



*Department of Anthropology*

October 30, 2008

To Whom It May Concern:

Enclosed please find a Collection Study Grant proposal to examine metal-tipped arrows in the North American Southwest ethnographic collections. If granted, this trip would take place from the 9<sup>th</sup> to the 13<sup>th</sup> of March, 2009. I should also note that I am submitting this proposal in tandem with a second proposal submitted by my husband, J. Andrew Darling, to examine the ANMNH Hrdlicka collections. Our plan would be to share expenses by traveling together, thereby making the trip more affordable. Please feel free to contact me with any additional questions or concerns at the address and telephone number listed below.

Sincerely,

A handwritten signature in black ink, appearing to read "B. Sunday Eiselt". The signature is fluid and cursive, with a long horizontal stroke at the end.

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**Collections Study Proposal**  
**A Metric and Visual Examination of Metal-tipped Arrows Attributed to Apache, Comanche, Ute, Navajo, and Pueblo Makers**

**B. Sunday Eiselt**

This proposal serves as my request to be considered for an ANMH Collections Study Grant. Specifically, I am interested in analyzing metal tipped arrows attributed to Apache (Jicarilla, Mescalero, and San Carlos), Ute, Comanche, Navajo, and Pueblo (Taos and San Ildefonso) makers from the ANMH North American ethnographic collections. The purpose of research is to investigate differences and similarities in manufacturing techniques dating to the turn of the last century. This study is an extension of dissertation research conducted through the University of Michigan, Museum of Anthropology. My dissertation, which was defended in May of 2006, considered the ways in which the Jicarilla adjusted to Spanish and later American contact and how they engaged rural *mestizo* populations in trade and other mutualistic relations stemming from preexisting patterns of Plains-Pueblo exchange. Museum collections were essential to this research. Examination of micaceous ceramic vessels in museum collections enabled me to attribute fragmentary archaeological sherds to ethnic makers and reconstruct female economy and trade. The study revealed little-known aspects of interethnic exchange between women and how Jicarilla women in particular dominated the micaceous ceramic market of the northern Rio Grande as a primary source of income for their families as they moved off of the plains and into the colony at Taos.

My dissertation focused primarily on women and ceramic circulation, and I developed this aspect of the study in order to focus my research. Ceramics, however, tell only part of a larger story. Work at Apache archaeological sites in the Rio del Oso Valley near Abiquiu (my primary study area) also revealed a vibrant trade in metal products between men that I was not able to fully explore. Jicarilla men were heavily involved in the production of metal-tipped arrows that they traded to their Hispanic neighbors in return for decorated tinworks and tinklers made by *mestizo* men. This counter-intuitive finding requires additional research, especially given that metal-tipped arrows were used in hunting, which provided animal products for trade, and they were used in Jicarilla warfare and raiding. Jicarilla men also employed the bow and arrow when protecting Hispanic sheep herds and villages and while serving the Spanish Crown as guides, guards, and spies against unfriendly nomadic tribes like the Navajo and Comanche. Additional research on metal-tipped arrows promises to reveal a great deal of information about men's economies and activities (some of them violent) that enabled the Jicarilla to adjust to the unfolding conditions of contact. Museum collections are required to address some of these issues archaeologically.

The challenge that I faced in the ceramics project is similar to the one I face now. Numerous nomadic groups and some Pueblo communities made and traded metal tipped arrows. Metal arrow points also were mass produced and sold through the American trading posts and forts of the 19<sup>th</sup>-century. Moreover, battle site archaeologists working on Apache sites in southern New Mexico have recorded a wide variety of metal points and have suggested that some of this variation is due to differences in the production techniques and styles attributed to Apache, Comanche, Ute, or Navajo makers. Historic documents and photographs reveal that arrows from these different groups are culturally diagnostic and that they can be distinguished from each other based on comparison of materials, shaft designs, and fletching techniques. However, these diagnostic parts rarely preserve in the archaeological record. Archaeologists instead must develop ways to distinguish the more durable metal points that are found in base camps and on battlefields.

The Rio del Oso archaeological record revealed the entire production sequence for metal points and how they were traded to Hispanics. Sources of metal included iron barrel hoops that were cold-hammered, chiseled, and then filed to a point (See Figure 1). This discovery led me to include arrow analysis in my pottery collections visits while doing dissertation research, and I developed a recording protocol for observations on 26 variables pertaining to shape, style, material, and production technique of arrows (Figure 2).

I applied this analysis to 60 arrows at the Denver Museum of Nature and Science. The collection included a total of 28 Jicarilla, 12 Mescalero, 14 Comanche, 4 Navajo, and 2 Ute arrows dating to the turn of the last century. Multivariate statistical analysis of the most numerous arrows (Jicarilla, Mescalero, and Comanche) revealed potentially significant differences in metal point shape, size, and base treatment by cultural group. One interesting finding was that the Jicarilla and Mescalero Apache arrows could be more easily separated from each other than either group could be separated from the Comanche. I expected instead that the Jicarilla and Mescalero Apache points would be difficult to distinguish given that these two groups were allied and intermarried, and I expected to find greater differences between Apache and Comanche points given that they were bitter enemies throughout much of the historical period. Arrow points could nonetheless be assigned to ethnic maker with a high degree of confidence in most cases. A second analysis that grouped arrows by quiver set further suggests that some variation in points is the result of individual stylistic choices. Although the Ute and Navajo collection was too small to be included in the quantitative study, these points were visually very different from each other and from Apache and Comanche points.

Initial results indicate that additional research is warranted, and I would like to expand this study to include well-documented ethnographic collections dating to the turn of the last century. The American Museum of Natural History collections contain nearly 160 metal-tipped arrows attributed to Apache, Comanche, Ute, Navajo, and Pueblo makers. This collection is large, well-documented, and relevant. Most of the specimens were collected directly from their maker/owners by notable anthropologists including Pliny Goddard, Herbert Spinden, Robert Lowie, or Isabel Kelly. The AMNH collections also contain numerous quiver sets, which would allow me to further explore potential sources of variation between individual makers. If funded, work with the ANMH collections will triple my sample size for arrows and nearly triple the number of cultural groups under consideration. With this in mind, I am particularly interested in the Taos and San Ildefonso metal arrows given that the Jicarilla were heavily involved with them in trade. I also am interested in the San Carlos arrows and how they may differ from the Jicarilla and Mescalero. Finally, the AMNH collections will enable me to test the results of statistical analyses on Jicarilla, Mescalero, and Comanche arrows while adding to the Ute and Navajo sample.

Data collection for this study involves non-destructive metric and visual examination of arrows and points including photo documentation and drawings as needed for research purposes only. I am also aware that some arrows may have poisoned tips or contain other unknown contaminants, necessitating extra precautions during analysis including the avoidance of direct contact with the tips and the use of surgical gloves. I have reviewed the ANMH ethnographic collections database in preparation of this proposal, but I would be interested in any additional relevant collections not included in this open on-line database. If funds are granted, I would like to visit the collections and conduct my analysis over a five day period from March 9 to 13, 2009. The individuals that I anticipate working with most directly include Peter Whiteley and Laila Williamson.

Work with the ANMH arrows will be incorporated into a larger survey of museum collections that includes the Denver Museum of Nature and Science, the Smithsonian Institution, and the Santa Fe Museum of Indian Arts and Culture. Research will result in the publication of journal articles and will be included in my forthcoming monograph on the Jicarilla. Documentation of stylistic variation in metal arrow points will assist ongoing archaeological studies of metal-tipped arrows recovered from Jicarilla camp sites, Indian battle sites, and also Pueblo and Hispanic villages and ranchos. The goal of this study is to develop methods for distinguishing ethnographic metal points that may be applied to archaeological specimens. Analysis of museum collections is essential to this research, where the context and distribution of points from different groups contributes to a broader understanding of Indian movements, strategies, and economic responses to American military domination in addition to little-known patterns of trade in metals between nomadic, Pueblo, and Hispanic men.

Figure 1. Production sequence of metal points from archaeological sites.

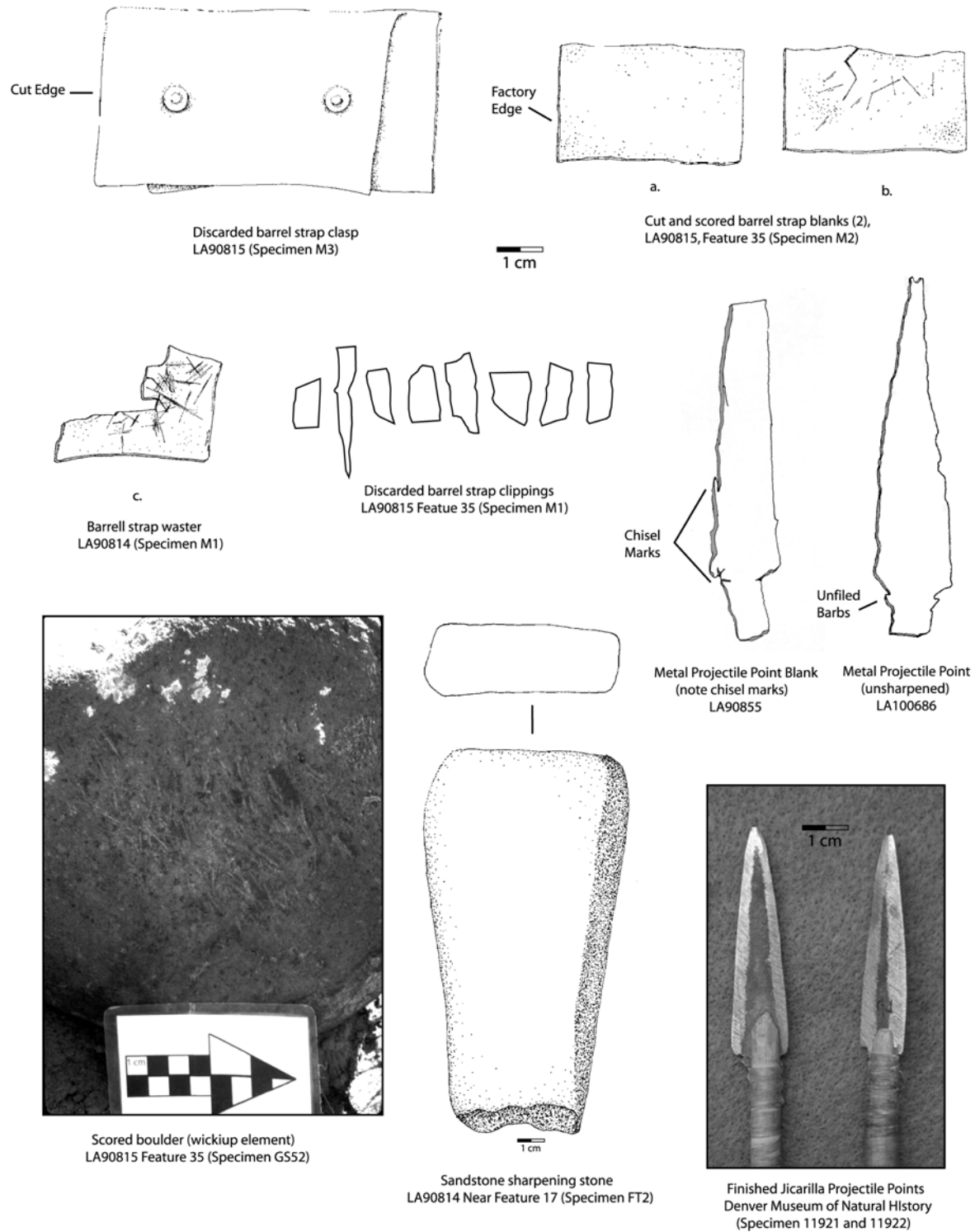
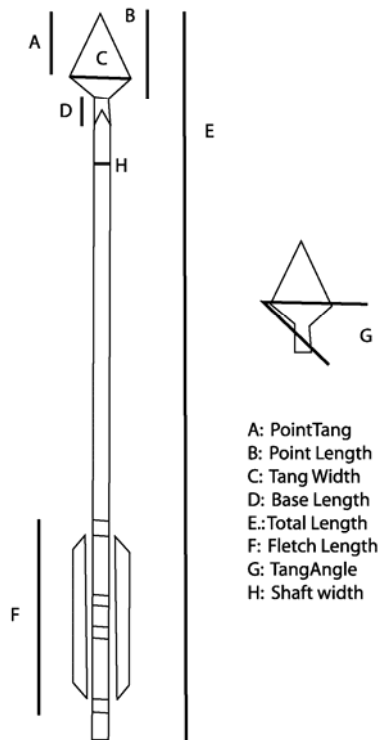


Figure 2. Analysis codes and protocols.

<b>Cat No.</b>	Catalog Number
<b>Museum</b>	Location of Collection
<b>Culture</b>	Culture Group
<b>Total Length</b>	Measured in cm from tip of arrow point to end of notch
<b>Shaft Width</b>	Measured in cm
<b>Point Length</b>	Measured in cm from tip of arrow to start (proximal end) of base
<b>PointTang</b>	Measured in cm from tip of arrow to cross-section that is even with tangs
<b>Tang Width</b>	Measured in cm from tang to tang
<b>TangAngle</b>	Measured in degrees using goniometer
<b>Base Length</b>	Measured from proximal to distal ends of point base
<b>Base Style</b>	Refers to shape of point base (e.g. notched, expanding, etc.)
<b>BaseProfile</b>	Refers to whether the point base protrudes from shaft - creating a ridge beneath sinew
<b>Sharpening</b>	Refers to presence and direction of sharpening marks
<b>Fletch No</b>	Number of split feather fletches
<b>Fletch Type</b>	Estimation of bird genera (common name) used for fletching
<b>Fletch Length</b>	Measured in cm from quills at proximal end to termination of feathers at distal end
<b>Inscise1</b>	Shape of incising on shaft
<b>Inscise2</b>	Shape of incising on shaft
<b>Inscise3</b>	Shape of incising on shaft
<b>ShaftColor</b>	Refers to whether the midsection of the shaft (between point and fletching) has been artificially colored
<b>ShaftMaterial</b>	Estimation of wood type used for shaft (Jicarilla designations made by Adelaide Paiz who visited collection on 3/26/2002)
<b>DistalEnd</b>	Refers to method of finishing distal end of arrow (distal is opposite from point)
<b>SinewP</b>	Measurement in cm of length of sinew wrapping at proximal end of fletching (towards point end)
<b>SinewD</b>	Measurement in cm of length of sinew wrapping at distal end of fletching (towards notched end)
<b>DesignColor</b>	Refers to color and order of painted bands at distal end of arrow (described in order from proximal to distal)
<b>Dye</b>	Estimation of dye type used to paint designs at distal end of arrow
<b>No Elements</b>	Refers to number of painted bands at distal end of arrow and whether these touch or are separated
<b>DesignL</b>	Measured in cm from proximal to distal end of painted bands at distal end of arrow
<b>DesignPosition</b>	Refers to whether painted bands at distal end of arrow are located on proximal, middle, or distal end of shaft at fletching
<b>Notes</b>	Notes

### Schematic of Measurements

Arrow Shaft Analysis  
(See Arrow Analysis Key)  
S. Eiselt



- A: PointTang
- B: Point Length
- C: Tang Width
- D: Base Length
- E: Total Length
- F: Fletch Length
- G: TangAngle
- H: Shaft width