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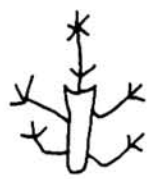

A Case of Heat Treatment of Lithic Materials in Aboriginal Northwestern California

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Excavations in 1964 at Point St. George, California, brought to light a two-phase stratigraphic and cultural sequence in which stone chipping was shown to have been a major activity at all times during the prehistoric occupation there (Gould 1966, 1972). Although black obsidian of non-local origin was present in both phases at the site, the predominant raw materials throughout the sequence were red and green jaspers and varied agates obtained locally from cobbles and deposits on the nearby beaches. Artifacts made from local, beach-collected agates and jaspers have also been found in surface collections from coastal sites extending from the mouth of the Klamath River, California, to Gold Beach, Oregon. In 1972, I revisited the Point St. George Site (DNo-11) and other nearby sites, accompanied by Mr. Don E. Crabtree, in order to examine several anomalous characteristics of northwest coastal California lithic technology that were not fully reported following the work in 1964. These anomalies were:

(1) In both phases I and II at Point St. George, one finds numerous discoidal cortex flakes of jasper and agate. These always lack retouch, and they also lack bulbs of percussion. These items occur on surface sites and in stratigraphically confirmed associations with hearths, butchered bones, finished artifacts, and other cultural debris, and recovered examples range in size from 2.1 cm. to 8.89 cm. in diameter. These are, in fact, "pot lid" flakes arising from heating of the stone. Many of these pieces, when tested by chipping off a portion, show definite signs of heat alteration. Following Crabtree and Butler's (1964) and Purdy's (1975) discovery and descriptions of heat treatment under controlled conditions, we are now able to recognize these items as by-products of some kind of heating applied to the stone. Crabtree has confirmed this interpretation through his on-site inspection of these items. They conform to his definition of a pot lid:

> A plano-convex flake leaving a concave scar. Pot lids are the result of differential expansion and contraction of isotropic material but are minus the compression rings of force lines usually associated with these conditions [Crabtree 1972:84].

(2) In addition to well-formed cores and flakes, Point St. George and other coastal sites of northwestern California contain large amounts of crazed and shattered agate and jasper. The breakage characteristics of these pieces are comparable to those of experimental samples subjected to rapid elevation of temperature by Purdy (1975:Plate 2a).

(3) Many of the finished arrowheads, harpoon tips, and other archaeological implements from this area show diagnostic signs of

heat alteration. This is not surprising, considering the widespread use of pressure-flaking in shaping many of these implements and the fact that heat treatment is most useful in rendering relatively tough varieties of stone, like agate and jasper, susceptible to pressure-flaking (Crabtree and Butler 1964:1).

Thus, it is abundantly clear that heat treatment of some kind was part of the pressure-flaked stone technology in aboriginal northwestern California, particularly along the coast. Yet, rather than consider this fact alone, it may be useful to hypothesize a sequence of events in the prehistoric lithic technology at Point St. George based on archaeological associations and behavioral experiments in stone toolmaking.

Most pieces of usable beach agate and jasper appear in the form of water-worn cobbles that usually lack angular surfaces which might serve initially as striking platforms. Hard, rounded cobbles of this sort are difficult to break open by direct percussion with a hammerstone. As I have learned from repeated efforts of this kind, it is almost impossible to obtain a striking platform by knocking off an end or side of such a cobble. Yet a flat platform is required for orderly flake removal. Aside from the occasional fortuitous break or naturally angular piece of stone, reduction of unaltered cobbles of agate or jasper by direct percussion would have been inefficient.

The possibility thus exists that cobbles of agate and jasper were collected by Indians from the beaches and placed in fires, perhaps solely for the purpose of lithic reduction or perhaps in connection with stone boiling of water and acorn gruel (attested to by large amounts of associated fire-cracked rock of coarser variety). No careful effort was made by the Indians to control the rate at which the agate and jasper cobbles were heated and cooled, so many cobbles shattered into useless fragments. But in cases where a pot lid flake came off, the piece was plucked from the hearth, allowed to cool, and used as a core. The negative bulb scar of the pot lid flake would have provided the angular facet needed for a striking platform, thus rendering the cobble usable as a source of flakes. The pot lid flake itself was abandoned unused wherever it fell. Both the cobble and the pot lid flake would have been heat-altered during this process, as would any flakes and artifacts derived from the cobble-core.

This hypothetical lithic reduction sequence could economically explain the technological anomalies referred to earlier. It should be tested by means of by-product experiments using heat and the appropriate raw materials, and I present it here in the hope that such experiments will be tried. Such a trial-and-error approach to heat treatment would have been feasible along the beaches of northwestern California, where cobbles of agate and jasper abound. If validated, this method of lithic reduction may also be found in other coastal and riverine regions in places where tough isotropic stones were being subjected to natural rounding by water movement.

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