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THE FUNCTIONS OF PALEOLITHIC FLINT TOOLS

Almost the only evidence of man's presence on the earth for a period of more than half a million years is vast numbers of stone tools. Some are made of basalt, some of quartzite or quartz and some of the volcanic glass obsidian. In many places the majority are made of flint. As soon as these objects were recognized as man's handiwork they were assigned names based on guesses about their probable function. The French began the process with coup-de-poing, which in English became "hand axe". A multitude of other functional names followed: "end scraper", "side scraper", "blade", "point", "burin" and the like. Although generations of prehistorians have used such names, there has been scarcely any tangible evidence on what purposes the stone tools actually served.

Over the past 15 years students of early man have grown sufficiently dissatisfied with this state of affairs to do something about it. The result has been the development of a methodology known as microwear analysis, which reveals the functions of many early flint implements. The evidence is almost indelibly recorded in the form of microscopic traces of wear on the working edges of the flint.

Early in the 1960's a new school of prehistorians began to offer fresh hypotheses to explain the variations between and within regional assemblages of tools.

In this view the variations were attributuble less to chronological and cultural differences and more to differences in function.

A vital prerequisite to the testing of the functional hypotheses was a detailed knowledge of what the artifacts were used for and how. In 1964 Prehistoric Technology, a summary of the studies of tool function conducted by the Russian prehsitorian S. A. Semenov, was published in an English translation. Semenov and his colleagues at the Leningrad Academy of Sciences had established the fact that tools of even the hardest stone retained actual traces of their use in the form of polishes, striations and other alterations of the tools' working edges. More often than not the traces of wear were visible only at quite high magnifications. It seemed to scholars in Britain and America that at last the means were in hand for pursuing just the kind of information about tool function that the new hypotheses required.

I first undertook research in microwear in 1972 after a review of the literature in the field and some preliminary studies. These preliminaries convinced me that I should employ a wider range of microscope magnifications and techniques than others had. I began with a program of experiments designed to provide a framework for analysis of the functions served by particular sets of flint implements from English sites of the Lower Paleolithic: 500,000 to 100,000 years ago.

After making replicas of Paleolithic stone implements I conducted a series of nearly 200 tests, processing a variety of foodstuffs and other materials in many different ways. I also subjected certain implements to the kinds of natural wear that are likely either to make microscopic scars similar to those made by human use or to erase such scars. Along this same line I was able, thanks to the availability of large numbers of Paleolithic implements that had been subjected to wear by soil movements, chemical weathering and abrasion by waterborne and windborne sediments, to compare this natural kind of wear with my experimental results.

The key finding that emerged from these tests was that microwear polishes on the working edges of modern replicas become visible at magnifications between 100 and 400 diameters under illumination striking the sample at an angle of 90 degrees to the optical axis of the microscope. The different kinds of polish can readily be distinguished from one another. Whether the activity was cutting or whittling wood, cutting bone, cutting meat or scraping skins, I found that each produced a characteristic kind of work polish.

The work polishes proved to be durable; they could not be removed from my replica implements even with chemical cleaning.

I concluded that the work polishes represent real and permanent alterations in the microtopography of the flint. Accordingly similar polishes seemed likely to have survived unaltered on flint artifacts of great age. This being the case, it should be possible to infer from the traces of microwear observable on a Paleolithic tool just what use that particular tool had served.

The distinctive microwear polishes can be described as follows.

Wood polish: The tool edge shows a polish that is consistent in appearance regardless of whether the wood being worked is hard, soft, fresh or seasoned. The polish is also the same regardless of the manner of tool use. It is very "bright". Thus if the original topography of the flint is coarse, the polish in its initial stages will be distributed in a net-like pattern. If the flint is line-grained, the polish is soon evenly spread. Regardless of the distribution, the polish has a constant bright, smooth character.

Bone polish: The tool edge is bright, but the polish has a rough, uneven texture that lacks the smoothness characteristic of wood polish. One distinctive feature of the rough texture of bone polish is the presence of numerous pits on the otherwise bright surface. Bone polish develops more slowly than wood polish. My experiments revealed no consistent differences between the polishes on tools used to work cooked bone and those on tools for working uncooked bone, or between the polishes on tools used to work bone belonging to different species of animals.

Hide polishes: Here the tool edges do not develop a single distinctive kind of polish. The hide polishes differ depending on the material being worked. They range from a relatively bright polish with a greasy appearance (produced by working fresh wet hide) to a dull matte polish (produced by working dry hide or leather). The differences are attributable to variations in the quantity of lubricants present in the animal skin at different stages. A fresh hide gradually creates a polish not unlike that created by the cutting of meat. As the hide becomes progressively drier it contains progressively less lubricant, and the tool polish not only develops faster but also is duller and less greasy in appearance. If the hide is fully dried or tanned, the polish is quite dull and shows an extreme matte texture. Regardless of these differences in polish all hide-working tools show two characteristic kinds of microwear. One is relatively severe attrition of the working edge of the implement, that is, removal of flint by means other than breakage or scratching. This attrition gives the stone implement a markedly rounded edge.

Meat polish: The tool edge that is used to slice meat and other soft animal tissue develops a microwear polish rather like the polish produced by working fresh hide. This polish is easily distinguished, however, from the polishes created by the working of dry hide, bone, antler, wood and nonwoody plant materials. Pronouncedly greasy, it is at the same time dull rather than bright. Thus with respect to brightness the contrast between meat polish and an unaltered flint surface is slight.

Antler polishes: The edges of tools used to work antler exhibit one or another of two distinctive polishes. The difference depends on how the tool was used. Scraping, planing or graving antler leaves a very bright and smooth polish. Sawing antler, however, leaves a polish like bone polish: it is bright but pitted. My experiments with antler were conducted almost entirely with samples that had been soaked for a day or two in water. Dry antler is so hard that stone tools used to work it are dulled by edge damage before anything has been accomplished.

Nonwoody plant polishes: The edges of tools used to cut nonwoody plant stems, such as grasses or bracken, acquire a "corn gloss". The characteristic feature is a very smooth, highly reflective surface with a "fluid" appearance. If any striations are present, they often appear to be "filled in". At the same time the polished surfaces of the working edge develop curious comet-shaped pits. As the term implies, corn gloss is most commonly found on the flint sickles used by Neolithic farmers to harvest domesticated species of the grass family.

Having established six broad categories of polishes, I was prepared to apply my experimental results to selected Paleolithic artifacts. A skeptical colleague suggested, however, that I first submit my analytical technique to a blind test. The colleague, Mark H. Newcomer of the University of London, had strong doubts about the validity of microwear analysis. We agreed that he would make several replicas of flint tools and then work on various materials with them. After recording what he had dome with the tools and then cleaning them, he would send them to me for analysis. Thereafter we would meet and compare my inferences with his records of the actual uses. Newcomer made 15 replicas of ancient flint tools and did various kinds of work with a total of 16 tool edges.

The results of the blind test were instructive. To be sure, the number of implements was small. Nevertheless, I identified the working portions of the tool edge in 14 of the 16. For 12 of the edges I was able to reconstruct the mode of tool use and for 10 of them to infer the kind of material worked.

Some of the inferences were remarkably close to the mark. For example, Newcomer had skinned a hare with a double-edged tool, using one of the edges for the actual skinning and the opposite edge to sever those parts of the limbs that remained with the skin during hide preparation. I identified the wear on the skinning edge as meat-cutting polish. (I had no way of knowing that in this instance the meat was less than a millimeter below the skin.)

With another implement Newcomer had cut fresh meat resting on a wood cutting board. I was able to distinguish between the microwear caused by the cutting of the meat and the incidental wear caused by the contact between the flint and the cutting board.

Even some of my misinterpretations were not unreasonable. For example, Newcomer had used the edge of one flint tool to cut frozen meat, which leaves few traces of wear. He had cut the meat on a wood board, however, and contact with the board did leave discernible traces. I interpreted the resulting microwear as characteristic of an implement used very delicately on wood. Since Newcomer's tests were the first check on the validity of high-resolution microwear analysis, I found the results quite encouraging.

(Extract from Scientific American, January 1977)

CHAPTER NEWS

Birmingham Chapter: The Chapter meets the first Thursday of each month at the Red Mountain Museum, 1425 22nd Street South. Call Tom Hutto for further information at 956-1895.

Huntsville Chapter: The speaker at the August meeting of the Huntsville Chapter was Mr. Lawrence Alexander, who gave an interesting program on the "Significance of Recent Discoveries of Ancient Man in North Alabama". The Huntsville Chapter meets the third Tuesday of each month at the Arts Council Conference Room, located at the north end of the Von Braun Civic Center, at 7:00 p.m.

Montgomery Chapter: The Montgomery Chapter was pleased to have folklorist Hank Willett give a program at the July meeting and Gwen Berry of the Alabama Historical Commission speak in August. The September 5 meeting will be an especially important one. All members and interested guests are urged to attend as details will be worked out for the Chapter's hosting of this year's State Society's Winter Meeting. The Chapter meeting will be Tuesday, September 5, at 7:30 p.m. in the Conference Room, 3rd Floor, Liberal Arts Bldg., A.U.M. Please attend!

MEETING

The Archaeological Society of Virginia will hold its annual meeting in Alexandria during October 20, 21 and 22. For more information, contact Mr. Howard McCord; 102 Windmere Drive; Colonial Heights, Virginia 23834.

ALABAMA HISTORICAL COMMISSION AWARD

The 11th Annual Preservation Conference of the Alabama Historical Commission was held in Selma August 11 and 12. Our congratulations to STONES & BONES Editor A. J. Wright, who was presented with a Distinguished Service Award by the Commission at the Awards Banquet on the 12th.

DEEP SOUTH GIRL SCOUT COUNCIL ACTIVITIES

A summer archaeological "dig" has been under way for the past two weeks near Dog River in Mobile County. The project is a joint undertaking sponsored by the Deep South Girl Scout Council and the University of South Alabama. Mrs. Judy Callen, Satsuma, is the director of the Girl Scout camp, with Mrs. Bette Kay Nell, Satsuma, serving as her assistant. Oscar Brock and Steve Lau of the University of South Alabama are the Site Supervisors; Professor Reed Stowe of the Anthropology Department is the program consultant.

Sixteen Girl Scouts from six southeastern states, including three Mobile County girls, and two Girl Guides from Worms, Germany, are participating in the "dig". Each has been selected in her own council as being qualified and prepared to live in the primitive camp site.

During their two-week encampment the girls have been learning the basics of archaeology on a site of real historical value. The girls have dug, cleaned and learned to identify and catalogue artifacts.

This is the 22nd year for the Girl Scout "Archy Program". Previous sites have been on Dauphin Island, Bayou LaBatre, and Blakely in Baldwin County.

Girl Scouts and Girl Guides attending the Mobile County "dig" are: Lee Bolding, Bladensburg, Maryland; Sandy Crowe, New Carrollton, Maryland; Shelly Carnes, Biloxi, Mississippi; Lori Jean Fitzpatrick, and Denice Ann McLeod, Broksville, Florida; Kathleen Fogarty, Dunwoody, Georgia; Deborah Lee Hurt, Harlem, Georgia; Barbara Lynn, Athens, Alabama; Nancy Hurford, Huntsville, Alabama; Kelly Williamson, Columbus AFB, Mississippi; Nancy Melton, Columbia, South Carolina; Dana Williamson, Mobile, Alabama; Melissa Callen and Kerry Nell of Satsuma, Alabama; Ina Meyer and Karin Muller, Worms, Germany.

Marsha Groves, Public Relations
Deep South Girl Scout Council
Mobile, Alabama

THE TOMATO

The tomato (a fruit that is almost universally treated as a vegetable and a perennial plant that is almost universally cultivated as an annual) is the focus of a large agricultural industry. Among vegetables grown for human consumption in the U. S. in 1977 the commercial production of tomatoes took up 491,080 acres (second only to sweet corn), yielded 8,755,950 short tons of produce (second to none) and had a value of $914.1 million (second to none).

As recently as 1900 it was widely avoided in the belief that it was poisonous because of its known relation to nightshades and other toxic members of the nightshade family (Solanaceae). Even by 1920 the per capita consumption of tomatoes in the U. S. was only 8.2 kilograms per year; now it is 25.5 kilograms.

As with cultivated plants generally, the origins and the early events of domestication are largely obscure. One can be reasonably certain about three aspects. First, the cultivated tomato originated in the New World, since all related wild species of tomato are native to the Andean region now encompassed by parts of Chile, Colombia, Ecuador, Bolivia and Peru. Second, the tomato had reached a fairly advanced stage of domestication before being taken to Europe. Woodcuts in the early herbals reveal that the first types cultivated in Europe bore large fruit. (In all wild species the fruit is small.) According to the descriptions, a good many sizes, shapes and colors were known. Third, the most likely ancestor, the wild cherry tomato, is spontaneous throughout tropical and subtropical America and has spread throughout the Tropics of the Old World.

The time, place and other aspects of domestication are far less certain. Although definite proof is lacking, the weight of data from several disciplines favors Mexico as the probable region of domestication.

Representations of the tomato have not been found in ancient pottery and other artifacts of the Andean region, and parts of the tomato plant have not been encountered in the archaeological remains of the region, whereas parts of most of the native cultivated plants have been. The tomato has no native name in the Andean region, whereas it is known in the Nahua tongue of Mexico as tomatl, which is unquestionably the origin of the modern name.

The early chronicles of the New World are disappointingly sparse in their references to tomatoes. The Peruvian chronicler Guaman Poma mentions the sporadic eating of wild tomato fruit in the Inca empire but does not mention large-fruited types. A good deal of confusion over the region of domestication has arisen from the name mala peruviana, which was applied to the tomato after its introduction into Italy. Although the name apparently had no factual basis, it badly misled plant geographers.

The first record of tomatoes in the Old World is credited to the descriptions published in 1554 by the Italian herbalist Pier Andrea Mattioli. The earliness of this date in itself supports a Mexican origin, considering the taking of Mexico City in 1519, the completion of the Peruvian conquest by 1531 and the time probably necessary for the introduction, cultivation and appreciation of the crop in Europe.

The references to the eating of tomatoes are quite rare. In most places the plant and its fruit were remarkably slow to gain acceptance except as an ornamental, a medicinal or a curiosity. People already knew it was related to poisonous members of the nightshade family, such as belladonna and mandrake. A typical statement was made in 1581 by the herbalist Matthias de L'Obel: "These apples were eaten by some Italians like melons, but the strong stinking smell gives one sufficient notice how unhealthful and evil they are to eat."

Such unfounded superstitions persisted widely even into the 20th century in many areas, including North America, to which the plant had been taken by colonists. The first mention of it there was made in 1710 by William Salmon in his Botanologia, the English Herbal, or History of Plants. The next surviving printed reference was by Thomas Jefferson.

(By Charles Rick, extracted from Scientific American, August 1978)

PUBLICATIONS AVAILABLE

"Moundville, an Introduction to the Archaeology of a Mississippian Chiefdom", by Dr. John A. Walthall. Forty-seven pages, 37 illustrations, $2.75 from Alabama Museum of Natural History; P. O. Box 5897; University, Alabama 35486.

EOS, bimonthly newsletter of the Alabama Museum of Natural History - for those interested in natural history and archaeology. For subscription information write to the Museum at the above address.

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