, like the others have largely been neglected in the literature (Prufer 1958-59). The Upper Paleolithic of Siberia may derive from a common base once shared with the Upper Paleolithic of other parts of the Eurasian steppe belt. If this is true, Europe and Siberia evolved in different directions from such a base. The teshoa was evolved as one element of the trend in Siberia, but it never came into existence in France.

Mal'lta has been considered the same age as Solutrean in the west, but the reasons for this equation are not convincing. An age of 20,000 years has been suggested on the basis of faunal evidence and seriation (Bushnell and McBurnery 1959: 100). The lithic industry suggests a very generalized early Upper Paleolithic with few specialized tool types. Carved ivory figurines of stylized women suggest the "Venus" carvings of the early Upper Paleolithic of France and Austria. The absence of choppers seems to be important. If choppers are in actual fact not present, this in itself would be a trait by contrast to other similar industries.

Afontova Mountain near Krasnoyarsk in the Yenisei Valley represents a culture stage widespread in the area from Ulan Batar to Blisk and in the Angara Valley east of Lake Baikal in the Ordos. Afontova produced eleven choppers and a

large number of boulder chip tools as well as heavy scrapers in ovoid, discoid, and wedge-like forms, largely made from cobblestones of quartzite and flinty shales. The three stratigraphic horizons at Afontova represent the middle or upper middle part of the Upper Paleolithic of Siberia. Later stages are much like Afontova, but with even more emphasis on massive tools fashioned from cobblestone.

The technological evolution seen in the Upper Paleolithic of Siberia is thus in an opposite direction to that known in the West (Europe). The Upper Paleolithic of Europe evolved in the direction of refined, specialized, tiny tools, culminating in the various microlithic assemblages of Mesolithic times. Siberian stone tool trends through the same time interval were in the direction of larger tools made from readily-available non-flint materials. Each can be seen as evolution toward a more efficient tool kit, but each proceeds in quite different directions even though they both appear to have been rooted in a very similar base of Aurignacian facies.

Some students have suggested that the regression from blade to boulder chip seen in the Siberian sequence is a result of the lack of good lithic materials in the East. This cannot be the explanation; Neolithic cultures in the same areas at a later time found flints which were perfectly adaptable to refined and delicate blade industries. Other students believed that the Upper Paleolithic of Siberia incorporated older lithic traditions within it and this being the case, absorbed the techniques of aboriginal Asiatic peoples that had survived from the Lower and Middle Paleolithic. This interpretation might be correct. Nevertheless, the fact that early sites such as Mal'lta and Buret' lack the chopper component indicate that this explanation actually is unlikely. The development of choppers and teshoa probably represents progressive evolution toward more and more efficient tools which were tightly adapted to specific uses.

Chopper industries of the Early and Middle Paleolithic stages in the Old World involve many problems of relationship; a concise recent summary includes a valuable guide to literature (Kretzoi and Vertes 1965: 84-87) having to do with such relationships.

Chopper industries characterize the lower Paleolithic of southeastern Asia, but their later persistance in southwestern Asia is poorly defined. The middle Paleolithic sites of Tishik-Tash and Amir-Temir in southeastern Uzbekistan include choppers and chopping tools with crude hand axes and (rarely) Levalloisian flake tools (Movius 1953: 400-02). That particular chopper complex is believed to represent the late survival of a lithic tradition which had elsewhere died out during late Acheulean times. To the south, choppers have been reported from Kili Ghul Mohammad in Baluchistan which is an early Neolithic site with mud-brick houses. Choppers found there were with crude flake tools and refined chert sickle edges made on blades (Fairservis 1956: 234-36).

Even more puzzling is a chopper industry within the Chalcolithic of Palestine where apparently it is found during only one stage in a single local culture. Palestine had, at this time, suffered invasion by a number of loosely-related but technologically-distinct peoples; these invasions caused breaks in the local culture continuity. One such group settled into a subterranean town at Tell Abu Matar, a site dated between 4,000 and 3,500 B.C. There is at this site evidence of intensive agriculture, little hunting and the earliest metal industry in Palestine. Choppers and crude flake tools made from local cobbles accompany cast copper ornaments and the debris and tools of the smelter and coppersmith. Like the Ghassulean and other chalcolithic cultures of similar age, the industries at Tell Abu Matar came in from outside of Palestine, and they seem to have had little continuity with local Bronze Age cultures which followed them (Kenyon 1960: 77-80, 304). The origin and the fate of this late chopper complex is unknown.

CONCLUSIONS

As I have studied series of choppers and associated tools, I have been particularly impressed by their great geographic spread, from Alaska to Terra del Fuego, from the Atlantic to the Pacific, with extensions of their range for unknown distances into Asia. Such a distribution suggests antiquity much as the great age of similar Old World tools suggests their fundamental nature. The problems of their culture history, however, resemble a closed book; none of the basic questions have been answered (Willey 1960: 74-76).

We have no real evidence to give us assurance that the chopper industries have a common root or are related to one another. It is possible that the principles involved have been independently invented at different times and in different places through the past. Nevertheless, they do not represent an inevitable human invention; their total absence in many regions, their over-whelming importance in others, these are significant cultural facts. Several interpretations of their history have been offered, but no evidence is available to demonstrate that any of the proffered theses has much validity. My primary objective here has been to indicate and stress the importance of industries of this style in certain places at certain times and to outline the major problems that they present so that we may work toward a fuller knowledge concerning critical questions.

Wherever we study a chopper complex, we are struck by the presence of a spectrum of similar types, and by ancient recognition of fundamental mechanical principles necessary in forming effective tools from non-flinty rocks. When we look more closely, differences in emphasis within each complex become obvious; one industry stresses the simple teshoa; another culture emphasizes cobble-choppers; a third goes in for Clactonian flake tools made on cobble-cores; still another preferred core-choppers shaped from blocks of bedrock. None of the complexes