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### *A Further Note on Lithic Heat-treating in Northwestern California*

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In a recent paper in this journal, Gould (1976) presented some very useful information on the archaeological evidence for the thermal alteration of stone by prehistoric flint-knappers in northwestern California. I have previously reviewed the ethnographic evidence of this technological practice in North America and other areas (cf. Hester 1972, 1973; Sollberger and Hester 1972) and Collins (1973) has presented archaeological and ethnographical data from the Old World.

There are two areas of Gould's paper which I believe call for further comment. I find to be of most interest Gould's statement on p. 143:

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. . . . 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. . . .

With this, and following statements, Gould sets forth a "hypothetical lithic reduction sequence" for the Point St. George site.

I believe that his "hypothetical sequence" is partly supported by ethnographic information available for the general north and northwestern California region. For example, there

is the well-known account recorded among the Yurok by Schumacher (1877), as reported by Squier (1953) and Hester (1972:63):

A piece of one of the . . . stones, which breaks sharp cornered, and with a conchoidal fracture, is heated in the fire, and then rapidly cooled, after which it is struck on the break-edge, by which means it is split into flakes. To such a flake, a suitable rough shape is given by striking it with a tool.

Although Schumacher's observation is not as specific as we might wish, it appears that the Yurok heated and then rapidly cooled chip-pable stone so that the material could be broken into flakes. This process could easily result in the production of numerous pieces of shatter, of the kind described by Gould (1976:143).

Another example is found among the neighboring Wiyot, as recorded by Stephen Powers (see Squier 1953:18):

The Viard proceed in the following manner: Taking a piece of jasper, chert, obsidian, or common flint, which breaks sharp cornered and with a conchoidal fracture, they heat it in the fire and then cool it slowly, which splits it into flakes. The arrow-maker then takes a flake and gives it an approximate rough shape by striking it with a kind of hammer.

Here we have an account which would more closely fit Gould's hypothesized sequence: the heating and subsequent slow cooling of siliceous cobbles, resulting in the splitting or shattering of the cobble. It is interesting to note that Powers uses a fairly technical phrase—"which breaks sharp cornered and with a conchoidal fracture"—identical to that used

by Schumacher in describing Yurok heat-treating. Schumacher's original version of this practice was published in 1874, and Powers, in his account published three years later, may have seen Schumacher's description and applied some of his terminology to the thermal alteration process as practiced by the Wiyot.

In north-central California, the Nomlaki obtained flint cobbles from local stream-beds and fractured them "by means of slow, even heating. . ." into more workable smaller fragments (Goldschmidt 1951:419; see also Hester 1972:63). Voegelin (1938:28) reports a similar lithic reduction sequence among the Tübatulabal of east-central California.

These and other California accounts, as well as records from Oregon, the Great Basin, and other parts of North America, clearly reflect the heat-treating technique as a primary phase in certain lithic technologies. Obsidian was also subjected to thermal alteration by some California groups (cf. Hester 1972:63). The brief accounts noted here from northwestern California would seem to support Gould's hypothesis: jasper, flint (chert), and other siliceous stones were thermally altered in a process in which the application of heat (and the subsequent cooling) was not carefully controlled. These brief ethnographic accounts suggest that the cobbles split or shattered, and that flakes were then selected for knapping purposes. Gould (1976:143) suggested that cobbles would shatter into "useless fragments"; this may be partially true, but the Wiyot account suggests that flakes were *selected* from the shattered material for further reduction.

I am dubious that cobbles with "pot-lids" were selected for use as cores (Gould suggests that the "pot-lid" fracture served to create a striking platform). In lithic assemblages that I have studied, particularly in Texas and north-eastern Mexico, "pot-lid" flakes usually result from an intense application of heat and both the "pot-lid" and the specimen from which it derives, are thoroughly fire-crazed and unsuitable for knapping. In the lithic industries of

southern Texas, where heat-treating was utilized in the knapping of coarse-grained chert cobbles, "pot-lids" and cobbles which have produced "pot-lids" have been too greatly damaged by excessive heating to be of use in lithic reduction (cf. Hester and Collins 1974). Perhaps, as Gould suggests, replicative experimentation can resolve this problem as it concerns the northwestern sector of California.

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## *Comment on Anderson's Review of Nava and Berger*

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In his review of *California: Five Centuries of Cultural Contrast* by Julian Nava and Bob Berger (*Journal of California Anthropology*, Winter, 1976, pp. 100-103), E.N. Anderson makes some relevant points concerning their "whitewashing" of the Spanish missionaries' treatment of the Indians. The reasons for this whitewash perhaps do not need to be expressed. While I generally agree with and like the tone of the review, in his correction of Nava's and Berger's gross errors concerning mission history Dr. Anderson has introduced another set of errors concerning mission history that require comment. He notes:

At a more remote level, why did the Colonial government give California to the harsh Franciscans rather than the more tolerant Dominicans and Jesuits, who had more success in keeping their charges alive? The Dominicans had been put out of (Lower) California, and the Jesuits out of all missionary activity, to a great extent

because they were too successful at protecting their charges from Spanish land-grabbers.

The following points may be considered:

1. The suppression of the Jesuit Order, first in the Portuguese Empire, then in the Spanish Empire, and a few years later completely, was a big event no doubt with complex causes. After 1740 the Jesuits were no longer fully controlling Baja California and excluding outsiders. The cause of the suppression is better sought in the efforts of Carlos III to establish secular authority in his realm. In any event, the Order was suppressed by 1769 and not available to missionize California.

2. The Jesuit record in Baja California shows greater efficiency than that of the Franciscans farther north. They accomplished their work with half the number of missionaries and far fewer soldiers in a harsher environment. Their record of protecting the Indians of the peninsula, however, is hardly better. In the 70 years up to the time of their expulsion (1767) the population of the Cape region had been exterminated and the Indian population of the rest of the missionized area reduced to one-fourth of its original number (actually to one-eighth except for the new northern missions founded after 1751). In the unpublished Venegas<sup>1</sup> there is an extended discussion explaining how the death of Indians shortly after their baptism was one of God's blessings since they could go directly to heaven in the full fervor of their faith and before they had a chance to backslide.

3. The Dominicans were not put out of Lower California but remained there as long as the Franciscans did in Upper California, that is until all missions were secularized by Mexican Law.

4. My reading of the record suggests that the Dominicans were considerably harsher toward their Indian charges than the Franciscans. Their free use of the whip was remembered by descendants of Frontier Indians into the 1920's.<sup>2</sup> The Dominican president