application form. A non-refundable fee of $50 in the form of a check or money order payable to the Academy of Certified Archivists must accompany the application. The application is reviewed by the certification regent and two board members to evaluate the applicant's education and experience to determine if the individual is qualified to take the exam. Unsuccessful applicants will be told why they do not qualify. Decisions may be appealed.

Where and when is the examination offered?

The examination is offered on August 30, 1995, in the following cities: Washington, DC; Columbus, Ohio; Arlington, Texas; and Denver, Colorado. Requests for application forms must be received by the ACA secretariat at least three weeks prior to the application deadline.

What happens after the examination?

Archivists who pass the test and have demonstrated the necessary education and experience must pay a certification fee ($150) within 30 days. Annual dues of $50 per year begin upon July 1, of the following year. Successful candidates may put the initials A.C.A. after their name and may join in the activities of the Academy.

Diane Vogt-O'Connor is the Senior Archivist, Curatorial Services Division, National Park Service, Washington, DC.

Kenneth P. Cannon

Blood Residue Analyses of Ancient Stone Tools Reveal Clues to Prehistoric Subsistence Patterns In Yellowstone

Since 1989, archeological fieldwork has been conducted along the shore of Yellowstone Lake by the National Park Service's Midwest Archeological Center in response to a number of construction projects, the largest being the reconstruction of the park's road system, and the rehabilitation of the Fishing Bridge developed area. Research has focused on a number of issues concerning prehistoric settlement and subsistence patterns and the reconstruction of paleoenvironmental conditions, both climatic and geomorphic (Cannon et al. 1992). Funding for these various projects has been provided by the Federal Highway Works Administration and the National Park Service.

How to obtain this information from buried contexts that are notorious for poorly preserving organic materials was a challenge. Typically, if preservation is good subsistence patterns can be reconstructed from direct evidence, such as the discarded remains of food items (e.g., processed animal bone). Poor organic preservation has plagued our work and we have had to resort to other methodologies to obtain this information (Cannon and Newman 1994). Fortunately, recent studies have demonstrated that biochemical and immunological methods have the potential to identify species of origin of animal residues on stone tools (Hyland et al. 1990; Kooyman et al. 1992; Newman 1990) and in soils (Newman et al. 1993), which has direct implications for reconstruction of prehistoric subsistence patterns, tool use, and paleoenvironmental studies.

The technique used is a modified version of cross-over immunoelectrophoresis (CIEP) analysis, used by the Royal Canadian Mounted Police Serology Laboratory (Ottawa) and the Centre of Forensic Sciences (Toronto) for identification of residues in criminal investigations (Culliford 1963; Gaensslen 1983; Royal Canadian Mounted Police 1983), and applied to archeological specimens by Dr. Margaret Newman of the University of Calgary. A full discussion of the techniques is presented in Newman and Julig (1989).

The artifacts were selected from subsurface deposits from sites in the Arnica Creek area of West Thumb on the western side of Yellowstone Lake and the Fishing Bridge peninsula on the northshore of the lake (figure 1). After discovery, each artifact was placed in a ziplock plastic bag

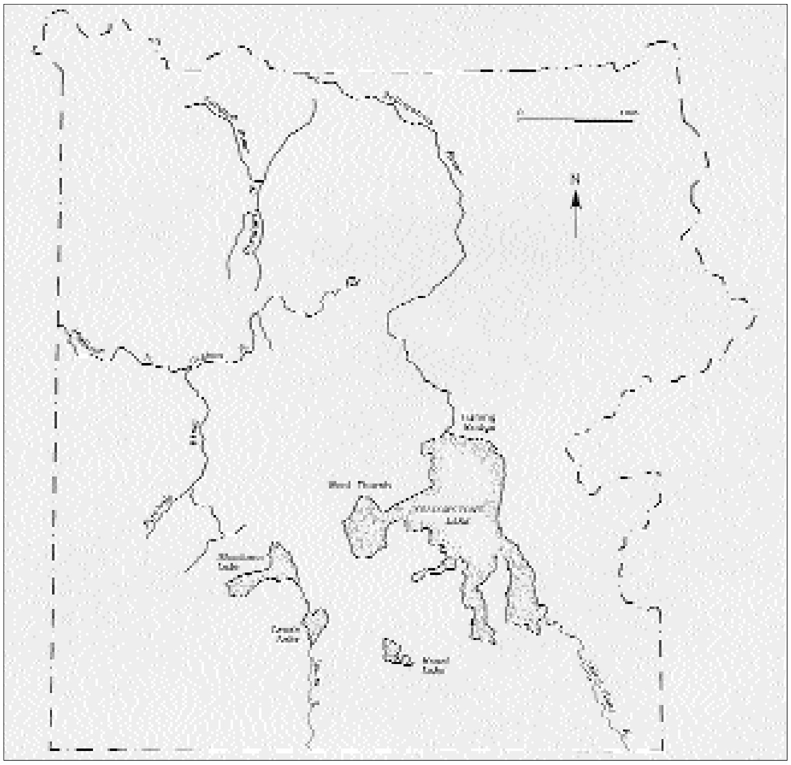

Figure 1. Map of Yellowstone National Park illustrating location of Fishing Bridge and West Thumb areas discussed in text.

and was not washed. Lakeshore landforms which contain the archeological deposits consist generally of constructional landforms of Pleistocene deltaic sediments, storm bars of Holocene-aged open-worked gravels, and Holocene eolian sands. A complex geomorphic history is apparent due to dynamics of the resurgent dome of the Yellowstone caldera, which has caused uplift and subsidence along the north shore of the lake on the order of tens of meters, significantly influencing landforms (Pierce et al. 1993), and human settlement (Pierce et al. 1994). Sediments tend to be acidic limiting the potential for organic preservation. Bioturbation, such as tree-throw and rodent burrowing, exacerbate the problem through destruction of stratification and site integrity, as well as the physical destruction of bone and other organic materials.

To date, 36 stone tool artifacts have been submitted to Dr. Newman for analysis. Positive results on 10 of the artifacts (28%) are very compelling. The assemblage includes projectile points, drills, utilized flakes, scrapers, and a sandstone metate (figure 2). The earliest projectile point is attributed to the Cody Complex, a northwest plains archeological tradition, which dates to 9,000 radiocarbon years ago, and is generally referred to as an economy focused on bison procurement (Wheat 1972; Frison and Todd 1987).

Species identified by residue analysis include deer, elk, rabbit, canid, and bear. Diversity of faunal species, in contrast to the bison-dominated Plains economy, appears to be a hallmark of prehistoric mountain economies (Husted 1969; Frison 1991, 1992). A rather unexpected result was the presence of elk blood on the sandstone metate. Traditionally, metates found on intermountain archeological sites have been interpreted as representing evidence of plant processing. While these results do not preclude the processing of plant resources, it does provide an additional dimension to how these tools functioned in the hunter-gatherer economic system.

These results are consistent with other studies using the same technique of CIEP: Hidden Cave in Nevada had 25% of 356 artifacts; 29% of 31 artifacts from Head-Smashed-In Buffalo Jump, Alberta; 25% of 36 artifacts from the Cumins site in western Ontario; and 42% of 12 grinding implements from two sites in southern California (Newman 1990; Newman and Julig 1989; Yohe et al. 1991). The range of site types and environments represented in this sample suggest one-quarter to one-third recovery rate can be expected.

Retouched artifacts, instead of sheer edges of flakes, seem to have better chances of preservation (Cattaneo et al. 1993). And while some researchers have suggested clay matrices may provide the best opportunity for preservation due to electrostatic interactions, experimental work indicates sandy soils may be a better matrix for preservation (Cattaneo et al. 1993). The results in Yellowstone suggest well-drained sandy soils, while poor matrices for faunal preservation, appear to be well suited for blood residue preservation.

Material types also influence preservation of residues. The Yellowstone assemblage includes obsidian, basalt, chert/chalcedony, quartzite, and sandstone. Obsidian at 11% (2/18) has produced the poorest results, although no quartzite artifact has produced positive reactions, but this may be a sampling issue since only two artifacts were submitted. With the exception of basalt (n=2) and sandstone (n=1) at 100%, chert/chalcedony at 38% (5/13) have been the most consistent material types. The capillary action which embeds the residue in the stone tool may be more effective on coarse-grained materials (e.g., cherts vs. obsidian), although amount of usage may also be a factor. A larger sample size and additional experimentation are necessary before these trends can be more adequately explained.

While immunological studies should be viewed with some skepticism, the results of these analyses by Dr. Newman, as well as those by other researchers, are providing more reliability in the techniques and the results. This data used in conjunction with use-wear studies of stone tools, and more traditional evidence (e.g., faunal remains), are exciting examples of how archeology is continuing to integrate and develop multi-

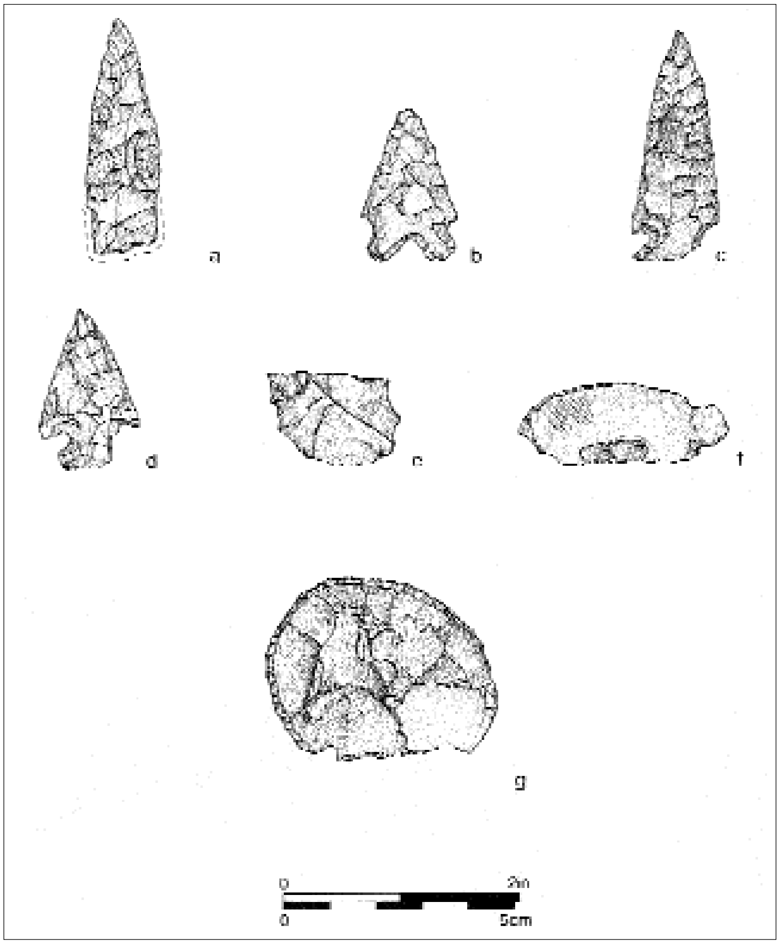

Figure 2. Selected lithic artifacts which produced positive anti-sera reactions: (a) chalcedony Cody-like (ca. 9000 yr B.P.) projectile point which tested positive for rabbit anti-sera; (b) basalt Oxbow (ca. 5000 yr B.P.) projectile point; (c) chert Avonlea-like (ca. 2000 yr B.P.) projectile point which tested positive for deer anti-sera; (d) chert corner-notched projectile point basalt which tested positive for bear anti-sera; (e) retouched basalt flake which tested positive for deer, elk anti-sera; (f) chert retouched flake which tested positive for canid; (g) chert scraper which tested positive for deer anti-sera.

disciplinary techniques in unraveling prehistoric lifeways.

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Kenneth Cannon is currently a project archeologist with the National Park Service's Midwest Archeological Center. He has been with the Center since 1987 and served as project director for a number of archeological investigations in Yellowstone National Park since 1989.