

5-1-2016

Basketmaker II Warfare and Fending Sticks in the North American Southwest

Phil R. Geib

Follow this and additional works at: https://digitalrepository.unm.edu/anth_etds



Part of the [Anthropology Commons](#)

Recommended Citation

Geib, Phil R.. "Basketmaker II Warfare and Fending Sticks in the North American Southwest." (2016).
https://digitalrepository.unm.edu/anth_etds/27

This Dissertation is brought to you for free and open access by the Electronic Theses and Dissertations at UNM Digital Repository. It has been accepted for inclusion in Anthropology ETDs by an authorized administrator of UNM Digital Repository. For more information, please contact disc@unm.edu.

Phil R Geib

Candidate

Anthropology

Department

This dissertation is approved, and it is acceptable in quality and form for
publication:

Approved by the Dissertation Committee:

Bruce B. Huckell, Chairperson

James L. Boone

Ann Ramenofsky

Patricia M. Lambert

Basketmaker II Warfare and Fending Sticks
in the North American Southwest

by

Phil R. Geib

B.A., Anthropology/Sociology, Ohio Wesleyan University, 1978

M.A., Anthropology, Northern Arizona University, 1985

DISSERTATION

Submitted in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy

Anthropology

The University of New Mexico
Albuquerque, New Mexico

May, 2016

ACKNOWLEDGMENTS

The catalog is long of people and institutions deserving my thanks for the help and support that they provided during the course of this research. First on this list is my mom, who unfortunately passed away before I had defended my dissertation, a little over a month before her 103rd birthday. I know that she would have been proud (as would my dad). She also would have been grateful because at times I think that she doubted my resolve to finish and worried needlessly, though that was her job.

Second on my list is Carrie Heitman, who is eagerly looking forward to our life after the dissertation. We met while both in graduate school and have survived as a married couple under the yoke of laboring on our respective research treatises; that and the birth of our two girls (Sienna and Millie) and three household moves across the county! I couldn't ask for a better and more supportive life partner to have done this with.

I received advice or help from many individuals during the course of my research but Chuck LaRue of Flagstaff deserves special notice. We developed a friendship because of our interest with prehistoric material culture, including Basketmaker II artifacts. Unfortunately we didn't become well acquainted until close to the time that I moved from Flagstaff to attend graduate school in Albuquerque, but we stayed in touch and often met up on my frequent trips to Flag. He may not agree with my conclusions but without his help I might have toiled several years longer or ended with a less informed product—thanks Chuck!

I appreciate the effort of my committee Bruce Huckell (chair), Ann Ramenofsky, Jim Boone, and Pat Lambert in reading and commenting on both drafts of the dissertation—the more big-picture but less focused initial draft and this final version. Pat's input on the first one was key to motivating me to jettison unnecessary material and make the structural changes that I knew in my gut were necessary to transform my research into a publishable report. Bruce and Ann provided considerable useful comments during the formative stages on drafts of research proposals and grant applications. I am also grateful to Patty Crown and fellow grad students of her proposal writing course for constructive criticisms that helped me forge a draft research proposal.

In addition to various museum staff that I mention below, I received useful advice, comments, or other help on this research from R.G. Matson, David Phillips, Steven LeBlanc, Winston Hurst, Joan Coltrain, Joel Janetski, Nick Geib, Kim Spurr, Stephen Plog, Laurie Webster, Ed Jolie, Kelley Hays-Gilpin, Ron Fields, John Whittaker, Devin Pettigrew, Justin Garnett, Byl Bryce, Bill Ringle, Carmen Junqueira, Sally Cole, Mick Robins, Julie Solometo, Thomas Perry, Maxine McBrinn, Peggy Peterson, Vaughn Hadenfeldt, Jay Willian, Randy Langstraat, Larry Loendorf, Bill Hyder, Scott Thybony, Tom O'Laughlin, Robert Dello-Russo, Dito Morales, Dennis Gilpin, Robert Mark, Kim Smiley, Myles Miller, Cynthia Robin,

LuAnn Wandsnider, Wirt Wills, John Greer, and Joel Williams. A number of these individuals kindly alerted me about artifacts that I might not have been aware of while conducting their own museum research. Others provided photos or leads to rock art sites or to other aspects important to my research.

Key financial support came from a National Science Foundation Doctoral Dissertation Improvement Grant (Award Number 1025643), the UNM Anthropology Department via the Hibben Trust (Hibben Doctoral Research Award and two junior scholarships), an Ethel-Jane Westfeldt Bunting Fellowship, the UNM Graduate and Professional Student Association (Graduate Research Development Grant and Student Research Allocations Committee Research Grant), and the New Mexico Archaeological Council. Thanks to Tim Jull I received training in radiocarbon dating at the Arizona AMS Facility under the expert guidance of Alex Leonard, along with a number of dates at no cost.

This research was possible because of the numerous museums around the country that house the material culture of the past. These institutions perform a great public service not only by educating people but by curating the specimens and records that are the lifeblood of archaeology. I greatly appreciate the access to collections and space provided for research from the following institutions and especially the help and assistance of curators and support personnel: *American Museum of Natural History* (Anibal Rodriguez, Senior Museum Technician in North American Archaeology; Gisselle Garcia, Curatorial Associate in Biological Anthropology; Kristen Mable, Registrar for Archives and Loans; Dave Thomas, Curator, Division of Anthropology); *Arizona State Museum* (Mike Jacobs, Museum Specialist in Archaeology; Patrick Lyons, Director); *Brooklyn Museum* (Susan Zeller, Associate Curator, Native American Art); *Centennial Museum* (Scott Cutler, Curator of Collections and Exhibits); *Glen Canyon National Recreation Area* (John Spence, Terrestrial Ecologist & Research Coordinator); *Lincoln National Forest* (Eric Dillingham, Assistant Forest Archaeologist); *Museum of Indian Arts and Culture* (Melissa Powell, Curator of Archaeology; Julia Clifton, Curator of Archaeological Research Collections); *Maxwell Museum of Anthropology* (David Phillips, Curator of Archaeology); *Museum of the Big Bend* (Mary Bones, Curator of Exhibits); *Mesa Verde National Park* (Carol Landes, Curator; Scott Travis, Chief of Research and Resource Management); *Museum of Northern Arizona* (Dr. Kelley Hays-Gilpin, Curator of Anthropology; Kara Kelly, Registrar); *National Museum of the American Indian* (Patricia L. Nietfeld, Collections Manager; Thomas Evans, Museum Specialist); *National Museum of Natural History* (James Krakker, Archaeological Collections Specialist); *Natural History Museum of Los Angeles County* (Chris Coleman, Collections Manager); *Nevada State Museum* (Gene Hattori, Curator of Anthropology); *Penn Museum* (Bill Wierzbowski, Keeper of American Collections); *Phoebe Hearst Museum of Anthropology* (Natasha Johnson, North America

Collections Manager); *Peabody Museum of Archaeology and Ethnology* (Steven LeBlanc, Director of Collections; Genevieve Fisher, Registrar; Susan Haskell, Curatorial Associate); *San Diego Museum of Man* (Phil Hoog, Curator of Archaeological Collections; Jennifer Stone, Registration Assistant); *Texas Archeological Research Laboratory* (Laura H. Nightengale, Head of Collections; Darrell Creel, Director); *Natural History Museum of Utah* (Michelle Knoll, Assistant Curator of Archaeology; Duncan Metcalf, Curator of Anthropology); *Yale Peabody Museum of Natural History* (Roger Colton, Senior Collections Manager). As it turns out, the Maxwell has the largest number of flat curved sticks and Dr. David Phillips deserves special mention for facilitating and encouraging my study.

To all, along with my children, Nick Geib, Annie Geib, Sienna Geib, and Millie Geib, I give a heartfelt thanks.

Basketmaker II Warfare and Fending Sticks
in the North American Southwest

by

Phil R. Geib

B.A., Anthropology/Sociology, Ohio Wesleyan University, 1978

M.A., Anthropology, Northern Arizona University, 1985

Ph.D., Anthropology, University of New Mexico, 2016

Abstract

Direct physical evidence and rock art, including head skin trophies, indicate that violence linked to warfare was prevalent among the preceramic farmers of the North American Southwest known as Basketmakers. The degree of intergroup conflict indicates that Basketmakers may have needed defense against atlatl darts. In the early 1900s archaeologists suggested that distinctive wooden artifacts served this purpose. Despite resembling Puebloan rabbit sticks, the first to report these S-shaped and flattened sticks with longitudinal facial grooves thought that hunting was not their purpose. Yet the sticks appear singularly inadequate for the task of atlatl dart defense. I evaluate the suggested function of these artifacts and their relationship to warfare in Basketmaker II society.

I consider multiple lines of evidence to analyze stick function: ethnography, experiments, use-wear, bioarchaeological markers of violence, and prehistoric art. I conducted a detailed analysis of almost 500 prehistoric flat curved sticks and radiocarbon dated 63 of them. Some of the documented variation in this artifact class is geographically patterned, likely based on learning networks, but dating reveals that much of it is linked to an evident shift in tool function. The sticks become more like ethnographic rabbit sticks through time and exhibit a corresponding increase in traces of such a use. Yet, there are those with damage that seems indicative of atlatl dart defense.

My experiments showed that a defender can knock aside atlatl darts from close range with these sticks. Some tribes in South America perform a similar feat in a duel-like context and Diego de Landa may have observed an analogous ritual in the 1500s among the Yucatec Maya. The fending hypothesis is most logical in a duel. Many of the analyzed prehistoric sticks come from a known Puebloan war god shrine in central New Mexico, where an informant identified one as symbol of membership in a warrior society. In addition to prowess as a man killer, war society membership in the distant past might have involved atlatl duels where dart defense with a stick displayed great skill and courage. Basketmakers may have considered S-shaped sticks as an ancient symbol of warrior status.

TABLE OF CONTENTS

LIST OF FIGURES	xiii
LIST OF TABLES	xxi
LIST OF TABLES	xxv
CHAPTER 1 Introduction.....	1
What's in a Name?.....	4
Organization.....	5
CHAPTER 2 The Fending Hypothesis	11
Heizer's Account	13
A Case for Fending and Throwing.....	15
How Can We Know?	16
Functional Analysis	18
Experimental Research	19
Emic Perspectives	20
CHAPTER 3 Spatial and Temporal Context	21
Environmental Characteristics	24
Temporal Parameters	32
Synopsis of Basketmaker II	34
The Temporal Span of Basketmaker II.....	35
Partitioning the Basketmaker II Period.....	37
CHAPTER 4 Basketmaker II Weapons.....	40
Fire-type weapons.....	40
Atlatl and Dart.....	41
Bow and Arrow.....	51
Shock Weapons.....	55
Weapons of Defense	59
Summary	60
CHAPTER 5 Evidence of Basketmaker II Conflict	62
There Was Violence, But Was It War?.....	62
Basketmaker II Massacre Assemblages.....	63
Cave 7	65

Massacre or Not?	68
New Dates	69
MNI Estimate	75
Frequency of Violent Death	77
The Cave 7 Massacre Reconsidered	81
Summary of Cave 7	84
Battle Cave	85
MNI Estimate	88
Dating	96
Other Physical Evidence	100
Trauma	100
Skull with Embedded Dart	100
Cave 21 Skull with Embedded Dart	101
Red Canyon Skull with Impact Wound	102
Cut-in-Two Cave (Cave 12/19)	102
Green Mask Site (Cave 11/17)	104
Site 33 Vertebrae with Embedded Dart Point	105
Woodchuck Cave (NA3112)	105
Mass Burials	106
Trophies	111
Flayed Head Skins	111
Head Skins in Rock Art	114
Severed Arms and Legs	124
Summary	125
CHAPTER 6 Analogues for Fending Use	128
Ethnographic	128
Solomon Islands, Melanesia	128
Upper Xingu Region, Amazon Basin	135
The Mesoamerican Evidence	138
Chichén Itzá Artifacts	141
Iconography	144

Ethnography.....	150
Experimental Fending Sticks.....	150
Methods.....	151
Results.....	153
Summary.....	158
CHAPTER 7 Analogues for Hunting Use.....	160
Ethnographic Rabbit Sticks of the Southwest.....	160
“Optimal” Design Parameters.....	167
Rabbit Stick Use-Wear.....	168
Experimental Rabbit Sticks.....	174
Summary.....	177
CHAPTER 8 Analysis of Prehistoric Flat Curved Sticks.....	178
Stick Sample.....	178
Sample Size.....	181
Analysis Methods.....	183
Geographic Distribution.....	185
Stick Condition.....	193
The Southwest Sample.....	199
Wood Selection.....	199
Stick Shape.....	201
Bending to Shape.....	202
Stick Dimensions.....	206
Stick Production.....	206
Finishing.....	210
Incised Longitudinal Grooves.....	211
Other Cut “Decoration”.....	218
Paint/Stain.....	221
Grip or Handle Treatment.....	222
Wrist Cord?.....	234
Sinew Bindings.....	236
Summary.....	239

CHAPTER 9 Functional Analysis of Prehistoric Flat Curved Sticks.....	242
Characterization of Wear Traces	244
Inclusions	248
Spines/Thorns	248
Rocks.....	255
Throwing Use-Wear.....	259
Fending Use-Wear	265
Summary.....	278
CHAPTER 10 Dating of Prehistoric Flat Curved Sticks.....	280
Sample Selection.....	281
Overall Dating Results.....	283
Early Archaic	289
Middle Archaic	292
Late Archaic/Early Agricultural Period	294
Correo Site	297
Basketmaker II Dating Results	301
Summary.....	306
CHAPTER 11 Evidence from Basketmaker II Rock Art	308
Background.....	308
Meaning of Basketmaker II Rock Art.....	314
S-Shaped Stick Depictions.....	318
Identifying Atlatls and Darts.....	329
Fight scenes.....	335
Dueling Bird Heads (Lower Chinle Wash, SE Utah)	335
Atlatl Face-Off (Cedar Mesa, SE Utah).....	338
Three Duelers (Bluff Area, SE Utah)	341
Mouth of Butler Fight Scenes (Bluff Area, Se Utah)	351
Skewered Man (Walker Creek, Ne Arizona).....	356
River House Duel (Bluff Area, Se Utah)	358
Impaled Neck (Lower Chinle Wash, Ne Arizona).....	360
Painted Duel (Canyon De Chelly, Ne Arizona).....	363

Various Impaled Individuals (Cedar Mesa to Canyon De Chelly).....	365
Dead Individuals.....	367
Summary.....	372
CHAPTER 12 Conclusions.....	373
Basketmaker II Flat Curved Sticks.....	373
Basketmaker II Violence and War.....	379
Why Basketmaker II Warfare?.....	382
Warfare By Whom Against Whom?.....	383
Resource Problems.....	387
Non-Resource Issues.....	394
Final Thoughts.....	398
ENDNOTES.....	396
APPENDIX A: Grooved Curved Stick Analysis Form.....	404
REFERENCES.....	406

LIST OF FIGURES

Figure 1.1. Two whole flat curved sticks from the Correo Site, west-central New Mexico	2
Figure 2.1 (72). S-shaped but slightly warped grooved curved sticks from White Dog Cave, NE Arizona	12
Figure 2.2. Contrast in use-wear on portions of two S-shaped sticks from Doughnut Alcove, lower Glen Canyon, SE Utah	17
Figure 3.1. Map of the North American Southwest showing the study area and the overall study region.....	22
Figure 3.2. Study Area in SE Utah and NE Arizona showing some of the important geographical features discussed in the text.....	23
Figure 3.3. Physiographic provinces of the North American Southwest.....	25
Figure 3.4. General biotic provinces (ecoregions) of the North American Southwest.....	26
Figure 3.5. Western Basketmaker II cultural-temporal phases for NE Arizona and SE Utah.....	38
Figure 4.1. Basketmaker II atlatls showing differences in finger loops and the distal end groove and spur	43
Figure 4.2. Basketmaker II atlatl dart foreshafts with hafted stone points, Cache 1, Desha Cave 2, SE Utah.....	46
Figure 4.3. Basketmaker II atlatl dart bunts made of bone from SE Utah	47
Figure 4.4. Example of how some Basketmaker II darts points are greatly elongated beyond a tip sufficient for hunting big game	50
Figure 4.5. Wooden bats that probably functioned as war clubs and that may date as early as Basketmaker II.....	56
Figure 4.6. Basketmaker II large corner-notched hafted knives, a possible weapon for close fighting.....	58
Figure 5.1. Location of both Basketmaker II massacre assemblages along with other important sites/finds of SE Utah and NE Arizona.....	64

Figure 5.2. Plan map of Cave 7 from Hurst and Turner (1993:Fig. 8.3) showing the probable location of the sections that Wetherill used for horizontal control during excavation.....	67
Figure 5.3. Plot of 25 AMS radiocarbon dates from Coltrain et al. (2012) on Cave 7 Basketmaker II skeletal remains, the subset within four contextual groups identified in Wetherill's field notes, plus the ungrouped Burial 322;.....	70
Figure 5.4. The summed probability distributions for the NSF-Arizona and NOSAMS AMS radiocarbon dates on duplicate samples of the same purified collagen from 11 Cave 7 skeletons.	72
Figure 5.5. Plot of calibrated 1σ and 2σ ranges for prior and new AMS radiocarbon dates for the Group 2 burials at Cave 7.....	73
Figure 5.6. Vertebrae with embedded dart point tip from skeleton 128 of Cave 7	80
Figure 5.7. Important characteristics of the Cave 7 Basketmaker II burial assemblage by section of recovery.....	82
Figure 5.8. Location of Battle Cave, Canyon del Muerto, Arizona.....	87
Figure 5.9. Wooden arrow foreshaft found embedded between ribs of the partially mummified Burial 6, Battle Cave, Canyon del Muerto, Arizona	94
Figure 5.10. Vertebrae with embedded chalcedony arrow point, Burial 6, Battle Cave, Canyon del Muerto, Arizona	94
Figure 5.11. Skull of adult male, bone cist (Burial 1), Battle Cave, Canyon del Muerto.....	97
Figure 5.12. Calibration of the average for five radiocarbon dates on the adult burials from the bone cist (Burial 1), Battle Cave, Canyon del Muerto, Arizona	99
Figure 5.13. Skull of Basketmaker II adult male that exhibits a perimortem impact wound to left side and a broken zygomatic arch, unknown site in Red Canyon, SE Utah.....	103
Figure 5.14. Basketmaker II flayed head skin from Cave 1 of Kinboko Canyon, NE Arizona.....	112
Figure 5.15. Two images of the flayed human head skin at the "Green Mask Site" (42SA3711), Sheik's Canyon, Grand Gulch, SE Utah.....	115
Figure 5.16. Pictographs and petroglyphs of the flayed human head skins.....	117

Figure 5.17. Basketmaker petroglyphs of probable hair ornaments rather than representations of flayed human head skins121

Figure 5.18. Basketmaker petroglyphs of anthropomorphs carrying or wearing flayed head skins.....123

Figure 6.1. Parrying clubs, *roromaraugi* and *qauata*, from the Solomon Islands.....130

Figure 6.2. Spear fight under way on the island of Santa Catalina at the *Wogasia* festival.....133

Figure 6.3. Atlatl and dart used by the Kamayura of the upper Xingu region of Brazil in a ritual joust-like fight known as *yawari* or *ifagaka*.....136

Figure 6.4. *Yawari* ceremony137

Figure 6.5. Flat curved sticks dredged from the Sacred Cenote at Chichén Itzá.....142

Figure 6.6. Flat curved sticks depicted in art at Chichén Itzá and Tula.....146

Figure 6.7. Flat curved sticks depicted in murals at Chichén Itzá148

Figure 6.8. Atlatl dart fending experiments.....154

Figure 6.9. Use-wear on replicated flat curved sticks used for deflecting atlatl darts....157

Figure 7.1. Rabbit sticks used by Native Americans of the Southwest and California ..164

Figure 7.2. Hopi men from Oraibi with bows and arrows and rabbits sticks166

Figure 7.3. Method for throwing a rabbit stick so that it flies horizontally above the ground surface to cut the widest possible swath.....164

Figure 7.4. Hopi rabbits sticks170

Figure 7.5. Apex of the convex edge for five Hopi rabbits sticks showing contrasts in use-wear173

Figure 7.6. Replicas of S-shaped flat curved sticks from Doughnut Alcove made used for rabbit hunting176

Figure 8.1. Map of the southern half of North America showing some of the important sites that have yielded flat curved sticks179

Figure 8.2. Cut transverse section of a flat curved stick handle fragment from the Correo Site revealing the annual growth rings and rays that allow clear identification of the wood as oak, likely *Quercus gambelii*184

Figure 8.3. Map of the North American Southwest showing some of the key sites that have yielded grooved curved sticks189

Figure 8.4. Miniature flat curved sticks from Ceremonial Cave	192
Figure 8.5. Flat curved stick fragments common at sites of the Chihuahuan Desert that exhibit recycling and reuse	196
Figure 8.6. Distal fragment of a grooved curved stick from Craven Cave that had been repurposed as a cook utensil to stir food	198
Figure 8.7. Examples of bending heated oak staves to the appropriate form, both simple curve and S-shaped.....	205
Figure 8.8. Cross-sections of flat curved sticks	208
Figure 8.9. Proportional representation of incised longitudinal groove quality for flat curved sticks from the Southwest	213
Figure 8.10. Variation when incising longitudinal grooves through knots.....	215
Figure 8.11. Example of longitudinal grooves, three in number, executed as a series of short segments	219
Figure 8.12. Examples of cut decoration on prehistoric flat curved sticks from the Southwest.....	220
Figure 8.13. Pitch-coated hide and cordage wrapped grips for prehistoric flat curved sticks from the Southwest	224
Figure 8.14. Probable hide wrapped grips for prehistoric flat curved sticks from Ceremonial Cave, Texas	226
Figure 8.15. Examples of narrower but thicker hide wrapped grips for prehistoric flat curved sticks from the Correo Site, NM	228
Figure 8.16. Cordage wraps for prehistoric flat curved sticks from the Correo Site.....	229
Figure 8.17. Typical grips on western Basketmaker II flat curved sticks of the Four Corners area	230
Figure 8.18. Cordage wraps for prehistoric flat curved sticks from three western Basketmaker II sites of the Virgin area.....	231
Figure 8.19. Close-up of a handle end for one of the whole but rotted S-shaped flat curved sticks from White Dog Cave.....	235
Figure 8.20. Sinew repair/reinforcement wraps or traces of such wraps on several grooved curved sticks	237

Figure 8.21. Sinew repair/reinforcement wraps on an S-shaped grooved curved stick from Doughnut Alcove	240
Figure 9.1. Three views of the same area on a whole flat curved stick from Ceremonial Cave showing how different angles and orientations of racking illumination bring out different details of use-wear	245
Figure 9.2. Examples of use-wear	244
Figure 9.3. Perfectly preserved wood surface on a flat curved stick from unknown site in Grand Gulch, Utah	249
Figure 9.4. Both sides of a variably preserved flat curved stick from the Correo Site ..	249
Figure 9.5. Examples of spines embedded in three prehistoric flat curved sticks	251
Figure 9.6. Examples of rock fragments embedded in two prehistoric flat curved sticks	256
Figure 9.7. Projectile-like damage to the midsection of Stick 447 that is probably from Ceremonial Cave, Texas	268
Figure 9.8. Comparison between the entry hole of Stick 447 and hafted dart points from Ceremonial Cave, Texas	269
Figure 9.9. Contrast in the nature of use-wear between convex and concave edges of a single bend flat curved stick from Fresnal Shelter	271
Figure 9.10. Cuts on single bend sticks that seem potentially indicative of fending use	272
Figure 9.11. S-shaped flat curved stick from the Correo Site that has cuts and nicks but lacks any obvious throwing-related use-wear	273
Figure 9.12. S-shaped flat curved stick from the Correo Site showing large cut near the handle	274
Figure 9.13. S-shaped stick from Doughnut Alcove that lacks any obvious throwing-related use-wear but exhibits a nick on the concave edge	275
Figure 10.1. Examples of radiocarbon sampling locations showing before and after images	282
Figure 10.2. Distribution of radiocarbon dates on prehistoric flat curved sticks from the Southwest	287

Figure 10.3. Two flat curved stick fragments that provided the initial early dates of 7145 ± 53 and 6493 ± 50 BP	290
Figure 10.4. Two flat curved stick fragments from Frightful Cave that also produced early dates of 7974 ± 89 and 6023 ± 54 BP	291
Figure 10.5. Three flat curved stick fragments from southern deserts of the Southwest that date 4500-4400 radiocarbon years ago.....	293
Figure 10.6. Two flat curved sticks from the Southwest that date 3800-3500 radiocarbon years ago	292
Figure 10.7. Graph of calibrated radiocarbon dates on flat curved sticks from the Correo Site ordered from oldest to youngest	298
Figure 10.8. Four examples of typical Basketmaker II White Dog Phase S-shaped flat curved sticks from the Four Corners area of the Colorado Plateau	303
Figure 10.9. Two examples of flat curved sticks from Basketmaker III and Puebloan sites that closely resemble ethnographic rabbit sticks	305
Figure 11.1. Location of the various BMII rock art sites discussed in the text within SE Utah and NE Arizona	310
Figure 11.2. Basketmaker II rock art from SE Utah	311
Figure 11.3. Small portion of the lower Butler Wash Panel showing the superpositioning of elements from the Archaic Period and the Basketmaker II Period	313
Figure 11.4. S-shaped sticks at a Basketmaker II rock art panel and an artifactual example for comparison.....	319
Figure 11.5. Paired S-shaped sticks and two additional S-shaped sticks at a separate Basketmaker II panel near the Impaled Neck Panel, lower Chinle Wash, NE Arizona.....	321
Figure 11.6. Paired S-shaped sticks in McElmo Canyon, at the mouth of Sand Canyon, Colorado	322
Figure 11.7. S-shaped stick at a probable late Basketmaker panel just downstream from the Impaled Neck Panel, lower Chinle Wash, NE Arizona	324
Figure 11.8. Single S-shaped stick alongside a pair of atlatl darts and other elements at a complex panel in Johns Canyon, SE Utah	325

Figure 11.9. Small Basketmaker anthropomorph holding what resembles an oversized S-shaped stick, Slickhorn Canyon, SE Utah.....	327
Figure 11.10. Examples of Palavayu style anthropomorphs holding what resemble S-shaped sticks, Chevelon Creek, central Arizona.....	328
Figure 11.11. An apparent S-shaped stick being thrown as a bighorn sheep, Monitor Mesa, SE Utah	330
Figure 11.12. Atlatls and darts in Basketmaker II rock art of SE Utah	331
Figure 11.13. Hunt scenes in Basketmaker II rock art.....	334
Figure 11.14. Dueling bird-headed anthropomorphs, lower Chinle Wash, SE Utah.....	336
Figure 11.15. A face-off of two figures holding atlatls and darts and wearing quadruped headgear, one of which is clearly a bighorn sheep, Johns Canyon area, SE Utah	339
Figure 11.16. Portion of an extensive rock art panel along the San Juan River, upstream from the mouth of Butler Wash that includes three atlatl duels and other evidence of conflict including a flayed head skin and a upside down anthropomorph that probably indicates death.....	342
Figure 11.17. Overview of Duel 1, Three Duelers Panel, upstream from Butler Wash along the San Juan River, SE Utah	344
Figure 11.18. Close-up of Duel 1, Three Duelers Panel, SE Utah	345
Figure 11.19. Overview of Duel 2, Three Duelers Panel, upstream from Butler Wash along the San Juan River, SE Utah.....	346
Figure 11.20. Close-up of Duel 2, Three Duelers Panel.....	347
Figure 11.21. Overview of Duel 3, Three Duelers Panel, upstream from Butler Wash along the San Juan River, SE Utah	349
Figure 11.22. Close-up of Duel 3 and adjacent elements, Three Duelers Panel.....	350
Figure 11.23. Close-up of Lobed Circle Duel, mouth of Butler Wash, upstream side, SE Utah.....	353
Figure 11.24. Close-up of duel at the mouth of Butler Wash, upstream side, SE Utah	353
Figure 11.25. Close-up of a possible killing at mouth of Butler Wash, upstream side, SE Utah.....	354

Figure 11.26. Overview of the Skewered Man Panel, Walker Creek, NE Arizona, with close-up images of two scenes.....	357
Figure 11.27. Close-up of the River House Duel along the San Juan River, SE Utah ...	359
Figure 11.28. Impaled Neck Panel, lower Chinle Wash, NE Arizona.....	361
Figure 11.29. Pictograph of two combatants with loaded atlatls in throwing position, Slim Canyon near Canyon de Chelly, NE Arizona.....	364
Figure 11.30. Dart-impaled individuals in Basketmaker II rock art of SE Utah and NE Arizona	366
Figure 11.31. Basketmaker petroglyph on Cedar Mesa, SE Utah that shows three bighorn sheep, one with embedded dart and an anthropomorph with upside down bighorn sheep with legs extended	368
Figure 11.32. Drawing and image of inverted Basketmaker II anthropomorph and flayed human head skin near Three Duelers Panel, upstream from Butler Wash along the San Juan River, SE Utah.....	370
Figure 11.33. Images of inverted Basketmaker II anthropomorphs at the Butler Wash Panel on the downstream side.....	371
Figure 12.1. Two tree-ring based reconstructions of annual rainfall for the Colorado Plateau.....	391

LIST OF TABLES

Table 3.1. Characterization of major environmental zones (ecoregions) of the North American Southwest from north to south	28
Table 5.1. AMS radiocarbon assays for 11 bone collagen samples from Cave 7, SE Utah that were redated at the National Ocean Sciences AMS Facility (from Geib and Hurst 2013).....	71
Table 5.2. Conservative count of individual Basketmaker II skeletons in the Cave 7 assemblage according to sex and age (adult or child) by section of recovery	76
Table 5.3. Count of individual Basketmaker II skeletons in the Cave 7 assemblage of Table 5.2 with perimortem damage according to Hurst and Turner (1993)	78
Table 5.4. Count of individual Basketmaker II skeletons in the Cave 7 assemblage by sex for which an assessment of perimortem damage was made by Hurst and Turner (1993); excludes the “unknowns” of Table 5.3.....	78
Table 5.5. Information on the Burials that Earl Morris excavated at Battle Cave, Canyon del Muerto, Arizona.....	89
Table 5.6. AMS radiocarbon assays for 8 bone collagen samples from Battle Cave, NE Arizona	98
Table 5.7. Examples of mass burials within the study area that do not appear to qualify as evidence of violence but rather for the reuse of pits as burial crypts..	107
Table 7.1. List of Native American groups in the southwest part of North America that used flat curved sticks to hunt rabbits, hares, and other small game	161
Table 7.2. List of intensively studied rabbit sticks by ethnographic group	162
Table 7.3. Measurements for ethnographic rabbit sticks; proximal width and thickness excludes the tab-like handles for Hopi and Zuni artifacts, features absent from the other sticks	162
Table 7.4. Errett Callahan’s (1992:29) optimal specifications for rabbit sticks or non-returning boomerangs along with data from Table 15 for ethnographic specimens.....	168
Table 7.5. Summary of use evidence for 19 ethnographic rabbit sticks that were examined in detail like the prehistoric flat curved sticks.....	171

Table 8.1. Count of artifacts analyzed by the author, both prehistoric flat curved sticks and ethnographic rabbit sticks	182
Table 8.2. Count of analyzed prehistoric flat curved sticks by region, state, and site....	186
Table 8.3. Condition of prehistoric flat curved sticks organized by general region of recovery.....	194
Table 8.4. Wood identification of prehistoric flat curved sticks from the Southwest	199
Table 8.5. Wood identification of prehistoric flat curved sticks by Southwest region...	200
Table 8.6. Basic form of prehistoric flat curved sticks by Southwest region	202
Table 8.7. Average, standard deviation, and range for width and thickness measurements of proximal, medial and distal portions of prehistoric flat curved sticks of different form.....	207
Table 8.8. Incidence of longitudinal grooves on prehistoric flat curved sticks from the Southwest.....	212
Table 8.9. Tabulation of longitudinal groove count by region of the Southwest.....	216
Table 8.10. Type of grip or handle for prehistoric flat curved sticks from the Southwest by general region of recovery.....	223
Table 8.11. Type of grip or handle for prehistoric flat curved sticks from the Southwest by general stick form.....	233
Table 8.12. Sinew binding occurrence by stick condition for prehistoric flat curved sticks from the Southwest.....	242
Table 9.1. Definitions of use-wear observed on flat curved sticks	246
Table 9.2. Incidence of spines/thorns observed in the two basic forms of prehistoric flat curved sticks from the Southwest.....	253
Table 9.3. Incidence of spines/thorns observed in prehistoric flat curved sticks from different regions of the Southwest	253
Table 9.4. Incidence of embedded rock fragments observed in the two basic types of prehistoric flat curved sticks from the Southwest.....	258
Table 9.5. Incidence of embedded rock fragments observed in prehistoric flat curved sticks from different regions of the Southwest	258

Table 9.6. Cross-tabulation of embedded rock fragments and spines in prehistoric flat curved sticks from the Southwest	258
Table 9.7. Cross tabulation of overall wood preservation by use-wear preservation for prehistoric flat curved sticks from the Southwest	260
Table 9.8. Cross tabulation of use-wear preservation by stick condition for prehistoric flat curved sticks from the Southwest.....	260
Table 9.9. Cross tabulation of use-wear preservation by use-wear intensity for prehistoric flat curved sticks from the Southwest.....	260
Table 9.10. Incidence of embedded rocks and spines by the extent use-wear development for prehistoric flat curved sticks from the Southwest	261
Table 9.11. Incidence of wood crushing on the proximal and distal ends of prehistoric grooved curved sticks from the Southwest.....	262
Table 9.12. Incidence of end wood crushing by use-wear intensity for prehistoric flat curved sticks from the Southwest	263
Table 9.13. Incidence of end wood crushing of prehistoric flat curved sticks by general region of the Southwest.....	263
Table 9.14. Incidence of end wood crushing by general type of prehistoric flat curved sticks from the Southwest	263
Table 9.15. Cross tabulation of summary inference about throwing use by general stick type for prehistoric flat curved sticks from the Southwest.....	264
Table 9.16. Cross tabulation of summary inference about throwing use for prehistoric flat curved sticks by general regions of the Southwest.....	265
Table 9.17. Cross tabulation of summary inference about fending use for prehistoric flat curved sticks of the Southwest	277
Table 9.18. Cross tabulation of summary inference about fending use by general stick type for prehistoric flat curved sticks from the Southwest.....	278
Table 10.1. Radiocarbon dates on prehistoric flat curved sticks from the Southwest	284
Table 10.2. Summary inference about throwing use for the radiocarbon dated prehistoric flat curved sticks from the Southwest organized into temporal chunks	299

Table 10.3. Descriptive statistics for maximum width and thickness of the radiocarbon dated prehistoric flat curved sticks from the Southwest organized into the same temporal chunks as Table 10.2	301
Table 10.4. Radiocarbon dates associated with prehistoric flat curved sticks from western Basketmaker II contexts of the Four Corners area	302
Table 12.1. Intervals of persistent drought during the Basketmaker II period	390
Table 12.2. Conceivable benefits from an offensive war according to Boone's (1992:Table 10.3) classification of goods based on the combinations of excludability and divisibility.....	395

PREFACE

This study reflects the culmination of a long research project that originated in the late 1980s when I had the opportunity to study and report on a cache of wooden artifacts that hikers found in a remote canyon of SE Utah within the Glen Canyon National Recreation Area. As responsible citizens concerned about science and the loss of heritage, they brought the artifacts to the attention of park officials. Two of the artifacts were S-sticks like Guernsey and Kidder had reported as forming part of essential trait list of Basketmaker II culture. Handling these specimens and pondering their possible use peaked an interest in me; this has occurred to others who have handled these artifacts. Little could I have known at that time where this interest would lead me. This is how nearly all of the archaeological research that I have conducted has occurred—an interesting artifact or aspect of an artifact resulting in a quest for understanding but without a set destination, just the objective of trying to learn. This might not sound like science to some but it is the sort of science that I like best. Guided by what is discovered in the process of research, the destination might be quite different than what was envisioned at the start. Such is the case with this study.

CHAPTER 1

INTRODUCTION

Lethal intergroup conflict, commonly known as war, is manifest on the Colorado Plateau of the North American Southwest among the initial farming populations of the Basketmaker II period. This was during the temporal interval of about 800 BC – AD 500. A Formative pattern of food production was well established by this time based on the prior introduction of maize and squash into the Southwest from Mesoamerica. Massacre assemblages provide the most conclusive evidence for war during this interval (Hurst and Turner 1993; Turner and Turner 1999; cf. Coltrain et al. 2012), but there are other indications as well (Cole 1984, 1985; LeBlanc 1999; Matson and Cole 2002). The fire-type weapon of offense during this interval was the atlatl and dart, components of which are well known from Basketmaker II sites. These artifacts do not in themselves constitute evidence for conflict since they were not designed and used exclusively as weapons of war but also for hunting, with that role likely paramount or equivalent. Yet, Basketmakers also had distinctive wooden artifacts that might serve as an indicator of intergroup conflict. These flattened, S-shaped or crescent-shaped wooden artifacts, usually with longitudinal grooves and a pitched cordage or hide wrap on the handle (Figure 1.1), are commonly designated as either *fending sticks* or rabbit sticks. Known from widely scattered locations throughout the greater Southwest, they were first described as *grooved clubs* from the important Basketmaker II site of White Dog Cave in NE Arizona and formed part of the essential trait list of Basketmaker II culture for the Four Corners area (Guernsey and Kidder 1921).

According to the “fending” interpretation, these flat curved sticks served as defensive implements to bat away atlatl darts (Guernsey and Kidder 1921:88–89). Although somewhat resembling the sticks that historic Puebloans and other tribes of the Southwest threw to kill rabbits, hares and other small game, Guernsey and Kidder argued that the use-wear observed on historic *rabbit sticks* did not occur on the prehistoric artifacts. They stated that, “while we can assign no specific use to these objects [Basketmaker II grooved sticks], *we do not think they are rabbit sticks* such as those used among the Pueblo tribes” (Guernsey and Kidder 1921:88, emphasis added).



Figure 1.1. Two flat curved sticks from the Correo Site, west-central New Mexico: (a) S-shaped stick dated 1660-1450 cal. BC (2 sigma; Geib 87, MMA 561.1); (b) crescent-shaped stick dated cal. AD 230-420 (2 sigma; Geib 102, MMA 566.1); (c, d) handles for (a) and (b); (e, f) longitudinal grooves on two other Correo artifacts, a crescent-shaped stick (Geib 69, MMA 314.1) and an S-shaped stick (Geib 66, MMA 257.1). (Collections of the Maxwell Museum of Anthropology; photos by Phil R. Geib.)

A footnote to this statement presents a suggestion by C.C. Willoughby, then director of the Peabody Museum of American Archaeology and Ethnology, that Basketmakers may have been deployed the sticks “after the manner in which the natives of one of the Solomon Islands used an odd-shaped club for fending spears” (Guernsey and Kidder 1921:88). Guernsey and Kidder (1921:89) help bolster this speculative fending role by calling attention to monumental art from Chichén Itzá, where comparable grooved sticks are shown in the hands of warriors that also carry atlatls and darts.

Whether Basketmakers actually used their S-shaped grooved sticks to deflect atlatl darts remains unresolved (cf. LeBlanc 1999:96–97, 106–107), exemplified by the common designation of such artifacts as rabbit sticks in many archaeological reports and most museum catalogs and exhibits around the country. Various authors have weighed in about the function of these artifacts, but often without recourse to use-wear or use-inclusions and never based on examination of a large artifact sample from across the Southwest. The most comprehensive previous study appeared more than 70 years ago when Robert Heizer (1942) reviewed the relationship between prehistoric grooved clubs and historic rabbit sticks. He correctly cautioned against functional inferences based on form similarity alone. LeBlanc (1999:106) cites Heizer as providing “a convincing argument” that the grooved curved sticks were *not* used for hunting rabbits, but this is not really the case and Heizer certainly does not champion the fending role that LeBlanc accepts.

One might reasonably infer that these artifacts had a particular if not specialized function given the effort that went into making them¹ and the commonalities in form and stylistic embellishment found across the entire North American Southwest and beyond, a vast geographic area that embraces distinct environments and likely included people of different language, culture, and ethnicity. This is not to deny that stick use may have varied both temporally and spatially and both factors might account for some of the apparent morphological variability in this artifact class. Yet, it is plausible that the sticks were initially produced for some specific task and spread throughout the Southwest in the context of fulfilling that purpose. So, what was that task? More importantly, what are the social and behavioral implications of determining how the sticks were used?

If the presumed defensive use can be supported, then the sticks could be treated almost as *prima facie* evidence of conflict. As the shield is to the bow and arrow so the fending stick is to the atlatl and dart and the temporal and spatial distribution of such specialized defensive artifacts could be used to document the presence of intergroup conflict. If true, they can be treated as a correlate of war. If the sticks have a temporal pattern that matches the spread of Mesoamerican domesticates, then intergroup conflict may have increased in the Southwest as food production altered the ecological and social landscape. If the sticks have great antiquity in the Southwest, then this could indicate that war also had great antiquity. If the foragers that existed in the Southwest during prior millennia used this tool as a defensive weapon, then this could indicate that group-level lethal conflict vastly predates food production.

Whether for war or another purpose, where did this implement originate? Did Basketmakers develop it in the Four Corners, or did they acquire it from elsewhere where it had a long history of use before being introduced to the Colorado Plateau? Guernsey and Kidder (1921:115) saw the grooved stick as a possible Mexican trait and one piece of evidence for the early influence if not population source of the Basketmakers. Basketmaker II examples of this artifact on the Colorado Plateau represent a sophisticated and refined implement with intricate details of fabrication for the grip and the longitudinal grooves. The implication is that this artifact form is more likely to have been developed and perfected elsewhere. If it is true that the S-shaped grooved stick did not originate on the Colorado Plateau, then does this artifact constitute part of the evidence that western Basketmaker II culture represents a migration of early farmers from the southern deserts, a site-unit intrusion as some have suggested (e.g., Berry and Berry 1976, 1986; Matson 1991, 2002; Morris and Burgh 1954)? Alternatively, do the sticks represent the intrusion of a new trait, instigated perhaps by the altered social-political environment on account of food production? Clark (2007) provides a useful review of Southwest archaeologists have used the terms site-unit and trait-unit intrusion with regard to Zuni origins.

What's In A Name?

Before continuing further it is important to mention that although I use “fending stick” in my title, I jettisoned this functional label for my research. Since determining

how Basketmakers used these artifacts was a key objective, I did not want to bias results by using a functional label such as fending stick, rabbit stick, or even club. Instead, I adopted the strictly descriptive, if cumbersome name of flat curved stick. I had initially used the moniker grooved curved stick because of the incised parallel facial grooves common to this artifact type. But this is not a universal feature, even for artifacts from the same site and temporal interval, so it seemed best to exclude this as part of the descriptive name. As I demonstrate in Chapter 9, whether or not there are longitudinal facial grooves is largely a temporal factor, perhaps tied to a shift in function through time. Grooves occur early but on sticks late in time they are often absent and the comparable ethnographic rabbit sticks lack them entirely.

Organization

This chapter has outlined my specific research interest, which concerns the past use(s) of flat curved sticks and how they might relate to war and other forms of violence in Basketmaker II society. The next chapter reviews the background of the fending hypothesis in detail and then discusses how this study proceeds toward deriving an understanding of function based on multiple lines of evidence, each of which is considered in various chapters. The strands of evidence that I consider include ethnography, experimentation, indicators of use on prehistoric artifacts, bioarchaeological markers of violence and warfare, and artistic representations of flat curved sticks in the southwest (rock art) and Mesoamerica (murals and monumental art).

Information about the spatial and temporal context of this study is covered in Chapter 3. My focus is on the Basketmaker II culture of the Four Corners area of the Colorado Plateau. Since flat curved sticks are found across the entire North American Southwest and beyond, I enlarge my geographical focus for the functional and temporal analysis of this artifact class. Chapter 3 briefly characterizes the environmental context of the Southwest. It then reviews the general temporal sequence for the Archaic period followed by the Basketmaker II period, which is considered in somewhat greater detail, especially for the western expression of Basketmaker II culture in NE Arizona and SE Utah.

Chapter 4 reviews Basketmaker II weapons that may have served in intergroup conflict. Atlatls and darts are well known from Basketmaker II sites and this is the

weaponry that flat curved sticks would have defended against. Bow and arrow technology supplanted the earlier fire-type weapon after the Common Era and would have changed the viability of trying to bat aside projectiles. Adequate defense against the far speedier arrows required new technology. Basketmakers might have had specific shock weapons for combat, but their S-shaped grooved sticks seem to be poor candidates for this task.

Chapter 5 describes the evidence for violent conflict in western Basketmaker II society. The nature of this violence has implications for whether or not Basketmaker II groups needed a specialized defensive implement. Can Basketmaker II violence be classified as an activity of social groups, true warfare? Or was it basically personal, at the level of individuals? Central to this is whether or not two assemblages of Basketmaker II human remains that exhibit perimortem damage consistent with violent death—Cave 7 and Battle Cave—can be attributed to massacres as originally claimed (Hurst and Turner 1993; Turner and Turner 1999). In the case of the Cave 7 assemblage, Coltrain et al. (2012) rejected this account based on a dispersed suite of AMS radiocarbon dates on bone collagen from the interments:

“Rather than an anomalous single-event massacre, the Cave 7 radiocarbon dataset suggests that raiding and intragroup, male/male violence was episodic among Basketmaker groups in southeastern Utah” (Coltrain et al. 2012:2220).

Their “plausible alternative to the massacre hypothesis” is that Cave 7 served as a special cemetery site for higher status males and their immediate kin who were victims of raids or disputes that occurred across a 500–700 year span of time. If a large-scale massacre was not true in what seemed like the most obvious instance, then what about the lesser case of Battle Cave?

Chapter 6 examines evidence from outside the archaeological record of the Southwest that is potentially supportive of the interpretation that flat curved sticks were used defensively. I begin by considering the implements from the Solomon Islands that prompted the fending speculation in the first place—those “odd-shaped clubs” mentioned in the footnote of Guernsey and Kidder’s report. This chapter then considers a South American case where several different tribes still use atlatls and darts in duel-like matches, with paired warriors alternating between attacker and defender. Defense consists of deflecting the darts with a sheaf of narrow poles. This example provides an

example of the sort of structured context where the notion that people would try batting away atlatl darts makes sense. It is not a deadly battle between two massed groups, but rather dyadic and rule bound. The third part of Chapter 6 considers the Mesoamerican evidence that Guernsey and Kidder introduced as ostensibly supporting the fending hypothesis. The grooved curved sticks recovered from the Sacred Cenote at Chichén Itzá and depicted in art there and at other sites such as Tula compare quite closely to some specimens from the Southwest. Mesoamerican archaeologists often identify these artifacts as fending sticks, accepting the speculative account given in Guernsey and Kidder. Starting in the late 1980s some started to doubt the fending interpretation, with Hassig (1988:294–295) arguing that the grooved curved sticks were specialized short swords for close fighting. My analysis of the Chichén Itzá sticks along with a consideration of the mural evidence disproves the short sword argument, but does not corroborate the fending role. However there is a tantalizing bit of ethnographic evidence from Diego de Landa that hints at the possibility of the Yucatan Maya deflecting atlatl darts using short sticks in a ritual designated as a dance. The final part of Chapter 6 describes an experiment using replicated examples of prehistoric Southwestern flat curved sticks to deflect atlatl darts. Aside from proving that the feat is possible, even at quite close range (11 m), the experiment provided important clues as to the sorts of use damage that could result from fending atlatl darts.

Chapter 7 considers analogues for using the flat curved sticks to hunt small game. Rabbit stick (non-returning boomerang) is the other primary use that these artifacts might have had and the one that seems best supported based on ethnographic accounts of Puebloan and other tribes living in the Southwest. This chapter summarizes information about historic rabbit sticks as a basis for comparison with the prehistoric specimens that appear antecedent in form if not function. It considers suggested “optimal” design parameters for a rabbit stick as well as mean values for ethnographic specimens from the Southwest, since these should reflect what those groups found well suited for hunting. More importantly, Chapter 7 documents the types of use damage (wear traces and embedded foreign materials) that occur on both ethnographic and experimental rabbit sticks as an essential aid for interpreting the use-wear and use-inclusions on prehistoric specimens. One key finding is that the environment of use plays a critical role in the

nature and intensity of use damage and that even the rabbit sticks from a single group such as the Hopi, who lived and hunted in a rather limited area, can have quite different signatures of use.

Chapter 8 provides a detailed description of prehistoric flat curved sticks, focusing on those from the Southwest. The findings in this chapter are based on my study of almost 500 museum specimens around the country. This chapter documents the variability that occurs within the artifact class, variability that is evident even within the two basic varieties of S-shaped and crescent-shaped. Some of this variation has a clear geographical pattern to it, likely based on learning networks, since certain areas have a greater tendency toward standard forms, such as those that characterize the western Basketmaker II area of NE Arizona and SE Utah. Still, even for single sites there can be diversity in stick shape, size, grip treatment and other variables, with the Correo shrine in central New Mexico west of Albuquerque a prime example. So, aside from differences related to find location, there is the likelihood of temporal variability, either because of stylistic drift or change in the actual functional role of these tools, a possibility hinted at by specimens that seem poorly suited to throwing, and those that seem little different from ethnographic rabbit sticks.

Documentation of the actual use-wear and use-inclusions on the prehistoric flat curved sticks from the Southwest is the subject of Chapter 9. I carefully inspected each artifact for use-related damage and paid attention to those aspects that affect the interpretation of such evidence, namely wood preservation and artifact recycling. Embedded inclusions consistent with throwing use include rock fragments and cactus spines or the thorns of various desert shrubs such as catclaw acacia (*Senegalia greggii*). There are also various kinds of damage to stick ends, edges and faces that are consistent with throwing use. Some sticks exhibit both inclusions (rocks, spines, or both) and use-wear that was fully supportive of having been used to throw at small game whereas others do not. A few sticks exhibit evidence that seems indicative of having been used for batting away atlatl darts. Most conclusive in this regard is a rent in one stick that appears created by a sharp pointed object that is a good match for a hafted dart point.

Chapter 10 presents the results from radiocarbon dating of a sizable sample of the prehistoric flat curved sticks from the Southwest. The association of these artifacts with

atlatls and darts and their apparent disappearance after the introduction of the bow and arrow (none recovered from secure Basketmaker III and later Puebloan contextsⁱⁱ) might seem like circumstantial support for the fending hypothesis, but the true temporal span of the artifacts required proof. The radiocarbon dates reveal considerable antiquity for flat curved sticks in southern deserts of the Southwest, back to the early Archaic. The artifacts continued in use in some areas, notably western Texas, well into the ceramic period. Relatively late use is also indicated by the specimens recovered from the Sacred Cenote at Chichén Itzá. There is a clear temporal trend in the dated artifacts from those that seem less suited for throwing early on (early Archaic) to those that are well suited for throwing later in time. Through time the flat curved sticks of the Southwest not only become more like ethnographic rabbit sticks in shape, dimensions and other aspects, but also exhibit more direct evidence of actually having been used this way.

One additional independent line of evidence concerning how Basketmakers used flat curved sticks comes from their rich corpus of rock art (e.g., Cole 1990, 2009; Schaafsma 1971, 1980). Chapter 11 examines this record to determine whether there is any visual support of the fending hypothesis. The typical Basketmaker II S-shaped flat curved stick is clearly portrayed in rock art, but never in the hands of an individual involved in deadly combat with atlatl and darts. There are numerous depictions of conflict between individuals armed with atlatls and darts, many that have a duel-like quality to them, but again S-shaped sticks are not in evidence. Basketmaker II warriors evidently conducted atlatl fights where flat curved sticks for defense might have proved useful—dyadic fights observed by third party referees—but, if they used fending sticks in these situations, they did not portray this. Given the realism of Basketmaker II rock art it seems likely that this detail would have been depicted if indeed it was a facet of their life (indeed, such a scene might exist in the hundreds of unrecorded Basketmaker rock art panels).

The previous chapters stay close to the facts but in Chapter 12 I pull together the various lines of evidence into an interpretive account that answers the basic questions of this research. My research indicates that the function of flat curved sticks evidently changed through time and across space and eventually became the rabbit sticks used by Puebloans on the Colorado Plateau. The latter served as war god symbols for some

Puebloans, reflecting a previous role for atlatl dart defense. I go on to briefly evaluate the cause of war in Basketmaker II society and to consider in more general terms the broad theme of conflict and war in human evolution.

CHAPTER 2

THE FENDING HYPOTHESIS

In 1916 Samuel Guernsey excavated at White Dog Cave in NE Arizona and uncovered the distinctive wooden artifacts shown in Figure 2.1 along with additional examples from that cave and other sites (Guernsey and Kidder 1921:88–89). These double-curved or “S-shaped” sticks have four deep grooves carefully incised into both faces and a notch cut into the handle end that Guernsey and Kidder (1921:88) mistakenly suggested may have served to seat a wrist cord. Designated as “grooved clubs,” these artifacts formed part of the essential trait list of Basketmaker II culture of the Four Corners region. Because the grooved sticks were associated either with atlatls, atlatl darts, or related paraphernalia in preceramic contexts, a temporal placement was implied and Guernsey and Kidder (1921:89) considered them “a distinct type used by people who also used the atlatl.” Although these grooved clubs somewhat resembled the rabbit sticks used by Puebloans of the Southwest, such as the Hopi, Guernsey and Kidder rejected such a function on account of use-wear, or rather, a lack thereof. The sticks that they recovered did not exhibit the sort of damage that they considered characteristic of rabbit sticks.

Guernsey and Kidder were unwilling to assign a specific use to the S-shaped grooved sticks. Rather, it was the director of the Peabody Museum of American Archaeology and Ethnology at the time, C.C. Willoughby, who suggested that Basketmakers may have used them as a defensive weapon to fend off spears like Solomon Islanders did using “odd-shaped” clubs. Guernsey and Kidder presented this speculative scenario in a footnote of their report (1921:88). They helped to bolster the fending interpretation by calling attention to sculptures at Chichén Itzá that depict warriors holding atlatls and darts and also grooved curved sticks similar to those from the Southwest; actual examples of these sticks were retrieved from the Sacred Cenote at Chichén Itzá and were in the Peabody collections at the time for comparative purposes (Guernsey and Kidder 1921:89).ⁱⁱⁱ Guernsey and Kidder (1921:112, 115) thought that the Basketmaker II grooved clubs provided one piece of evidence that certain cultural characteristics of the Southwest originated in Mesoamerican or northern Mexico.



Figure 2.1. S-shaped but slightly warped grooved curved sticks from White Dog Cave, NE Arizona: (a) Geib 355, PMAE A-2812; (b) Geib 354, PMAE A-2811. Both were found with an adult male burial in Cist 27; the burial has a radiocarbon age of 410-205 cal. BC (2 sigma; 2288 ± 44 BP; Coltrain et al. 2007:Table 1). (Collections of the Peabody Museum of American Archaeology and Ethnology; photos by Phil R. Geib.)

This fending account was accepted by Earl Morris (1939:14), C.B. Cosgrove (1947:59–60), and Charles Amsden (1949:73) among others.^{iv} Morris (1939:14) observed that “the curved fending stick adroitly handled would have been most efficacious in striking aside the relatively slow-moving darts.” As documented in Chapter 6, atlatl darts can be effectively deflected with Basketmaker II S-shaped sticks as long as the throwing distance is 10 m or more. Yet, a separate stick for parrying darts is not necessary since an atlatl or spare darts are totally adequate for this purpose or by merely dodging the projectiles. Moreover, loading darts into an atlatl requires two hands, so a fending stick becomes an encumbrance.

The fending interpretation has not received unanimous support and some researchers disavowed it, such as Jackson (1937) for flat curved sticks found in far western Texas. Just like Guernsey and Kidder, Jackson pointed to use-wear traces as indicative of function, but he believed that the evidence on the Texas specimens was consistent with their use as rabbit sticks: “Often one end was battered, as also occasionally were the sides. This seems to confirm their use as throwing sticks” (Jackson 1937:182). Yet Cornelius Cosgrove reached a contrary conclusion based on the flat curved sticks that he studied from western Texas: “that these objects were actually fending sticks to deflect darts is more than probable ... apparently they were never used for throwing, since none of them are badly chipped on the edge, as they would have been if thrown at small game through rocks and brush” (Cosgrove 1947:59–60). These opposing functional conclusions might derive from the nature of the samples examined since Cosgrove studied mainly whole sticks from the ritual deposit of Ceremonial Cave and Jackson studied mostly stick fragments from the domestic refuse of various shelters. Moreover, some of the fragments that Jackson recovered had been recycled for other purposes, although he did not recognize them as such (discussed in Chapter 8).

Heizer’s Account

In a somewhat rambling article, Heizer (1942) reviewed the relationship between prehistoric grooved clubs and historic rabbit sticks. Heizer correctly cautioned against functional inferences based on form similarity alone. Yet he did not undertake new analysis or experiments to investigate stick use and it seems that he personally examined few if any artifacts, relying on the descriptions and observations of other researchers.

Heizer (1942:53) concluded that the ethnographically documented throwing sticks used to kill rabbits “are historically connected with the ancient Basketmaker grooved clubs.”

Heizer’s statements about function are rather inconclusive, either because he was unsure or felt the exercise too speculative, perhaps especially without firsthand observation. He presents four possible uses: 1) fending darts or arrows; 2) throwing to injure or disturb the aim of an opponent; 3) clubbing in war or while hunting; and 4) throwing to kill rabbits (Heizer 1942:52). These consist of three main tasks—fending, clubbing and throwing—with the latter two further differentiated as involving war, hunting or both. Although LeBlanc (1999:106) cites Heizer as providing “a convincing argument” that the grooved curved sticks were *not* used for hunting rabbits, this is not really the case and Heizer certainly does not champion the fending role that LeBlanc accepts. My impression is that Heizer mainly favored the hunting and war club interpretations, which is perhaps why he used the term *club* in the title and throughout his article. He opines that “these clubs would have made good offensive weapons at close quarters” (Heizer 1942:44). As I document in Chapter 8, this claim cannot be supported for many of the prehistoric flat curved sticks, especially the earliest specimens, since they are light in weight and unlike the robust ethnographic rabbit sticks such as those of the Hopi. Even the heaviest prehistoric specimens would have required mastery of stick fighting to be classified as effective combat weapons.

Heizer listed ethnographic support for the last three functions but could not do so for the first. For example, aside from the well-documented use of flat curved sticks in hunting rabbits and other small game, Puebloan informants reported throwing rabbit sticks in deadly fights to injure, kill, or disrupt someone aiming a bow and arrow (e.g., Stephen 1936:99). Such uses are certainly reasonable for Hopi rabbit sticks, which can weigh upwards of 300 g. No ethnographic evidence exists in the Southwest for using sticks to knock aside darts or spears, although such evidence does exist in other areas of the world as reviewed in Chapter 6. All groups in the Southwest during the historic era used the bow and arrow and had done so for more than a millennium, with shields deployed for defense. Thus, the lack of ethnographic support for fending use in the Southwest is easily understandable. Whether the ethnographic evidence for the other uses has any relevance for the prehistoric artifacts is largely dependent upon how similar

they are to the ethnographic specimens—similarity in form, in weight, in aerodynamic properties, in use-wear or breakage patterns. An analogical argument can be made with these and other traits. Dissimilarity is also an important consideration.

In this regard, Heizer (1942:52) lists the similarities and differences between the prehistoric and historic artifacts, arguing that the similarities in dimensions and flat curved form were the “essential or primary features” but that the differences were “non-essential or secondary features.” For example, ethnographic flat curved sticks lack the S-shaped form and longitudinal grooves and have plain tab handles rather than being cordage or hide wrapped (see Chapter 7). In more formal terms, the primary features are those that Heizer evidently thought would allow a strong analogy whereas the secondary features are those that, if emphasized, could result in a weak analogy since they are inessential. Yet, any conclusion as to which features are *essential* and which *nonessential* is largely dependent upon the presumed function of the sticks and in this regard Heizer clearly had in mind the historic rabbit hunting role. The double curve form, longitudinal grooves, and pitch-covered grip wraps (“bumpers”) on prehistoric specimens clearly seem unnecessary for such a purpose. I am in agreement on this point but only to the extent that throwing was the presumed function. A strong analogy for roles other than use as a rabbit stick such as a lethal club or for deflecting atlatl darts might emphasize other features. It is worth pointing out that there are some significant differences between ethnographic and prehistoric specimens for stick dimensions, one of Heizer’s primary features

. I provide details about this in Chapters 7 and 8 but, in short, some of the prehistoric sticks are so narrow and light in weight that use for throwing to kill small game is dubious.

A Case for Fending and Throwing

Ambivalence about the function of these artifacts continued after Heizer’s report. For example, in his introductory text *Southwestern Archaeology*, McGregor (1965:183) stated that “it has generally been accepted that they [S-shaped grooved sticks] were used as rabbit sticks,” but he then mentions the possible fending role, citing a conversation with Charles Amsden. As Guernsey and Kidder pointed out long ago, use-wear is a key feature for making inferences about stick function. In this regard, I reported on the use-

wear traces of a whole and fragmentary S-shaped stick from a Basketmaker II cache in Glen Canyon (Figure 2.2; Geib 1990). These artifacts lack the longitudinal grooves and have pronounced bends, but are otherwise identifiable as examples of the general artifact type under consideration. The two sticks exhibit distinct wear traces that I thought were indicative of different usage. The broken specimen, which is a distal half of an S-shaped stick, exhibits the type of heavy attrition consistent with use as a throwing stick—battering and scarring on ends, edges and faces—whereas the whole specimen lacks such wear traces. Minute rock fragments (quartz grains) embedded in damaged parts of the convex edge of the stick fragment corroborate the throwing use; I observed these intruded grains in a subsequent reanalysis of the artifacts, hence they are not reported in the 1990 article.

I thought that the contrast in use-wear on these two specimens cached together showed that Basketmakers used flat curved sticks for throwing (likely rabbit hunting) but also for a different purpose, which I presumed to have been fending as suggested in Guernsey and Kidder. I offered no support in the 1990 article for the fending function, merely observing that the use-wear on the whole artifact was inconsistent with rabbit stick use. I thought that the whole artifact preserved the use traces from the intended function (primary role) whereas the stick fragment preserved the traces of use from recycling a broken artifact. The repurposing of sticks, whether broken or whole, is important to recognize since it can have a significant bearing on use-wear and use-inclusions that are observable.

How Can We Know?

Archaeologists frequently grapple with the question of artifact function. From more than a century of study they have generated a catalog of general artifact uses and often provide functional or quasi-functional labels for many objects, rabbit stick being one of them. Behind such statements is the notion that function is inferable from form, coupled with simple direct analogies to ethnographic descriptions and depictions of objects used by societies around the world. This sort of implicit approach involving common knowledge coupled with simple analogy is widespread. Like it or not, almost all archaeological arguments are by analogy (Wylie 1985, 2002), and this especially



Figure 2.2. Contrast in use-wear on portions of two S-shaped sticks recovered from Doughnut Alcove, lower Glen Canyon, SE Utah (Geib 1990): (a) whole stick that exhibits essentially no use-wear attributable to throwing; (b) stick fragment that exhibits heavy use-wear attributable to throwing, including damage to the sinew wraps intended to prevent the stick from splitting. (Collections of the National Park Service, Glen Canyon National Recreation Area; photos by Phil R. Geib.)

holds true when making functional assignments of prehistoric tools and behavioral inferences.

To justify the knowledge claims implied by a functional label it is important to provide corroborating evidence consistent with an inferred use. Such independent points of reference are especially critical for those artifacts that lie outside the documented technological repertoire or for ambiguous cases such as the sticks considered here. This is what Wylie (2002:136–153) termed extending the base or breadth of source and subject comparison to strengthen an analogy. In the case of a presumed rabbit stick, does it exhibit the sorts of use-wear that ethnographic rabbit sticks exhibit or that experiments have shown to occur on such artifacts? Does it contain embedded rock fragments that would be expected for an artifact frequently thrown in the often stone-strewn landscapes of the Southwest? These are examples of ways to introduce other lines of evidence contained on the artifact that are direct expectations from use in a particular way. They help by a process of triangulation, providing other features/aspects that can be used to test the form-based inference. These other aspects might strengthen the inference, suggest that another functional inference is more warranted, or indicate that the item perhaps had more than one primary purpose.

Functional Analysis

Artifact use, just like artifact production, often results in telltale traces, breakage patterns or residues. This is the basis behind the field of lithic use-wear analysis (e.g., Hayden 1979; Keeley 1980; Odell 1977), an approach that with appropriate modification can be extended to other materials such as ceramics, bone and wood (e.g., LeMoine 1994; López Varela et al. 2002; Skibo 1991). The behavioral plasticity and inherent unpredictability of humans does not negate the validity of making inferences about processes in the past by observing past results, at least when it comes to diagnosing artifact function. Because the emphasis is on natural physical processes that operate the same everywhere in the world and throughout time, Lyell's (1830) notion of uniformitarianism is a readily accepted assumption.

Functional analysis involves two interrelated aspects: 1) the characterization of wear traces, breakage patterns and use-inclusions and 2) interpretation of their meaning in terms of past activity. The first requires observation and documentation of use-related

modifications or adhesions/additions to artifacts. This can be accomplished in several ways but is essentially visual and often involves varying degrees of magnification accompanied by photo documentation. The second aspect involves a functional interpretation of any of the observed use modifications or additions based on a frame of reference. The latter is best provided by experimental (middle range) research à la Binford (1977; and see Arnold 2003) that allows distinctive use-traces to be linked to particular activities. Damage from use or a lack thereof is what Guernsey and Kidder and some other authors have used as a basis for making inferences about stick use. Guernsey and Kidder had Puebloan rabbit sticks as a frame of reference but they never developed it in any detail or examined the idea critically and they also lacked a point of comparison for the fending role. Also, an evaluation of use-wear on a few sticks is clearly insufficient for making general claims as to the function of this artifact class across the entire Southwest. Rather, there needs to be an intensive and systematic study of numerous examples of prehistoric flat curved sticks from the entire Southwest. The artifacts have to be analyzed for use-wear traces in a consistent fashion and the results then compared with use traces on ethnographically documented rabbit sticks and also replicated sticks used for throwing and fending.

Experimental Research

Underway since the late 1800s (e.g., Skertchly 1879), experimental archaeology provides the operational linkages between present observations on artifacts or other aspects of the archaeological record and the inferred uses/functions (and other behaviors) in the past. It is another key for strengthening the “source-side” of the analogical equation. Ethnographic specimens can help to establish such linkages, although seldom in a simple way since the history of artifact use is rarely documented in more than a cursory manner and some collected artifacts might never have been used. The latter possibility is especially evident for highly decorated Puebloan rabbit sticks that were produced for ceremonial purposes in Katsina dances or the “tourist trade” and that lack any use traces from throwing at small game.

Part of developing knowledge about the use of artifacts involves experience with actually trying them out for a presumed task. At the most basic level this approach allows an assessment of whether a suspected use is even reasonable—feasible or

practical. An obvious simple example is the flaking of stone to make stone tools by dripping water on heated rock (e.g., Whittaker 2015). Aside from determining whether or not something can be done, experiments can also provide useful insights as to the contexts for when some activity might have occurred. In the case of batting away atlatl darts for defensive purposes, this might be possible in certain controlled circumstances but would be utterly preposterous in true warfare. Experimental research obviously cannot solve all problems of archaeological inference, and issues of equifinality loom large here. Humans often have practices and beliefs that seem to defy logic and can stand at odds with strictly practical concerns of efficiency or risk aversion. In this instance, experiment proved useful for creating use-wear signatures to compare against prehistoric examples and also as a means to determine whether sticks of a given shape, size and weight actually perform appropriately, either as rabbit sticks or as fending sticks.

Emic Perspectives

One additional piece of evidence about stick function that can be brought to bear in this particular case comes from rock art, a consideration of how the people that made and used the artifacts depicted them and in what contexts. Basketmaker II artists created a plethora of petroglyphs and pictographs with quite realistic details of everyday objects and sometimes with a narrative quality. This art can be studied to see how it can inform about the use of flat curved sticks—to determine whether there is any visual evidence in support of the fending hypothesis. Given the realism of Basketmaker II rock art it seems likely that fending atlatl darts might get depicted if indeed it was a facet of their life. The typical Basketmaker S-shaped flat curved stick is clearly portrayed in rock art and there are also scenes where these artifacts would be expected if they were indeed used as suggested. The latter consists of atlatl fight scenes that have a duel-like quality to them; during such dyadic fights is when it is reasonable to assume that a fending stick would be deployed.

CHAPTER 3

SPATIAL AND TEMPORAL CONTEXT

My focal study area is where the artifacts identified as grooved clubs or fending sticks first came to light—the Four Corners area of the Colorado Plateau where the preceramic farming culture designated as Basketmaker II was initially recognized. Yet these artifacts are distributed across the entire Southwest and beyond. To fully understand the history and development of this tool it is important to situate any local patterns of the study area within a larger interpretive context. The latter embraces the entire North American Southwest as captured by Erik Reed's (1951:428) memorable short-hand: from Durango to Durango (Mexico to Colorado) and from Las Vegas to Las Vegas (Nevada to New Mexico; Figure 3.1).

The study area consists of SE Utah and NE Arizona and takes in such features as Cedar Mesa/Grand Gulch, Black Mesa, Comb Wash, Butler Wash, Chinle Wash, Canyon de Chelly, the Marsh Pass area, and the Rainbow Plateau (Figure 3.2). Two assemblages of human skeletons from this area are thought to represent massacres. These provide the best evidence for Basketmaker II intergroup conflict, but there is plenty of other evidence for violence during this interval (reviewed in Chapter 5); thus there may well have been a real need for a potential defensive weapon.

The Basketmaker II materials of the study area are what Matson (1991, 2002, 2006) recognizes as comprising the “western” variant of Basketmaker II culture. There are other Basketmaker II “variants” on the Colorado Plateau, most notably an eastern expression located in SW Colorado and NW New Mexico.^v A “far western” variant is identifiable for the “Virgin Anasazi” area of SW Utah, the Arizona Strip, and far SE Nevada (McFadden 2011). Here there is some evidence for violence in rock art (e.g., Snake Gulch) and grooved S-shaped sticks also occur in this area as reviewed in Chapter 8. A Basketmaker II occupation of the Moab area north of the core Grand Gulch–Butler Wash area is significant for the presence of head skin trophies (Howard and Janetski 1992) analogous to those of the study area. On the south side of the study area projectile point styles suggest an extension of the western Basketmaker II variant to at least the upper Little Colorado River area (e.g., C. Berry 1984, 1987). Indeed, the similarities in

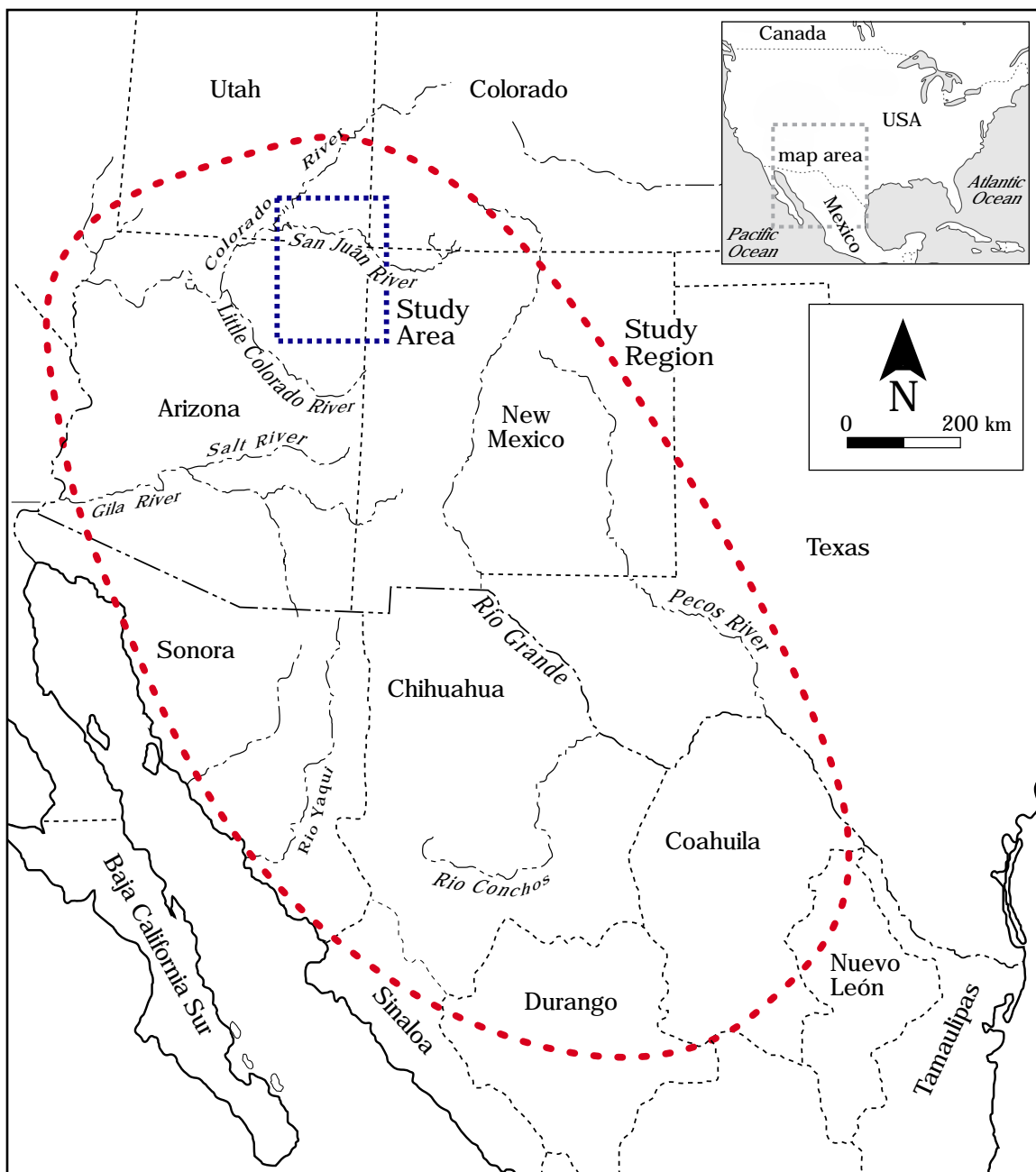


Figure 3.1. The North American Southwest showing the western Basketmaker II study area and the overall study region.

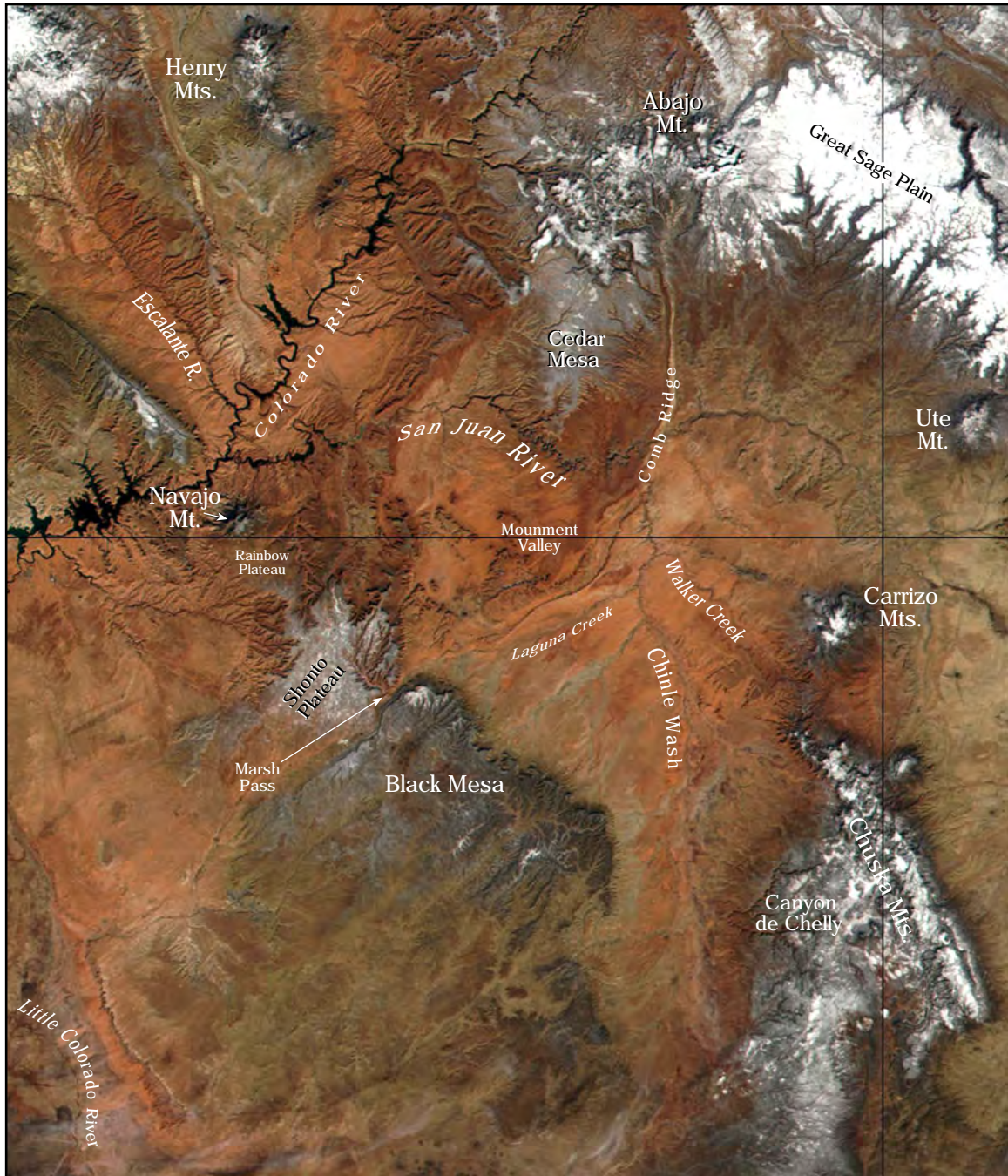


Figure 3.2. Western Basketmaker II Study Area in SE Utah and NE Arizona showing some of the important geographical features discussed in the text. (Base image: GrandCanyon.A2002019.1820.250m.jpg available at <http://visibleearth.nasa.gov>.)

material culture of western Basketmaker II sites and McEuen Cave provide a strong indication of cultural relatedness extending south off the Colorado Plateau (Huckell et al. 1999; Moreno 2000). The records from adjacent areas are not examined in any detail here except as they may relate to flat curved sticks or the patterns of violence in the focal study area. For example, Matson and Cole (2002) speculate about the possibility of warfare between groups of eastern and western cultural traditions or ethnicities. If true, this could qualify as a form of external war (e.g. Otterbein 1968, 1970) when cultural constraints to restrain the violence might not apply.

Environmental Characteristics

The extraordinary environmental diversity of the North American Southwest is well known, and indeed inspired C. Hart Merriam to develop the Life Zone concept (Merriam 1890). Within the distance of just 80 km extending from the 3850 m summit of the San Francisco Peaks to the 732 m depth of Grand Canyon in northern Arizona, Merriam recognized six different life zones that represent a latitude difference of approximately 2900 km. Nowhere else in North America were such distinct life zones compressed into such small areas making it possible for people to move between them in just a day or two. The principal underlying factor is the great vertical relief that occurs in the area, with elevations ranging from sea level to more than 3700 m. Moreover, as Merriam's transect reveals, extremes in vertical elevation can occur within relatively short horizontal distances. This is a result of the complex geologic processes of uplift, deformation, faulting, erosion, and volcanism that ultimately relate to plate tectonics. These processes have produced a dramatic landscape of deeply dissected canyons adjacent to high plateaus and mountains (the Colorado Plateau), broad to narrow desert valleys bounded by restricted mountain chains (the southern Basin and Range), and an intervening rugged zone of mountains and narrow basins (the Mogollon Highlands; Figures 3.3 and 3.4). The southern Rocky Mountains bound this region on its northeastern side and provide a snowpack that supplies water to the two major permanent rivers that drain through the area—the Rio Grande on the east side and the Colorado along the north and west sides. Rocky Mountain snowpack also feeds the important San Juan River tributary to the Colorado and the Pecos tributary to the Rio Grande.

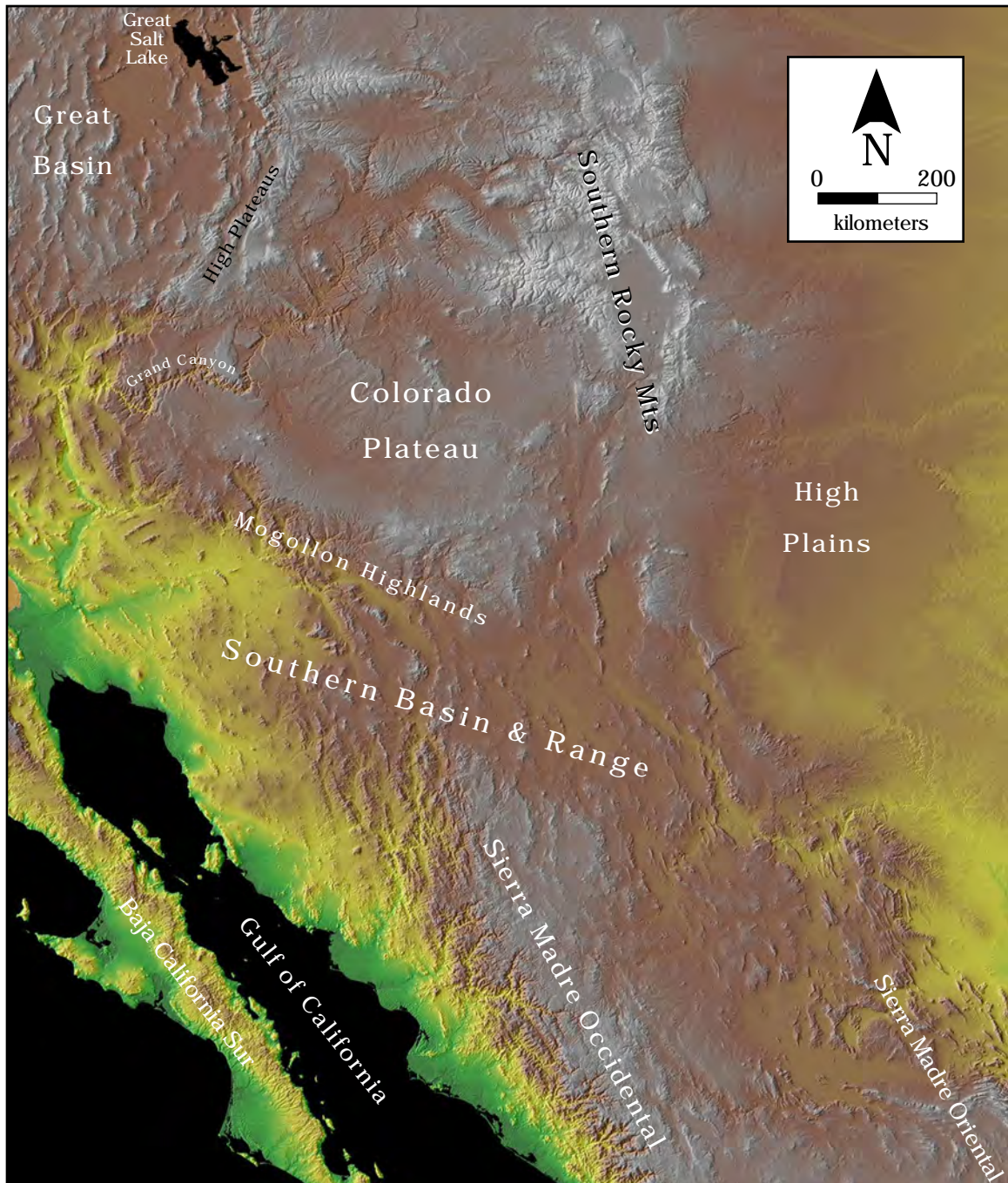


Figure 3.3. Physiographic provinces of the North American Southwest. (Shaded relief map from http://www.lpi.usra.edu/education/fieldtrips/2004/maps/usa_topo_lg.jpg.)

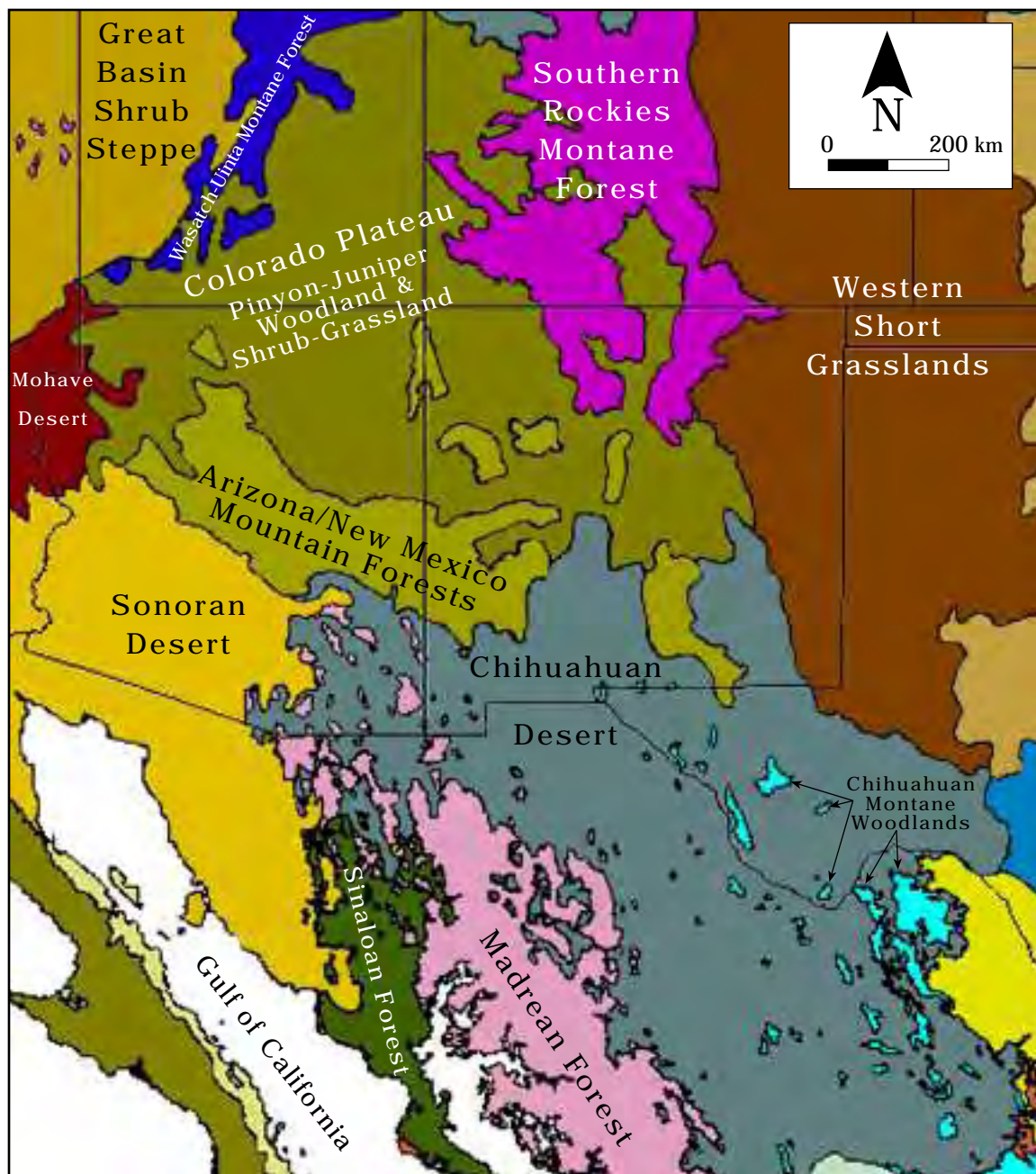


Figure 3.4. General biotic provinces (ecoregions) of the North American Southwest. (Map data from <http://www.epa.gov/wed/pages/ecoregions.htm>.)

Two other mountain ranges extend northward into the southern part of the Southwest from central Mexico. The largest of these is Sierra Madre Occidental, which almost reaches the Arizona–New Mexico border and bisects the southern Southwest, while the lesser is the Sierra Madre Oriental which extends to the Big Bend area on the Texas–Mexico line and bounds the SE side of the region. Precipitation on the Sierra Madre Occidental supplies water to a few permanent rivers in the southern part of the Southwest such as the Río Yaqui and Rio Conchos.

Overall the region is arid to semiarid and includes three large deserts—the Chihuahuan, Mohave, and Sonoran—listed in order of increasing resource potential for humans, whether true foragers or those with a mixed farming and foraging economy. Table 3.1 provides a synopsis of some key environmental factors for the deserts and other ecological zones shown in Figure 3.4. The Sonoran Desert is moderately productive because of large columnar cactus (especially Saguaro) and several mesquite species, resources that reliably produce an abundant food supply even during periods of drought (Castetter and Bell 1942). The deserts all occur in the Basin and Range physiographic province where internal drainage is common, resulting in playas that brimmed with water during the Pleistocene and with variable amounts thereafter (e.g., Castiglia and Fawcett 2006). The deserts comprise the majority of the southern Southwest and extend from sea level to roughly 1000 m. As elevation increases plant and animal communities change because of decreasing heat along with the corresponding decrease in rate of evapotranspiration and an increase in the amount of precipitation. As a result, there are different resource opportunities for humans, including pinyon nuts and more game animals. Most of the northern half of the Southwest lies above 1500 m in elevation and is characterized by pinyon-juniper woodland or shrub-grasslands (Brown 1982). Mountain environments occur throughout the northern half of the region and cover more area than in the southern half where they are concentrated to a central corridor. These cooler and relatively lush highlands with their different types of evergreen forests offer other sorts of resources for humans, especially more abundant large game.

Table 3.1. Characterization of major environmental zones (ecoregions) of the North American Southwest from north to south (information abstracted from Griffith 2010).

WASATCH-UINTA MONTANE FOREST

Elevation: 1460 m to 4123 m.

Geology: Tertiary and Mesozoic sedimentary and igneous rocks and some Precambrian igneous and metamorphic rocks.

Terrain: Core of high, precipitous mountains with narrow crests and valleys flanked in some areas by dissected plateaus and open high mountains. Southern part has rolling mountains and thrust-faulted plateaus.

Climate: Severe mid-latitude humid continental climate; winters mild-severe; summers warm to hot; no pronounced dry season. Mean annual temperature range: -2°C in the High Uintas to 8°C in low valleys. Frost-free period ranges from less than 40 days to nearly 200 days. Mean annual precipitation is 602 mm, ranging from 150 mm in dry valleys to more than 1400 mm on the wettest high peaks. Deep snowpack high elevations.

Hydrology: Many perennial and intermittent streams; glacial lakes and tarns at high elevations. Runoff from deep snowpack is a major source of summer water for adjacent lower and arid areas.

Vegetation: Valleys have sagebrush, grasses, some pinyon and Utah juniper; foothills have pinyon-juniper woodland and sagebrush with maple and Gambel oak scrub in the north; mountains have Ponderosa pine at lower elevations, Douglas-fir, aspen, subalpine fir, Englemann spruce, limber pine at higher elevations. Elevational banding of vegetation similar to Southern Rockies except that aspen, chaparral, and juniper-pinyon and oak are more common at middle elevations; much less lodgepole pine than in the Middle Rockies.

Wildlife: Black bear, elk, cougar, coyote, bobcat, red-tailed hawk, golden eagle, mountain bluebird, pinyon jay, cutthroat trout, Utah mountains kingsnake, Utah tiger salamander.

SOUTHERN ROCKIES

Elevation: 1550 m to more than 4390 m.

Geology: Precambrian metasedimentary, metavolcanic, and intrusive rocks, Tertiary and Cretaceous sedimentary rocks, and Tertiary volcanic rocks.

Terrain: High elevation, steep rugged mountains, with both linear ranges and complex masses of peaks; some high intermontane valleys.

Climate: Severe mid-latitude humid continental climate; subarctic climate at high elevations; warm to cool summers and severe winters; no pronounced dry season. Mean annual temperature is approximately -4°C at highest elevations to 11°C in warmer lowlands. Frost-free period ranges from 25 to 150 days. Mean annual precipitation is 588 mm, ranging from 255 mm in low dry areas to over 1750 on the wetter high peaks. Deep snowpack at high elevations.

Hydrology: Many medium and high-gradient perennial streams and rivers; numerous alpine lakes. Rainfall and snowpack provide water for adjacent low elevation, arid areas.

Vegetation: Mostly coniferous forests with a pattern of elevational banding. Lowest elevations are generally grass or shrub covered, with sagebrush, mountain mahogany, pinyon, juniper, or scattered Gambel oak woodlands. Low to middle elevations have a variety of vegetation including juniper oak woodlands, ponderosa pine, Douglas-fir, and aspen. Middle to high elevation forests of Englemann spruce, subalpine fir, aspen. The highest elevations have alpine low shrubs, cushion plants, sedges, and krummholz vegetation of stunted spruce, fir, and pine.

Wildlife: Elk, mule deer, Rocky Mountain bighorn sheep, wolverine, Canada lynx, cougar, yellow-bellied marmot, shoeshow hare, pika, golden eagle, Clark's nutcracker, gray jay, mountain bluebird, cutthroat trout.

Table 3.1. cont.

COLORADO PLATEAU, North (CANYONLANDS SECTION)

Elevation: 900 m to more than 3000 m.

Geology: Pennsylvanian through Tertiary limestones, sandstones, siltstones, and claystones intruded and overlain by Tertiary igneous rocks (basalt, andesite, etc.).

Terrain: Rugged tableland topography with precipitous side-walls mark abrupt changes in local relief, often from 300 m or more; however, the region also has large low-lying areas in river canyons. The uplifted, eroded, and deeply dissected tableland of sedimentary rock contains benches, mesas, buttes, cliffs, canyons, and valleys.

Climate: Dry, mid-latitude steppe climate marked by hot summers with low humidity, and cool to cold dry winters. The mean annual temperature ranges from approximately 5°C at high elevations in the north to 15°C in southern deep canyons along the Colorado River. The frost-free period ranges from 50 days to more than 220 days. The mean annual precipitation is 298 mm, ranging from 130 mm in arid canyons to more than 800 mm at high elevations.

Hydrology: Many ephemeral and intermittent streams; perennial streams originate in adjacent mountains and several large rivers cross the region (Green, Colorado, San Juan, Rio Grande); few lakes.

Vegetation: Low elevation basins and canyons sparsely vegetated with blackbrush, shadscale, fourwing saltbush, and Indian ricegrass and dropseed. Uplands and higher valleys have big sagebrush, black sagebrush, pinyon-juniper woodlands and at higher elevations some areas of Gambel oak, mountain mahogany, aspen, and some Douglas-fir; generally less grassland than in the Arizona/New Mexico Plateau to the south.

Wildlife: Elk, mule deer, pronghorn, coyote, kit fox, white-tailed prairie dog, cottontail rabbit, sage grouse, turkey vulture, burrowing owl, pinyon jay, common raven, western rattlesnake, Colorado pike minnow, razorback sucker, bonytail chub.

COLORADO PLATEAU, South (ARIZONA/NEW MEXICO PLATEAUS)

Elevation: 740 m to more than 3000 m.

Geology: Rocks representing almost the entire geological timespan are exposed from Precambrian to Tertiary; sedimentary rocks of sandstone, shale, mudstone, limestone, and dolomite, and volcanic rocks of basalt and andesite are extensive. Precambrian igneous and metamorphic rocks.

Terrain: Plateaus and mesas, cliffs, deep canyons, and valleys, some irregular plains. Local relief in the region varies from a few meters on plains and mesa tops to well over 300 meters or more along tableland side slopes.

Climate: Dry, mid-latitude steppe and desert climates marked by hot summers with low humidity, and cool to cold dry winters. The mean annual temperature is mostly about 11°C, but ranges from approximately 5°C in the San Luis Valley of Colorado in the northeast to 16°C in deep canyons along the Colorado River in the west. The frost-free period ranges from 50 days to more than 250 days. The mean annual precipitation is 293 mm, ranging from 125 mm to 380 mm at higher elevations.

Hydrology: Water is scarce, mostly ephemeral and intermittent streams. Perennial streams originate in adjacent mountains. Several large rivers cross the region (Colorado, San Juan, and Rio Grande); very few lakes.

Vegetation: At arid lower elevations, shadscale, fourwing saltbush, greasewood, galleta grass, blue and black gramas; Indian ricegrass, dropseed; higher elevations have pinyon-juniper woodlands. In the northeast, big sagebrush, rabbitbrush, winterfat, western wheatgrass, blue grama.

Wildlife: Mule deer, pronghorn, cougar, bobcat, weasels, badgers, Gunnison prairie dogs, jackrabbits, desert pocket mouse, greater roadrunner, Swainson's hawk, burrowing owls, rattlesnakes, Rio Grande silvery minnow.

Table 3.1. cont.

COLORADO PLATEAU, South (ARIZONA/NEW MEXICO MOUNTAINS)

Elevation: 1300 m to more than 3800 m.

Geology: Paleozoic sedimentary rocks of sandstone, shale, and limestone, Tertiary volcanic rocks.

Terrain: Includes both Colorado Plateau and Basin and Range physiography. Steep foothills and mountains, some deeply dissected high plateaus.

Climate: Variable depending on latitude and elevation, ranging from severe alpine to mid-latitude steppe; region generally marked by warm to hot summers and mild winters. Mean annual temperature ranges from approximately 3°C at higher elevations to 19°C in lower southern valleys. The frost-free period ranges from 60 to 280 days. More than half of the precipitation occurs during July, August, and September thunderstorms. Pacific frontal storms December through March accounts for much of the other seasonal moisture. The mean annual precipitation is 477 mm and ranges from 270 mm to over 1000 mm on the highest peaks.

Hydrology: Many ephemeral, intermittent, some perennial streams, moderate to high gradient; few lakes; water from this area important to settlements in adjacent lower elevation areas.

Vegetation: Indicative of drier, warmer environments compared to mountainous area to the north. Chaparral is common on the lower elevations, pinyon-juniper and oak woodlands are found on lower and middle elevations, and the higher elevations are mostly covered with open to dense ponderosa pine forests. Some Douglas-fir, southwestern white pine, white fir, and aspen. Southernmost extent of spruce-fir forest at higher elevations. Southern areas have some Madrean evergreen oak species.

Wildlife: Mule deer, bighorn sheep, cougar, Mexican gray wolf, coyote, bobcat, ring-tail cat, kit fox, black-tail jackrabbit, tassel-eared squirrel, Cooper's hawk, red-tailed hawk, turkey vulture, canyon wren, Gila trout. Northern extent of some Mexican wildlife species occurs in this region.

MOJAVE BASIN AND RANGE

Elevation: 85 m below sea level (Death Valley) to more than 3300 m on the highest peaks.

Geology: Deep Quaternary alluvial deposits on valley floors and alluvial fans; complex geology with intrusive granitic and other igneous rocks, recent volcanics, metamorphic, and sedimentary rocks including some carbonates.

Terrain: Scattered north-south trending mountains that are generally lower than those of the Central Basin and Range. Broad basins, valleys, and old lakebeds occur between the ranges, with long alluvial fans.

Climate: Dry, subtropical desert climate, marked by hot summers and warm winters. The mean annual temperature is approximately 5°C at high elevations, and 24°C in the lowest basins (sometimes over 56°C for Death Valley). The frost-free period ranges from 150 days in colder areas to 350 days in the warmer valleys. The mean annual precipitation is 167 mm, and ranges from 50 mm to over 900 mm on the wetter high peaks. Snow occurs in the mountains, but is uncommon at low elevations.

Hydrology: Surface water is scarce, mostly intermittent and ephemeral streams. The Colorado River crosses the eastern portion of the region. Some springs, seeps, and ponds.

Vegetation: Sparse desert vegetation, predominantly creosote bush, as compared to the mostly saltbush-greasewood and Great Basin sagebrush to the north, or the creosote bush-bursage and palo verde-cactus shrub and saguaro cactus in the Sonoran Desert to the south. In the Mojave, creosote bush, white bursage, Joshua-tree and other yuccas, and blackbrush are typical. On alkali flats, saltbush, saltgrass, alkali sacaton, and iodinebush are found. On mountains, sagebrush, juniper, and singleleaf pinyon occur. At high elevations, some ponderosa pine, white fir, limber pine, and some bristlecone pine.

Table 3.1. cont.

Wildlife: Desert bighorn sheep, pronghorn, coyote, kit fox, black-tail jackrabbit, desert cottontail rabbit, greater roadrunner, Gambel's quail, mourning dove, desert tortoise, rattlesnake.

SONORAN DESERT

Elevation: From sea level to more than 1400 m.

Geology: Quaternary alluvium, boulder deposits, playa and eolian deposits. Precambrian to Mesozoic igneous and metamorphic rocks, Tertiary volcanics and sedimentary rocks.

Terrain: Similar to the Mojave Basin and Range, this area contains fault-block mountain ranges, scattered low mountains, alluvial fans, and alluvial valleys.

Climate: Dry subtropical desert climate, marked by very hot summers and mild winters. The mean annual temperature ranges from approximately 19°C to 25°C. The frost-free period ranges from 200 to 365 days. The mean annual precipitation is 206 mm, and ranges 75 mm to 560 mm. Winter rainfall decreases from west to east, while summer rainfall decreases from east to west.

Vegetation: Large areas of palo verde—cactus shrub and giant saguaro cactus. Also creosotebush, white bursage, ocotillo, brittlebrush, catclaw acacia, cholla, desert saltbush, pricklypear, ironwood, and mesquite.

Hydrology: Mostly ephemeral and intermittent streams. Few surface water resources occur in the region, except for exotic rivers such as the Colorado with distant sources. Some springs. Many internally drained basins terminate in playas.

Wildlife: Desert bighorn sheep, southern mule deer, coyote, bobcat, kit fox, gray fox, ringtail, javelina, black-tailed jackrabbit, kangaroo rat, desert pocket mouse, desert tortoise, kingsnake, western diamondback rattlesnake, red-spotted toad, desert horned lizard, elf owl, Gila woodpecker, red-tail hawk, Gambel's quail.

CHIHUAHUAN DESERT

Elevation: From 300 m to more than 1400 m.

Geology: Mountain ranges are a geologic mix of Tertiary volcanic and intrusive granitic rocks, Paleozoic sedimentary layers, and some Precambrian granitic plutonic rocks.

Terrain: The region includes broad basins and valleys bordered by sloping alluvial fans and terraces. Isolated mesas and mountains occur. The physiography is generally a continuation of basin and range terrain that is typical of the Mojave Basin and Range and the Sonoran Desert to the west and north.

Climate: Dry desert to steppe climate, marked by hot summers and mild winters. The mean annual temperature is approximately 17–20°C. The frost-free period ranges from 150 days at high elevations in the north to more than 320 days in warmer areas of the south. The mean annual precipitation is 340 mm, and ranges from 200 mm to 635 mm depending on elevation, occurring mostly in summer.

Hydrology: Streams are mostly ephemeral, a few springs occur. Outside of the major river drainages, such as the Rio Grande/Rio Bravo, Rio Conchos, and Pecos River, the landscape is largely internally drained with playa lakes.

Vegetation: Vegetative cover is predominantly desert grassland and arid shrubland, except for high-elevation islands of oak, juniper, and pinyon pine woodland. The extent of desert shrubland is increasing across lowlands and mountain foothills due to gradual desertification caused in part by historical grazing pressure. Creosotebush, tarbush, acacia, mesquite, yuccas are common in the basins. Some grasslands with black, blue, and sideoats grama, bush muhly, and dropseeds occur.

Wildlife: Desert bighorn sheep, mule deer, pronghorn, coyote, bobcat, kit fox, collared peccary, jackrabbits, Montezuma quail, black-throated sparrow, Texas horned lizard.

Table 3.1. cont.

MADREAN ARCHIPELAGO

Elevation: 800 m to more than 3000 m.

Geology: Tertiary volcanics, Paleozoic and Mesozoic sedimentary rocks, and Precambrian granites are found on the ranges, while basins are deeply filled with Quaternary sediments.

Terrain: Basins and ranges, or “sky islands,” with medium to high local relief, typically 1,000 to 1,500 m on ranges.

Climate: Dry, subtropical to mid-latitude steppe climate marked by hot summers and mild winters. The mean annual temperature ranges from approximately 7°C to 19°C. The frost-free period ranges from 170 to 280 days. The mean annual precipitation is 421 mm and ranges from 260 mm at low elevations to over 950 mm on the highest peaks. Much of the precipitation falls during July to September thunderstorms.

Hydrology: Surface water is scarce, mostly ephemeral and intermittent streams. Some perennial streams at higher elevations. Some springs occur.

Vegetation: In the basins, semi-desert grasslands and shrub steppe, with black grama, tobosa, sideoats grama, blue grama, plains lovegrass, sand dropseed, vine mesquite, curly mesquite, ephedra, sotol, yucca, ocotillo, cacti, and agave. On mountain slopes, Madrean oak-juniper woodlands include Emory oak, silverleaf oak, netleaf oak, Tourney oak, Arizona white oak, border pinyon, Mexican pinyon, alligator juniper, one-seed juniper, and chaparral species. At higher elevations ponderosa pine is predominant, along with areas of southwestern white pine, Apache pine, Chihuahuan pine, and some Douglas-fir.

Wildlife: Mule deer, cougar, jaguar, coyote, bobcat, antelope jackrabbit, Mexican fox squirrel, Cooper’s hawk, red-tailed hawk, raven, turkey vulture, ash-throated flycatcher, canyon wren, greater roadrunner, elf owl, acorn woodpecker, western diamondback rattlesnake, western whiptail lizard, gila monster.

Many of the ecoregion maps, publications, and GIS files are available at <http://www.epa.gov/wed/pages/ecoregions.htm>.

Temporal Parameters

The temporal focus of this research is an interval of some 1300 years duration between about 800 BC and AD 500 when the early farming culture known as Basketmaker II was in fullest expression within the Four Corners area of the Colorado Plateau. This culture came into being as a result of the northward diffusion of Mesoamerican-derived domesticates, specifically maize and squash, that spread into the American Southwest around 2100 BC (Huckell 2006; Merrill et al. 2009). For the entire study region, the interval of initial food production is designated as the Early Agricultural Period (EAP) following Huckell (1995). Because the EAP is a development out of the prior Archaic Period and because the artifacts described in this document date as early as 7100 cal. BC (~7900 rcybp), or early Archaic, it is important to briefly review the larger temporal context of the Southwest.

The lengthy Archaic Period is commonly subdivided into a tripartite sequence of early, middle and late (e.g., Geib 1996; Holmer 1978; Huckell 1996; Matson 1991). There can be good grounds for where breaks are made, such as major declines in population, site abandonments on a large scale, and changes in various aspects of technology, usually projectile points. Even so, such patterns invariably differ across the entire Southwest and the ages assigned to the tripartite divisions vary among researchers. Huckell (1996; also Roth and Freeman 2008) places them as follows: ca. 7560–4350 cal. BC for the early Archaic, 4350–1800 cal. BC for the middle Archaic, and 1800 cal. BC – cal. AD 200 for the late Archaic. In contrast, for a much smaller portion of the Southwest represented by the far western part of Texas, Miller and Kenmotsu (2004) assign a date range of 6000–4000/3000 BC for the early Archaic, 4000/3000–1200 BC for the middle Archaic and 1200 BC to AD 200/900 for the later Archaic. For this same area Turpin (1994a) proposes a span of roughly 8100–4300 cal. BC (8900–5500 BP) for the early Archaic, roughly 4300–400 cal. BC (5500–2300 BP) for the middle Archaic, and roughly 400 cal. BC to cal. AD 900 for the late Archaic.

The Archaic subdivisions used here are similar to those of Huckell (see Geib 2011) but with 8250 cal. BC (~9000 rcybp) as the start of the early Archaic and the date range for the middle part shifted to 5200–2500 cal. BC (~6200–3800 rcybp). The earlier beginning of the Archaic acknowledges evidence for intensive small seed use from the Colorado Plateau (Janetski et al. 2012; Jolie and Geib 2010; Geib and Jolie 2010, 2015), a change that was doubtless well underway in the northern part of Mexico at the same time and one that Turpin (1994a:70) clearly acknowledges for the lower Pecos area of Texas and Mexico. The shift in the middle interval on the early end better accords with the greatly diminished evidence for human occupation of the Colorado Plateau and abandonment of several key sites, which occurs before 5100 cal. BC (~6200 rcybp). This may have been a response to middle Holocene drying but atmospheric circulation patterns might have produced a different effect in the southern Southwest since some researchers believe that monsoonal activity intensified during the middle Holocene (e.g., Poore et al. 2005). Ending the middle Archaic (start of the late Archaic) at about 2200 cal. BC (~3800 rcybp) provides a closer approximation to when Mesoamerican domesticates first appeared in the Southwest.

Synopsis of Basketmaker II

Credited to discoveries by Richard Wetherill and his brothers (Blackburn and Williamson 1997; McNitt 1966), initially publicized by Pepper (1902; also Prudden 1897), and corroborated and elaborated upon by Kidder and Guernsey (1919:32, 204–212; Guernsey and Kidder 1921), the term *Basketmaker* became formalized as three stages of cultural development (I–III) in Kidder’s (1927:489–491) summary of the first Pecos Conference (see also Kidder 1962 [1924]). Basketmaker II was the pre-pottery, atlatl-using, initial farming stage. According to Kidder’s original scheme, Basketmaker I was the postulated pre-agricultural stage of nomadic hunting and gathering that today is known as the Archaic. Basketmaker III was characterized by the use of pottery, but also the elaboration or refinement of perishable items such as sandals (e.g., Guernsey 1931:75–92; Hays-Gilpin et al. 1998).

Basketmakers left a spectacular inventory of perishable remains that were unearthed in the late 1800s and early 1900s from dry caves scattered across the Four Corners area. Several canyons in SE Utah and NE Arizona were the most prolific: Grand Gulch, Butler Wash, Allan Canyon, Chinle Wash, the Marsh Pass area, and Canyon de Chelly. The trove of material culture of these initial farmers provided a detailed picture for many aspects of past lifeways (Guernsey 1931; Guernsey and Kidder 1921; Kidder and Guernsey 1919; Morris 1939; Morris and Burgh 1941, 1954; Schilz 1979), and a sizable skeletal sample (Mowrer 2006)). A focus on dry cave excavations continued into the early 1960s (Lindsay et al. 1968; Lockett and Hargrave 1953) and still has much to offer (e.g., Geib and Davidson 1994; Smiley and Parry 1992; Geib et al. 2007). Basketmaker research shifted direction during the 1970s toward an emphasis on open sites, with Lipe and Matson’s research on Cedar Mesa leading the way (see review in Matson 2006b; Matson and Brand 1995). Issues of settlement pattern and subsistence came into focus, and radiocarbon dating began to refine the temporal duration of Basketmaker II. The extensive excavations on the Peabody Coal lease of northern Black Mesa exemplified this trend. When that project ended in the early 1980s, excavation of 35 late Basketmaker II (Lolomai phase, ca. cal. AD 50–350) sites of various settlement types provided the first detailed documentation of this previously unstudied portion of the local archaeological record (see review in Smiley 2002). A more recent equally

significant project in this regard was conducted ahead of the paving of the road that leads to Navajo Mountain, Utah and involved the excavation of all or portions of 17 Basketmaker II sites, many of them habitations (Geib 2011).

Judging from the residential sites excavated to date, it is evident that Basketmakers lived in small communities of one or a few families. Large settlements on Cedar Mesa, Black Mesa, and the Rainbow Plateau can have upwards of six or seven pithouses, but the refined dating done on the Rainbow Plateau indicates that few of these were contemporaneous. Grouping of scattered residential sites might well form dispersed communities as argued by Karen Dohm (1994, 1995) for Cedar Mesa, but even these aggregates were small affairs unlikely to have contained more than about 30 people. The layout of residential sites lacked a formal structure, with local conditions of topography and soils playing a role. Sites tended to be situated on sand-covered rises or slopes such that they received solar warming with trash tossed downslope to the east or southeast. Deep sand allowed for the excavation of the sometimes numerous large-volume storage pits in common use during Basketmaker II. These were always located exterior to houses wherever the terrain afforded good drainage. By late Basketmaker II slab-lined cists started to also be used for food storage. Many storage features were subsequently used for burial purposes, both at open and sheltered sites, but especially the latter. Residential use of shelters is also clearly indicated but sometimes shelters merely formed part of a residential complex that included pithouses in the open. Some shelters and open settlements were also evidently lived in on just a seasonal basis for more limited tasks.

The Temporal Span of Basketmaker II

The term Basketmaker II has cultural, geographical, and lifeway connotations that are difficult to avoid—connotations that are themselves legitimate subjects of inquiry, but which are difficult to examine once the label is applied. Depending on definition, Basketmaker II can be placed as early as 2100 cal. BC with the appearance of maize on the Colorado Plateau or later, after around 800 BC when a Formative-like reliance on this domesticate is evident. Matson (1991:123) emphasized adaptation or lifeway, stating that Basketmaker II was “a stage rather than a cultural or ethnic group, which I think fits well with the term’s original use in the Pecos classification.” He (Matson 1991:309; 1994:249–250) maintains that evidence for maize reliance, especially the isotopic data

(e.g., Coltrain and Janetski 2013; Coltrain et al. 2006, 2007; Chisholm and Matson 1994; Matson and Chisholm 1991), indicates that Basketmaker II groups were on the “Formative” side of the dietary spectrum for Holocene populations of the Colorado Plateau, analogous to later Puebloan populations in maize dependence. The evidence for this economic strategy is associated with the archetypal Basketmaker II cultural materials unearthed by Guernsey and Kidder from White Dog Cave and from comparable sites of the Four Corners.

If Basketmaker II is Formative, then what about those prepottery groups less reliant on farming? Should they be considered “as ‘Late Archaic with Maize,’ reserving ‘Basketmaker II’ for the more intensive maize growers?” (Lipe 1994:339). Lipe cautions that such an approach may just confuse matters because the issue of maize dependence would be solved largely by chronological placement rather than investigation. Matson (2006a) tentatively suggests resurrecting the Basketmaker I label and reinstating it with new meaning as the earliest portion of the Basketmaker interval when dependence on domesticates was substantially less than it finally became later in the Basketmaker sequence.

Regardless of what naming convention is ultimately adopted, there was doubtless temporal and spatial variability in the degree of agricultural commitment during Basketmaker II. This is certainly expectable given paleoclimatic fluctuations coupled with a variety of ecological factors, demographic patterns, an evolving social landscape, and heterogeneous cultural practices. Geographic variability is expectable for much the same reasoning, plus the diversity of settings occupied by Basketmaker II groups. Inter- and intra-annual variability in domesticate use is a predictable consequence of erratic yields, among other factors, such that evidence pertaining to specific points in time might say little about overall reliance on produced food. This is where isotopic research (e.g. Coltrain and Janetski 2013; Coltrain et al. 2006, 2007) plays a critical role by disclosing the long-term dietary pattern of maize use.

Within the Four Corners area maize in association with typical Basketmaker II material culture is well dated to roughly 800 cal. BC (e.g., Smiley et al. 1986; Smiley and Perry 1992), with heavy reliance occurring at about this time or shortly thereafter (Coltrain et al. 2007). Maize was present in the area earlier than this, especially if the

outlying Three Fir Shelter date is accepted (Smiley 1994:Table 1; Smiley and Parry 1992). Maize dates for the Lukachukai site (Gilpin 1994) to the east of Black Mesa clearly indicate use of this domesticate by around 1400 cal. BC (~3100 rcybp, Gilpin rejected an outlier of 3445 rcybp), although cultural associations there are less clear cut. The earliest securely dated maize on the Colorado Plateau comes from the Old Corn Site south of Zuni, New Mexico (Huber 2005), where cultural associations are also unclear. There is also evidence for the persistence of foraging populations at this time, at least around the margins of some areas such as on the Rainbow Plateau of SE Utah and NE Arizona (Geib 2011).

Partitioning the Basketmaker II Period

Various researchers have devised different cultural-temporal schemes or phases to organize what is becoming an increasingly long interval for Basketmaker II. Figure 3.5 presents my current understanding of Basketmaker cultural-temporal systematics for NE Arizona and SE Utah. The introduction of corn demarks the end of the Archaic and the transitional interval to the Formative period (the Archaic–Formative transition). The earliest Basketmaker II cultural expression within this transitional interval is not clearly manifested until around 800 cal. BC (2600 BP). This is based on clusters of dates from Three Fir Shelter (Smiley and Parry 1992) and the earliest dates on human and artifactual remains from the classic Basketmaker II type sites of the Kayenta region such as White Dog Cave and Kinboko Caves 1 and 2 (Coltrain et al. 2007; Smiley 1994:Table 1; Smiley et al. 1986). Dating might eventually show that diagnostic western Basketmaker II material culture along with heavy reliance on maize extends back in time to when domesticates first appeared on the Colorado Plateau, but this has yet to be demonstrated; thus the beginning of Basketmaker II is restricted to the temporal interval when such remains are known to exist.

Rather than using phases tied to specific attributes to partition the Basketmaker II period, I have simply adopted three arbitrary cut points as follows: 800–400 cal. BC (early Basketmaker II); 400–0 cal. BC (middle or classic Basketmaker II); 0–500 cal. AD (late Basketmaker II). The bulk of Basketmaker II material with adequate chronological control based on high-quality samples derives from the middle and late periods. As of yet, few sites are well dated to the early interval. The late Basketmaker II interval is

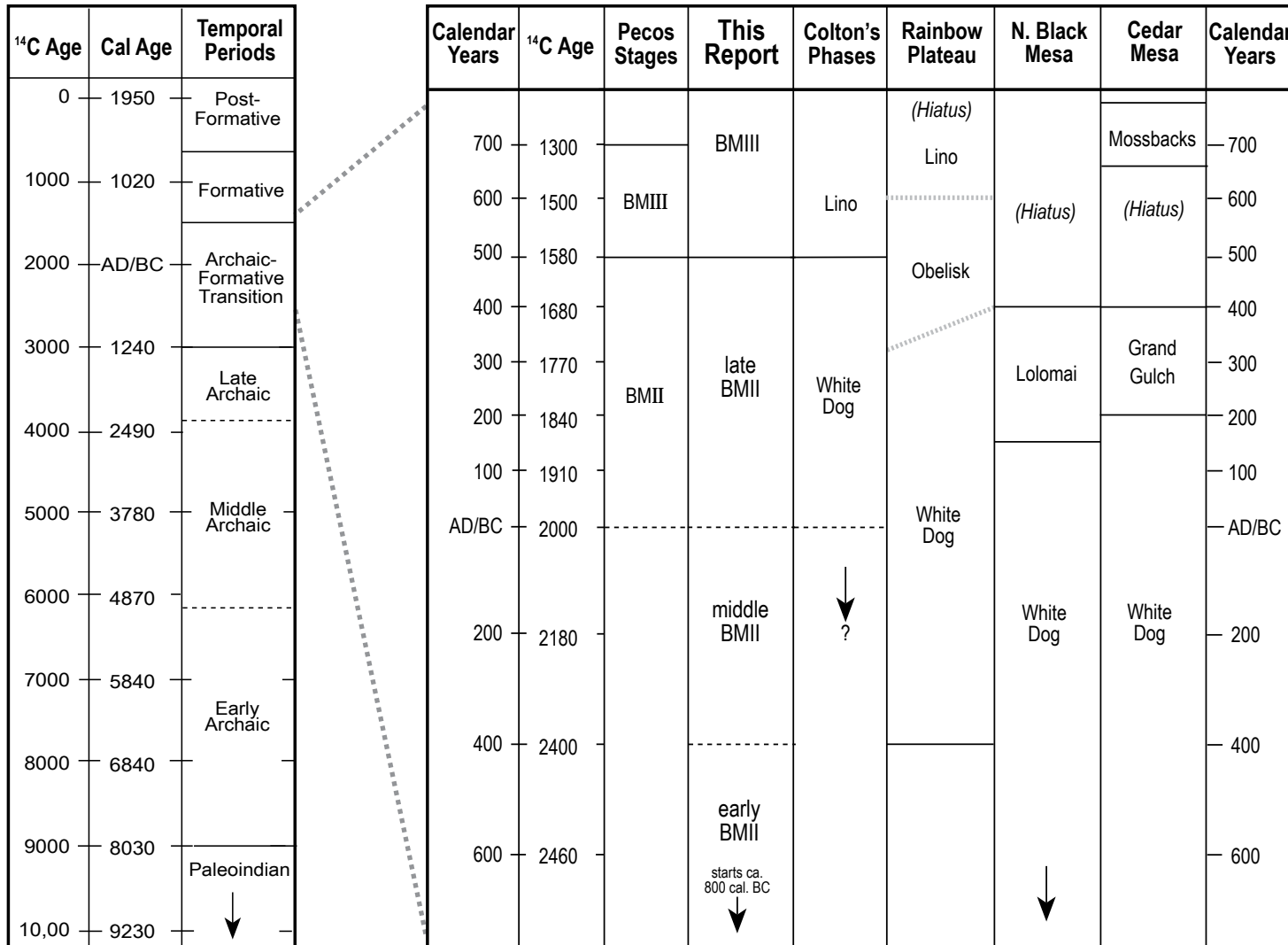


Figure 3.5. Western Basketmaker II cultural-temporal phases for NE Arizona and SE Utah (modified from Geib 2011).

recognized on both Cedar Mesa and Black Mesa by distinct phases characterized by mesa-top adaptations with open-air pithouse settlements. There seems little doubt that Basketmaker II populations greatly increased on both mesas and probably elsewhere during this final interval, but open pithouse settlements probably date to the start of Basketmaker II, contemporaneous with cave/shelter use, as they do on the Rainbow Plateau (Geib 2011).

Basketmaker II chronology is largely one of radiocarbon dates but in a few instances, such as on Cedar Mesa and for Talus Village and Falls Creek Shelters near Durango, there are a few tree-ring dates. This presents challenges not faced by others working with Basketmaker II materials, namely how to best integrate radiocarbon dated sites and remains to those dated by dendrochronology. Dealing with radiocarbon dates is challenge enough, but this can be exacerbated by a need to meld or reconcile dates specified in centuries (radiocarbon) with those specified in years or seasons (dendrochronology). Is a corn cob radiocarbon dated at around 300 BC from one of the Falls Creek Shelters, for example, really that old given that the houses at the sites are so much more recent (ca. AD 200–300) or is the date simply in error? Shelters easily could have been used over an extended period of time but this needs to be evaluated on a case by case basis.

CHAPTER 4

BASKETMAKER II WEAPONS

In this chapter I review the principal weapons Basketmakers may have used in intergroup conflict. Potential offensive weapons are commonly differentiated as either shock/melee or fire/range, with the former consisting of those used for close hand-to-hand combat (swords, clubs and the like) and the latter consisting of all things hurled from some distance. The hypothesis that Basketmaker II S-shaped grooved sticks were used defensively for fending purposes has them pitted against atlatl darts (Guernsey and Kidder 1921:88–89). These projectiles have velocities that are slow enough, generally less than around 60 mph or 26.8 m/sec (Whittaker and Kamp 2007) to make deflection with a stick seem intuitively possible. This was Earl Morris's (1939:14) impression but whether he actually experimented to confirm his inkling remains unknown. Atlatls and darts are well known from Basketmaker II sites but bow and arrow technology supplanted the earlier fire-type weapon and would have changed the viability of trying to bat aside projectiles. Arrows could perhaps also be deflected, especially those propelled by primitive self-bows, but this is a far riskier proposition, which is perhaps why defense against arrows has commonly involved shields or protective clothing. Basketmakers might have had specific shock weapons for combat, but their S-shaped grooved sticks seem to be poor candidates for this task.

Fire-Type Weapons

According to traditional culture history, Basketmaker II fire-type weapons consisted principally of atlatls and darts, with bow technology a relatively late addition to the Southwest, being adopted after about AD 500. This follows Kidder's (1927) original presentation of key differentiating traits between Basketmaker II and III in the Pecos classification, and most archaeologists continue to list the bow as a Basketmaker III addition along with pottery and the common bean (*Phaseolus vulgaris*; e.g., Cordell 1984:102; McGregor 1965:213; Plog 1979:114). Yet, there is evidence for bow use prior to AD 500 and perhaps as early AD 200 in northern portions of the Southwest (Geib 2011; Reed and Geib 2013). If flat curved sticks were used for fending purposes then

adoption of bow technology would have ended the effectiveness of this tool for projectile defense.

Atlatl and Dart

Direct radiocarbon dates on darts and atlatls along with associated dates for the same from secure stratigraphic contexts confirm that this technology has great antiquity in the new world and likely arrived with the initial migrants from NE Asia or elsewhere (Hemmings [2004] and Whittaker [2007a] report evidence for Paleoindian atlatls). Continued use of the atlatl up until about AD 500 is also verified by direct dating or stratigraphic associations with reliable dates. For example, an atlatl from Antelope Cave on the Arizona Strip has a direct date of 1850 ± 60 BP (Beta-8394, Janetski and Hall 1983), which is late Basketmaker II and near the end of the period considered here (cal. AD 20–340 at two-sigma). Likewise, a hunter's tool bag with atlatl paraphernalia recovered from Sand Dune Cave in SE Utah has an age of cal. AD 80–330 based on the average of three AMS radiocarbon assays (Geib 2004). Among the various items within this cache were six dart point foreshafts with hafted stone points and a small pouch with 16 dart point preforms and two notched dart points (Geib 2002; Lindsay et al. 1968).

Some have proposed that atlatls continued in use in portions of the Southwest almost 1000 years after adoption of bow technology (e.g., Lorentzen 1993; Vanpool 2006). Such arguments are ultimately based on point size and require direct dating on atlatls and darts to provide a definitive answer. Hare et al. (2004) supply an informative example of the sort of dating project that could be done in the Southwest; in their study area of southern Yukon, Canada the bow and arrow replaced the atlatl and dart rather abruptly at about cal. AD 700. I side with Whittaker's (2007b, 2012) skeptical view about the persistence of atlatl technology in the Puebloan period but, like him, acknowledge that atlatls may have occasionally appeared in the Southwest from Mexico. Nonetheless, Puebloans quickly dropped the atlatl and dart after introduction of the bow and arrow and it is doubtful that any groups living in the Four Corners region used the atlatl after about AD 600.

The dating of atlatl replacement is significant for the relative temporal ordering of rock art images. Hays-Gilpin (2000:171) believes that the atlatl and dart persisted as a ritual icon long after the bow and arrow replaced the traditional weapon and certain rock

art panels seem to support this interpretation. It is also possible that atlatls were retained for specific non-hunting purposes as among certain South American tribes (see Chapter 6). Nonetheless, most depictions of an atlatl in Basketmaker rock art are thought to occur prior to about AD 500.

Whole Basketmaker atlatls (Figure 4.1) are known from Battle Cave (Morris 1929), Broken Roof Cave (Guernsey 1931), an unknown site in Grand Gulch (Pepper 1905), Kinboko Cave 1 (Kidder and Guernsey 1919), Mummy Cave (Quirolo 1988), Sand Dune Cave (Lindsay et al. 1968), and White Dog Cave (Guernsey and Kidder 1921); fragments are known from some of these same shelters as well as other sites. These atlatls have a basic uniformity in general details that contrasts with atlatls of the greater Southwest and beyond (Ferg and Peachey 1998) but they also exhibit differences among themselves in specific aspects of fabrication, especially those relating to the finger loops, which hint at specific learning traditions or temporal change in such traditions (Figure 4.1 and see the website <http://basketmakeratlatl.com/>).

The basic Basketmaker atlatl form is a thin and rather narrow stick generally tapering in width from the distal end to a somewhat narrower handle. The hardwood (oak seems common) was worked flat on the upper surface or belly and gently rounded on the back or dorsal (note that Ferg and Peachey [1998:180] refer to this side as the ventral). The distal end exhibits a groove that ends in a short spur or projection that engages the butt-end of the dart; this is Ferg and Peachey's (1998) "mixed" style of atlatl—a combination of both "male" (spur only) and "female" (groove only) types. The grooves are of varying length, many having a tapered start that imparts an elongated heart shape as with the Battle Cave atlatl of Figure 4.1 or an abrupt start that imparts a rectangular shape as with the Sand Dune Cave atlatl. The spurs are either flush with the stick (Battle Cave) or slightly projecting (Sand Dune Cave).

Grips exhibit the greatest variability but in general are defined by hide finger loops that are firmly lashed to the stick. These can consist of folded strips of hide as with the Battle Cave atlatl or hide that is stitched to a more ridged core of sinew or raw hide as with the Sand Dune Cave atlatl. The finger loops are often accompanied by finger-wide notches cut in the wood to reduce stick width where the index and middle fingers are inserted (both atlatls of Figure 4.1 have this feature) or by a slight width constriction

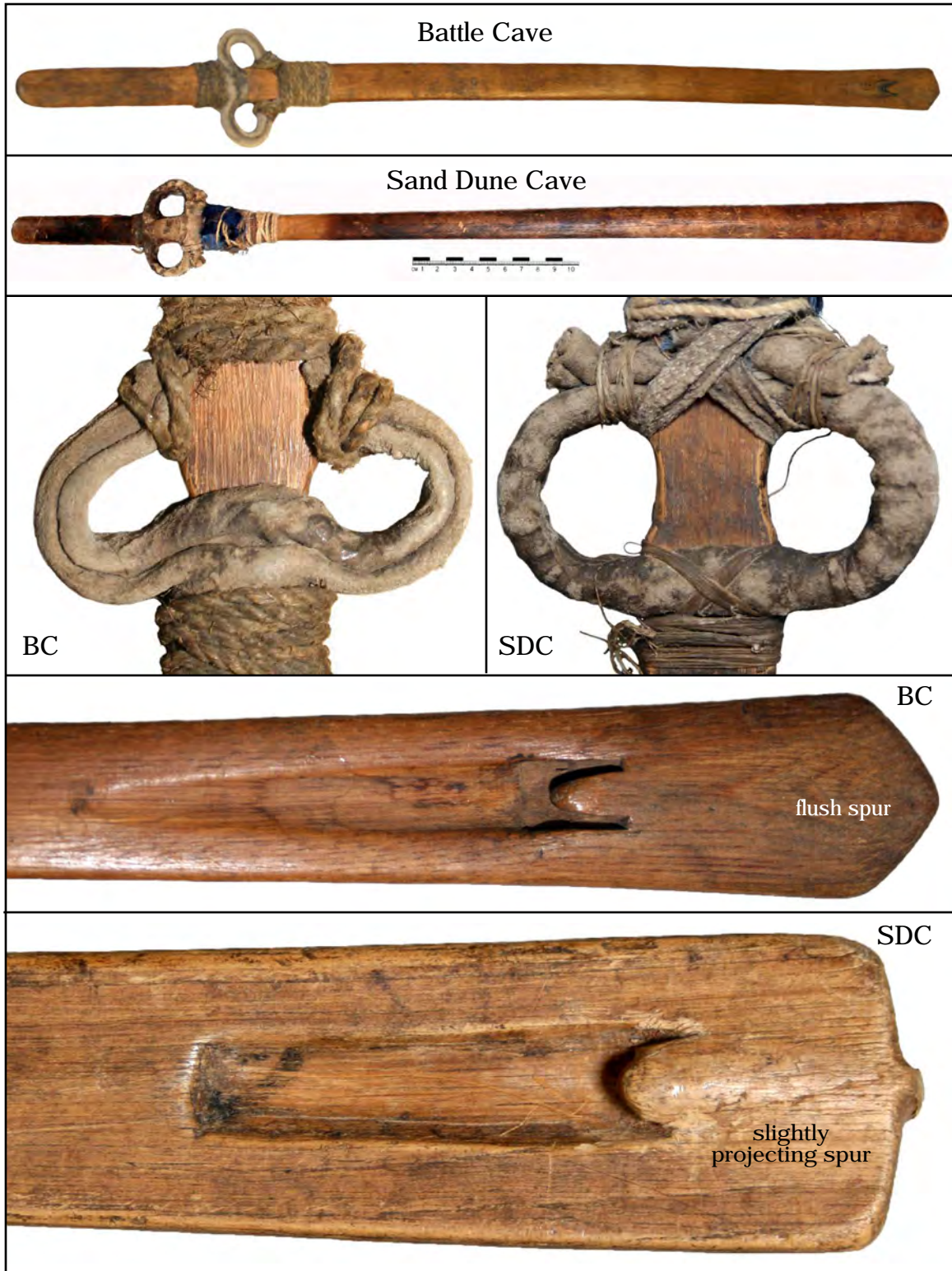


Figure 4.1. Basketmaker II atlatls showing differences in finger loops and the groove and spur on the distal end: Battle Cave, Canyon del Muerto, NE Arizona (AMNH 29.1/8598) and Sand Dune Cave, NE foot of Navajo Mountain, SE Utah (MNA NA7523.K29-30.8). (Collections of the American Museum of Natural History and Museum of Northern Arizona; photos by Phil R. Geib.)

(“waisting”) as with the Broken Roof Cave atlatl or the specimen described by Pepper (1905). The intricate details of finger loop fabrication, which need to be documented as J. Richard Ambler did for the Sand Dune Cave atlatl (Lindsay et al. 1968), are likely to disclose learning networks that largely pertain to vertical transmission (older to younger generations) and might prove useful for mapping out social groups during Basketmaker times, at least as indicated by a male craft item. Significant too in this regard is that different atlatl grip types might necessitate somewhat different throwing techniques (Pettigrew 2012), also something likely learned early in life. There could also be a temporal component to this in that the Sand Dune Cave atlatl likely dates to the first few centuries of the Christian era, just like the hunter’s bag from the site (Geib 2004), whereas the specimens from Broken Roof Cave and Battle Cave might well date a few centuries earlier.

Other more idiosyncratic details of atlatl fabrication include the addition of fetishes or weights and other decorative touches such as the addition of blue feathers to the Sand Dune Cave atlatl. Pettigrew (2012, http://basketmakeratlatl.com/?page_id=418) provides an informative and informed discussion of the purpose of the stones attached to atlatls; Cain and Sobel (2015) document the results of an interesting experiment using a mechanical atlatl launch that indicates atlatl weights decrease range (dart distance) but improve precision.

Basketmaker II darts are mainly represented by foreshafts and fragments of the mainshaft, with just a few complete specimens known. Guernsey and Kidder (1921:83) recovered three specimens from White Dog Cave that were in nearly perfect condition and whole though snapped in half for burial; they also recovered a number of less complete specimens. The Correo Site in west-central New Mexico (see Chapter 8) probably has the largest assemblage of atlatl darts including two whole specimens with foreshafts. The Correo dart assemblage, numbering into the hundreds and perhaps more than 1000, was described in a general way by Sandberg (1950) with far greater detail gleaned by Ron Field’s recent analysis (see Fields 2013 for a partial account).

It is abundantly clear that the basic Basketmaker II dart consisted of a main shaft with a detachable foreshaft to which was attached a stone point; there are rare darts without foreshafts or with nondetachable foreshafts. The intact dart main shafts from

White Dog Cave measure around 1.3–1.4 m long; those from the Correo site measure around 20 cm longer (1.56 and 1.66 m). The wood in most cases appears to be willow, which is light and easily worked, that was debarked and with twigs and branches cut flush and sometimes abraded flat. The proximal ends have small dimples or depressions for seating on the atlatl spur while the distal ends (tips) have conical shaped holes to accommodate the foreshafts; this end almost invariably has a sinew wrap to prevent the wood from splitting. The fletching was usually of three feathers secured to the shaft at the trailing end by an intricate means described by Guernsey and Kidder (1921:84) of sinew twisted around the feather tips. This same method plus direct wrapping of the feather tips was used at the Correo site along with three different methods to secure the leading end of the flight feathers (Ron Fields, personal communication 2012).

The business end for nearly all darts consisted of a hardwood foreshaft to which was attached a stone projectile point. Examples of the Basketmaker II foreshafts have come from numerous sites and Figure 4.2 shows one collection from Desha Cave 2 in SE Utah. There are also examples of foreshafts that lack stone points altogether but instead have a simple sharpened tip either pointed or chisel-like. Such wooden points are rare but an impaled skull reported by Pepper (1905:129) adequately demonstrates that they are quite lethal (reviewed in the next chapter).

Bunt points made of wood, bone, and antler also occur. Figure 4.3 shows three bone examples from Grand Gulch first illustrated by Pepper and wood examples are known from several sites across the southwest including 14 from the Correo site (Sandberg 1950). The bone examples consist of the lower end of deer tibias affixed to short wooden dowels by pitch and sinew wrap. One bunt from the Correo site has the butt end of a deer antler affixed to a foreshaft.

Pepper (1905:126) mentions the use of bunts to kill small animals without punching holes through their skins and thereby ruining them for bags and the like (Basketmakers commonly produced animal skin bags and pouches). Although this is certainly a possibility, snares and nets are quite effective at capturing small animals and Basketmakers commonly used both; thus a need for bunts in hunting seems poorly supported. Pepper refers to an 1899 article by Mason that illustrates atlatls and what are



Figure 4.2. Basketmaker II atlatl dart foreshafts with hafted stone points from Cache 1, Desha Cave 2, SE Utah (NHMLA A 4515-1); length of shortest foreshaft is 15.9 cm, longest is 21.2 cm. (Collections of the Natural History Museum of Los Angeles County; photo by Phil R. Geib.)



Figure 4.3. Basketmaker II atlatl dart bunts made of bone from SE Utah (NMAI 051505, 051504 & 051503), the same three illustrated by Pepper (1905:Plate III); longest measures about 10 cm in total length. (Collections of the National Museum of the American Indian; photo by Phil R. Geib.)

called “stunning darts” that have bunt tips used by tribes of the Xingú region (Mato Grosso) of central Brazil. The implication is that these blunted dart tips were hunting implements when in fact they served in atlatl duels where the darts were tipped with bunts so as not to inflict mortal wounds (Basso 1973:152; Oberg 1953:57–58). Chapter 6 explores this in greater detail.

The Kamayurá (Camayurá) tribe still conducts such ritual fights and indeed this is the only time when they use the atlatl; hunting is done with bow and arrow and blowgun. The bunts create “severe bruises” (Oberg 1953:58) but limit the lethality of such duels, as does the directive to throw at the buttocks and thighs and not the head or upper body. Atlatl bunts of the Southwest could have been used in similar fights perhaps even with deadly effect, especially for ones made of bone or antler. A bunt striking an individual at close range in the head could result in a circular impact fracture like that seen for the Red Canyon skull reported in the next chapter, although in this case the probable simultaneous fracturing of the zygomatic arch (see Figure 5.13) suggests use of a club.

Although a case can be made that bunts were principally used in what were mainly non-lethal fights—atlatl duels—foreshafts with stone points clearly had the hunting of large game as one primary purpose. There are countless Basketmaker II rock art panels that depict hunting quadrupeds with atlatls and darts, with bighorn sheep as the apparent principal prey. Ethnographic groups of North America and elsewhere commonly differentiated between stone arrow tips used primarily for hunting and those specifically designed for warfare (Ellis 1997). In all cases, stone tips were used to kill larger animals whether human or otherwise, with organic tips used on smaller game. Ellis noted that “stone points used for warfare could differ in size and shape, and often in the presence or absence of barbs, from those used on large game” (1997:45). A number of early authors familiar with the arrows of ethnographic groups mentioned that tips used for war were designed to make them difficult to extract without surgery or by pushing the arrow entirely through, whereas those used in hunting should be easily extracted for future use (see review in Loendorf 2010:105–109). Whether prehistoric groups also differentiated dart points this way remains unknown and at present there are no obvious distinctions in Basketmaker II points from given regions that suggest specific projectile point designs directed at hunting vs. war.

Basketmaker II dart points, of which the specimens in Figure 4.2 are quite representative, do not have features such as prominent barbs that would greatly hinder removal. Moreover, the heavy sinew wrapping that is so characteristic of Basketmaker II hafted points is also not likely to give way easily if a foreshaft was being pulled from a wound. Nonetheless, Basketmaker II dart points are deeply notched, some exceedingly so, such that there is a natural weak point. This combined with the heavy sinew wrap helps to ensure breakage across the notch when any sort of bending or leverage force is exerted while the point is embedded in flesh or bone. This seems to match Keeley's (1996:52) observation that the tips of "war projectiles were commonly weakened or hafted in such a way that when the shaft was extracted, the point or some part of it would remain in the wound." Consequently, Basketmaker II dart points might well represent a compromise between the need for projectiles in both war and hunting. Use-wear and residues on hafted Basketmaker II projectile points disclose that they were used for cutting and other tasks, thus there were likely other design considerations for dart tips than was true for arrow tips.

One aspect of some Basketmaker II points that seems consistent with a design for warfare is their very elongated nature, at least for those points in primary form such as the specimens of Figure 4.2. Basically, the amount of the stone tip that extends forward from the haft is far more than needed for effective penetration by at least two-fifths. Figure 4.4 illustrates this using one of the Desha Cave hafted points. The basal width for the hypothetical point (b of this figure) remains unchanged, but tip length is shortened by about 2.5 cm. This would save in both raw material and production time but without sacrificing depth of penetration or lethality, since the short point would doubtless perform just as well as its longer counterpart, something that could ultimately be tested experimentally (e.g., Waguespack et al. 2009). Having greater blade length certainly provides more opportunities for resharpening and recycling (if breakage occurs across the notches) and this could be a consideration, but longer points also ensure the intrusion of a larger and potentially infectious foreign body into an enemy and also perhaps the greater chance for leaving a portion behind because a longer point has more surface area to leverage against and snap than a shorter point. The partially healed-over dart point tip



Figure 4.4. Example of how some Basketmaker II darts points are greatly elongated beyond a tip sufficient for hunting big game: (a) one of the Basketmaker II atlatl dart foreshafts from Desha Cave 2 (NHMLA A 4515-1, see Figure 4.2); (b) a hypothetical dart tip that likely would provide equivalent depth of penetration and cutting edge to create a bleeding wound. The basal width of the hypothetical point is unchanged from the actual point. (Collections of the Natural History Museum of Los Angeles County; photo by Phil R. Geib.)

embedded in a vertebra of a Cave 7 massacre victim (see Figure 5.6) was clearly an elongated form.

Bow and Arrow

A.V. Kidder and other archaeologists of his time certainly had good reason for stating that bow and arrow technology was absent during Basketmaker II but present during Basketmaker III. After all, they were not using potentially ambiguous or misleading projectile point measurements (e.g., weight, shoulder width, neck width and the like) to make statements about which technology was present and which absent. They had the good fortune of recovering the perishable components—the actual atlatls, darts, bows and arrows. In all cases where they excavated in preceramic contexts bow technology was absent but atlatl technology was present, whereas from ceramic contexts they recovered bow technology and in the earliest of these, such as Broken Flute Cave of the Prayer Rock district in NE Arizona (Morris 1980), the last traces of atlatl technology.

With the advent of AMS dating we now know that many of the Basketmaker II contexts excavated by Kidder and his contemporaries were relatively early, often prior to the Common Era. As a result, their sampling did not necessarily cover the full range of temporal variability. Moreover, they also did not sample the full range of spatial variability nor site type variability since the primary focus was on dry shelters to the exclusion of open sites. Considerably more is now known about the temporal pattern of given technologies based on research conducted with old collections over the last 30 years and contract archaeology projects that are starting to fill some of the spatial and temporal lacunae. The current evidence suggests a more complicated temporal and spatial pattern to the introduction of the bow and arrow than is usually presented in standard accounts of culture history. In a general sense the old framework is correct, in that by the start of Basketmaker III or shortly thereafter, at or about AD 500, the bow and arrow was in general use and was the preferred fire-type weapon for hunting or war. But, prior to its ubiquitous use, bow technology made a spotty appearance in the northern Southwest, perhaps back as early as AD 200. It also seems clear that the earliest use of this technology occurred in more northerly areas around the periphery of the Four Corners region.

Direct radiocarbon dates on arrows or bows are exceedingly rare and the timing for the introduction of this technology was generally based on ceramic associations and tree-ring dates. Archaeologists have generally recovered arrow points, arrows, bows and bow strings from layers that also contain pottery. Deciding what is an arrow point or a dart point when the organic components are missing, as they almost always are at open sites, is sometimes problematic. Point size is a critical variable, with dart tips generally much larger than arrow tips on average and often best summarized by size differences in the haft elements (stems) on account of the reduced shaft diameter of arrows (or arrow foreshafts) when compared to darts (or dart foreshafts). Statistical verification comes from Shott's (1997) expansion of Thomas's (1978) study of hafted dart and arrow points, which reveal significant differences in summary metric data (Shott 1997:Table 2) between dart and arrow points in virtually all measures. Shott's (1997:98) threshold value for distinguishing between dart and arrow points is a shoulder width of 20 mm. Other researchers have emphasized neck width (e.g., Corliss 1972; Fawcett and Kornfeld 1980; cf. Shott 1997:98), with arrow points measuring 6 mm or less. Given the limited sample of hafted projectiles, especially dart points, it is always possible that some of the variability within certain regions is not adequately characterized, there being dart points within the threshold values for arrow points or vice versa. As a result, points of intermediate size between dart and arrow might get wrongly classified, with bow technology being attributed as arriving far earlier than actually occurred. Hildebrandt and King (2012) present an illuminating case in this regard from the Northwest Coast. In their critique of Ames et al. (2010), who proposed a significant revision in the introduction of bow technology (back perhaps to 8500 BP and ubiquitous by 4400 BP), Hildebrandt and King (2012) demonstrate that the projectile points that Ames et al. classified as arrow are actually dart points.

An analogous situation is evident for the southern Southwest with Cienega points. Sliva (1999, 2005) subdivided this type into four subtypes, two of which she thought functioned exclusively as arrow tips based on Shott's metrics, with two-thirds of another subtype also classified as arrow points. Silva took this finding as evidence that bow technology may have been in use as early as 800 BC (beginning of the Cienega Phase) in SE Arizona. Many Cienega points might well be smaller than the hafted dart points that

Shott used to generate his classificatory functions, but if the classificatory criteria developed by Shott do not adequately cover the range of variability for the size of true dart points, then this does not automatically indicate that they tipped arrows. Since Shott's sample did not include any hafted specimens from southern Arizona it is possible that dart points in this area simply reduced in size along with a change in morphology (style) leading up to the start of the Common Era (from San Pedro to Cienega). Certainly projectile point size had changed rather drastically by the Tortolita Phase (AD 450–600, Roth et al. 2011:90) when there is little doubt that bow technology was present. The same occurs elsewhere in the Southwest and Great Basin: at some juncture there is such a miniaturization of point size that statistical classification procedures are hardly called for to decide whether an item tipped an arrow or a dart.

Unless one wants to make the rather tenuous argument for independent invention of this rather complicated projectile system, the issue of when the bow and arrow was introduced should also be placed within the larger geographic spread of this technology. Bow use in southern Arizona by 800 BC would be substantially earlier than elsewhere in the Southwest or indeed the Great Basin, Intermountain region or the Great Plains, which presumably the technology would have spread through in order to arrive in the Tucson area (e.g., see the 2013 special issue of *Evolutionary Anthropology*). So, until portions of bows or arrows from the southern deserts of the Southwest are directly dated earlier than about AD 400 or Cienega points are found hafted to certain arrows, then I side with those who consider Cienega points as dart tips (Huckell 1995; Roth and Huckell 1992). In a review of the evidence for when bow technology first appeared in the Mogollon region, Roth et al. (2011) place it at around AD 500, so essentially the same as in the southern deserts.

On the Colorado Plateau the “when” of bow and arrow introduction depends on where one looks. For much of the area south of the Colorado River in Arizona and New Mexico the technology appears to date roughly the same as for the Mogollon area and southern Arizona: that is, at around AD 500. On the northern Colorado Plateau of Utah and Colorado there is accumulating evidence for bow use several centuries before this (see review in Geib 2011:281–284). The evidence not only includes obvious arrow points—those of such a small size that no one would doubt an arrow tip assignment—but

also arrow and bow portions such as those from Unit V at Cowboy Cave (Janetski 1980). The evidence for bow use by around AD 200–300 extends southward into the NE part of Arizona around Navajo Mountain (Rainbow Plateau), but not evidently much farther south or east and use seems patchy at this time with some areas of dense late Basketmaker II occupation (ca. AD 1–400) evidently lacking evidence for bow and arrow use such as Cedar Mesa (R.G. Matson, personal communication 2010) and northern Black Mesa (Parry and Christenson 1987; Smiley 2002).

Patchy use also seems evident in SW Colorado. No arrow points or remains of bows or arrows came from the well-dated Basketmaker II sites of Talus Village and the Falls Creek Shelters in the Animas Valley near Durango (Morris and Burgh 1954; Dean 1975). Yet excavations at the nearby Tamaroon Site recovered arrow points in association with a structure that closely resembled those of Talus Village and Falls Creek Shelter (Reed and Kainer 1978). A charred antler fragment from the site returned an AMS radiocarbon date of 1740 ± 40 BP (ca. AD 240–390 at 2σ) verifying the Basketmaker II assignment and the temporal overlap of this site with the excavated shelters downstream to the south (Reed 2012). Another site indicating potential early bow and arrow use is 5DL896 which yielded eight arrow points from a stratum radiocarbon dated between AD 130 and 430 (Reed and McDonald 1988). Dating here, though, is based on wood charcoal so it easily could be several hundred years too early. “Large” arrow points are reputed from the Darkmold site just downstream from Talus Village (Charles and Cole 2006:174), but lacking photos and measurements on these it is impossible to evaluate the evidence. Nonetheless, there is sufficient reason to see the northeast portion of the Basketmaker area (SW Colorado) as also containing evidence for use of bow and arrow technology by some groups during late Basketmaker II times.

One seemingly convincing piece of evidence for early bow use in the southern part of the Four Corners area has always been the supposed Basketmaker II burial with an arrow point foreshaft embedded between the ribs that Earl Morris recovered from Battle Cave in Canyon del Muerto (Morris 1939:19; Lister and Lister 1968:137; Wormington 1961:55). Radiocarbon dating reported in Chapter 5 demonstrates that this individual is Pueblo I or late Basketmaker III in age, not Basketmaker II, a temporal assignment totally

consistent with the style of the stemmed arrow point in the foreshaft between the ribs and another point embedded in a vertebra.

Shock Weapons

Shock or melee weapons are not well represented in the Early Agricultural Period archaeological record, at least not ones specifically designed for that purpose. The effects of such weapons are evident enough in skeletal remains, such as the Cave 7 and Battle Cave massacres discussed in the next chapter, but the crushed skulls and other signs of blunt force trauma could have been inflicted by digging sticks or unmodified logs and rocks that were expediently used rather than specialized weapons of war.

The S-shaped grooved sticks might seem to qualify as a shock-type weapon. Indeed, these artifacts are often called “clubs,” which has the implication of use as a cudgel, and Heizer (1942) specifically mentioned this as one possible function, as did Roberts (1929:12). Some Mesoamerican archaeologists insist that the analogous artifacts at Chichén Itzá and related Toltec sites were shock weapons, and designate them as short swords, disavowing the fending interpretation (e.g., Hassig 1992, 2001; discussed in Chapter 6). As I detail in Chapter 8, some of the flat curved sticks from the Southwest are so light that they could never have delivered a killing blow except to a small animal, and even the heaviest examples hardly qualify as deadly weapons, as war clubs. The skeletal damage observable on some of the individuals at Cave 7, Battle Cave, and other sites is beyond the capacity of the Basketmaker II grooved sticks. Moreover, if these artifacts played a common role in hand-to-hand combat as fighting sticks then this leads to expectations for certain types of use-wear. The evidence of use reported in Chapter 9 does not support a shock weapon role.

Far more likely candidates for specialized close-fighting weapons are wooden bats that resemble scaled-down versions used for baseball, a few of which have been recovered from sites in SE Utah (Figure 4.5), including Allen Canyon just upstream from Cave 7. These items could inflict severe and lethal injuries of the sort that occur on some Basketmaker II skeletons. Yet these bats might all date to the Pueblo III period. Indeed, Judd (1952) reported finding one within the roof of a Pueblo III period kiva in Bullet Canyon of Grand Gulch. A wooden bat from White Canyon recovered by McLoyd and part of the “Kunz Collection” at AMNH is the one possible Basketmaker II specimen



Figure 4.5. Wooden bats that probably functioned as war clubs and that may date as early as Basketmaker II: top is H/13396 from Cave 30, Allen Canyon; bottom is H/12337 presumably from White Canyon although the AMNH catalog only specifies "Grand Gulch region." (Collections of the American Museum of Natural History; photo by Anibal Rodriguez.)

(upper example of Figure 4.5). This bat is described as “25 inches in length, 1¼ inches in diameter at the large end; has a knob at the small end, to prevent it from slipping through the hand” (anonymous cited in Hurst and Turner 1993:165). This is identical in form to those that are clearly Pueblo III in age. The Basketmaker II temporal attribution of the White Canyon specimen currently hinges on the memory of McLoyd who evidently did not keep a field log but later recalled artifact associations and claimed that the club was with a headless male mummy that had various other typical Basketmaker II artifacts (Hurst and Turner 1993:165). This intriguing possibility needs to be verified by direct dating.

Pueblo III rock art such as the famous club-wielding anthropomorphs at Defiance House in Forgotten Canyon, Utah (Lipe 1960) may well depict the use of wooden bats and one of the AMNH specimens comes from room 22 of Poncho House (H/15647), a Pueblo III site largely contemporaneous with Defiance House. A nearby Puebloan style rock art panel in Chinle Wash shows a pair of club-wielding combatants carrying shields (Cole 2009:Figure 88). Likely significant in this regard is the virtual lack of clear club-like weapons in Basketmaker II rock art yet abundant depiction of atlatls and darts, both for hunting and in dyadic fights (discussed in Chapter 11).

The Red Canyon skull described in the next chapter (see Figure 5.13) has an impact fracture that is quite consistent with a blow from a bat like the White Canyon specimen. Not only is the circular impact fracture to the temporal region a good match but also the fracture of the zygomatic arch, which would have occurred simultaneously. Yet a digging stick or unworked log also could have dealt this death blow. Until direct dating confirms that there are Basketmaker II bats I am reluctant to base such a claim on McLoyd’s memory.

One other Basketmaker II artifact that might represent a somewhat specialized melee weapon consists of the corner-notched hafted knives that Guernsey and Kidder (1921:93–95, Plate 35j–l) first described. These large, thin, well-made artifacts are up to 18 cm long and 7 cm wide but just 6 mm thick; Figure 4.6a illustrates a particularly nice example. This particular specimen was found between the right rib bones of an adult male at Cave 7 that exhibited obvious signs of perimortem damage to the skull (Skeleton 196), with the implication that the knife had been plunged into the chest cavity.

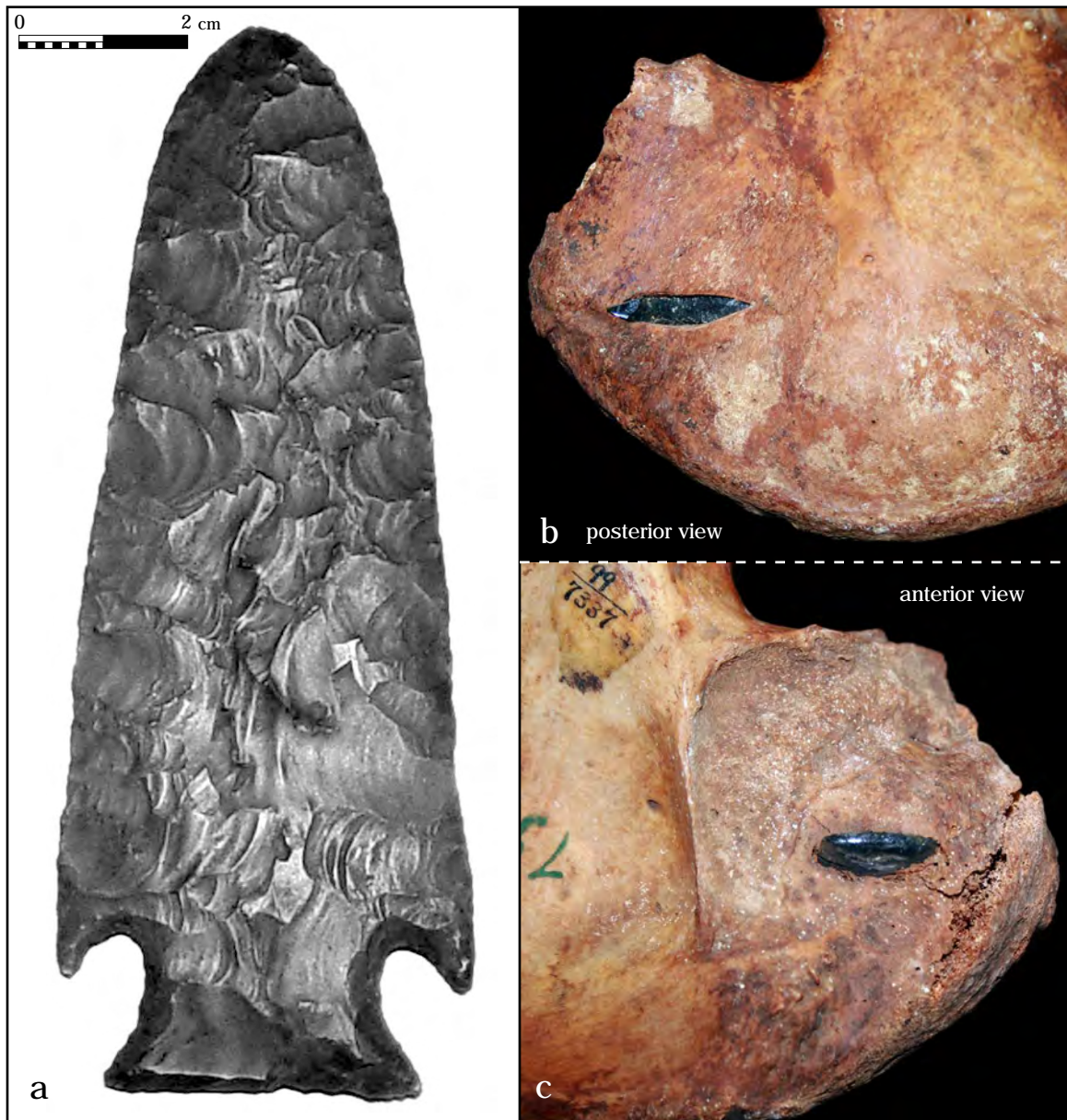


Figure 4.6. Basketmaker II large corner-notched hafted knives, a possible weapon for close fighting: (a) specimen found between the right rib bones of Skeleton 196 at Cave 7 (adult male exhibiting obvious signs of perimortem damage to the skull); (b,c) specimen of obsidian sunk clean through the left innominate of Skeleton 79 with the tip embedded in the sacrum. (Collections of the American Museum of Natural History, photos by Phil R. Geib.)

Even more dramatic evidence for the use of such knives as weapons is the equally large blade of obsidian found pierced clean through the left innominate of Skeleton 79 at Cave 7, with the tip extending into the sacrum pinning the two bones together (Figure 4.6b,c). Certainly knives like this could have been put to ordinary cutting tasks, although Basketmakers already had a good option for this with their numerous hafted dart points. Archaeologists have recovered few of the large knives, perhaps because they were readily recycled into smaller tool forms. The two whole examples described by Guernsey and Kidder came from burials, and a hafted but broken specimen came from the fill of a storage cist. A heat-spalled example of such a knife blade came from a Basketmaker II site on northern Black Mesa (AZ D:7:103) along with small heat-spalls from at least three or four additional bifaces (Parry 1987a, b:238, Plate 6-7; Parry and Christenson 1987:Plate 15). These latter tools came from the fill of a hearth along with beads and thus also represent some special depositional context. A rock art panel on Cedar Mesa that shows two warriors squared off with atlatls and darts might show an example of a large knife wielded by one of the opponents (see Figure 11.14).

Weapons of Defense

No certain examples of shields are known from Basketmaker II or even Basketmaker III contexts. Shields made of basketry or hide all date relatively late in the Southwest, after about AD 1150, and are clearly associated with bow and arrow technology. Shields are well suited for protection from arrows but they are equally effective against spears or darts since many tribes in Australia used them for this purpose (called *hieleman* or *heeleman*; an account of a fight where such shields were used occurs at http://freepages.genealogy.rootsweb.ancestry.com/~jray/coffs_harbour/battle.htm). Excavations have recovered large close-coiled basketry trays from Basketmaker II sites that could have been suitable for use as shields but none appear to have had handles on the concave side for such a purpose. Circles with designs in rock art are commonly interpreted as baskets, such as at the Wolfman panel (see Cole 1989:Figure 3 and Cole 2009:Figure 57d,e), but these do not occur in the hands of anthropomorphs as they might if shields were represented. There is a petroglyph near Moss Back Butte next to Cedar Mesa that shows a male impaled by a dart or arrow and holding a shield. This figure seems more likely to be Puebloan in age given its “style.”

Merely having shields would not necessarily cast doubt on the fending stick hypothesis; nonetheless, it perhaps gains greater plausibility because Basketmaker II groups evidently lacked shields. Either there was no defense against atlatl darts except for dodging the projectiles or the grooved flat curved sticks served this purpose as initially proposed in Guernsey and Kidder (1921:88).

Summary

For most of the Basketmaker II Period the atlatl was the exclusive fire-type weapon and it is for defense against atlatl darts that flat curved sticks purportedly had their primary role. Obviously a standard thrusting spear could also be thrown and the supposed fending sticks could have been effective against them, but I am not aware of any certain examples of such implements from Basketmaker sites or elsewhere in the Southwest. Toward the end of the period, bow and arrow technology started to be used, evidently as a part of a southward spreading trait from the Great Basin and Intermountain region of North America that was probably mediated by intergroup relationships and competition. Current evidence indicates potential use of the bow as early as about AD 200–300 on the Rainbow Plateau, in portions of the Glen Canyon lowlands, and from the Moab area extending eastward into SW Colorado. This new technology may have had a rather immediate impact on intergroup conflict by facilitating stealth attacks of greater precision and hence perhaps increased lethality. It also could have enabled a more effective defense by those groups that were numerically disadvantaged yet possessed the technology and facing larger social groups with more rapidly growing populations that only possessed the atlatl and dart. Such a scenario may well have occurred all across the northern periphery of where food production (maize farming) was becoming established. If flat curved sticks served as defense against atlatl darts this would have proven impractical (too risky) against arrows. So the timing of when bow technology arrived in the Southwest could have implications for the fending hypothesis.

Effective use of the atlatl and dart requires two hands, one to hold the atlatl and the other for loading it with darts. As such, a defensive stick appears to be an unnecessary encumbrance. It is true that such a stick can be held in the second hand along with extra darts and that this can occur even when loading darts, but the stick cannot be used effectively while holding darts. Additional darts could always be inserted

upright in the sandy sediment common to the Southwest, in order to free up the defensive hand, but why bother since the darts alone can be used effectively to bat away oncoming projectiles.

It is also worth pondering in what sort of conflict a fending stick could have seemed like an asset. Would a deadly surprise attack qualify, such as what likely initiated the Cave 7 massacre assemblage considered in the next chapter? This massacre dates to the first century of the modern era before any conclusive evidence for bow technology on the Colorado Plateau. Atlatl darts were used in that incident along with other weapons but not bows and arrows. It is doubtful that fending sticks were used or would have had any value at the Cave 7 incident. Large pitched battles such as exemplified by those of the Dani people of New Guinea that were documented in the film *Dead Birds* also seem an unlikely setting for using fending sticks. Such “theaters of war” (Roscoe 2011) certainly provide a more plausible scenario than a surprise attack, but in such a contest projectiles are coming from various trajectories, making it very difficult to track all potentially lethal projectiles thus limiting effective use of a fending stick. Incoming darts could just as easily be dodged or batted away with the atlatl or darts in a warrior’s possession, rendering the fending stick seemingly superfluous.

If flat curved sticks were also an effective offensive weapon, as were the Solomon Island parrying clubs that gave rise to the fending stick speculation in the first place (see Chapter 6), then these artifacts might not be superfluous in a conflict. Yet, it is difficult to make a convincing case that Basketmaker II flat curved sticks would make an effective club. This differs from the wooden bats of the Four Corners; if these billy clubs date to the Basketmaker II period, then they could have served equally well both to bat away atlatl darts and to deliver a crushing skull blow in close combat.

CHAPTER 5

EVIDENCE OF BASKETMAKER II CONFLICT

The extent to which individual and group conflict is ubiquitous and common is a chief predictor of whether or not specialized defensive implements might be deployed. At the time that the fending interpretation for the S-shaped grooved clubs was first presented (Guernsey and Kidder 1921:88–89), the nature and degree of conflict during the Basketmaker II period was poorly known. The case is much clearer now since a plethora of direct and indirect evidence for Basketmaker II violence is known to exist, including unequivocal proof for warfare. The purpose of this chapter is to review the most significant finds, mainly the biological data. No matter what circumstantial support one might be able to muster, confirmation that lethal conflict was group behavior qualifying as war comes from massacre assemblages; hence, they are considered first. Other evidence consists of trauma to individual skeletons, scalps and other trophies, and mass burials lacking perimortem damage. Some of these other facts clearly support violence and some of them *do not*, such as the case of missing skulls at Woodchuck Cave or mass burials lacking any trace of perimortem damage. Also, the nature of Basketmaker II violence has implications for evaluating the applicability of using sticks to bat away atlatl darts. As I observed in the Chapter 4 summary, warfare might not be a context in which fending sticks make sense. A massacre is certainly the wrong setting. A more plausible context is one in which social or other constraints are in effect to control the lethality of group violence (some examples are considered in Chapter 6).

There Was Violence, But Was It War?

The archaeological record for various regions and time periods can contain evidence for violent conflict, but does the evidence meet a behavioral definition of war?^{vi} Does it qualify as lethal intergroup conflict or is the violence private and personal or the result of capital punishment? This is an important yet difficult question for archaeologists who do not have access to people's thoughts and rationalizations and who study the consequences of behavior. Skeletal remains that exhibit traumatic injuries are indispensable for demonstrating violent conflict (Walker 2001), but with single individuals it is always possible that homicide alone is represented. An ambush killing or

lone deaths in more formal battles would also result in single deaths, but inferring war from such remains is less certain.

For example, the skeletons from Cemetery 117 at Jebel Sahaba (Wendorf 1968) are often held up as evidence for warfare at the end of the Pleistocene prior to the advent of food production (e.g., Keeley 1996; Kelly 2000, 2005). Yet, given that the excavator interpreted the remains as constituting a formal cemetery, with interment events spread across some duration of time, perhaps generations, an inference that seems reasonable enough based on the cemetery plan map, war is not the only plausible account. Episodes of within-group violence might also play a role in the formation of the Jebel Sahaba assemblage and even the individuals impaled by numerous projectile points, such as skeletons 20 and 21, could be accounted for by local group execution for some offense. If the points exhibited foreign styles or raw materials then a case for conflict with an external group would be strengthened, but to my knowledge such evidence has not been marshaled for skeletons 20 and 21 or the Cemetery 17 assemblage overall.

Skeletal remains exhibiting traumatic injuries are central to making a case for war, but a strong inference in this regard comes from massacre assemblages: the skeletal remains from several individuals interred together and exhibiting perimortem damage and embedded weapons such as projectile points. As confirmatory evidence of war, prehistoric massacres merit detailed study to document the health, nutritional status and demographic profile of the deceased since these factors are important for trying to arrive at an understanding of the causes of lethal intergroup aggression.

Basketmaker II Massacre Assemblages

Massacre assemblages are moderately well represented on the Colorado Plateau during the Puebloan periods, after about AD 700 (e.g., Billman et al. 2000; Kuckelman et al. 2000; LeBlanc 1999; Potter and Chuipka 2010; Turner and Turner 1999). During the Basketmaker II times, however, such assemblages are rare, represented by just two finds (Figure 5.1): Cave 7 in Whiskers Draw of Cottonwood Wash, SE Utah (Hurst and Turner 1993) and Battle Cave in Canyon del Muerto, NE Arizona (Turner and Turner 1999). The Cave 7 skeletal assemblage looms large in Southwestern archaeology, both in the history of the discipline and, more importantly, for the social and theoretical ramifications of the remains. Although Christy Turner described both the Cave 7 and

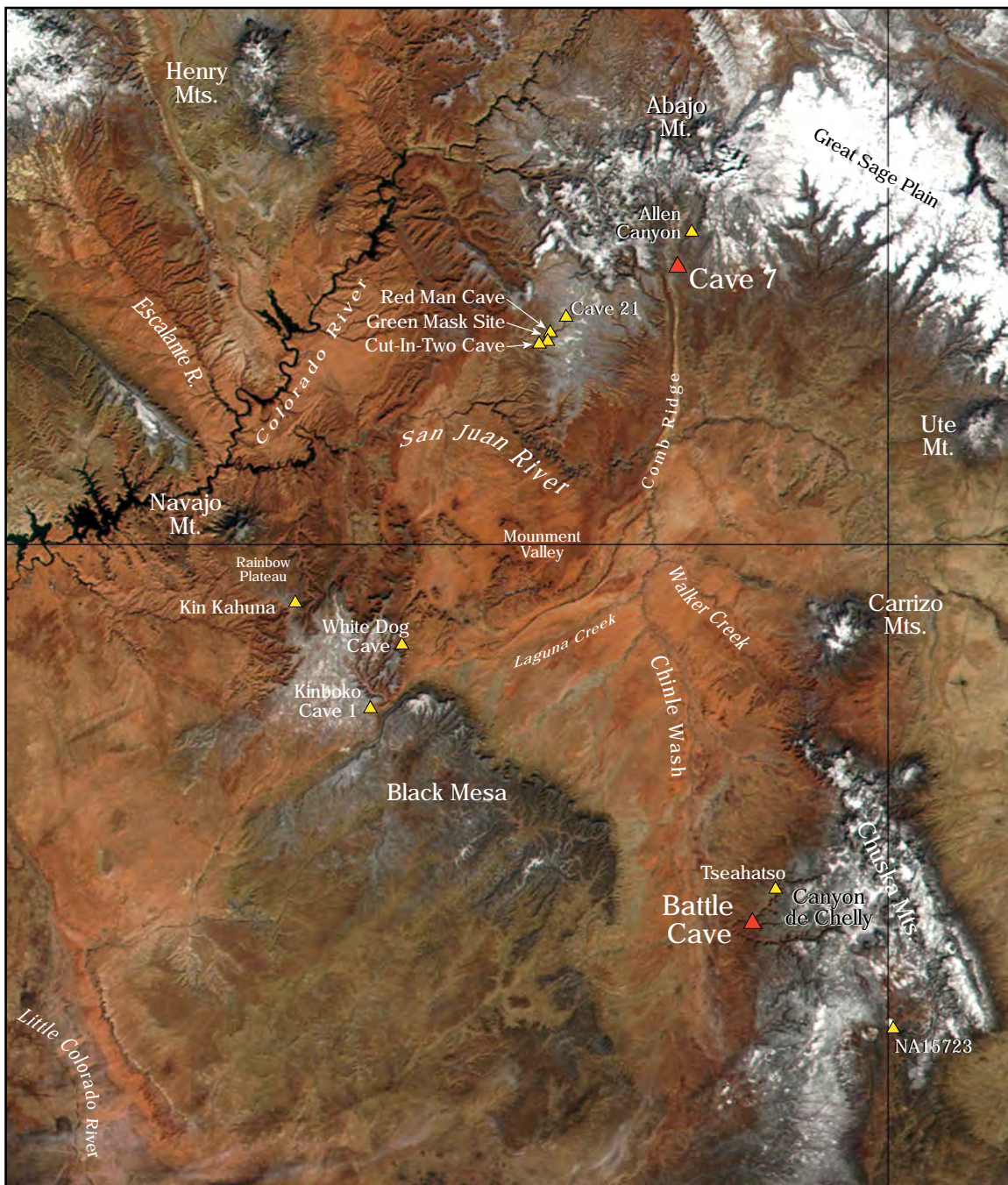


Figure 5.1. Locations of both Basketmaker II massacre assemblages along with other important sites/finds within SE Utah and NE Arizona. (Base image: GrandCanyon.A2002019.1820.250m.jpg; available at <http://visibleearth.nasa.gov>.)

Battle Cave assemblages in a general fashion, a number of important issues remained to be investigated when I started my dissertation research in 2006.

Temporal placement is foremost on the list. Assignment to the Basketmaker II period has been assumed based on artifact associations (dart points and a lack of pottery) and the absence of cradle board cranial deformation (a later Puebloan trait). Yet, even if correct, temporal placement within the 1300 years of the Basketmaker II period is critical for correctly situating the remains in their environmental and social context. Direct dating is also important for determining the temporal order of the two massacres—were they roughly contemporaneous or not? Testing for contemporaneity within an assemblage is also possible, but because of the statistical nature of radiocarbon dates combined with the need for calibration, it is virtually impossible to be certain that individuals with identical ages, even with exceedingly low error terms, had strictly contemporaneous times of death (a few hours or days at most) in order to qualify as a massacre. Such an inference can only be made based on excavation context, which places a premium on the observations made by those who excavated the remains, along with any supporting field documentation—notes and especially photos. Other questions about the assemblages concern the actual number of massacre victims, the incidence of skeletons exhibiting perimortem trauma, and the ratio of males to females and adults to infants. Whether the violence evident at these sites resulted from internal or external warfare (Otterbein 1968, 1970) is potentially significant since this could influence whether there were any rules that potentially circumscribed the nature of intergroup conflict.

Cave 7

When the dust settled after Richard Wetherill and his band of dilettantes shoveled through the deposits of the now infamous Cave 7 in Whisker's Draw of southeastern Utah in the late 1800s, a previously unknown^{vii} prehistoric people had come to light (Blackburn and Williamson 1997; Hurst and Turner 1993). Their work provided clear stratigraphic evidence for the greater antiquity in the Southwest of a preceramic group that underlay the cliff dwellers or Puebloans. This earlier culture was designated as Basket Maker (Pepper 1902; Prudden 1897) and today as Basketmaker II. These earlier people lacked ceramic vessels, but their finely crafted coiled basketry prompted Wetherill

to call them “Basket People,” a term that evolved over several decades into the name that remains in current use (see Hurst and Turner 1993:147 for a discussion of name evolution).

A more significant aspect of the Cave 7 skeletal assemblage was the evidence that many of the 90 or so individuals died as a result of violent conflict. This seemed immediately obvious to Wetherill, leader of the excavation; a few weeks after the find he wrote a letter saying that they had recovered more than 90 skeletons many with “broken heads and arms” and skeletal elements pierced with projectile points (Hurst and Turner 1993:145). A fuller account appeared in *The Archaeologist* magazine in 1894, listing the total number of skeletons recovered at 92. Three of them were recognized as “cliff-dwellers” but the rest were identified as Basketmakers who were interred so close together in the central portion of the shelter that bones touched each other. “The number of skeletons found at one level and in one place would suggest a sudden and violent destruction of a community by battle or massacre” (H. 1894). So it was that Cave 7 became known to Southwestern archaeologists as a massacre site, one of three such finds identified in 1893 (Turner and Turner 1999:Table 3.1).

Cave 7 (42SA22180) is a small, west-northwest-facing rockshelter 32 m wide by 12 m deep (Figure 5.2) that Richard Wetherill and other members of the Hyde Exploring Expedition excavated near the end of 1893. For horizontal control, they subdivided the shelter into six sections that each measured about 12 feet wide, but of variable length as they extended from the shelter’s back wall toward the dripline. Information in Wetherill’s field documentation is somewhat ambiguous in regard to directionality, as he considered the alcove to be north facing, whereas it actually opens to the west-northwest. His “north” is therefore closer to west than north. For this reason, my directional references are not perfectly consistent with those given in Wetherill’s catalog. Unfortunately, except for some tiny schematic sketches in the artifact catalog that do not show his section divisions, there is no known surviving Wetherill map of the site. Nevertheless, using entries in his field catalog along with his other descriptions and field photos, Winston Hurst was able to reconstruct the approximate location of these subdivisions as shown in Figure 5.2 (Geib and Hurst 2013). These sections were numbered starting at the south end of the shelter and ending with section 6 partially under

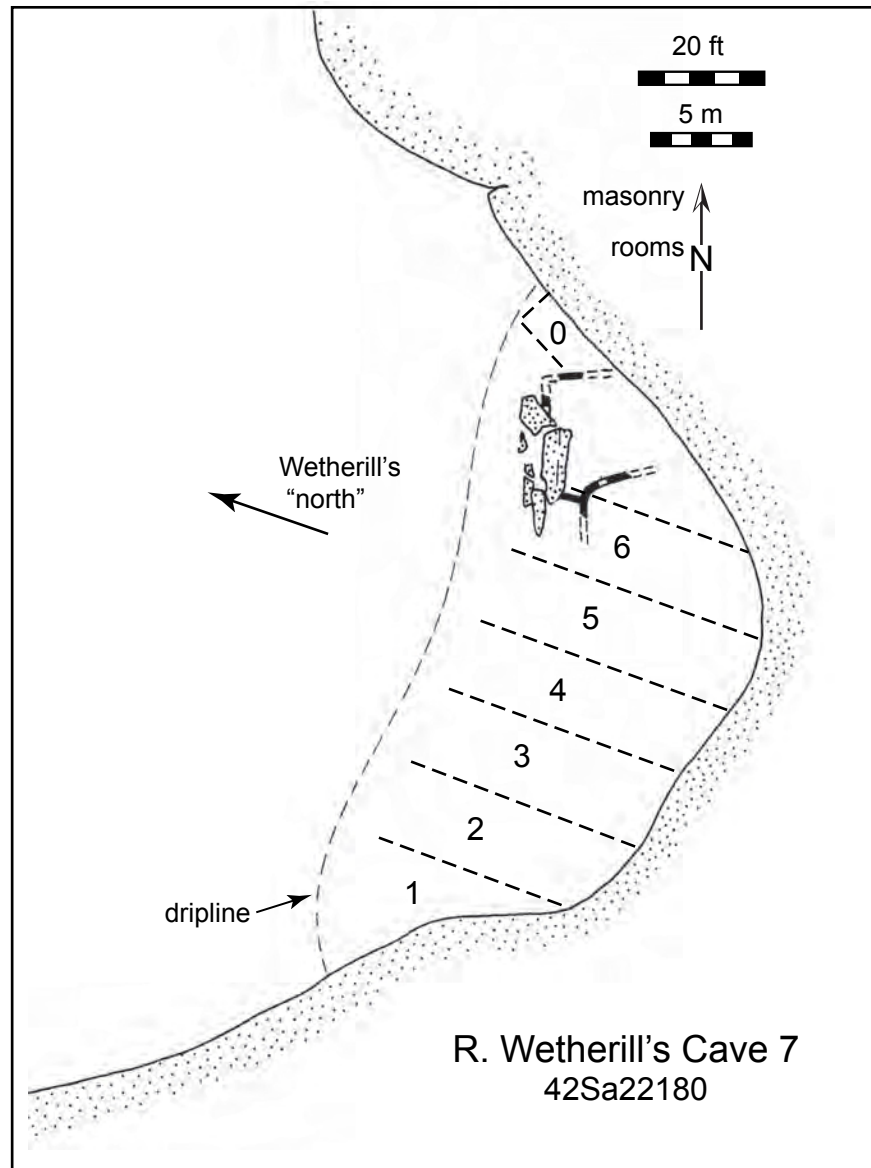


Figure 5.2. Plan map of Cave 7 from Hurst and Turner (1993:Fig. 8.3) showing the probable location of the sections that Wetherill used for horizontal control during excavation of the shelter (from Geib and Hurst 2013).

the walls of a Puebloan structure. Near the end of work, they added another section designated 0 on the north side of the masonry rooms.

After the initial fervor over the Cave 7 find had subsided and the existence of a Basketmaker culture predating the Pueblos was verified by more scientifically focused and well-published excavations (Guernsey and Kidder 1921; Kidder and Guernsey 1919), the Cave 7 remains were largely forgotten until interest in old collections surfaced during the 1980s. Indeed, the actual location of the site was lost to science until 1990 when Winston Hurst and Owen Severance finally managed to relocate it (Hurst and Turner 1993:148–156). Fortunately, however, the skeletal assemblage and artifacts had been given to the American Museum of Natural History (AMNH) and accessioned there in 1899, thus allowing the sort of modern-day investigations reported by Turner (Hurst and Turner 1993; Turner and Turner 1999) and Coltrain et al. (2012).

Massacre or Not? The excavators of Cave 7 identified it as a massacre site and since the late 1800s Southwestern archaeologists have thought of it this way. Christy Turner's examination of the remains only bolstered confidence in the veracity of this interpretation (Hurst and Turner 1993; Turner and Turner 1999:59–65). Then in 2012 the *Journal of Archaeological Science* published a study that presented a suite of AMS radiocarbon dates seemingly inconsistent with a single-event interpretation (Coltrain et al. 2012). Dates on purified collagen from 96 Basketmaker II bone samples ranged from ~2085 to 1650 radiocarbon years ago, or roughly 110 BC to AD 400 for calibrated date midpoints. Since these 96 dates span some 500 calendar years, statistical testing for contemporaneity is an academic exercise. As Coltrain et al. (2012:2223, 2226) demonstrate, the dates fail to pass such a test. This is true even after removing the most extreme outliers. Since the individuals exhibiting obvious violent death extend across virtually the full date distribution, it is likewise no surprise that a test for contemporaneity among the trauma victims also fails at the 95% level. Because the dates are statistically different, Coltrain et al. concluded that Cave 7 contained the skeletons from several different burial events rather than a massacre. They speculated that Cave 7 served as a special cemetery site for higher status males and their immediate kin who were victims of episodic violence from raiding or disputes that occurred across a 500–700 year span of time.

The results of Coltrain et al. (2012) look convincing at casual glance but detailed examination suggests otherwise. Only by ignoring excavation context can the dates be accepted as accurate estimates of individual sample age (time of death) within the range of their error terms. As Figure 5.3 shows, burial context discloses significant anomalies with some of the assays. This figure plots the 2σ calibrated ranges for skeletons within four contextual groupings identifiable from Wetherill's field log; these are burials that occurred together spatially such that contemporaneity at death and interment is highly probable. The skeletons of each group were not just clustered together within the shelter but had skeletal elements of different individuals physically touching. Geib and Hurst (2013) present a detailed discussion of these groups along with several of Wetherill's excavation photos that document the spatial relationship between dated individuals. Figure 5.3 shows date midpoints as either a black dot for individuals with obvious perimortem damage or a white dot for individuals that lacked this or for which such an assessment was never made. If we accept these dates as valid, then we have some rather unbelievable intrusions of younger skeletons onto, around and even under older skeletons. A seemingly more likely scenario was that these dates are relatively imprecise estimates of one or more episodes of interment. If true, then they can not be used to refute Wetherill's interpretation of a single-event massacre.

New Dates. If one wanted to identify a series of separate interment events in Cave 7 like Coltrain et al. (2012) propose as their alternative explanation for the assemblage, then the associated skeletons identified by Wetherill make excellent candidates to investigate this possibility. This is especially true for those groups with contrasting characteristics such as males exhibiting obvious signs of violence (Groups 1 and 3) vs. females and children that lack signs of violence (Groups 2 and 4). Certainly the burial groups provide excellent test cases for investigating the veracity of the existing Cave 7 determinations. I did this by obtaining new radiocarbon dates from an independent AMS facility (the National Ocean Sciences Accelerator Mass Spectrometry Facility) on residual collagen for 11 of the Cave 7 skeletons (Dr. Joan Coltrain graciously provided the collagen). These 11 samples consist of ten from skeletons of the four groups highlighted in Figure 5.3 plus the youngest of the Basketmaker II skeletons based on the dates reported by Coltrain et al. (skeleton 322). The latter exhibits severe

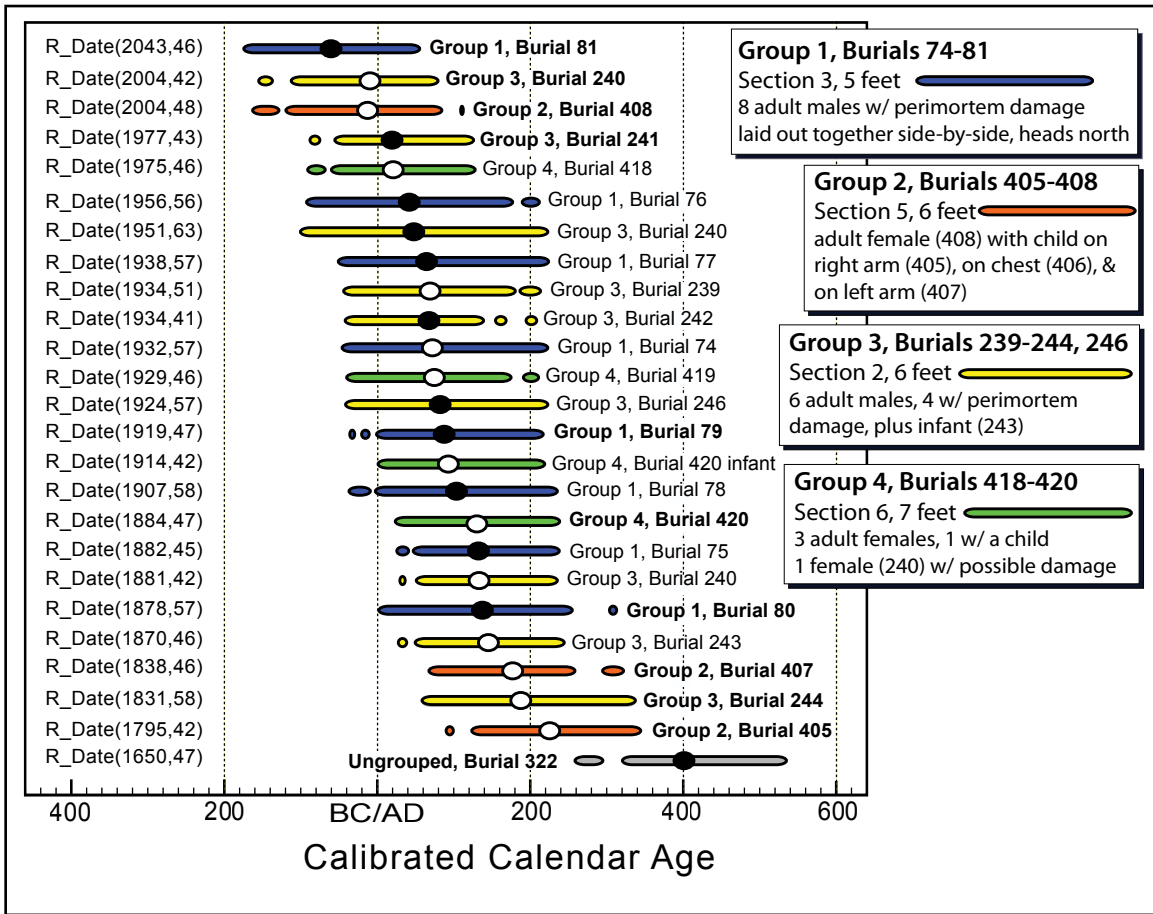


Figure 5.3. Plot of 25 AMS radiocarbon dates from Coltrain et al. (2012) on Cave 7 Basketmaker II skeletal remains, the subset within four contextual groups identified in Wetherill’s field notes, plus the ungrouped Burial 322. Dates are plotted using calibrated 2σ ranges with color fills denoting burial group; date means are shown as white or black dots, with black indicating individuals that died violently. Bold text indicates samples that were redated and reported in Geib and Hurst (2013).

perimortem cranial damage: “face sheared from vault” with “two penetration wounds in the occipital bone” (Hurst and Turner 1993:188).

Geib and Hurst’s (2013) redating results are listed in Table 5.1, with Figure 5.4 providing a graphic summary. There are clear correspondences between the dates of both labs, but noticeable differences as well. The NOSAMS dates exhibit much less dispersion, being largely centered during the first two centuries AD, whereas the Arizona dates extend from the early centuries BC to the AD 500 range. Whereas the Arizona dates indicate that some skeletons comprising contextual groups had different ages of death, the NOSAMS dates support the opposite: that individuals interred together died contemporaneously, a conclusion that seems inescapable based on the corroborating field photos for the burial groups such as the adult female with infants of Group 2. Not only do the Arizona dates have large error terms but some are arguably inaccurate since they cannot be averaged with other Arizona dates on skeletons of the same contextual group.

Table 5.1. AMS radiocarbon assays for 11 bone collagen samples from Cave 7, SE Utah that were redated at the National Ocean Sciences AMS Facility (from Geib and Hurst 2013). NSF-Arizona dates on the same collagen samples are from Coltrain et al. (2012). Dates calibrated with OxCal 4.1 using 5-year rounding.

NOSAMS No.	Conventional date	Calibrated 2- σ range	NSF-AZ date	Wetherill’s Field #	Burial Group	AMNH Cat. #	Coltrain’s ACRF #
OS-97873	1930 \pm 20	AD 25–230	1919 \pm 47	79	1	99/7337	1781
OS-97874	1950 \pm 20	AD 1–120	1878 \pm 57	80	1	99/7338	1782
OS-97875	1980 \pm 20	40 BC – AD 70	2043 \pm 46	81	1	99/7339	1783
OS-97876	1980 \pm 20	40 BC – AD 70	1951 \pm 63	240	3	99/7354.1	1802
OS-97877	1950 \pm 25	25 BC – AD 125	1831 \pm 58	244	3	99/7355	1805
OS-98986*	1940 \pm 35	40 BC – AD 130	1977 \pm 43	241	3	99/7357	1807
OS-97884	1920 \pm 30	AD 1–210	1650 \pm 47	322	none	99/7381	1839
OS-97885	1930 \pm 40	40 BC – AD 210	2004 \pm 48	408	2	99/7392	1852
OS-97886	1890 \pm 25	AD 55–215	1795 \pm 42	405	2	99/7407	1867
OS-97887	1850 \pm 25	AD 85–235	1838 \pm 46	407	2	99/7408	1868
OS-97888	1900 \pm 25	AD 25–210	1884 \pm 47	420	4	99/7415	1880

* This is the second result for this sample; since the initial assay of 1860 \pm 25 (OS-97878) was inconsistent with the other assays for this group, it was redated again.

For example, Figure 5.5 shows the results for an adult female with children resting on either arm (contextual group 2). The Arizona dates for these skeletons encompass nearly the full spread of the original date distribution and they fail to pass the test for contemporaneity. Yet all three of the NOSAMS dates exhibit substantial overlap

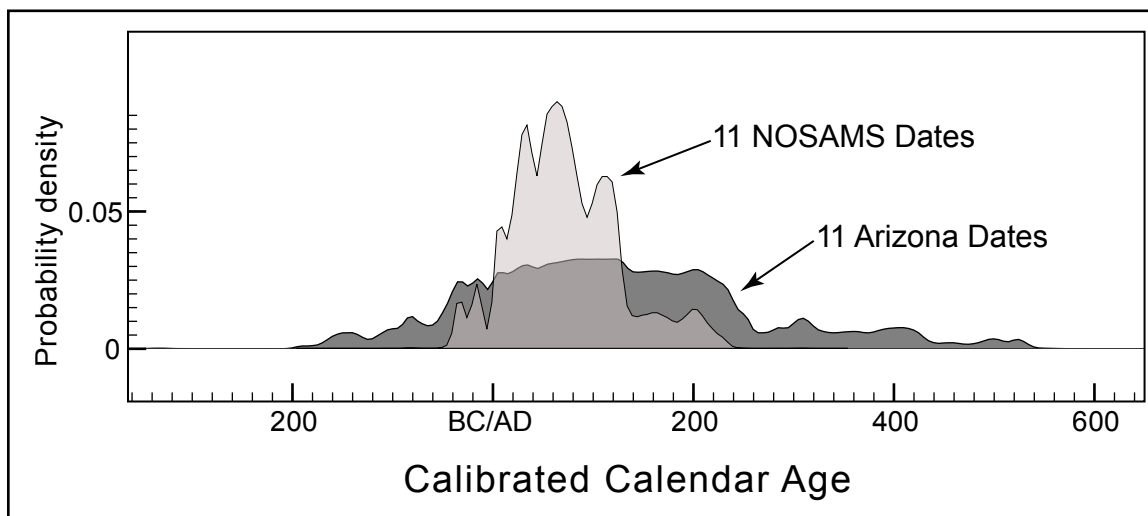


Figure 5.4. The summed probability distributions for the NSF-Arizona and NOSAMS AMS radiocarbon dates on duplicate samples of the same purified collagen from 11 of the Cave 7 skeletons.

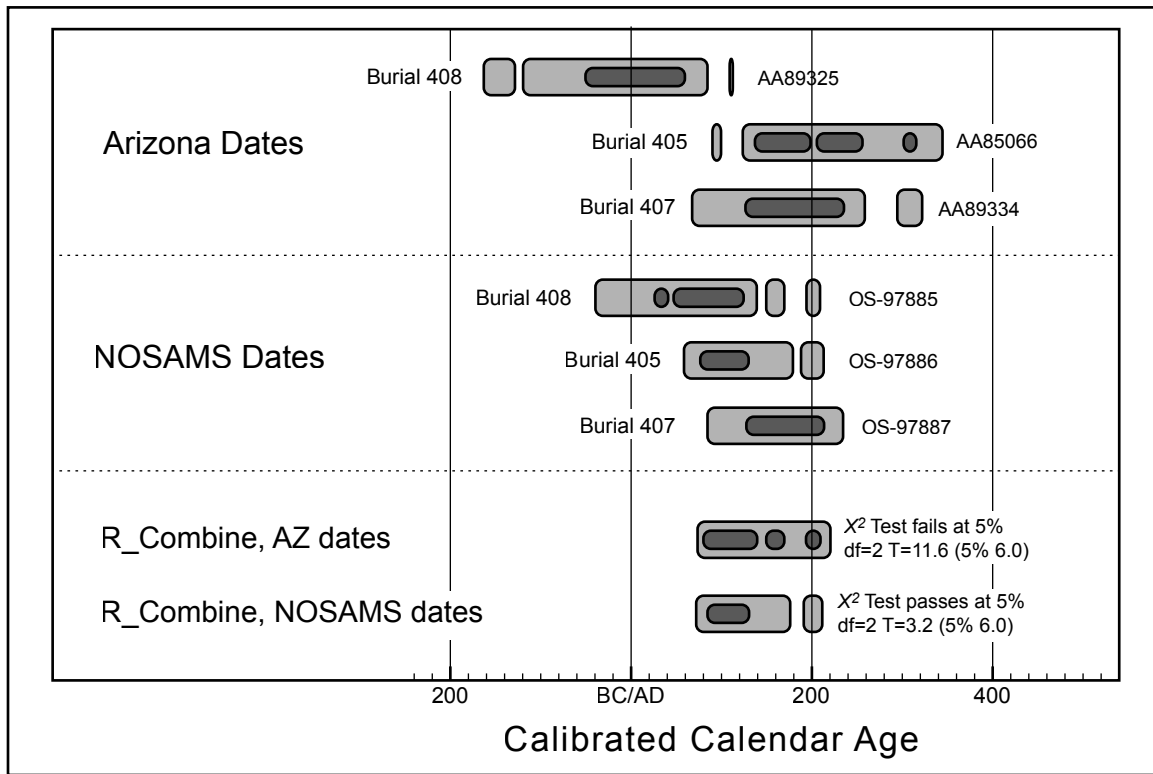


Figure 5.5. Plot of calibrated 1 σ and 2 σ ranges for prior and new AMS radiocarbon dates for the Group 2 burials at Cave 7. Also shown are averages for each set of dates along with the results of χ^2 tests for contemporaneity based on OxCal 4.1.

of their distributions and pass the test for contemporaneity. The correspondence among the three NOSAMS dates and their consistency with the contextual evidence suggests that they are more reliable and indicate that the Arizona date on Burial 408 is too old and that on burial 405 is too young.

Though not part of a contextual group, I also redated skeleton 322 because it has the youngest of the previous Basketmaker II dates and exhibits extreme perimortem cranial damage. This adult male skeleton and the equally brutalized Burial 81 of Group 1 are the cornerstones of Coltrain et al.'s argument, because their assays are what allow them to claim that acts of violence were separated "by more than two centuries" (Coltrain et al. 2012:2223). The NOSAMS assay for Burial 322 is 1920 ± 25 BP (OS-97888), 270 radiocarbon years older than the previous date. Coltrain et al.'s date on Burial 322, just like the youngest of their assays for the skeletons of Groups 1 and 2, appears too recent and inconsistent with contextual data. Since Burials 81 and 322 have dates that are statistically indistinguishable, the acts of violence perpetrated on these individuals are not separated by more than two centuries; indeed, given the resolving power of the radiocarbon technique, they were contemporaneous. In such a case, the excavator's observations and interpretations must be accorded their proper interpretive weight. The massacre account cannot be justifiably overturned by the suite of radiocarbon assays reported by Coltrain et al. (2012).

Geib and Hurst (2013) should be consulted for a full account, but a few additional points must be mentioned. An average of the three NOSAMS assays provides the best estimate as to when Group 1 was interred: 1953 ± 12 BP, which has a 2σ calibrated date range of AD 5–80. An average of the three NOSAMS assays for Group 2 provides the best estimate as to when these individuals died: 1880 ± 17 BP which has a 2σ calibrated date range of AD 70–215. There is negligible overlap between the averages of Group 1 and Group 2; thus, the new dates support Coltrain et al.'s (2012) suggestion that not all Basketmakers from Cave 7 were contemporaneous. The enhanced precision and statistical equivalence among the NOSAMS dates allows this detail to be teased out.

Group 1 consists of eight adult males laid out side by side on their backs with heads toward the shelter front and knees up. One male lacked obvious damage to his cranium or other evidence for violent death, but he was doubtless killed at the same time

as the other males. Other Cave 7 individuals lacking obvious traces of perimortem damage likewise may have been killed and interred at the same time as those who were singled out for cephalic brutalization. Group 3 is like Group 1 in that it consists of adult males, four of whom clearly died violently. The NOSAMS dates of Group 3 not only exhibit substantial overlap and pass the test for contemporaneity but they are also contemporaneous with those of Group 1. Nonetheless, there is again almost no overlap with the age of Group 2.

MNI Estimate. The exact number of Basketmaker individuals interred in Cave 7 remains in doubt for a variety of reasons, as detailed in Geib and Hurst (2013). Coltrain et al. (2012) dated 96 bone samples but it is essential to distinguish between the individual skeletons or burials that Wetherill excavated and identified by field number (FN) and the skeletal samples that were radiocarbon dated, because the two are not isomorphic. In addition, the AMNH catalog numbers (CN) for the Cave 7 assemblage are not isomorphic with individual burials or with the samples dated by Coltrain et al. In a few cases multiple CNs were assigned by AMNH to the remains from a single individual and in a few cases where obvious comingled remains were included in a single FN, these were separated and given individual CNs or a letter appended to the primary number. Wetherill's catalog lists 88 skeletons and one group of skeletons mixed together, placing the total body count recognized by the excavators in the 90–92 range; this accords with most written accounts of the day by the principals involved. This total includes several obvious Puebloan skeletons that the excavators recognized by shallow depth of burial, associated pottery, and/or cradle board flattening of the skull (something not seen with the Basketmakers). Thus, the number of individual Basketmaker skeletons exhumed from Cave 7 is unlikely to have totaled 96.

Table 5.2 presents my best estimate for the number of Basketmaker II skeletons interred in Cave 7, a total of 89. These individuals are identified as adults (including subadults) of male, female, or unknown sex, or as children. The individuals are tallied according to cave section of recovery, with Sections 2, 3, and 5 accounting for more than 70 percent of the individuals. This count is based on trying to eliminate duplication and resolve contradictions that exist among Wetherill's FNs, AMNH catalog notes, Turner's observations (Hurst and Turner 1993) and the information presented by Coltrain et al.

(2012), supplemented by my own notes and photographs of the collection. Wetherill's field catalog provides the essential start for this process but his account has to be rectified against what is actually within the collections at AMNH. Adding to this are problems with misnumbering, both in the original field catalog and at AMNH, and the mixing of remains across burial lots that Wetherill recorded as single individuals.

Table 5.2. Conservative count of individual Basketmaker II skeletons in the Cave 7 assemblage according to sex and age (adult or child) by section of recovery.

Cave Section	Male		Female		Adult, unsexed		Child		Total	
	n	%	n	%	n	%	n	%	n	%
0	3	6.8	0	0.0	1	10.0	0	0.0	4	4.5
1	3	6.8	1	6.3	2	20.0	2	10.5	8	9.0
2	17	38.6	5	31.3	4	40.0	5	26.3	31	34.8
3	15	34.1	3	18.8	0	0.0	1	5.3	19	21.3
4	0	0.0	0	0.0	0	0.0	1	5.3	1	1.1
5	3	6.8	3	18.8	3	30.0	5	26.3	14	15.7
6	0	0.0	4	25.0	0	0.0	1	5.3	5	5.6
?	3	6.8	0	0.0	0	0.0	4	21.1	7	7.9
Total	44	100.0	16	100.0	10	100.0	19	100.0	89	100.0
Col. %	49.4		18.0		11.2		21.3		100.0	

My estimate of 89 might exclude some children, as their skeletal remains were far more scattered and fragmentary and perhaps less likely to be individually identified by excavators. Nonetheless, it is likely that Coltrain et al.'s count of 23 infants and children, a full 24 percent of their dated sample, contains duplicate dates on single individuals since many of the samples came from mixed collections that represented just partial skeletons; indeed, the Cave 7 assemblage contains few if any complete or nearly complete infant/child skeletons within a single CN or FN. The six dated child/infant specimens from CN 7414, which lacks any FN or provenience information other than the site, are also likely represented in burials with other FNs and hence are not counted in Table 5.2. My estimate of 19 children/infants is less than Coltrain et al. but still more than Hurst and Turner (1993:Table 8.1). Likewise, my estimated number of males is lower than Hurst and Turner's tally, but still more than Coltrain et al. (2012). Males account for about half of the dead and there are likely even more males among the unsexed adults.

Frequency of Violent Death. Table 5.3 presents information on the number of skeletons that exhibited perimortem damage. I acknowledge that evidence of violence might not be equally registered in the skeletons of all individuals regardless of age or sex, that the elements of different individuals have unequal chances of preserving such indications (e.g., an unfused and thin-walled infant skull vs. that of an adult male), and that the excavators, who were working rather hurriedly and not screening, likely did not recover all remains equally. It is also important to distinguish between those individuals that lack skeletal evidence of violence and those for which the information is simply unavailable, either because no detailed examination has been done (most common) or because the remains were too fragmentary or incomplete to do so. To calculate an informative proportion of trauma victims in the assemblage, it is important to exclude those that are indeterminate, and they account for 38 percent of the assemblage. Table 5.4 thus leaves out the unknowns of Table 5.3 and presents the information about perimortem damage according to sex.

Individuals with glaring evidence of violent death are included in the “obvious” category of Tables 5.3 and 5.4. These are those skeletons that Hurst and Turner (1993) described as exhibiting severe forms of perimortem cranial damage such as smashed nasal borders, “blown-out” teeth, fractured skulls, split mandibles, and cutting marks suggestive of scalping. Some of these also had stone weapons embedded in bones or mixed with ribs or other elements indicative of wounds that left no obvious skeletal indication. The “possible” category includes skeletons that Hurst and Turner identified as potentially having some perimortem damage such as the young adult male skeleton of FN189 that exhibits “minor breakage at left nasal bone area” (Hurst and Turner, 1993:181) and that Wetherill noted had a bone awl under the left breast. Hurst and Turner (1993:164) recount that “awls” were deployed as “bone daggers” in several cases at Cave 7 and skeleton 189 might also have been stabbed with one although there is evidently no telltale skeletal damage in this case. Coltrain et al. (2012:2223) excluded FN189 and other individuals with possible trauma from violent death because they found the evidence questionable.

Table 5.3. Count of individual Basketmaker II skeletons in the Cave 7 assemblage of Table 5.2 with perimortem damage according to Hurst and Turner (1993). Percentages are calculated by cave section (within row).

Cave Section	Obvious		Possible		None		Unknown		Total	
	n	%	n	%	n	%	n	%	n	%
0	2	50.0	0	0.0	0	0.0	2	50.0	4	4.5
1	1	12.5	0	0.0	2	25.0	5	62.5	8	9.0
2	7	22.6	5	16.1	6	19.4	13	41.9	31	34.8
3	10*	52.6	0	5.3	7	36.8	2	10.5	19	21.3
4	0	0.0	0	0.0	1	100.0	0	0.0	1	1.1
5	1	6.7	1	6.7	6	42.9	6	42.9	14	15.7
6	0	0.0	1	25.0	2	40.0	2	40.0	4	5.6
?	0	0.0	0	0.0	3	42.9	4	57.1	7	7.9
Total	21	23.6	7	7.9	27	30.3	34	38.2	89	100.0

* This count includes the female skeleton 103 with dart point sticking in backbone although the cranium was undamaged.

Table 5.4. Count of individual Basketmaker II skeletons in the Cave 7 assemblage by sex for which an assessment of perimortem damage was made by Hurst and Turner (1993); excludes the “unknowns” of Table 5.3. The child column includes individuals too young to be sexed and consists mostly of infants and young children.

Cave Section	Obvious		Possible		None		Child	Total	
	♂	♀	♂	♀	♂	♀		n	%
0	2	0	0	0	0	0	0	2	3.5
1	1	0	0	0	1	0	1	3	5.3
2	7	0	3	2	5	1	0	18	31.6
3	9	1	0	0	5	2	0	17	29.8
4	0	0	0	0	0	0	1	1	1.8
5	1	0	1	0	1	3	2	8	17.5
6	0	0	0	1	0	2	0	3	5.3
?	0	0	0	0	3	0	0	3	5.3
Total	20	1	4	3	15	8	4	55	100.0
%	36.1	1.8	7.3	5.5	27.3	14.5	7.3	100.0	
Summed %	38.2		12.7		49.1			100.0	

Being conservative in the attribution of violence is not without merit, but if it was specific males who were singled out for bludgeoning then slight perimortem damage on other individuals might be just as indicative of violent death. The subadult skeleton of FN100 is another example. Coltrain et al. list this individual as lacking any evidence of violence, yet Hurst and Turner (1993:178) identify it as exhibiting “one blow possible to basal occiput” and Wetherill notes that a projectile point occurred in the right ribs. Given

the overall Cave 7 context, this is perhaps sufficient cause to suspect death by violence. As another example, Coltrain et al. exclude the young adult female of FN103 from the trauma class, despite a dart point embedded in one of her vertebrae and another point tip in the back area (Hurst and Turner 1993:178). Coltrain et al. excluded this individual because the person evidently recovered from the wound, citing an unpublished manuscript by Douglas W. Owsley and others. But the person that survived with a dart point embedded in their back was Burial 128 not 103. Even Wetherill made it clear that he found two individuals with dart points embedded in their backs: “six of the bodies had stone spear heads in them . . . in one joint of the backbone of skeleton 103 a spear point of stone sticking into the bone at least an inch. The same thing occurs with skeleton 128 but it seems that this one did not die from the wound as the cut in the outside of the bone has partially healed” (Wetherill 1895, in Hurst and Turner 1993:145). Figure 5.6 shows the vertebrae of skeleton 128 that sustained the nonlethal atlatl dart wound.

Skeleton 103 alone disproves the claim of Coltrain et al. (2012:225) that “no adult females . . . appear to have sustained perimortem injuries.” The skull of burial 103 might be undamaged, but she clearly died violently. A convincing claim for a lack of perimortem damage to female skeletons requires a thorough osteological study. Even then, it is worth recalling Walker’s (2001:584) caution that “the frequency of injuries detected in ancient skeletal remains is just the ‘tip of the iceberg’ in terms of the actual incidence of injuries.”

Of the 55 individuals examined for perimortem damage, 38 percent exhibit obvious evidence of violence and another 13 percent exhibit possible damage, together representing a total of 51 percent or just over half of the skeletons that have been assessed in this regard. Just under half of the 55 lacked any osteological traces of violence but it is worth noting that Wetherill observed dart points, knives, or bone awls among the bones of some of these. The individuals with obvious perimortem damage are all male except for the previously mentioned skeleton 103 with a dart point embedded in a vertebra. Although killed and buried at the site, she lacked the facial beating many of the males received, suggesting that this practice was male biased.

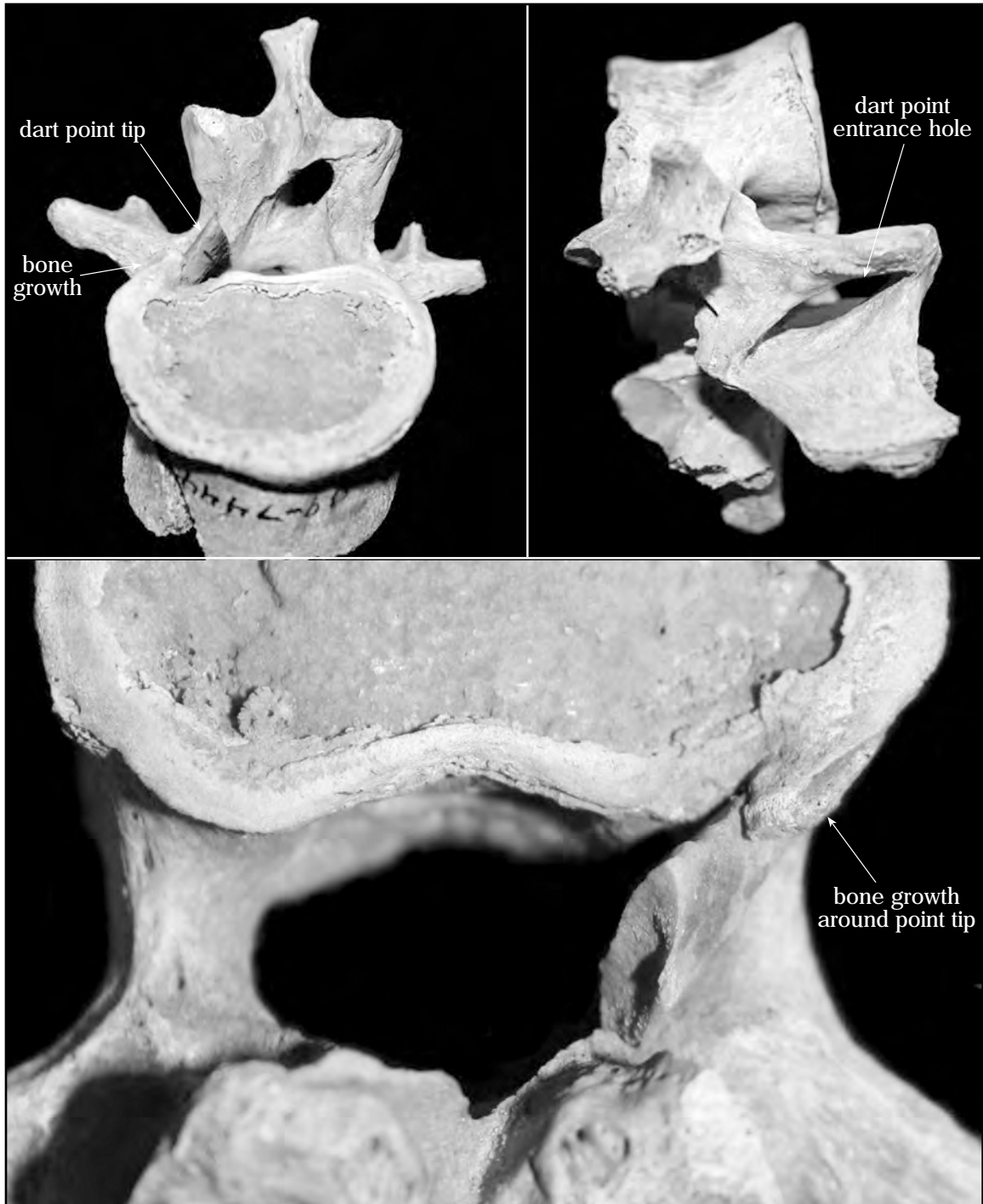


Figure 5.6. Vertebrae with embedded dart point tip (AMNH 99-7444) from skeleton 128 (AMNH 99-7447) of Cave 7. Bone growth around the point indicates that the individual lived with this injury for years. The entry hole has not closed but exhibits bone growth extending outward, indicating that the point midsection was within the bone at the time of burial, but evidently slipped out during or after excavation (from Geib and Hurst 2013). (Collections of the American Museum of Natural History; photos by Phil R. Geib.)

The Cave 7 Massacre Reconsidered. A visual summary of the spatial patterning of important characteristics for the Cave 7 Basketmaker burials is shown in Figure 5.7. This information allows basic parceling of the assemblage. Sections 1–3 stand out because they yielded the majority of individuals (65%) and also almost all of the skeletons that exhibited obvious evidence of violent death (86%). The newly redated males with perimortem damage came from Sections 1–3 (Groups 1 and 3 and Burial 322) as did the one female that obviously died violently (Burial 103, from Section 3 below the Group 1 males). Females were poorly represented in Sections 1–3, with just nine (a male:female ratio of 3.9); children were also underrepresented, with just eight. Significant in the overall distribution is the near absence of remains from Section 4, just a single adolescent, despite the abundance of burials in the sections on either side, with 19 in Section 3 and 14 in Section 5. Coinciding with the gap in burials is an increase in the representation of females and children and vast decrease in obvious evidence for violent death. Section 5 has the most “normal” death assemblage, consisting of equal numbers of males and females (3 each) and 36 percent children (see Table 6). Included are the Group 2 skeletons that were evidently interred sometime after the violently killed individuals of Sections 1–3. Section 5 has only one individual exhibiting obvious perimortem damage, a possible adolescent male 12–15 years of age (Hurst and Turner 1993:186). The adjacent Section 6 had just 5 individuals—a child and four adult females, none of which exhibited obvious evidence of violent death; this includes the Group 4 burials.

Given the evidence just reviewed in conjunction with the new dates, the densely massed remains of Sections 1–3 represent a massacre assemblage interred at one time. This includes males exhibiting obvious perimortem damage and impaled with dart points (one female is also impaled) as well as males, females and children that do not exhibit such traces. Just because the women and children at the site lack the same sort of obvious perimortem damage as the males does not preclude them from victim status. Considering the number of interments in the limited space of Sections 1–3 of the small shelter, 50 of them adults, the individuals had to have been packed tightly together and overlapping, which is exactly what Wetherill’s field record indicates. Accommodating this many individuals, along with the side-by-side placement of the eight Group 1 males,

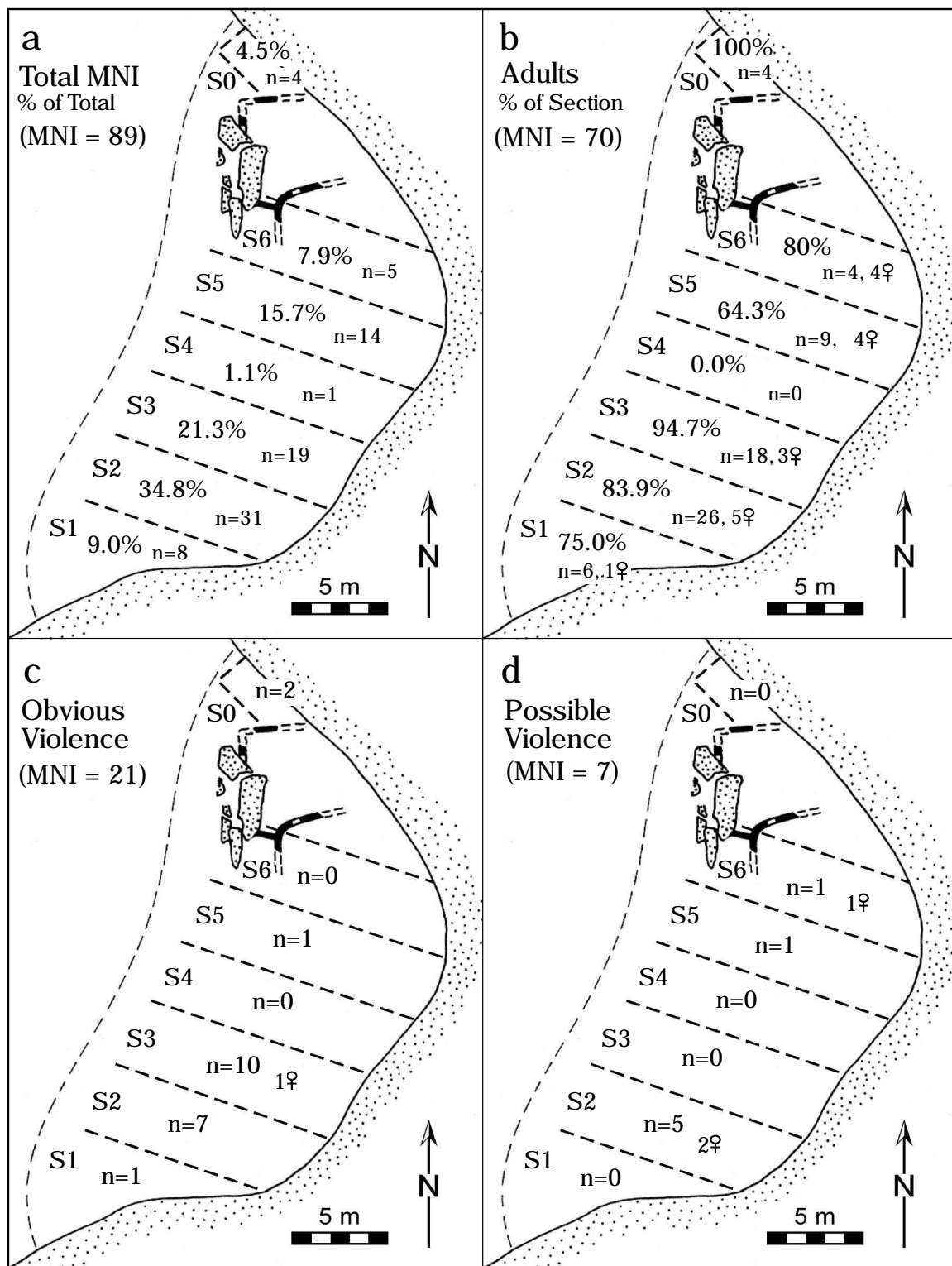


Figure 5.7. Characteristics of the Cave 7 Basketmaker II burial assemblage by section of recovery: (a) proportion and count of individuals for the site; (b) proportion and count of adults per section, with count of females indicated; c, count of skeletons per section exhibiting obvious evidence of violence, including one female; d, count of skeletons per section exhibiting possible evidence of violence, including three females (from Geib and Hurst 2013).

would have required one massive burial pit or a few very large pits. Numerous individual pits could not contain this population in the limited space available because doing so would have required contiguous excavations that would have amounted to a single large pit anyway.

The age for this massacre assemblage is best approximated by the NOSAMS assays for the burials of Groups 1 and 3 along with Burial 322. All seven dates can be combined ($df = 6$, $T = 6.3$, $X^2 = 12.6$, $\alpha = .05$) resulting in an average of 1954 ± 9 BP. The 2σ calibrated range of the average is AD 20–80. The 3σ calibrated range of AD 1–115 provides a more cautious estimate, but there is vanishingly low probability of the event occurring after 90 AD given that 99.5 percent of the distribution is AD 1–85.

The NOSAMS assays indicate that the Group 2 individuals of Section 5 were probably interred in Cave 7 after the massacre assemblage, thus this northern portion of the shelter (Sections 5, 6 and 0) is a logical place to look for other post-massacre interments. Identifying additional interment events will require an expanded suite of accurate and precise assays like those reported here. However, as with Group 4 of Section 6, the temporal gap between the massacre and subsequent interments might be so short that it is undetectable with the radiocarbon technique. Continued use of Cave 7 as a burial place following the massacre makes sense for family members that survived and the demographics of the massacre assemblage strongly indicate that women and children were taken captive, just like Hurst and Turner (1993:168, 171) suggested. Thus, one can envision wives or daughters of some of the slain men in Sections 1–3 comprising the Group 4 individuals. Continued use of Cave 7 as a family resting place also makes sense of the near absence of skeletons in Section 4—the general location of where the massacre victims were placed was doubtless known but perhaps not precisely, so a buffer was allowed to prevent needless disturbance of prior burials.

As Figure 5.7c shows, there are three obvious victims of violence in the northern portion of Cave 7: the previously discussed adolescent male in Section 5 (Burial 308) and two adult males in Section 0 (Burials 289 and 311). Redating these individuals is called for in order to see whether these individuals postdate the massacre assemblage. The Arizona dates for two of these individuals (Burials 308 and 311) suggest that this might be the case since they are 100 radiocarbon years or more younger than the mean of the

pooled dates for massacre assemblage. If verified, this would support Coltrain et al.'s suggestion that additional victims of violence were interred in the cave. If these individuals instead date to the interval of the overall massacre assemblage then it could mean that victims of the massacre were placed in more than one general place within the shelter. Burial 311 is significant in this regard as the head of this individual had been severely beaten much like those of the massacre assemblage (see Hurst and Turner 1993:Figures 8.28 and 8.29).

Summary of Cave 7. Claims for massacres or similar atrocities justifiably require critical scrutiny and verification, but the radiocarbon technique has limits in resolving power that must be acknowledged. Dates with narrow confidence intervals and that appear accurate based on internal evaluative criteria, such as constancy among probable groupings or reproducibility of radiocarbon measurements on the same sample can only go so far. The error terms of individual dates combined with a need for calibration virtually precludes conclusive demonstration that a group of individuals formed a single death assemblage instead of accumulating across decades. Such a determination is beyond the limits of resolution of the radiocarbon method and must be based on excavation context and observations made while exposing the remains, with direct dates serving to place them in time and helping to corroborate judgments about the relative ordering of events. New techniques might eventually be developed that can allow stronger inferences in cases where the field record is less than ideal, as is the case here, but the current set of radiocarbon dates needs to be interpreted in conjunction with field notes, photos and observations by the excavators, rather than treated as the ultimate arbiter.

In the case of Cave 7, the NOSAMS dates prove that the radiocarbon dates of Coltrain et al. (2012) cannot be used to overturn Wetherill's massacre interpretation. Some of their assays are either too old or too young by a century or more and they lack sufficient precision to separate burial events closely spaced in time. The more recent set of internally consistent and more precise dates combined with the information of burial context strongly suggests that Cave 7 contains the remains of several interment events, with the largest of these consisting of a massacre assemblage. It is smaller in scale than Richard Wetherill thought in the late 1800s or that Hurst and Turner argued for in 1993.

The number of massacre victims at Cave 7 is less than what Wetherill thought because the NOSAMS dates confirm that the Group 2 skeletons were interred in Cave 7 after the massacre. Information on burial treatment, demographics, and placement in the shelter suggest that this is also likely for many of the other skeletons recovered outside the area that contained the massacre assemblage (burials outside of Sections 1–3). Radiocarbon dating might not allow interment events to be statistically distinguished, as with the females and infant of Group 4, something that may never be achieved for burials that occurred soon after the massacre. Continued use of Cave 7 for mortuary purposes after the massacre is certainly worth evaluating with additional dating and a good starting place would be the males of Sections 0 and 5 that exhibit obvious signs of violent death.

Regardless of how many other separate interments occurred in the northern part of the shelter, it is evident that the majority of the Basketmaker II skeletons were buried at Cave 7 at the same time and consisted of victims of a mass killing. The skeletons were grouped together in both somewhat formal layouts and haphazard heaps in the southern part of the shelter (Sections 1–3). These victims consisted of at least 58 individuals, including 35 adult males and perhaps more in the six unsexed adults that were present in Sections 1–3. Knowing that Group 2 of Section 5 slightly postdates the massacre event as likely do other interments in this section, such as Group 4, further emphasizes the overall sex and age bias of the massacre assemblage at Cave 7—it is dominated by adult males many of whom had been bludgeoned. The number of individuals killed, especially the tally of males, implies an attacking force of considerable size and thus the ability to mobilize a coalition of unprecedented scale for this early time period in the Southwest.

Battle Cave

The rarity of the Cave 7 find should be appreciated. Numerous shelters and caves throughout the Southwest have been extensively excavated, many by the same men that made the Cave 7 discovery, yet there is just one other confirmed Basketmaker II massacre, that of Battle Cave in Canyon del Muerto, Arizona (Turner and Turner 1999:133–141). This discovery came to light in 1929 as a result of Earl Morris's excavations. Morris, like Richard Wetherill, ranged throughout the Four Corners region and excavated countless sheltered and open sites, yet he too only uncovered a single Basketmaker massacre assemblage. Unfortunately I lack even a rough estimate of the

number of shelters that these men put their shovels into that had Basketmaker remains. With such a number one could calculate an approximate probability of finding a Basketmaker massacre, something that is likely to be low, such as 1 out of 200. Even so, there is a good chance that Basketmaker II intergroup conflicts were small-scale affairs that would have left relatively few dead. It is also likely that fighting commonly occurred in the open, away from shelters or habitations, thereby greatly diminishing the chances of preservation and archaeological discovery. Even if fights were common at settlements, the count of open Basketmaker II residential sites that have been excavated is still miniscule, especially when compared with Puebloan sites.

Battle Cave is a large north- and east-facing alcove on the south side of Canyon del Muerto, Arizona almost directly opposite from the site of Antelope House (Figure 5.8). The site is also referred to as Battle Cove (Morris 1986:14) and should not be confused with a site in Allen Canyon of SE Utah that is also known as “Battle Cave” (Hurst 1996; Blackburn and Hurst 1994). The Utah site was excavated by Charles B. Lang and others in the middle 1890s and the collections from there, a considerable number of which are Basketmaker II in age, are curated as part of the Martin Ryerson Collection at the Field Museum of Natural History in Chicago. The Utah site name appears to have been inspired by a hastily erected wall thrown up across the front of the alcove, whereas Earl Morris gave the name for the Canyon del Muerto alcove because of an assemblage of human skeletons exhibiting obvious evidence of violent death.

Earl Morris excavated Battle Cave as part of the seventh Bernheimer expedition sponsored by the American Museum of Natural History (Lister and Lister 1968:136). His collections from the site ended up at AMNH where Turner examined the skeletal assemblage in the 1980s and I reexamined the remains along with some artifacts in 2007 and 2010. What little we know about Battle Cave comes from Morris’s popular account of the “weaver mummy” that he uncovered there (Morris 1948), a short account in his La Plata District report (Morris 1939:19), and his notes on file at AMNH. From these sources an approximate description of both the site and finds was reconstructed; Turner and Turner (1999:133–141) provide some of this information as concerns the massacre assemblage.

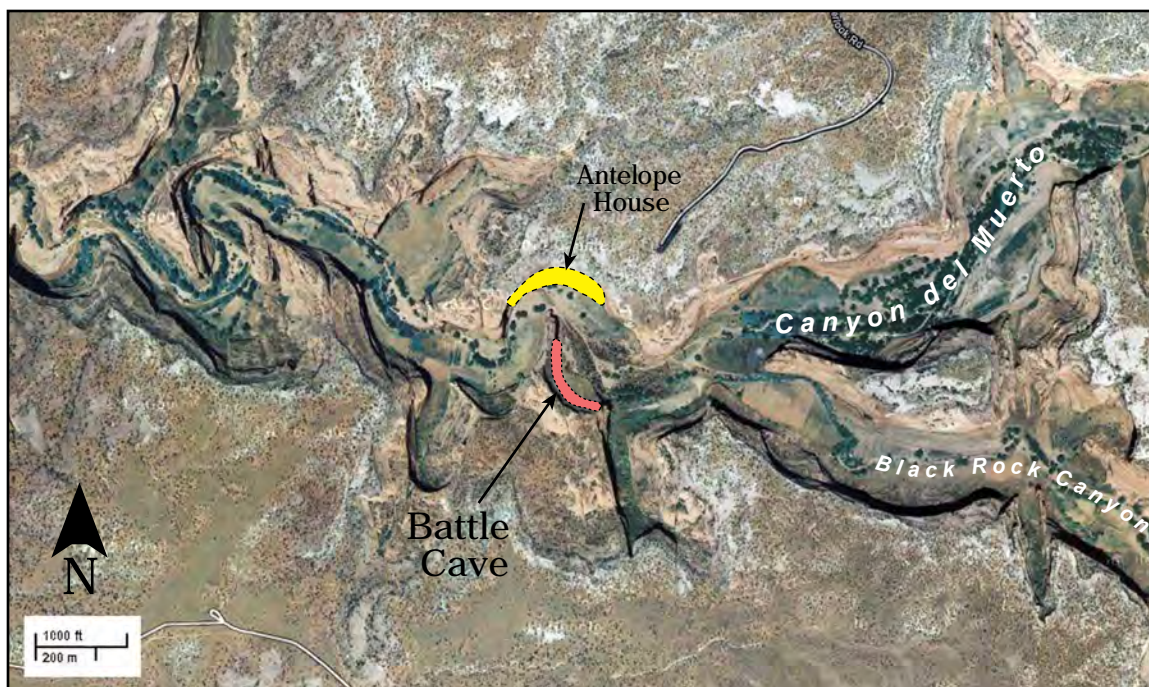


Figure 5.8. Location of Battle Cave, Canyon del Muerto, Arizona (base image from Google Maps).

Morris (1939:19) characterized Battle Cave as “the most typical Basket Maker II site I know of in the entire canyon [de Chelly].” Morris likened the long and shallow alcove of Battle Cave to a “carpenters square laid flat” with the shorter arm pointing east and the longer arm pointing north. The latter provides sheltered space roughly 150 m long that faces east; toward the sunlit north end of this area is where Puebloans constructed an eight-room masonry structure. The eastward-pointing extension of the alcove provides north-facing sheltered space that never receives sunlight. Morris intensively excavated this southern part of the alcove, which measures about 40 m long “from one end to the other” and recovered a diversity of remains that seemed to be Basketmaker II in age. This area contains a hardpan of ancient alluvium that the Basketmakers had dug into to create storage pits (cists), some of “bizarre form.” The first pit that Morris described in his field notes was an oval one 3.5 x 5 feet in size and 4 feet deep that contained a mass of disarticulated skeletons (Burial 1 or the “bone cist”). This find and one other burial (no. 6) gave the site its name because the skeletal remains exhibited obvious signs of violent death:

A great fight or massacre occurred here. Two adult males were entire; the whole face of one was crushed in; the right base of another similarly treated and two smashed like egg shells. The larger child’s skull was broken in around the foramen magnum and the entire base of the smaller one also knocked in. The heads of both babes were marked. (Morris 1929:2)

MNI Estimate. Morris lists 228 field numbers from the 1929 season with 145 of these assigned to both artifacts and human remains from Battle Cave. Morris also identified individual burials in the catalog using sequential numbers with 16 burials discovered at Battle Cave. Table 5.5 provides summary information about each of these burials based on Morris’s field notes with the Basketmaker burials listed first. FNs were only assigned to collected materials and he left some skeletons in the field, hence they lack FNs despite having burial numbers. Any associated artifacts that were saved from uncollected burials were assigned FNs. In addition to the 16 Battle Cave burials, Morris collected several loose human elements (MNI of 2) found together (FN175), but since these did not comprise an individual interment per se they were not given a burial number. Two of the identified burials that Morris excavated contained the mixed skeletal elements of more than one individual. Burial 27 consisted of the partially

Table 5.5. Information on the burials that Earl Morris excavated at Battle Cave, Canyon del Muerto, Arizona (abstracted from field notes and artifact records on file at AMNH).

Burial #	MNI	Age & sex	Provenience	Other info	FNs	Artifacts	TA
1	10	7 adults, 3 children; 3 m, 2 m?, 1 f, & 1?	cist, east side of shelter, south end (bone cist)	mass of disarticulated bones of "at least six adults, one child half grown, one smaller child & two babies"	1-17	diverse items from refuse fill; small basket & wooden 'blade' at cist bottom	BM
2	1	adult; sex?	cist, 10' S of bone cist	flexed body on back, head to E, wrapped in feather cloth, basket over face	33 & 34	basket frags & feather cloth	BM
3	1	infant	mouth of a filled cist, ca. 6' farther toward cliff from bone cist	wrapped in rabbit skin blanket tied at feet & head w/ yucca cord, head to east; between layers of bunch grass; on top of blanket over breast ca. 1.5 pints of pinyon nuts and purple red corn kernels	35 & 36	pinyon nuts; corn kernels; rabbit blanket	BM
4	1	small child	4' farther SE under edge of same rock as Burial 3	"enveloped" in feather & fur blanket head to east, between layers of bunch grass; coiled basket bowl partially on edge under head; small gourd bottle at left breast	37 & 38	coiled basket; feather-fur blanket	BM
5	1	small child	immediately beside and S of Burial 4	"enveloped" in rabbit blanket and sandwiched between bunch grass; head to east with small basket tray over crown and small gourd bottle stuffed with grass at left shoulder	39-41	small coiled basket tray; small gourd bottle; rabbit blanket	BM
26	1	child	8' W of Burial 6, pit ca. 3.5' in diam and 2.5' deep	on L side of back, head to south, knees drawn up at angle to trunk, L arm bent outward at right angle from elbow away from body, R crossed over breast, hand on L upper arm against chin	167-170	large basket bowl; bone awl; pair of sandals; large hank of human hair tied with yucca; grooved curved stick	BM
27	2	2 adults; 1 m?, 1 f	cist below FN 175 which is ca. 20' N of Burial 26	scrambled remains of 2 partially mummified individuals, one with apron and menstrual pad; burials might have been dug up from somewhere else prehistorically and thrown in this cist for reburial. Morris thought that finer objects with burial had been looted in prehistory	176-188	human hair hanks; 1/2 an atlatl (distal); pair of bolster-toe sandals; rabbit skin pouch w/ corn cob & cedar bark; coiled basket frags; small coiled basket; hide scraps; corn cob in woven cloth; yucca cordage; pair of tied short sticks; 2 wooden die; 2 olivella beads & abalone shell; fragments of fur & feather blankets	BM
28A	1	adult, m?	deep and large ramified cist 40' E of Burial 27; this burial in "branch A" of pit	"scrambled remains" of adult, evidently lain flexed on left side of back, head to SW; trunk and arms had been torn out and redeposited prehistorically; body wrapped in feather blanket and overwrapped by cedar bark mat; coiled basket bowl in corner beyond feet; perfectly preserved atlatl lay above a jumble of ribs and vertebrae at NW side of cist at knee level	189-192	coiled basket; atlatl; cedar bark mat (feather blanket evidently not saved)	BM

Table 5.5. cont

Burial #	MNI	Age & sex	Provenience	Other info	FNs	Artifacts	TA
28B	1	adult, f?	deep and large ramified cist 40' E of Burial 27; this burial in "branch B" of pit with head ca. 8" below the disturbed individual of branch A, but totally undisturbed	back down, knees bent at less than right angle with trunk, arms extended, hands over groin, head turned on L side pointing NW; head & breast covered by large basket, small twined bag R side of throat, on R breast small coiled basket bowl containing stone pipe & cloth bag; entire trunk covered by twined bag most "beyond recovery;" olivella shell beads & tubular bone beads at back of head; hanks of human hair lying between upper arms & ribs (cut from head as hair is shorn to 1-1.5" long); digging stick & "ceremonial stick" at left of body; corn kernels, squash seeds & pinyon nuts on breast; head lay on double band of cedar bark	193-203	large coiled basket; small twined bag w/ decayed vegetal matter; coiled basket bowl; stone pipe; cloth bag w/ vegetal matter; twined bag frags; olivella shell beads & tubular bone beads; hanks of human hair; digging stick; long round stick, finely marked, tapering to a point with round hole at other end (6" below hole is mass of feathers bound to stick by cord wrapping); corn kernels, squash seeds & pinyon nuts	BM
6	1	adult; f?	45' W of bone cist in trash filled cist	body lain on R side closely flexed, head to N & smashed, wrapped in 2 heavy feather blankets; grave robbed & body torn apart, arrow foreshaft embedded through L side	42-44	feather blankets; arrow foreshaft with point stem	P
7	1	adult; sex?	N section of cave, N of rooms, 2' from cliff	headless skeleton of adult on brunch grass; badly decayed & not removed	none	miscellaneous sherds and feather string	P
8	1	adult; m	N section of cave, 3' S of Burial 7	lying on L side wrapped in feather blanket on mass of cedar bark, grass & separated yucca fiber & covered by mass of grass; neck to SE, upper legs forming angle of 145 degrees with trunk, lower legs folded back along thighs, L arm by side, R lying across abdomen, head missing	56-61	tied hide bag w/ crushed corn; small hide bag; twined bag; pair of fine sandals; twined cloth; stick & feather ornament	P
9	1	child	N section of cave, 7' S of Burial 8	on back, head away from cliff (SE) hands by sides, legs flexed, knees down to R; small basket at R side & cordage blanket around body; lying on bark, grass and yucca fiber	62-63	small coiled basket	P
10	1	infant	N section of cave, 4' S of Burial 9	tiny infant, on back next to cliff, neck to south, lying on reeds and separated yucca fiber; head torn off when large corrugated pot intruded down	none	intrusive pot not associated	P
11	1	infant	N section of cave, 1' below Burial 10	tiny infant, covered first with buckskin then separated yucca fiber, head south against cliff	67		P
14	1	adult; m	Tomb of the Weaver	see Morris 1948	82-99	abundant material, see Morris 1948	P
25	1	child	4' S of Burial 14 & 10' away from cliff	3' (N-S) by 18" wide "crypt" of dry-laid stones within crude masonry cist; crypt roofed similarly to weaver's burial; child lay face up on cradle board, covered with cotton cloth & feather blanket & resting on coarse plaited rush mat with another as a cover; head to south with corrugated pot in NE corner and ring basket along E wall	162-163	jar & basket collected; most remains left in place	P

FN = Morris's field numbers for collected materials

TA = temporal affiliation with BM for Basketmaker and P for Puebloan

mummified elements of two individuals that were “scrambled” together. Burial 1, designated the “bone cist” by Morris, contained the massacre assemblage of 10 individuals, with all elements again mixed together. Morris thought that the remains of the bone cist had sat on the surface for a goodly length of time prior to interment but Turner and Turner (1999:141) dispute this, arguing that they saw no evidence indicative of prolonged surface exposure (“little weathering”) and almost no animal gnawing. Nonetheless, the time was sufficient for remains to become skeletonized, something that was not true for other burials from the site, all of which were mummified to varying degrees.

Eight of the 16 Battle Cave burials appear to be Basketmaker II in age, a temporal assignment confirmed for the massacre victims (see below) and for Burial 2 (2132±43 BP, AA57717, Coltrain et al. 2007). The other Basketmaker interments include burials 3–5 and 26–28. These consist of five adults and four children; four of the adults occur in pairs, apparently male and female, in separate large storage pits with a moderate number of artifacts including atlatls. All of the children also contained a number of artifacts, with Burial 26 especially notable for the inclusion of an S-shaped grooved stick like those from White Dog Cave and other Basketmaker II sites. The other eight Battle Cave burials are probably Puebloan in age. A Puebloan temporal assignment is certain for a few of the burials with associated pottery or other temporally diagnostic items such as sandals; one of these is the exceptionally preserved and well-furnished “Tomb of the Weaver” that dates to the late Pueblo III period (Morris 1948).

Burial 6, once thought to be Basketmaker II in age, is now known to be Puebloan. This adult has an arrow foreshaft embedded between the ribs, a projectile point embedded in a vertebrae, and a smashed-in head (Turner and Turner 1999:141).

The body told an eloquent story. In the flesh of the left side was the foreshaft of an arrow. It had entered at the side above the eighth rib, and ranged upward between ribs and skin to emerge over the fifth rib. The reed shaft had been broken away and the stone point, which had come through the skin, was also missing excepting the tang, which remained in the slot in the foreshaft. The old person had been killed by a terrific blow on the left side of the head which broke the lower jaw at center and carried in the entire left side of skull. (Morris 1929:5–6; Ann Morris [1933:217] also provides a vivid account of this find)

Morris clearly assumed that this person formed part of the Basketmaker II massacre assemblage for the site, as did Turner and Turner (1999).

Among the many artifacts found with the dismembered skeletons there was only one definitely atypical specimen—a slender arrow foreshaft of wood embedded between the ribs and skin of the left side of an old woman. The stone tip had emerged just above the breast and been snapped off, leaving the slender straight stem in place in the foreshaft. Obviously the bow was in use by whatever tribe the attacking party represented. (Morris 1939:19)

Others accepted this interpretation. Wormington (1961:55) concluded from this find that “although the Basketmakers did not use the bow and arrow, they apparently were in contact with people who did.” Lister and Lister (1968:137) echo this: “The Basket Maker did not use the bow and arrow but unquestionably an enemy people did, with indisputable effectiveness.” If true, this would provide convincing evidence for early bow use in the Southwest and also document the sort of intergroup competitive relationships that could have driven the rapid adoption of bow technology.

The partially mummified torso of Burial 6 with the embedded arrow foreshaft is curated at AMNH as CN 29.1/8686 and included with the “mummies”; the rest of the individual has CN 99/9610 and is with the skeletal material. My examination of the remains in 2007 confirmed Morris’s report: the individual had been shot in the back on the left side with the arrow tip entering from below at an angle as though the assailant was in a lower topographic position or the victim was bending over or lay prone. The arrow tip passed between the 8th and 7th ribs on the posterior side and protruded above the 5th rib on the anterior side. The left side of the individual is caked with blood-soaked sediment. The hardwood foreshaft had been snapped at the tang prehistorically where it was affixed to the arrow mainshaft (Figure 5.9). The foreshaft^{viii} measures 14.3 cm long and 7 mm in diameter, tapering to a diameter of just 4.8 mm at the distal end, which was split to attach an arrow point. The stem portion of a yellowish red chert point remains within the split, snapped across the notches by bending force; it measures 5.7 mm long and 2 mm thick, with a neck width of 3.4 mm and base width of 5.9 mm. The rest of this point is missing, but judging from the stem, the point is typical for Basketmaker III or Pueblo I (similar to Rose Spring Corner-notched). Sinew once wrapped the tapered area

of the foreshaft below the point for a distance of 29 mm to hold it in place and prevent splitting the wood; cuts to seat the sinew lashing are evident along this tapered area.

The rest of this individual (CN 99/9610) includes the severely damaged skull just like Morris described it, with an unmistakable perimortem blow of great force to the left side. There is also a lumbar vertebra with a deeply embedded chalcedony arrow point that split the transverse process of the left side and sunk into the vertebral body up to the depth of the stem (Figure 5.10); judging from the visible part, this point also seems typical for Basketmaker III or Pueblo I.

There is no doubt that someone shot this individual with arrows, but did that occur during Basketmaker II as suggested by Morris and subsequent archaeologists or later as hinted at by the probable point style? A purified collagen sample from this individual, extracted and pretreated by Joan Coltrain, returned an AMS radiocarbon date of 1278 ± 53 BP (AA86998, -6.6‰). With a two-sigma calibrated range of AD 650–880, it is clear that the individual is not Basketmaker II in age and indeed the date is fully consistent with the temporal estimate based on the nature of both arrow points. Some sort of conflict is clearly indicated, just not Basketmaker II conflict; more than likely this skeleton provides more evidence for conflict during Pueblo I (e.g., Potter and Chuipka 2010). Late Basketmaker II groups might well have been in contact with those using the bow and arrow, but the Battle Cave find can no longer be used as evidence for this.

Morris (1929:2) describes the mass of disarticulated bones of Burial 1, the bone cist, as containing “at least six adults, one child half grown, one smaller child, and two babies.” Turner and Turner’s (1999:133–141) detailed analysis of the remains refined this and upped the minimum number represented to 11 by the addition of an extra adult. Their summary is as follows: “two older adult males; one middle-age adult male; one older adult female; one old adult, male?; one old adult, sex?; one young adult, male?; one 15–18 year old, male?; one 4–5 year old child; one 6–9 month old infant; one infant less than 6 months old” (Turner and Turner 1999:Table 3.9, footnote). They document that the perimortem damage to the skeletal elements is restricted to the heads and illustrate the cranial violence in a series of photos (Figures 3.83–3.92). These images also disclose how Turner and Turner arrived at an MNI of 11 whereas Morris placed it at 10. Turner and Turner upped the count by wrongly including the remains of Burial 6, CN 99/9610,

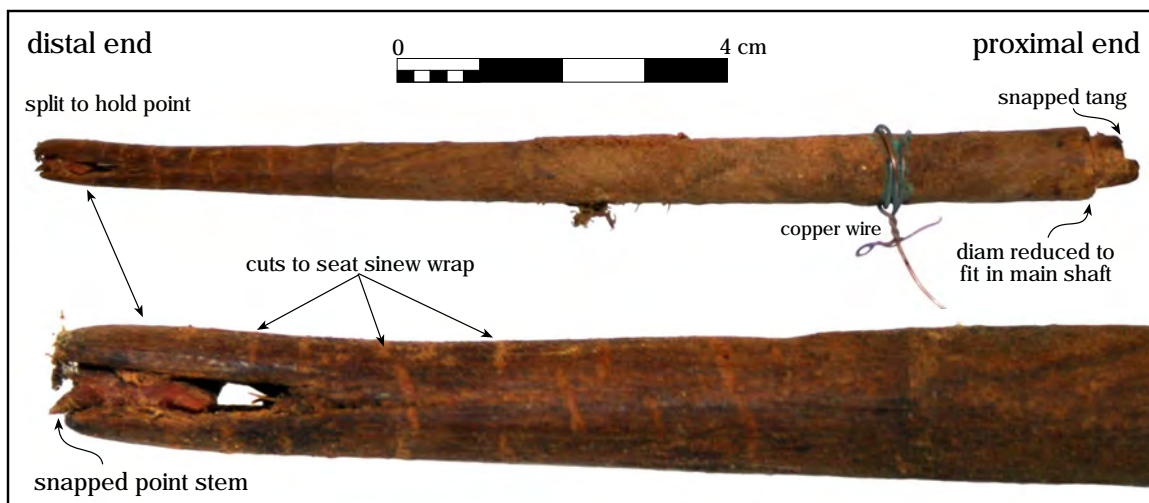


Figure 5.9. Wooden arrow foreshaft that was embedded between ribs of the partially mummified Burial 6, Battle Cave, Canyon del Muerto (AMNH 29.1/8686; collections of the American Museum of Natural History; photos by Phil R. Geib).

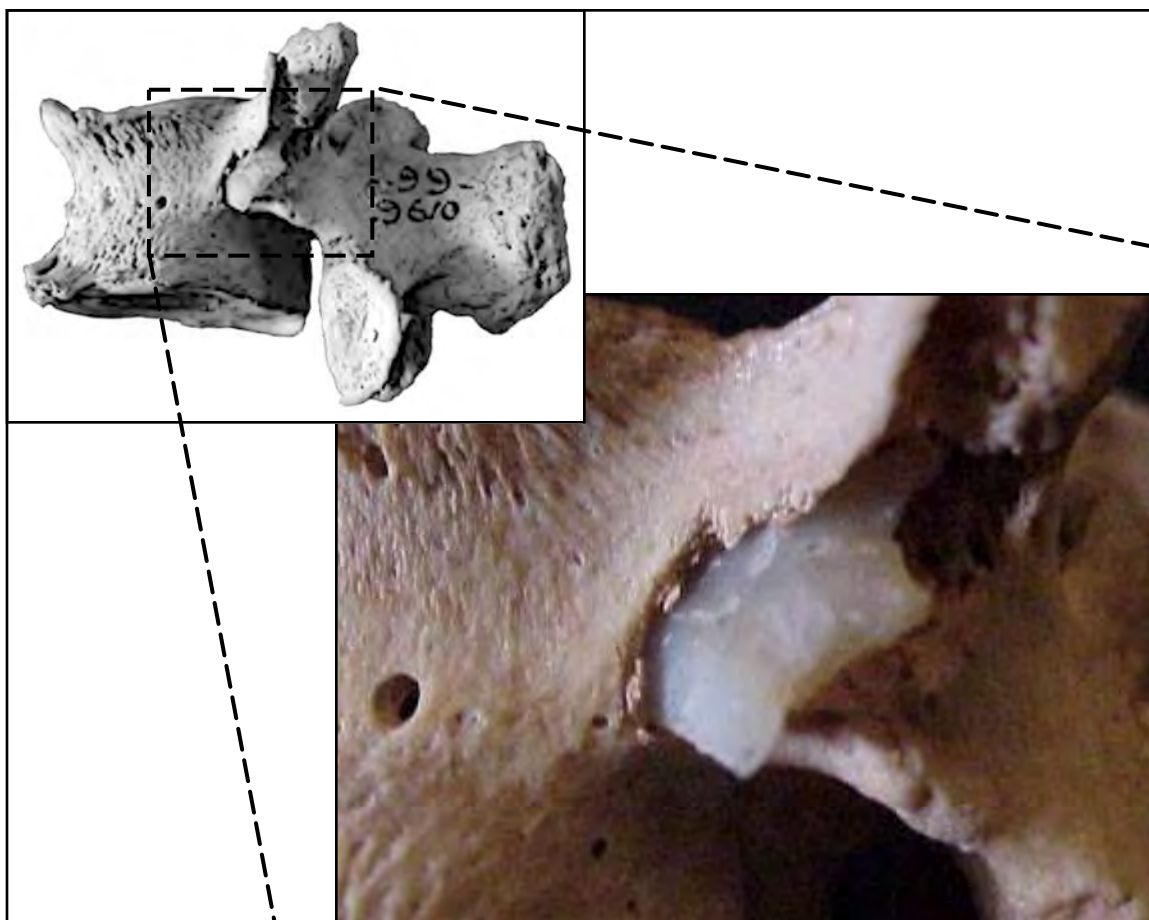


Figure 5.10. Vertebrae with embedded chalcidony arrow point, Burial 6, Battle Cave, Canyon del Muerto, Arizona (AMNH 99/9610; collections of the American Museum of Natural History; modified from images in Stone 2012).

with those of the bone cist. Figure 3.88 of Turner and Turner (1999:138) documents this mistake: the AMNH CN assigned to Burial 6 (99/9610) is plainly visible on the damaged skull. The nature of the damage revealed in the photo exactly matches Morris's description of the horrific blow suffered by the individual of Burial 6.

Turner and Turner identify the 99/9610 individual as "old adult male?" Removing this individual from their tally for the bone cist means that it contains six adults just like Morris said, along with a subadult (15–18 year old) and three children. Even with this corrected number of adults, the bone cist has an adult-biased sample that is dominantly male. One simple and useful comparison comes from examining the adult to child ratio for the rest of the numbered burials that Morris excavated in 1929. The ratio for the bone cist is 2.3 (7/3) with the subadult included as part of the adults, whereas the ratio for the rest of Morris's numbered burials is 0.6 (11/19). The bone cist sample is also male biased in that just a single female is represented, with three definitely male, two seemingly male, and one unknown. Like with Cave 7, the demographic profile is atypical from a normal burial sample and is consistent with a fight where men were selectively killed but not women, or at least not young women.

Aside from the number of victims, there is at least one significant contrast between the massacre assemblage at Battle Cave and that of Cave 7. The obvious difference concerns how the killing took place. Whereas the Cave 7 individuals exhibited unmistakable wounds from various penetrating weapons—dart points, knives, and bone daggers—none of the Battle Cave individuals exhibited such trauma. All were evidently killed by blows to the head or in ways that left no physical traces. The Cave 7 evidence is indicative of a melee whereas at Battle Cave it seems more like an execution, either of individuals that had already been captured and perhaps tied or that were caught totally unaware such as could occur at a "treacherous feast" (e.g., Sponsel 1998:100).

Scalping might be seen as another possible contrast, because Turner and Turner (1999:59) thought that the evidence for Cave 7 was confirmative (unmistakable and with numerous cranial cut marks on several skulls), but dubious for Battle Cave. Turner and Turner (1999:139) report cut marks on just one of the 66 cranial pieces from the Battle Cave bone cist, a frontal bone of an adult male. My examination showed one cut across the superciliary arch of the left eye (also Turner and Turner 1999:Figure 3.83) and

several more or less short parallel cuts midway back toward the coronal suture just off center on the right side with the cuts largely paralleling the facial plane (Figure 5.11). This evidence is no less than the traces on some of the individuals from Cave 7 that Turner thought indicative of scalping (see Hurst and Turner 1993). Indeed, given the considerable care that is evident with Basketmaker II scalp taking (details presented later in this chapter) there is good reason to argue that removing such trophies might have been achieved with few if any visible cut marks to the cranial bones. If cuts were to happen, then one of the highest probability areas for this would be right where they occur on the Battle Cave adult male shown in Figure 5.11. This is roughly along the front hairline exactly like as Kidder and Guernsey (1919:190) report a cut was made to remove the hair and ears in one piece for the full head scalp that they recovered from Kinboko Cave 1; the other two portions consisted of the upper face to the mouth and then the chin and lower cheeks. The evidence for scalping at Battle Cave seems as convincing as for Cave 7. Even if just this lone individual was scalped, then the proportion of adults so treated is 14 percent (1/7 including the subadult) whereas it is probably less than 6 percent for Cave 7 depending on the total count for the massacre assemblage (3/58 conservatively as argued previously; see also Geib and Hurst 2013).

Dating. Unlike Cave 7, virtually all the remains from the bone cist exhibited signs of perimortem damage indicative of violence at or around the time of death and all were interred within the same large pit, one that might have originally been used for storage. Consequently there is every reason to expect that the 10 individuals of the bone cist were killed at the same time and then interred at some later time. The evident temporal gap between these two events remains unknown, with Morris considering it lengthy and the Turners doubting this interpretation. Regardless, it is the age of the massacre event that is important, something that radiocarbon dating can establish.

The problem in sampling the Battle Cave remains for dating purposes is ensuring that separate individuals are dated rather than running duplicate samples on the same individual. The cranial elements that Turner and Turner (1999) used to establish an MNI would have sufficed but at the risk of destroying useful information. The best procedure was to select elements that could provide an MNI but without the loss of too much additional information and for this the left talus seemed optimal. This dense bone is not



Figure 5.11. Skull of adult male from the “bone cist” (Burial 1), Battle Cave, Canyon del Muerto; exhibits perimortem damage and cut marks (AMNH 99/9572); pencil arrows were on skull at the time of photography (collections of the American Museum of Natural History; photos by Phil R. Geib).

only likely to have excellent collagen preservation but there were four adult specimens represented. A fifth sample was a vertebrae from the adult female (CN9570) as this individual did not appear to be included in the talus sample. The five bone specimens were prepared by Joan Coltrain according to the procedures presented in an earlier paper (Coltrain et al. 2007:305–309). She obtained isotope measurements on purified bone collagen and then submitted the samples to the NSF-Arizona AMS Laboratory which combusted the collagen, converted the gas to graphite, and measured the ratio of $^{14}\text{C}/^{13}\text{C}$. These measurements were converted to conventional radiocarbon years using Coltrain's measured $\delta^{13}\text{C}$ values for correction. The results of this effort are presented in Table 5.6.

Table 5.6. AMS radiocarbon assays for eight bone collagen samples from Battle Cave, NE Arizona. The bottom two samples are on individuals not part of the massacre assemblage.

NSF-Arizona Lab #	Conventional date	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$	Burial #	AMNH Cat #	Coltrain #
AA86999	2153 ± 51	-6.6	8.4	1	99/9570	2201
AA87000	2187 ± 52	-7.3	8.6	1	99/9591	2202
AA87001	2155 ± 76	-6.8	8.7	1	99/9594	2203
AA87002	2134 ± 52	-7.6	9.1	1	99/9595	2204
AA87003	2070 ± 51	-5.8	9.7	1	99/9607	2205
AA57717	2132 ± 43	-6.3	8.5	2	99/9608	593
AA86998	1278 ± 58	-6.6	8.3	6	29.1/8686	2200

The five dates for the massacre assemblage pass a test for contemporaneity ($df = 4$, $T = 2.8$, $\chi^2 = 9.5$, $\alpha = .05$). Their average is 2138 ± 25 , which has a calibrated two-sigma range of 355–55 BC. Because of a pronounced reversal in the calibration curve between 2200 and 2100 BP and smaller wiggles after this, the average has a 300 year span after calibration even with an error term of 25 years (Figure 5.12). Little of the date distribution extends past 85 cal. BC (2.1%), so in all likelihood the massacre occurred prior to this. There is a high probability that it occurred between 210 and 85 cal. BC but the possibility of occurrence some 100 years earlier cannot be ignored since 15 percent of the probability distribution at two-sigma falls in the date range of 355–300 cal. BC. What is clear from these results is that the Battle Cave massacre happened a century or two before the Cave 7 massacre.

The date on Burial 2 from Battle Cave (Table 5.6) is essentially no different from the average for the five assays of the massacre assemblage; it has a calibrated two-sigma

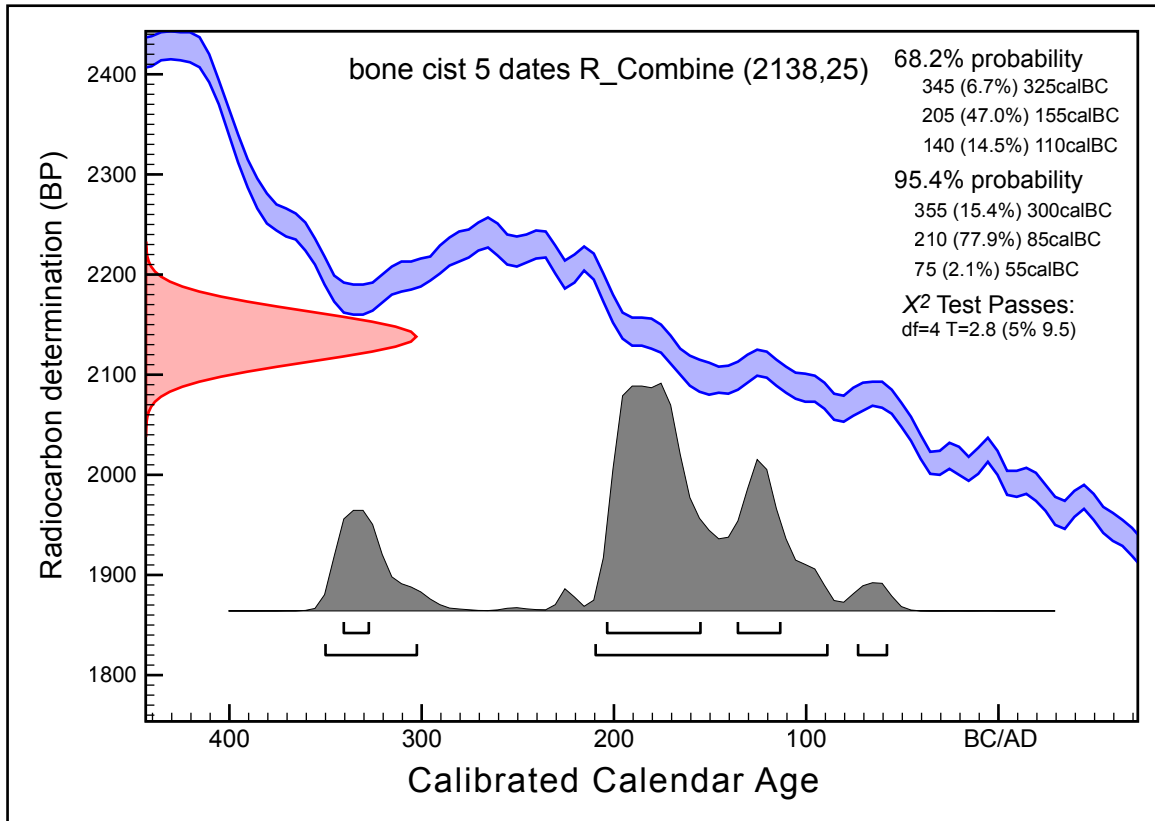


Figure 5.12. Calibration of the average (R_combine) for five radiocarbon dates on the adult burials from the bone cist (Burial 1), Battle Cave, Canyon del Muerto, Arizona; OxCal Version 4.1 (Bronk Ramsey 2009), using the IntCal09 calibration curve (Reimer et al. 2009) for the northern hemisphere with 5-year rounding.

range of 360–40 cal. BC. Nonetheless, there is no evidence to suggest that this single adult interred in a hardpan cist was in any way one of the massacre victims. The cist that contained Burial 2 was about 3 m south of the bone cist and the interment was “normal” for Basketmaker II, consisting of a flexed body on its back wrapped in a woven blanket with a coiled basket placed over the face. This burial had been disturbed prehistorically, like several of the Basketmaker burials at the site, but the bones do not exhibit any evidence of violence, which is also true for other Basketmaker skeletons at the site that were not part of the bone cist.

OTHER PHYSICAL EVIDENCE

Aside from the massacre assemblages, evidence of physical violence during Basketmaker II consists of scattered and poorly reported finds. Early excavators clearly encountered numerous Basketmaker burials but they were highly selective in what got saved, often just the skulls,^{ix} such that we will never have the sort of understanding that might have been possible had recovery been complete. Exacerbating the issue is a lack of systematic study of early collections or lack of public dissemination of analysis results that have been obtained within the last dozen years or so. Nonetheless, it is worth reviewing various pieces of evidence concerning Basketmaker II violence, some of which might well pertain to group level conflict and several of which involve atlatl darts.

Trauma

Skull with Embedded Dart. Pepper (1905:129, Plate IV) illustrates and briefly describes a Basketmaker II cranium with an embedded atlatl dart foreshaft. According to Pepper, “the shaft penetrated the head at a point directly under the lower jaw and its course carried it through the nasal cavity and into the brain.” The skull was also partially crushed. Because just a small portion of the proximal end of the foreshaft was visible, Pepper cut a few inches of dried skin thereby enabling him to remove the cranium and expose the shaft. It turned out to be a 15 cm long hardwood point lacking any stone tip; the penetrating end is described as carved to “a perfect tapering point” 8 mm wide “the sides of which are beveled showing that it had been carefully prepared.” The pictures of this find accord well with his description and leave no doubt that this was a lethal injury. Unfortunately Pepper does not mention a site location of this skull. Given that he was

describing collections originating from SE Utah, which was the only area at the time where Basketmaker II materials were known to occur, it is a safe assumption that this was its source, likely somewhere between Allen Canyon and Butler Wash west to Grand Gulch. The skull not only provides further evidence for Basketmaker II conflict in this area but also discloses the potential lethal nature of wooden dart tips. Appreciation of this latter aspect is perhaps limited in the Southwest, not just because of underestimating the lethality of wooden projectiles for humans but because so few wooden projectiles are known from Basketmaker II sites. The Correo site in west-central New Mexico yielded a number of darts that were tipped with wooden projectiles similar to those embedded in the skull that Pepper described (Fields 2013).

Cave 21 Skull with Embedded Dart. There is an entry in the original field catalog of the first Richard Wetherill collection from Grand Gulch, obtained during the years of 1893 and 1895, that describes a find similar to the impaled skull described by Pepper. Regarding a site listed as Cave 21 in Grand Gulch between Turkey Pen Ruin and Junction Ruin, the account reads: “Dug out by previous explorers or relic hunters—face mashed[,] has a spear point and shaft 6 in. long in head[.] Entered under chin [drawing][.] kind thrown by Atlatl[.] Hair brown—cloth on face. Same kind of race as is found in all B. Caves [B = Basketmaker]” (Wetherill 1895:38; also Blackburn and Atkins 1993:72–73). This find has AMNH number H/13428 and Wetherill field number 788; there was another skull recovered at the same time (AMNH 99/7463, Wetherill field number 790) that is described as “face gone—hair cut” (Wetherill 1895:38). If it were not for the fact that the FN788 (H/13428) find is listed as having a “spear point” it would otherwise seem identical to Pepper’s find. The 6 inch long foreshaft is an exact match for the one that Pepper describes and so is how the dart penetrated the skull in a trajectory from under the chin. In a November 15, 1896 letter to T. Mitchell Prudden, Richard Wetherill appears to recount this find: “[In] one case the face was mashed in and the skull contained an Atlatl point that had been fired in under the chin or below as the point sticks out of the top of the head” (in Blackburn and Atkins 1993:96–97). It appears that Wetherill’s Cave 21 find is different from that of Pepper as the drawing of the fatal weapon that occurs on page 38 of his field catalog shows a foreshaft with an unmistakable side-notched point,

and this is different from what Pepper showed in his photograph of the skull after it had been cut to expose the dart foreshaft.

Red Canyon Skull with Impact Wound. Figure 5.13 shows the skull (AMNH H/12657) of a Basketmaker II adult male that exhibits a circular green bone fracture to the left side centered on the squamosal suture between the temporal and parietal bones. The fracture has a diameter of 2.5 cm with one piece of bone spalled on the inside. The zygomatic arch is also broken and it is possible to envision how a right-handed assailant wielding some sort of club could have fractured the arch while delivering the evidently fatal blow to the head. Turner and Turner (1999:398, Figures 3.284 and 3.285) were the first to report this find, which McLoyd and Graham recovered in 1893. The exact location of the site is unknown but McLoyd's catalog lists it as "Red Canyon," which is what the AMNH catalog records it as. Red Canyon drains the western side of Red House Cliffs and empties into the Colorado River. The one associated artifact is a coiled basket (H/12265) placed over the face of the individual; a variety of other artifacts and humans remains at AMNH are attributed to Red Canyon by McLoyd and Graham.

The Basketmaker II temporal assignment of the Red Canyon damaged skull has been confirmed by direct AMS dating. Joan Coltrain extracted dentin from a loose molar from this skull for the purposes of isotopic measurement and radiocarbon dating. This sample (ACRF 2436) returned a radiocarbon age of 2050 ± 47 BP (AA97499, -7.7‰ $\delta^{13}\text{C}$, 8.6‰ $\delta^{15}\text{N}$). This date has a calibrated 2σ range of 185 BC to AD 55. The delta ^{13}C value for this individual is consistent with a high maize diet like for other Basketmaker II individuals of the Four Corners area (e.g., Coltrain et al. 2006, 2007, 2012). The temporal range for the death of this individual overlaps somewhat with the estimate for when the massacre at Cave 7 occurred, but in all likelihood it was an earlier occurrence.

Cut-in-Two Cave (Cave 12/19). This site, which is a dry shelter on the west side of Grand Gulch a short distance upstream from the Bullet Canyon tributary, yielded an abundance of remains listed in Wetherill's field catalog as numbers 669 to 765. The site name comes from perhaps the most memorable find, the mummy (H/13497, FN 753) of a "Man nearly 6 ft tall. Knees drawn up. Hands on abdomen. Was cut in two at loins

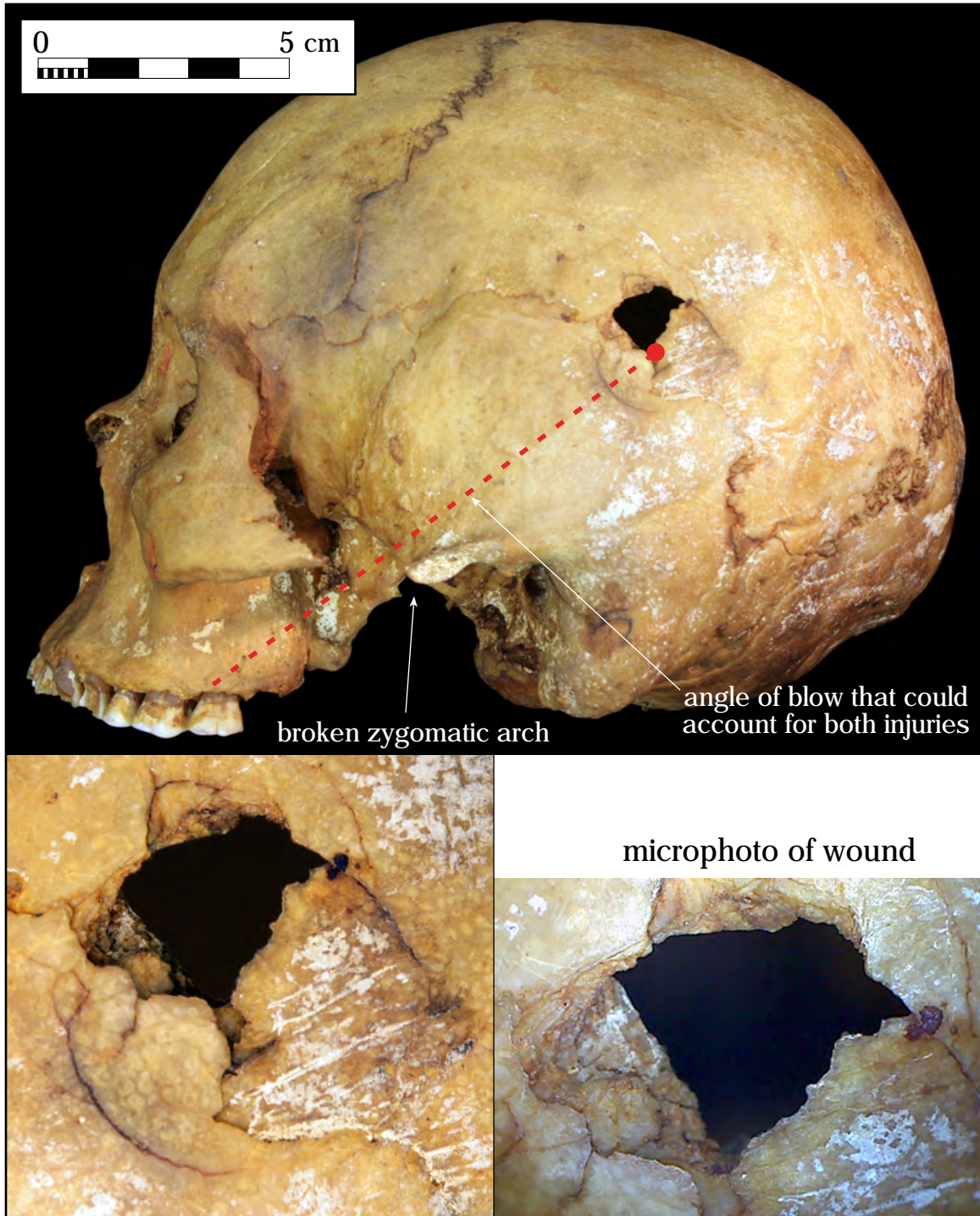


Figure 5.1.3 Skull (AMNH H/12657) of Basketmaker II adult male that exhibits a perimortem impact wound to left side and a broken zygomatic arch, unknown site in Red Canyon, SE Utah. (Collections of the American Museum of Natural History; photos by Phil R. Geib.)

and sewed together again with hair string (one of the most curious specimens ever found)” (Wetherill 1895:37; also Blackburn and Atkins 1993:72). Examination of this individual at AMNH showed exactly what Wetherill described, with a cut across the waist such that at least one and possibly two of the lumbar vertebrae were retained on the lower half. The human hair cordage used for stitching is a rather complex cable that has two plies Z-twisted together, but each of the larger plies consists of some 8–10 S-twisted strands that appear to consist of Z-spun hairs (lighting was poor and I lacked the magnification necessary for positive identification). A rather crude whipstitch was used to hold the two halves together, but by whipstitching using two separate cords the result was something like a baseball stitch. Just because this individual was cut in half does not necessarily mean that they died violently since this could have occurred for ease of transport if the person perished a long distance from where burial was to take place. Wetherill reported, however, that an atlatl point “fell out” of the cut-in-two mummy once it had arrived at the museum [presumably AMNH] (November 15, 1896 letter to T. Mitchell Prudden cited in Blackburn and Atkins 1993:97). Because there was no outer wrap of clothing on this individual the point was evidently within the body cavity, thus the individual might have died violently, something that will require detailed study and perhaps a CT scan or other imaging to verify. Joan Coltrain obtained a radiocarbon date on this individual of 1974 ± 50 BP (-10.1‰ $\delta^{13}\text{C}$, personal communication, 2010), which has a 2σ calibrated range of 105 BC to AD 135.

Green Mask Site (Cave 11/17). Turner and Turner (1999:397) report an incomplete skeleton of an old adult female (?) (AMNH H/16034) that Wetherill retrieved from the Green Mask Site (Cave 11 during the 1897 expedition when the find was made, or Cave 17 during the 1893–1895 expedition, when other materials were recovered). They state that this individual “had perimortem and postmortem breakage of her cranium” (Turner and Turner 1999:397). They also note that arm and leg bone fragments from the site had “perimortem mid-shaft breakage” and call for detailed study in order to understand the nature of violence represented at the site (Turner and Turner 1999:398). To my knowledge that has not yet occurred and I was not able to do so when conducting research at AMNH.

Site 33 Vertebrae with Embedded Dart Point. In the collections at the National Museum of the American Indian is a human spinal column (NMAI 64473) from Richard Wetherill's Site 33 in Butler Wash of SE Utah (Wetherill's field # 1101, AMNH # H/13534). Wetherill's field catalog reports the find as a "backbone with spear point in it" and states that it was "found on surface—dug by other parties and overlooked." It consists of 10 articulated vertebrae with the blade portion of a dart point embedded in the body of one. A forensic analysis report by Dr. David Hunt, National Museum of Natural History, on file at NMAI stated that the point was in the 11th thoracic vertebra, entering from the left at an angle, such that the dart would have gone through two or three organs: liver, pancreas, spleen. The point is made of chalcedony with reddish spots and mottles that might be a silicified wood and certainly appears similar to material from the Chinle Formation. The point was deeply side-notched and the top part of the notches are straight like those typical of Basketmaker II points of NE Arizona. The point snapped across the narrow neck, which measures 6.2 mm wide; maximum blade width is 16 mm.

Wetherill reports two skulls from Site 33 (FNs 1014 and 1015) of women buried together both of whom "had been killed with a blow in the face." He also notes that "this cave [33] adjoins the forked cave [perhaps the site known as Ballroom Cave] where a great battle had taken place." Wetherill does not specify whether the two skulls were those of Basketmakers or cliff dwellers nor is any further information about the great battle provided.

Woodchuck Cave (NA3112). LeBlanc (1999:141, Table 4.1) lists Woodchuck Cave in NE Arizona as an example of Basketmaker II violence, stating that the site contained "twenty of both male and female individuals of all ages, all of them missing skulls" referencing Lockett and Hargrave's (1953) site report. Schaafsma (2007:100) uses the term "decapitated" with reference to the adult males from Woodchuck Cave with the clear implication of violent death. She cites Turner and Turner's (1990:201) observation that the heads had been removed by cutting with a metal knife, but then tries to partially counter this claim. Lockett and Hargrave indeed report that adult burials were missing craniums, along with many long bones for some individuals, but this site cannot be used as evidence of violence in any meaningful sense. They state that "although the crania of all infants recovered were intact [n = 7], all adult skeletons were lacking skulls

and in only four of the latter were mandibles in evidence” (Lockett and Hargrave 1953:31). Twelve adults were found at the site so the number without skulls is 40 percent less than the number given by LeBlanc; a child of around 10 was also recovered but the report does not clearly indicate whether or not the cranium was present.

The important point is that the skulls and many long bones were removed “at an unknown period in the past” but clearly *after* the individuals had been interred. These were “normal” Basketmaker II burials that were subsequently rifled through with select body parts removed. In this instance, the objective was clearly for skeletal parts (skulls and long bones) and not jewelry or other artifacts (Lockett and Hargrave (1953:31). Given the need for human bone in certain Navajo ceremonial practices, especially those concerning witchcraft (Kluckhohn 1944), the removal of skulls and long bones is readily explained and indeed the seclusion of Woodchuck Cave seems an ideal location for the practice of witchcraft. Early excavators such as Wetherill also selectively collected just crania at the behest of museums and this could account for missing heads in some cases, but the fact that artifacts were not collected suggests that removal by witches is more likely. Turner and Turner’s opinion that the skulls were detached using metal knives is consistent with historic disturbance of the graves. It is also worth noting that the sex ratio of the individuals at this site is opposite that for the massacre assemblages of Cave 7 and Battle Cave since the 14 adults consist of seven females, four males and one indeterminate (Lockett and Hargrave (1953:12–14). Not only does Woodchuck Cave contain a relatively high proportion of infants and children (40%) but almost 60 percent of the adults are females—this is more consistent with a natural death assemblage at this time.

Mass Burials

A somewhat common Basketmaker II burial practice was for mass interments—numerous individuals within single burial pits (Table 5.7). One of the first well-documented examples of this, and one of the largest, was at Sayodneechee Cave in NE Arizona, especially Cist B, which “contained the skeletons of no fewer than 19 individuals—8 adults and 11 children, under 5 years of age” (Kidder and Guernsey (1919:29). This mass of humanity was contained within a pit that measured just 4 feet in diameter and 4.5 feet deep. The excavators concluded that this was no ossuary as the

skeletons lay in order: “The bodies could hardly have been packed in so tightly, and yet show so little disturbance, if they had been put in one by one and the cist closed up between times” (Kidder and Guernsey (1919:29). They thought that the Cist B remains represented a single burial event (“filled at one time”) and they speculated that “some particularly virulent epidemic” may have been the cause. Kidder and Guernsey are explicit that carnage was not involved: “No signs of violence, no crushed or cut skulls, no bones apparently broken before death, were noted; a massacre theory seems untenable” (1919:29).

Table 5.7. Examples of mass burials within the study area that do not appear to qualify as evidence of violence but rather for the reuse of pits as burial crypts.

Site Number/Name	Feature	n	Demographics	Ref
Sayodneechee Cave, Tseya Neechee Canyon, AZ	Pit	19	8 adults; 11 children	Kidder and Guernsey 1919
Tseahatso, Canyon del Muerto, AZ	Pit	18	18 children	Morris 1933
NA15723, Navajo, NM	Pit	32	8 adult M; 4 adult F; 2 ?sex adult; 18 children	Hartman nd, 1983
Black Mesa, AZ	Bell-shaped pit ^c	13	7 adults; 6 children	Spurr et al. 1998
Ariz. D:7:3141, Black Mesa, AZ	Bell-shaped pit ^d	6	2 adult M; 1 adult F; 3 children	MacMinn et al. 1984; Magennis and Martin 1984
NA13,166, Red Mesa, AZ	Pit	8	?	J. Lee Correll (no report)
Kin Kahuna, Rainbow Plateau, AZ	Bell-shaped pit ^e	5	2 adult M; 1 adult F; 2 children	Geib and Spurr 2007
Broken Roof Cave, Lower Chinle Wash, AZ	Slab-lined cist	5	1 adult M; 4 children	Guernsey 1931

^c Eight bodies laid out in a row on floor and five laid over these. Varied and rich mortuary offerings despite rotting of organics including shell, bone and stone beads and pendants, a bone awl, a few non-flaked stone tools and minerals/pigments. Bodies were evidently wrapped in clothing or textiles as indicated by organic staining and partially decomposed organics in the fill and a few small decayed pieces of a twined bag. About one-third of the pit floor was devoid of bones and might have contained perishable mortuary offerings.

^d Six bodies placed near the pit floor (F10) surrounded by beams, both above and below, with sandstone slabs above the beams. One of the burials may have been a bundle burial; two of the individuals, one adult and one subadult, were articulated, but the remains of the others were mixed and could not be completely separated (Magennis and Martin 1984:808).

^e Five bodies placed quite close together on or just above the floor of Pit 17 and somewhat overlapping with some skeletons largely disarticulated, perhaps due to multiple interment events. Some mortuary items were obviously associated with each individual but numerous items also occurred from the general fill of the pit, including stone and bone ornaments (beads and pendants), abraded stone disks, and bone “needles” that may have been from hair pins. The crowding of individuals into the southern and eastern area of the pit suggests that the western part may have contained perishable mortuary offerings.

Another good example of a mass burial comes from the site of Tseahatso in Canyon del Muerto where Earl Morris recovered 18 children in a single cist. According to Ann Morris (1933:200), this find consisted of an enormous basket packed with four children that lay at the bottom of a hardpan cist upon which there rested 14 babies and infants. She, like Kidder and Guernsey, envisioned a virulent epidemic that “swept the cave” culling most children of the inhabitants within a day or two. LeBlanc (1999:141) discounts the epidemic scenario based on the number of individuals and the small group sizes of the time. Epidemics are far more likely during later periods when population levels were higher and people were less residentially mobile and lived in more crowded conditions, yet mass burials other than massacre assemblages are generally absent after Basketmaker II. While LeBlanc is willing to consider the possibility of repeated use of the pits/cists for burial proposes for this and other mass Basketmaker burials (the ossuary scenario that Kidder and Guernsey dismissed), he maintains that a massacre origin must be “equally considered” (LeBlanc 1999:141).

If 18 children were killed in a single event then what about their parents? Surely Morris would have encountered their remains as well yet there is no indication of this from his extensive Tseahatso excavations. And although it is certainly possible that 18 children could be killed without leaving any osteological trace, this is not what occurred at Battle Cave just down canyon from Tseahatso. In the case of Sayodneechee Cave, eight of the 19 buried individuals were adults, so it seems likely that some direct evidence of violence would have been discovered as adults are unlikely to have relinquished life peacefully such that no traces of physical trauma would have been sustained. This, plus the lack of any body mutilation, renders the massacre theory untenable, just like Kidder and Guernsey suggest. Nonetheless, I think that these authors are wrong to argue that instances like Cist B at Sayodneechee Cave do not represent a multiple burial. There is no reason to expect that bones would become disturbed in a dry shelter by repeated use of a single burial feature, especially if the various filling events occurred within the span of just a generation or two. Even after two thousand years some of the skeletons excavated by Kidder and Guernsey and others were tightly held together by desiccated muscles, tendons, and skin, implying that reopening a dry burial chamber a mere 10 or even 100 years following the initial interment is unlikely to result in much if any disturbance. As

concerns the tightly packed bodies in Cist B, Kidder and Guernsey state that "great pressure seems to have been exerted in cramming them down" (Kidder and Guernsey 1919:29). The use of specific pits or cists as family crypts should be seriously considered as an ancient practice in the Southwest and one that would readily account for mass burials without recourse to speculations about epidemics or massacres when no physical evidence exists and even the demographics seem unsupportive (e.g., Woodchuck Cave).

The largest Basketmaker II mass burial currently known came from site NA15723 (also LA16825) at Navajo, NM, just across the AZ line to the SE of Canyon de Chelly. Excavated in 1978, a summary description appeared in *American Antiquity* (Hartman 1983) but unfortunately a full report was never prepared. The site notes and skeletal analysis sheets on file at the Museum of Northern Arizona provide a more complete record. A progress report in the MNA site files gives an estimated MNI of "24 to 28 individuals" from a "pit measuring less than 2 m in diameter and under 1 m in depth" (Hartman nd). Hartman's skeletal analysis sheets indicate a total MNI of 32 as follows: eight adult males ranging in age from 18 to late 50s (six under ca. 35 years and 2 over); four adult females, with three in mid-late teens and one 35–55 yr; two unsexed adults, both 35–55 yr; and 18 children consisting of three fetal/neonate, six infants (about 1 year or less), five young children (~3–7 yr) and four older children (~9–15 yr). All the designated burials are partial or fragmentary but there are numerous unassigned skeletal elements that probably go with these individuals. Hartman states emphatically that she found no "apparent cause of death for any of the individuals" (nd:1) and none of the analysis forms or field notes mention any evidence of trauma. There was disarticulation of elements because most of the burials were secondary. Hartman (nd:1) reports that stratification within the pit indicated a minimum of three separate interment events at various times. A series of primary burials occurred on the bottom of the pit (at least 5), overlain by numerous secondary, bundle burials (at least 16), and then more primary burials on the top of the pit (at least 3). Exceedingly few artifacts were associated with the remains given the number of individuals represented, most notably a few hundred *Olivella* sp. shell beads that could nonetheless represent just a single artifact, three dart-sized projectile points, and a few bone beads and abraded sandstone disks. Although the remains from NA15723 could perhaps benefit from additional study, Hartman was an

experienced analyst and MNA had several good examples of comparative collections resulting from massacres that she was familiar with. The fact that she did not document any trauma to the skeletal remains coupled with the evidence for sequential use of the pit indicates that this mass burial is unlikely to have resulted from a massacre but rather from repeated use of a pit for placement of the dead, perhaps as a family crypt.

In the NA15723 progress report Hartman (nd:2) mentions that radiocarbon samples were taken from discrete strata in the burial pit and submitted to the University of Georgia. Because no dating results were on file at MNA, I contacted the Center for Applied Isotope Studies (CAIS) at the University of Georgia to learn what if any assays had been obtained. Fortunately, CAIS had recently organized their old records so it was relatively easy to find the necessary information, which consisted of a letter report from Betty Brandau to Dana Hartman at MNA dated December 5, 1978 (Jeff Speakman, personal communication 2013). . The letter indicates that only one of the several samples submitted for analysis was large enough for dating based on the sample size requirements of the beta decay technique then in use (#17, A-78-107). The sample came from under the skull of Burial 18; unfortunately the nature of the material is not specified. The date is 1965 ± 80 BP (UGa-2494), which has a two-sigma calibrated range of 170 BC – AD 230. None of the original sample material was archived at CAIS, so evidently the unanalyzed samples were returned to MNA. Because the sample material remains unidentified and there was no measurement of or correction for $\delta^{13}\text{C}$, the age estimate is provisional but it certainly supports the Basketmaker II temporal assignment.

Other mass burials from the study area consist of individuals numbering anywhere from 2 to 13 and in all cases osteological analysis did not reveal any obvious signs of trauma or other evidence of conflict. Some of these lack the sort of detailed study necessary to totally dismiss the possibility of violent death (e.g., the eight burials at NA13,166 that J. Lee Correll recovered) but others did receive detailed osteological analysis and no violence is indicated. Given that burial events might not be separated by a significant amount of time and that organic remains such as juniper bark might have been packed within the upper fill of pits to absorb moisture, reuse might not be readily observable archaeologically by extensive disarticulation. There is good reason to place close attention to the stratigraphic context and positioning of skeletal elements for any

future discoveries of mass burials so that the possibility of family crypting can be properly considered. It is also possible in cases of mummified remains that recent advances in epidemiological analysis of ancient remains will enable detection of pathogens if any are indeed present (Raoult and Drancourt 2008) and thus allow verification or elimination of one suspected cause of mass burials.

Trophies

Severed or flayed human body parts have been used worldwide in various cultural practices and Native Americans were no exception to this practice long before European contact (e.g., Chacon and Dye 2007; Friederici 1907). The contexts for trophy taking are varied among ethnographically documented groups but most often the taking of body parts occurred during intergroup conflict. Killing an enemy combatant supplied a story that could be recounted but removing some portion from the corpse provided tangible support for such an account. “Trophies are displayable, and constitute a dramatic proof of victory, proclaiming the warrior prowess of their takers and owners” (Arkush 2008:563). Chacon and Dye (2007:633–634) relate how earning prestige can be a primary motivation behind trophy taking, or, as McCauley (1990:20) phrased it: “Status can require getting a head to get ahead.”

Flayed Head Skins. Within the Four Corners study area a single example of a full head scalp is known that dates to the Basketmaker II time period (Figure 5.14). This specimen is the head skin recovered in 1915 from Cist 16 of Cave 1 in Kinboko Canyon of NE Arizona. Kidder and Guernsey (1919:190–191) describe this remarkable find in detail, noting that the skin had been removed in three pieces, tanned, and then sewn back together: a principal cut down the frontal plane at the hairline was used to remove the scalp proper along with the ears as a single piece; a tangential cut at the mouth intersected the frontal cut below the ears to remove the upper face including the nose as the second piece and the lower face and front neck as the third. In sewing the pieces back together the lips were cut off, evidently to ensure a straight seam since no trace of them remained. The hair was carefully dressed and both it and the face were painted rather elaborately with bands of green, red, and yellow. A band down the central part of the scalp had been clipped of hair, as had a “large semilunar tonsure at the crown” (Kidder and Guernsey 1919:191). Guernsey and Kidder (1921) illustrate this as Plate 10 in their synthetic

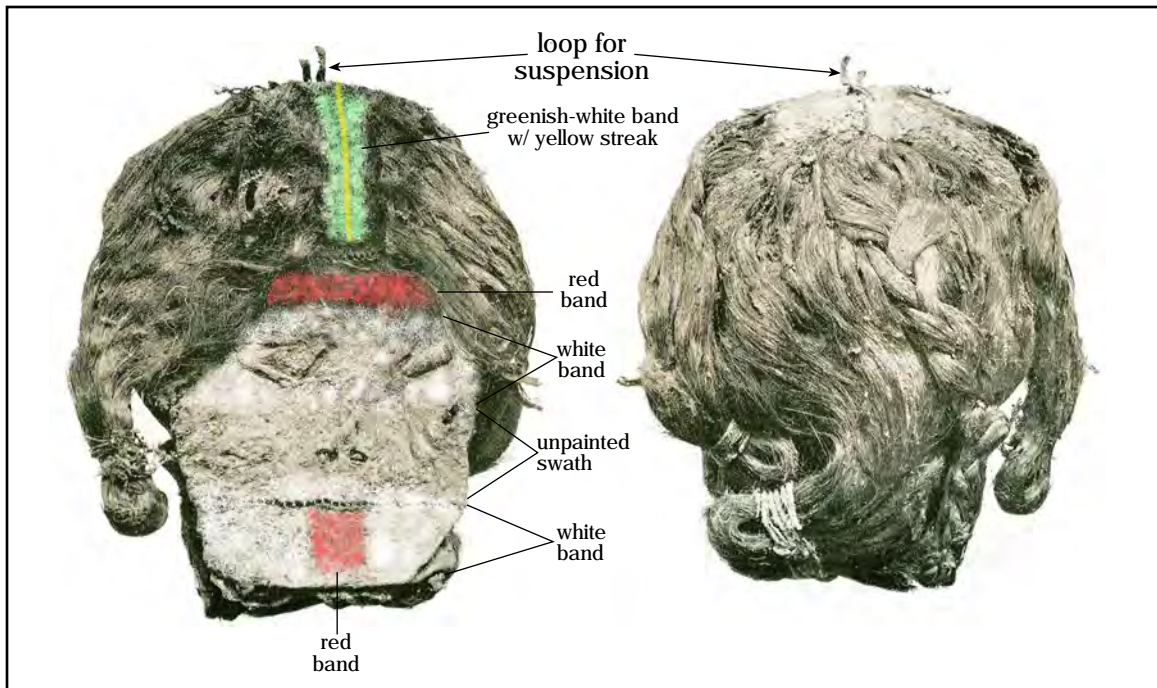


Figure 5.14. Basketmaker II flayed head skin recovered from Cave 1 of Kinboko Canyon, NE Arizona; associated radiocarbon age is ca. 385-200 cal. BC at two sigma. (Collections of the Peabody Museum of American Archaeology and Ethnology; modified from Kidder and Guernsey 1919:Plate 87).

treatment of Basketmaker II remains. This head shaving is significant because Robins (2002:392–393) has effectively argued that it bears “a striking resemblance to both the headdresses and heads portrayed in many rock art figures.” More will be said about this later. A thong had been inserted through the top of the scalp for suspension and scalps like this are at times shown in rock art held in the hand of an individual. This item was recovered under the shoulders of a young woman that had been laid to rest within a cist apparently wearing the scalp. This item almost certainly represents a war trophy, which is Kidder and Guernsey’s interpretation (1919:191). The head skin is probably that of a male judging from the long hair and its coiffure. Based on Basketmaker mummies it is evident that males wore their hair long and commonly in braids, whereas females usually had their hair cropped close to the head (Guernsey and Kidder 1921:52–53), perhaps after marriage. Artifacts made of human hair cordage are abundant from Basketmaker contexts and doubtless most of these are of female hair.

The age of the Cave 1 head skin trophy is known because of radiocarbon determinations on two individuals from Cist 16 (Coltrain et al. 2007:Table 1): one on the young female that wore the artifact (2205 ± 55 BP) and another on a child (2245 ± 47 BP). Since both determinations are contemporaneous they can be averaged (2228 ± 36 BP), resulting in a calibrated two-sigma age range of 385–200 BC.

A trophy like this is likely to be even far rarer than the physical evidence for massacres, not only because of being perishable and highly susceptible to consumption by various insects, even if deposited in a dry context, but because such items were probably highly valued and curated, thus rarely disposed of. Disposal of such a potentially powerful and symbolically charged item might have been highly regulated and involved measures that precluded common archaeological discovery. For example, Beaglehole and Beaglehole (1976:23–24) describe a Hopi scalp ceremony where the scalps are thrown into a rock fissure never to be retrieved, although they are ceremonially fed each year by tossing wafer bread into the fissure. Suffice it to say that no other Basketmaker II scalp has been found in the Four Corners region despite a considerable amount of excavation in dry shelters.

On the far northern edge of Basketmaker II territory near Moab Utah, five scalps were recovered from four different sites of Mill Creek Canyon (Howard and Janetski

1992). These scalps differ from the Kinboko specimen because they consisted of hair alone though one also included an ear. Several of these had the addition of a small basket plaque on the inside to hold the scalp open for better display and most had thongs for suspension. A direct date on one specimen indicates that it is late Basketmaker II in age, which might also apply to the other Mill Creek examples.

Both the Zuni and the Hopi have traditional stories about scalps and their ceremonial uses (Beaglehole and Beaglehole 1976:23–24; Parsons 1924; Stevenson 1904:39, 50). According to Ellis, “A [Taos] warrior promptly scalped any enemy he had killed, and other warriors ran up to shoot at the corpse . . . Upon return of a party, the War Chief required a personal report from each and took the scalps to prepare them by stretching and coating with red paint” (Ellis 1951:190). Scalp taking provided the opportunity for prestige and even political advantage. When discussing the political hierarchy at Zuni, Stevenson (1904:577) mentions that of the eight (or nine) positions, two were bow priests and that when a new “Elder Brother Bow Priest” was needed, “the one who has been serving as Younger Brother Bow Priest customarily is put into that position unless some other member of the organization has become more famous in war when his scalp trophies win for him the highest honors conferred on any member of the body.” In a passage discussing the warlike ways of the Apache, Bandelier (1890:194) stated that “scalping was sometimes practiced by them, but not so generally as by the Pueblos.” The Basketmaker II evidence suggests that this practice is one with significant time depth in the Southwest.

Head Skins in Rock Art. Although the Kinboko flayed head skin is unique, depictions of similar full head scalps occur in Basketmaker II rock art (e.g., Cole 1984, 1989; Schaafsma and Young 1983), implying that these trophies were more common than archaeological recovery indicates. These depictions of head skins were initially called masks (e.g., Cole 1984; Schaafsma 1980:117; Schaafsma and Young 1983), and the most dramatic specimen in this regard is known colloquially as the “green mask,” a name extended to the site as a whole (Figure 5.15). Polly Schaafsma first mentioned this sort of imagery in passing in her 1980 rock art book, then provided detailed documentation a few years later of around 20 flayed head skins at seven different sites in SE Utah and NE Arizona (Schaafsma and Young 1983). Schaafsma and Young argued that the depictions



Figure 5.15. Basketmaker II pictograph of a flayed human head skin at the "Green Mask Site" (42SA3711), Sheik's Canyon, Grand Gulch, SE Utah (photo by Randy Langstraat). The faint suspension thong is incised into the rock; the faint vertical red swath below the chin is likely the back hair which is commonly gathered together and bound into a long lock or shorter bob (see Guernsey and Kidder 1921:Plate 19).

were truly masks or face disguises much like those of later Puebloan rock art, but Schaafsma (1994) subsequently retracted this interpretation.

Sally Cole (1984, 1985) was the first to explicitly draw the obvious connection between the rock art depictions of flayed human heads and the physical specimen of the same found by Kidder and Guernsey in 1914. Nonetheless, she labeled the depictions as “masks” or “faces” rather than Kidder and Guernsey’s more accurate designation of trophy head or scalp. In a 1989 paper and then again in her 1990 general book on rock art of the Colorado Plateau Cole refers to the depictions as “whole face and hair scalps” or simply “scalps” in recognition that they are something different from Puebloan masks. Schaafsma (2000, 2007), too, now refers to them as scalps or head trophies and is very explicit about their link to Basketmaker II conflict at different social scales: “the heads displayed in the rock art are indeed trophies. Trophy heads, as desirable fetishes, could also have been obtained in conflicts of a much smaller scale than the massacres that leave such a dramatic impression in the archaeological record” (Schaafsma 2007:100). Although this is true, the evidence from the two documented Basketmaker II massacres reviewed previously indicates that head skins were perhaps also obtained from select individuals in large-scale killings.

The depictions of flayed human heads occur as both pictographs and petroglyphs with the degree of detail and nature of features varying according to the medium and image size (Figure 5.16). Pictographs allow the most detail as seen with the green mask image, but other painted examples appear simpler, perhaps in part because of fading and blurring of the pigments. Also, small-scale pictographs of head trophies can be greatly simplified to the point of abstraction, especially when the items are shown held in the hands of anthropomorphs, which themselves might be rather small. The depiction at the Green Mask site is certainly the most precisely detailed example known and, as Cole (1984) discussed, provides a close approximation of the Kinboko Cave 1 trophy because of its alternating horizontal color bands on the face and paint applied to the part. The color schemes are different as the facial bands for the Cave 1 head skin are white with a vertical red patch below the mouth whereas the bands of the Green Mask trophy are blue-green and yellow with yellow for the vertical patch below the mouth. For the Kinboko specimen there is an unpainted swath from just below the eyes to the mouth, the



Figure 5.16. Pictographs and petroglyphs of flayed human head skins: (a) Lions Track Ruin, Grand Gulch, SE Utah (photos by Rob Jones); (b) Sand Island, SE Utah; (c) Headhunter Shelter, NE Arizona (photos by Phil R. Geib).

same area painted yellow for the Green Mask image, so it is possible that the yellow signifies exposed skin. On both examples the part area is painted with green and the suspension loop is faint but unmistakable on the Green Mask image. On the Kinboko scalp the part is more than the line of separation for the hair as it includes a band about 2.5 cm wide that is shorn to the skin with pigment applied to this swath; this is evidently what was being illustrated in the Green Mask depiction by the break in the red arc of hair. Kidder and Guernsey (1919:190–191) make no mention of pigment being applied to the hair of the Kinboko trophy, but the bobbing of the brow tresses either side of the head and securing them with string is exactly as portrayed with the Green Mask image.

The Green Mask image has a faint vertical band of red partially outlined by white that is pendant below the head and somewhat resembles a neck or beard. Indeed these same appendages are seen on other head trophy depictions, both pictographs and petroglyphs, such as at Sand Island (Figure 5.16b), and have been called beard-like (e.g., Schaafsma and Young 1983:18, 21, Figures 4 and 5) and interpreted as representations of neck skin (Schaafsma 2007:93, Figure 5.5). It is noteworthy that such a neck flap is absent from the Kinboko head trophy as the head was skinned to the base of the chin but did not include the neck. Hanging down at the back of the head is the rest of the hair, which was secured in a bob thicker and longer than those on the side. The head reconstruction based on this artifact (Kidder and Guernsey 1919:Plate 88, especially b) shows the large hair lock dangling in the back, which minus the neck would clearly be visible with the trophy held up for display. Moreover, from Guernsey and Kidder's (1921:52–53, Plate 19) descriptions and illustrations of additional Basketmaker II hair-dressing, it is clear that some males wore their back hair long even with the side trusses bobbed, and depicting this in rock art is likely to result in different lengths of tab-like appendages below the chin, which is exactly what is seen in both pictographs and petroglyphs.

At the Green Mask site there is just the solitary head trophy but just several kilometers up Grand Gulch from the tributary with the Green Mask site is Lions Tracks Ruin and on a portion of the shelter wall under a small ledge is a striking series of at least 10 flayed head skins (Figure 5.16a). This is Schaafsma and Young's (1983:16) SJ-Site 1 and it provides the largest gallery of full head scalps yet known. Schaafsma and Young's

(1983:Figure 2) illustration does not show any suspension loops at the top of the head but these are plain enough on several of the images and it is likely that all scalps had them. The white oval faces appear nearly featureless but on a few there seem to be traces of faded pigment marking eyes or bands like at Green Mask. The hair is painted in a thick continuous arch of dark greenish paint without the evident break on the part as with the Green Mask image or the Kinboko Canyon trophy.

The painted bands seen on the face of the Kinboko trophy head and on both the painted and pecked depictions of the same in rock art are also seen on Basketmaker II anthropomorphs (Cole 1985:Figure 4; Schaafsma and Young 1983:Figure 6). This would seem to indicate that Basketmaker males sometimes painted their faces with distinctive patterns and colors that were probably individualistic but within the constraints of an overarching cultural tradition. This most likely occurred for rituals or other special occasions and one of the common traditions for doing so among Native Americans occurred in the context of war and to commemorate achievements therein. For example, Teton Lakota warriors prior to a fight had their faces painted with blue pigment forming “a band across the man’s forehead with a branching end on each cheek bone” (Densmore 1918:350). Among the Omaha at the time of initiation into the warrior society called *Hethushka* “each man painted himself in accordance with the directions given him at the public ceremony when he received his grade of war honors” (Fletcher and Laflesche 1911:461, also p. 350). Fifth honor among the Ponca was for taking a scalp: “The sign of this honor was to paint the face with a slight tinge of red and put black stripes across it” (Fletcher and Laflesche 1911:440). It is quite possible that Basketmaker warriors painted their faces for similar reasons and therefore that the head trophy of such an individual would be highly valued because it demonstrated the valor and capabilities of the individual that procured it—it was not the head skin of just anyone but that of a feared warrior, a man-killer and scalp-taker in his own right. In such a case there would be real information value in maintaining the face paint on a trophy or depiction thereof in the manner of the individual killed because it conveyed the status of the vanquished, which became the status of the vanquisher and then some.

Although depictions of flayed human head trophies are perhaps more numerous in Basketmaker II rock art than is currently known, largely because of abstraction to the

point of making the reference vague, it is also true that some depictions suggested as representing scalps are highly doubtful. Schaafsma (2007:Figures 5.2, 5.6) presents several examples of this from near Bluff, SE Utah which I illustrate in Figure 5.17. One of these occurs at the Wolfman panel along lower Butler Wash (see Figure 11.2a) whereas the other is at a panel along the San Juan River upstream from the confluence with Butler Wash (see Figures 11.15 and 11.18). These are labeled as heads, with that at the Wolfman panel suggested as a possible female because of what Schaafsma thought to be Puebloan “hair whorls” with the pendant lines interpreted as “blood, rain, or perhaps both” (Schaafsma 2007:95). The items depicted are almost certainly hair ornaments of the sort that Guernsey and Kidder (1921:51, Plate 18) describe and illustrate that have a series of bone or wooden pins lashed together in a row and surmounted by feathers (also Guernsey 1931:Plate 49b,d). When one looks at the whole scene of both panels it becomes even more evident that these items are not only hair ornaments but ones that were perhaps emblematic of social position or group affiliation.

Perhaps even more dramatic than the images of scalps alone are those depictions of males carrying scalps in one hand as if for display purposes. Such images seem like a clear declaration of status as man-killer and scalp-taker. An excellent example occurs at a small rockshelter near the far northern end of Black Mesa (see Figure 5.16c). This image shows an obvious male figure that holds a flayed head skin in the left hand. The male has a crescent above his head, a probable status symbol as Robins (2002) argues and also a plume. This site appears unlikely to have been one of residential use although without excavation this is hard to judge; the floor is so strewn with recent rock fall from the ceiling that there could well be buried material. The site is at a relatively high elevation and the setting is not well suited to agriculture as at Three Fir Shelter (Smiley and Parry 1992), which is relatively close by. The chief evidence for use of the site consists of rock art, scattered small fragments of basketry, and two bighorn sheep skulls. The site seems more like a “private” gallery or specialized ritual space rather than the far more public space of galleries such as Green Mask.

Two somewhat faded examples of scalp carriers are known from Canyon de Chelly (Figure 5.18a, b; Cole 1989:Figure 7; Matson and Cole 2002:Figure 3). Both are pictographs with the scalp trophies held in the left hand just like the Black Mesa example.

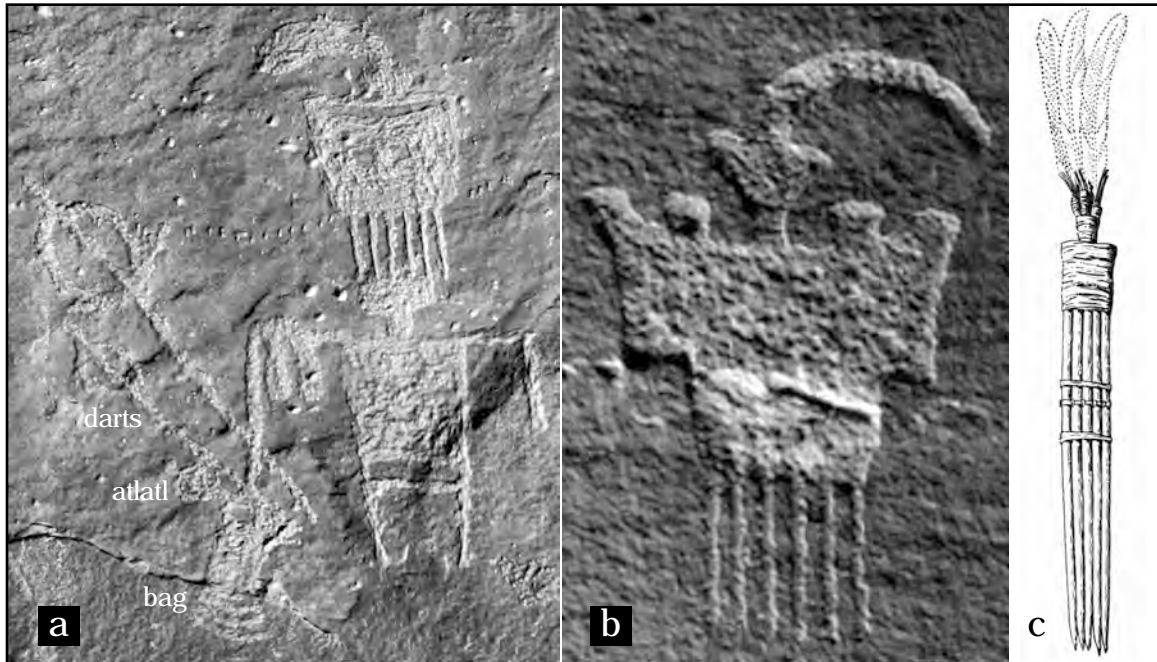


Figure 5.17. Basketmaker petroglyphs of probable hair ornaments rather than representations of flayed human head skins (cf. Schaafsma 2007): (a) anthropomorph holding darts, atlatl and bag (part of Feature 33, 42SA8019, see Figures 11.15 and 11.18); (b) close-up of element at Wolfman Panel, Butler Wash that occurs immediately to the right of the anthropomorph (see Figure 11.2a); hair ornament of bone pins and feathers (from Guernsey and Kidder 1921:51, Plate 18; photos by Phil R. Geib).

One is a green anthropomorph with white crescents as head ornamentation that holds a white head skin with red painted face and the other is a white anthropomorph lacking head gear that holds a white head skin with green painted face. Presumably both anthros are carrying the scalps by a thong inserted for just such a purpose, although this is not as clear as for the Black Mesa example. One of the de Chelly examples has an adjacent anthropomorph that almost appears to be touching the scalp.

The flayed head skin that Kidder and Guernsey recovered was found buried with a young female who evidently wore the fetish on a string around her neck that passed through the suspension thong. Figure 5.18c shows a petroglyph along the lower Chinle Wash that shows two human forms, one of which has a pair of heads draped over their shoulders. Based on how the body is executed this figure is thought to represent a female; other obvious males in the vicinity depicted in the linear body outline style are shown with expanded knee and elbow joints and two straight legs with dangling feet.

Cole (1989) and Schaafsma and Young (1983) argue that head skins are linked to “shamanic practices.” Although possible, depending on the definition of shamanism (e.g., Kehoe 2000), the taking of heads and other trophies is a common practice in war worldwide and sometimes the participants state that this is the very reason for risking life (Darlington 1939; George 1996; Hoskins 1996; various chapters in Chacon and Dye 2007). Puebloan ethnography (Ellis 1951; Parsons 1924, 1939) indicates that scalping was not restricted to religious specialists and indeed was often a necessary step for those wanting to enter certain social positions or societies. With head skins deriving directly from intergroup conflict it is easy to see how they would have served as tangible symbols of dominance over perceived enemies and as status symbols for the procurers, symbols that may have provided admittance to important social positions. This is not to deny that flayed head skins lacked important ritual power to help with fertility, rain, and the like, analogous to the power that scalps had (have) among Puebloan groups ethnographically (e.g., Ellis 1951:189, 192; Parsons 1924:6). This was achieved by the initiation and propitiation of the dead into the killing group (Parson 1924:6), something that required a specialist for proper handling, but this was after acquisition. In this manner, enemies that would threaten group survival were not only eliminated but their power was transferred to help the group. The trophies also served to enlarge the ranks of those whose role was

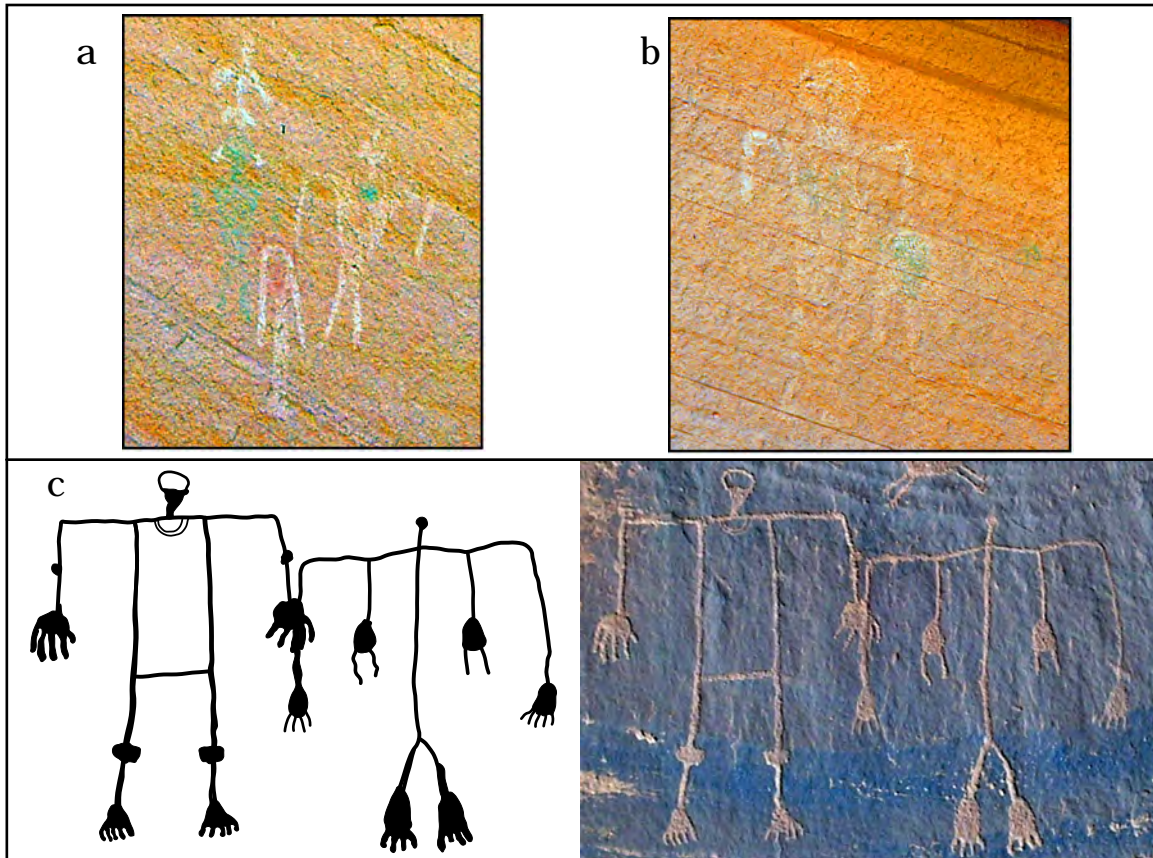


Figure 5.18. Basketmaker II pictographs of anthropomorphs carrying and wearing flayed head skins: (a, b) Canyon de Chelley, NE Arizona (photos by Sally Cole, scanned from color slides with saturation level intensified); (c) petroglyphs of two anthropomorphs, one of which wears upside-down heads, lower Chinle Wash, NE Arizona (drawing and photo by Phil R. Geib).

to help protect the group, which among Puebloans ethnographically was the war society or the bow priesthood among the Zuni according to Parsons (1924:7). The roots of Puebloan beliefs about scalps and scalp taking can be traced to Basketmaker II times where the rock art depictions of flayed human heads make it clear that this practice was widespread.

Severed Arms and Legs. There are multiple examples of Basketmaker II burials that consist of arms and hands, items that might well represent additional examples of war trophies. Wetherill recovered one of these from Cut-in-Two Cave in Grand Gulch (Cave 19): “mummified remains of arms and hands from elbows and legs and feet from knees showing evidence of having been cut off before burial” (Wetherill 1895:36; also Blackburn and Atkins 1993:72). This find, FN 733 (H/13988), was accompanied by a wooden “box” or tray (H/14011) that contained a variety of remains including dart foreshafts with projectile points, remains that confirm the Basketmaker II temporal assignment. This and the find made by Earl Morris at Canyon del Muerto (see below) indicate ceremonial burial.

Upstream several kilometers from Cut-in-Two Cave, Charles Graham excavated at a shelter in March of 1891 that Blackburn calls Red Man Cave. His March 9th diary entry reads as follows: “I worked in cave where I was yesterday, there were 4 sets of arm and leg bones with the skeleton I found yesterday from the elbow and knee down, 3 spear points” (Blackburn and Atkins 1993:64). Skeleton A-15 at the Chicago Field Museum is evidently the skeleton that had the associated sets of arms and legs but the severed limbs do not appear to have been saved. An entry in Green’s catalog for the McLoyd and Graham collection indicates that only the skull of skeleton A-15 was saved (listed as “Natural Shaped Skull,” i.e., not cradle board flattened and thus Basketmaker II). This entry explicitly states that buried with the skeleton were “four sets of arm and leg bones (from the elbows and knees down)” and “some flint spear and arrow points lying on the breast, belonging to the skull” (Green 1894:5). There is no entry for the arms or legs, so evidently these items were left at the site by Graham.

In his excavations within Canyon del Muerto, Earl Morris found a burial of forearms with hands at Tseahatso (Morris 1925:291–292; A. Morris 1933:203–204). In his account of the find, the arms were laid out palms upward upon a bed of grass and

accompanied by various offerings including two pairs of what Anne Morris (1933:204) called “the most exquisitely woven sandals patterned in black and red that have ever come out of Southwestern soil.” The meaning of the offerings, like with the arm and leg burial that Wetherill found in Grand Gulch, remains elusive but they serve to establish temporal affiliation and indicate the ritual significance of the body parts. It is possible that the long bones were from revered ancestors rather than war trophies, although ritual deposition is not evidence of this since trophies acquired in war have recognized power that must be appropriately handled and propitiated (e.g., Parsons 1924, 1939). It seems clear from cut marks on skulls of victims within massacre assemblages such as at Cave 7 and Battle Cave that heads were skinned as war trophies. If long bones were taken in the context of intergroup conflicts then we should find missing long bones from massacre assemblages or single individuals where death from violence is evident (e.g., Andrushko et al. 2005).

A find from Red Canyon reveals modification of a human long bone into a six-holed flute, an object that also has clear ceremonial significance. This find, H/12475, is correctly listed as coming from Red Canyon in the AMNH catalog because it was recovered by McLoyd and Graham in 1893 from that drainage along with other items. The flute was associated with a probable Basketmaker burial, the skull of which was collected (H/12661), along with a stone pipe (H/12561). The famous petroglyph panel of Sand Island near Bluff, Utah that depicts several flayed human head skins (Cole 1985) also shows these sacred objects surrounded by flute players (see images in Chapter 5). Flutes of wood seem more common in the archaeological record, including one that McLoyd and Graham also recovered; those of human long bones might have had greater prestige.

Summary

The evidence reviewed in this chapter suggests that intergroup conflict was a prominent feature of Basketmaker II society. Such conflict was not just individualistic (dyadic) but involved large social groups. The Cave 7 massacre provides the best evidence of this because of its social scale: those killed far exceeded that of any Basketmaker II residential units or even clusters of such units. The scale of the social group implicated in this slaughter is vastly greater, otherwise they would not have

achieved such an outcome. The social scale leaves no doubt that true warfare was practiced and might well have been a common experience for Basketmakers. This is supported by the evidence that human head skins and other trophies from conflict were evidently valorized and imparted social status to the individuals and perhaps groups that acquired them.

Flayed head skins and other trophies were one clear consequence of Basketmaker II warfare. The societal recognition that comes with such tangible symbols of valor and victory over opponents can strongly encourage participation in violent intergroup conflict. Such recognition or social prestige forms part of the tangible, culturally defined rewards that help to sustain the risky behavior of acting like a warrior. But the cultural salience of a symbol such as a head skin does not arise *ex nihilo*. Rather, it stems from the prior existence of a social environment characterized by war. Trophies comprise part of the divisible but nonexcludable benefits from offensive war (see Boone's [1992] classification of goods according to the combinations of excludability and divisibility) that will not undermine group cohesion since they generate scramble rather than contest competition within groups (I expand upon this argument in Chapter 12). Warriors are motivated to excel for the social prestige they will receive from being successful on the battle field and little serves this better than a body portion of a vanquished enemy. This sort of competition is beneficial for the group and the individual. It encourages participation in fighting for the group (the scramble competition for prestige) while limiting costly infighting for those divisible but excludable benefits such as wealth or mates that could corrode collective action. The social status achieved by successful achievement of cultural goals serves to facilitate greater reproductive success (Irons 1979), at least among preindustrial human populations (e.g., Hill 1984; Hopcroft 2006:Table 1; Pérusse 1993).

Given the level of intergroup violent conflict that appears evident in Basketmaker II society, there may have been a real need for defense against atlatl darts. Yet, flat curved sticks seem like an unlikely choice as a specialized implement for defense. A shield would be far more effective for this. Mesoamerican art shows shields as the implement of choice for atlatl dart defense (examples shown in Chapter 6) and Australian aborigines also used shields for this purpose. In the Southwest were adopted sometime

after the introduction of the bow and arrow. Perhaps the environment of intergroup violence for Basketmakers placed a premium on the training of warriors and the demonstration of their abilities. Atlatl dart throwing contests would provide such a venue, especially if conducted as potentially lethal duels. Use of flat curved sticks to knock aside atlatl darts could make sense in such a setting and could provide another means of acquiring social status—a risky endeavor where rules of engagement meant that death was not certain even if it was an intent.

CHAPTER 6

ANALOGUES FOR FENDING USE

In this chapter I first consider the specific ethnographic case from the Solomon Islands mentioned in Guernsey and Kidder (1921:88–89) that served as the source of the interpretation that Basketmakers used S-shaped grooved sticks defensively to bat aside atlatl darts. As I show, the Melanesia example is not a good analogue for the Basketmaker II case because the sticks used in the Solomon Islands to bat aside projectiles are formidable weapons in their own right and because the projectiles are hand-thrown spears rather than atlatl darts. Not only is just a single hand needed for effective spear use, but these projectiles have less velocity than atlatl darts. I then consider an ethnographic example from South America where atlatls and darts are still used in joust-like ritual fights. This sort of controlled context provides a believable venue for the use of Basketmaker II fending sticks.

The third focus of this chapter is the Mesoamerican evidence that Guernsey and Kidder (1921:89) called attention to as potentially supporting the fending stick interpretation. This evidence consists of three parts. First I describe the few extant examples of grooved flat curved sticks similar to the Basketmaker II specimens that came from the sacred Cenote at Chichén Itzá. I then discuss the elite art that shows the grooved curved sticks and scenes of warfare where use of these artifacts might be expected. Then I consider a brief ethnographic account by Diego de Landa that plausibly suggests the fending of atlatl darts in a certain ceremony by Yucatec Maya. My final topic of this chapter is an experimental case for the fending hypothesis: Can it be done? What use-wear results? How can we make an inference about this activity in prehistory?

Ethnographic

Solomon Islands, Melanesia

The odd-shaped clubs mentioned in Guernsey and Kidder (1921:88) that Solomon Islanders used to knock aside spears are doubtless those known as *qauata* and *rromaraugi* on Makira Island (formerly San Cristóbal) and adjacent smaller islands (Evans 2005:252–253; Mead 1973). These long-handled, crescent-shaped parrying clubs

are differentiated on blade shape and whether or not there is a figural handle. *Qauata* have a simple crescent for the blade whereas *roromaraugi* have a projection or beak opposite the concave side of the crescent; *qauata* lack a figural handle and *roromaraugi* have one (a small human form). Based on measurements that I could glean from museum records and those of auction houses, the clubs measure around 1–1.5 m long with blades (crescents) that are 30–50 cm in width. Figure 6.1 shows an example of each type. According to Guppy (1887:74) the “flat recurved blades [were] cut out of the flange-like buttresses of a tree having very hard wood which bears a polish like that of mahogany.” The often less finely crafted *qauata* seem more likely to have been the implement regularly used for fights (e.g., plate 33 in Bernatzik 1936), although the latter are more common in museums and at art auctions.

In recent times these weapons have come to be known as dance clubs (e.g., Scott 2013) potentially obscuring their essential role in warfare, which is the source of their cultural significance. Warfare was “quite prominent if not endemic in most coastal and insular areas of Melanesia at the time these regions were first regularly contacted by Europeans” (Knauff 1990:225). For all of the island groups of the Solomons, including San Cristóbal, Younger (2014:Table 1) finds that warfare was “chronic,” meaning essentially continuous. According to Hopkins (1928:168), “peace, except for short, uncertain intervals, was practically unknown. Everywhere any individual or tribe might be attacked anywhere at any time.” The cultural salience of “dance clubs” (*mada ni mao*, Scott 2013:246) derives from their role in the chronic warfare of previous times prior to colonial pacification. Indeed, Scott learned from a key informant that “in the past these dances weren’t just dances; they were practice for warfare . . . the gestures the dancers make with the *mada* [*qauata*/*roromaraugi*] simulate fending off spears” (2013:246). Guppy (1887:74) states that he

“frequently met natives, when away from the coast, carrying them [*qauata*/*roromaraugi*] on their shoulder; and I often learned from them of the true character of the weapon. Traders, who had been years in this part of the group [Solomon Islands], spoke of them to me as *war-clubs*. Together with their spears, the St. Christoval natives carry them during their hostile incursions against the bushmen [people of island interiors]” (emphasis added).

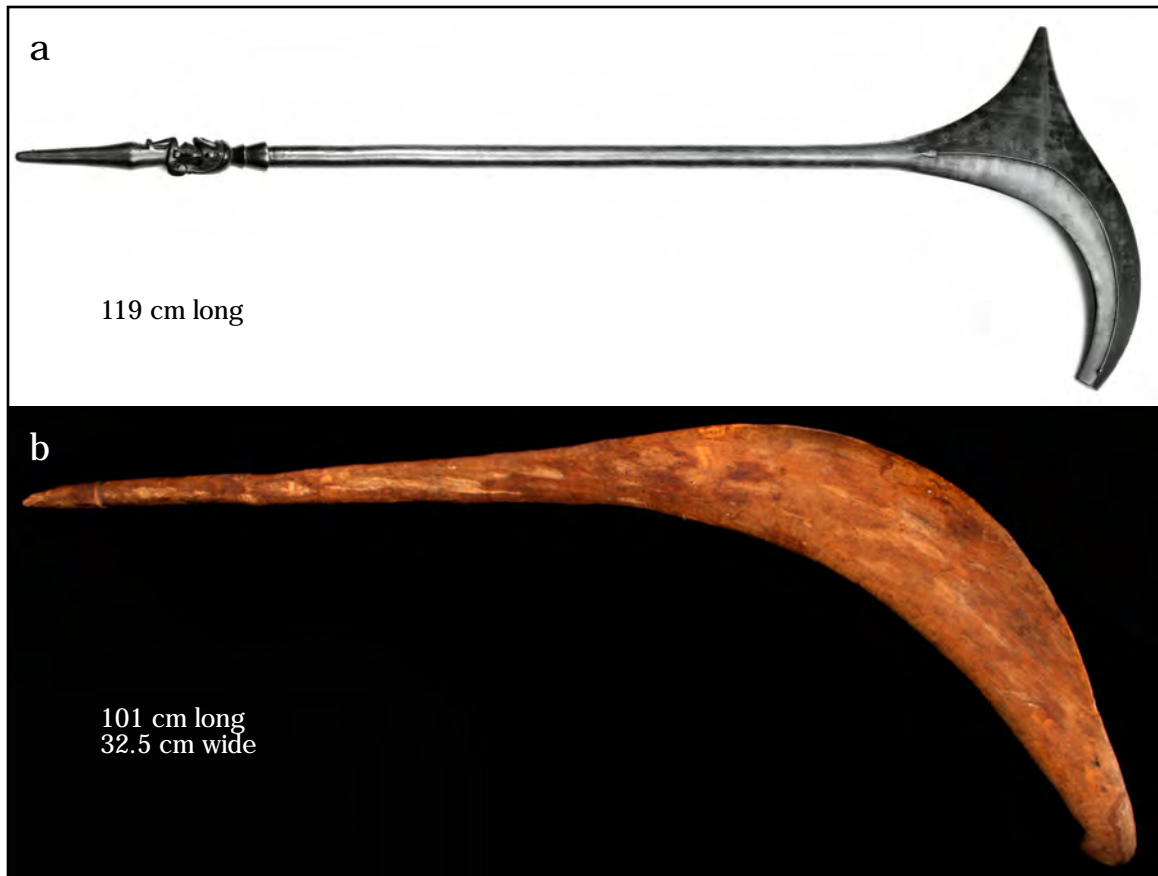


Figure 6.1. Parrying clubs, *roromaraugi* and *qauata*, from the Solomon Islands: (a) *roromaraugi*, a finely crafted example with crouching figure on the pointed handle (1979.206.1405, image courtesy of the Metropolitan Museum of Art); (b) *qauata*, a less finely finished stick lacking figural handle (image courtesy of the Zanesville Museum of Art).

Starzecka and Cranstone (1974:15–16) report that all Solomon Islanders used clubs in hand-to-hand combat, to deflect spears, and for delivering a *coup de grâce*, but that “one type of San Cristóbal [Makira] club had a very distinctive sickle shape and was especially well adapted to parrying spears.” They were referring to the *qauata* and *roromaraugi*, the only ones that are specifically identified as parrying clubs and sometimes labeled as a club shield. Other Solomon Island clubs resemble rather typical shock weapons for bludgeoning, stabbing or both, with some clearly derived from ocean paddles. It appears that the *qauata* and *roromaraugi* were wielded such that the convex edge was the one principally used for deflection, but with the concave edge also used as needed.

Solomon Islanders threw spears by hand, which means that they had less velocity than atlatl darts thus they were more easily deflected. More importantly, use of hand-thrown spears means that wielding a parrying club did not impede one’s fighting ability. Also, since the grip end of parrying clubs was pointed, this allowed for easy insertion in the sand beaches where engagements usually occurred, which meant that the clubs could be set aside (“stuck upright in the ground” [Guppy 1887:74]) in a way that still offered protection while also being quickly brought back into action.

The hand-thrown spears were tipped with elongated and barbed projectiles of wood or bone whose lethality is not in doubt. Guppy (1887:72) claimed that those in the northern part of the island chain (Bougainville Straits) were more formidable and exquisitely carved than those in the south. There is no doubt as to the latter aspect. He reported that the spear tips of Makira Island had “blunt” wooden points and barbs, but the ones from this island that he depicts on the figure facing page 74 are as equally pointy and lethal looking as any from the northern islands. Used as both missiles and thrusting weapons, Guppy reported that “the natives of St. Christoval spear their victims through the abdomen, and as a mark of their prowess they often allow the gore to dry on the point of the weapon” (1887:72).

The specific nature of traditional Solomon Island warfare is poorly documented, but observations, such as those by Guppy (1887:75) that “fair” fights in the open rarely occurred, indicate a preference for raids and other forms of surprise attacks. Fairness, of course, has nothing to do with warfare, only a romanticized European notion thereof.

Guppy observes that, “by the unusual success of their treachery and cunning—the two weapons most essential to savage warfare in St. Christoval as well as in the other islands—some chiefs have acquired a predominance over the neighboring villages, and their name inspires terror throughout the island.” Guppy goes on to provide an interesting account of what he termed “sham fights” that he witnessed on the beach at Santa Anna, one of the small islands off the eastern tip of Makira: “two parties confront each other in open and irregular order and hurl their spears with *all the excitement of a real contest*. Every man keeps constantly on the move as in dancing a jig, in order to be able to more easily avoid the missiles hurled at him” (Guppy 1887:75, emphasis added).

This mock battle is remarkably similar to what Fox (1924) described for Haununu on the west side of Makira in the 1920s and that still occurs on the tiny island known as Owariki (formerly Santa Catalina) just to the south of Santa Anna. Here two phratries still conduct ritual fights as part of a ceremony known as *wogasia* (Davenport 1996; Revolon 2003; Wasuka 2013). Popular accounts of this occur in Perry (2011, 2012) and the movie *Solomon Islands Culture* released in 1980 by Film Australia shows two of the *wogasia* fights. Based on Perry’s pictures, the opposing lines of warriors now use spears without lethal points (Figure 6.2) but there is still risk of serious injury and the *qauata* or *roromaraugi* as well as paddles are deployed to knock aside oncoming projectiles. According to Revolon (2003:386) the two opposing teams of warriors stand just 15 m apart and when throwing each takes a few steps forward to increase the velocity of the hurl, meaning that the distance between men exchanging projectiles might be 12 m or less. She reported that the distance between adversaries visibly diminished during the combat while imprudence multiplied (2003:386) and just when it seemed like matters might escalate out of control a referee walked the gauntlet between the two factions calling an end to the fight. Although killing is clearly not an intention in these fights, serious injury could result: Revolon (2003:388) reports profuse bleeding from a head wound that occurred during the combat that she witnessed and the 1970s film shows a man losing an eye. Aside from any physical pain is the humiliation that accompanies being injured since that is a sign of guilt for some previous misconduct to the successful attacker (Revolon 2003:388).



Figure 6.2. Spear fight under way at the *Wogasia* festival on the island of Owariki (Santa Catalina) in the Solomon Islands. Note that the spears lack the lethal tips that were traditionally used and that many men carry *gauata* to knock aside on-target projectiles (photo courtesy of Thomas Perry).

Perry (2011:77) lists four main rules of the Spear Fighting Festival according to the local authority with whom he talked. The first is to “fight only with someone who has made you angry or caused you distress.” Second, if that is a family member, “you can only fight a brother or a cousin – never your father or an uncle.” Third, it’s okay to fight over a grievance that “is still in your heart” despite previous compensation payments made in reconciliation. And fourth, “if your spear hits the wrong person, expect to pay them compensation after the fight.” Such rules seem tailored toward preventing conflicts among the warriors from escalating. They might have a shallow time depth stemming from British pacification but even if arising out of antiquity such rules were probably not part of traditional war practice. According to Revolon (2003:393–394) the *wogasia* fights served as a means of preparing young men for war by teaching them both how to defend and how to kill and that in the not too distant past such training was an essential aspect of life.

The curved shape of the *qauata* and *roromaraugi* is somewhat reminiscent of the flat curved sticks from the Southwest, but the comparison ends there. *Qauata* and *roromaraugi* were formidable weapons in their own right given the weight that occurred in their broad heads and their acute edges, plus the beak on the *roromaraugi* could create a deep puncture wound. None of the prehistoric flat curved sticks from the Southwest can be considered formidable weapons and even in the hands of highly trained stick fighters many of the specimens could do little serious damage because of their overall light weight. Another key difference is that the flat curved sticks are an encumbrance to anyone fighting with atlatls and darts, as in the Southwest, since two hands are needed for effective loading of atlatls. In contrast, Solomon Island parrying clubs not only provide for defense but complement the offensive side of the equation by being effective shock weapons. Whereas parrying clubs can be seen as high-utility additions to a serious fight in the Solomon Islands, the flat curved sticks of the Southwest, even if effective at batting away darts, are an impediment in a murderous melee. Another critical difference is that hand-thrown spears are much slower in velocity than atlatl darts, which makes it far easier to deflect or dodge them in a fight. My conclusion from this is that Solomon Island parrying clubs make a poor analogue for the grooved curved sticks of the Southwest.

Upper Xingu Region, Amazon Basin

The Kamayurá (Camayurá) of the Upper Xingu region in South America and some adjacent tribal groups conduct what amount to duel-like ritual fights with atlatls and darts (Basso 1973:152; Oberg 1953:57–58). Figure 6.3 shows an example of an atlatl and dart that the Kamayurá use in these contests, the tip of which consists of a bunt made of beeswax. Among the Kamayurá these dart-throwing contests are known as *yawari* (Oberg 1953:57) and among the neighboring Kalapalo of a different language group they are referred to as *ifagaka* (Basso 1973:152). These inter-village and even inter-ethnic group ritual fights include target practice using a straw dummy, a mock battle, and then the actual duel between paired opponents. The entire event is permeated with an “explicitly aggressive tone” with real insults exchanged and is “constantly in danger of exploding into overt physical aggression” (Basso 1973:152).

For the target practice a straw dummy is erected in a plaza (Figure 6.4) and each warrior takes a turn throwing spears at it while calling out an insult directed at an individual of the opposing group. Warriors from each opposing village are subsequently paired up to face each other in a rule-bound fight where they stand at close range between a gauntlet of warriors and take turns hurling the bunt-tipped atlatl darts at one another. The goal is to strike an opponent in his thigh while the target individual uses a bundle of poles held upright on the ground to duck behind or to deflect the oncoming dart. “While the lower end of the bundle rests on the ground the player moves the bundle from right to left in front of him so as to meet the flying arrow [dart] or to cause it to glance aside” (Oberg 1953:58). This narrow bundle consists of just a few poles (e.g., a 1978 image by Milton Guran at http://img.socioambiental.org/v/publico/kamaiura/amaiura_1.jpg.html), offering little protection given the close range involved. The distance between contestants is not explicitly stated but judging from photos it appears to be no more than about 5 m. The darts are tipped with bunts so that mortal wounds are not inflicted, but “severe bruises are sustained” (Oberg 1953:58). According to Oberg (1953:58) the group with the greater number of “hits” is the winner but Basso (1973:152) claims that “no village is considered the winner of these events, only individuals, but...the individual winners confer prestige upon their group.” These atlatl fights, along with wrestling matches known as *yoetikawa*, reinforce men’s esteem as great warriors while also

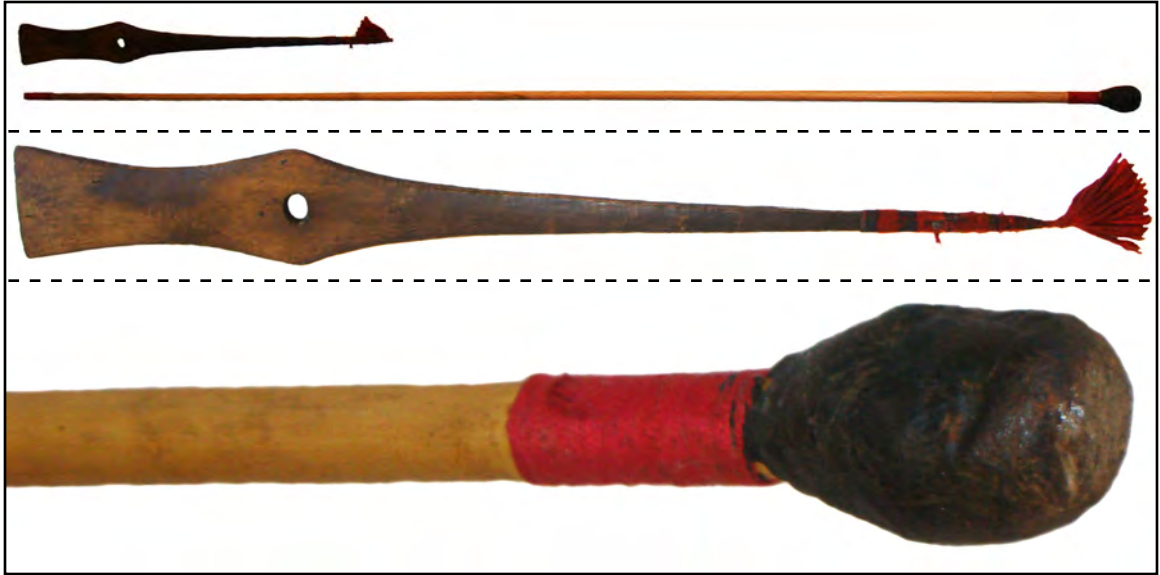


Figure 6.3. Atlatl and dart used by the Kamayurá of the upper Xingu region of Brazil in a ritual joust-like fight known as *yawari* (*jawari*) or *ifagaka*, darts measure ca. 150-180 cm (photos courtesy of Carmen Junqueira).



Figure 6.4. *Yawari* ceremony: (a) contestants practice throwing darts at a straw dummy; each holds an atlatl loaded with a dart in the right hand and a second dart in the left; (b) the "target" stands waiting for his opponent to throw a dart within an alley-like space defined by two lines of warriors from the opposing tribes; his left hand holds the bundle of sticks used to deflect the oncoming projectile (photos courtesy of Carmen Junqueira).

simultaneously reinforcing peaceful relationships between neighboring groups. Gregor (1985:96) details how success in these events provided a measure of a man's worth, both to his fellows and in the eyes of women. The benefits of achievement seem obvious.

This South American example is interesting since it demonstrates the practice of using atlatls and darts in a duel-like dyadic contest between opposing warriors. It is within the context of just such a rule-bound fight that fending sticks make sense. The curved sticks would be used instead of the bundle of upright poles. The *yawari* or *ifagaka* contests show that atlatl darts from even very close range can be deflected or dodged as long as attention can be focused on single projectiles at a time. Of course the bundle of poles provides for a much more substantial defense than a flat curved stick, so this is where the analogue loses utility. But the feat of deflecting atlatl darts would seem all the more impressive using just a single small stick.

The time depth for the *yawari* ceremony is unknown but considering the weapons involved it seems likely that it dates to precontact times. Given the Mayan ethnographic evidence reported below it is possible that the *yawari* ritual atlatl duel represents the surviving remnant of a once widespread tradition in the Americas, perhaps one that extended from Mesoamerica into South America.

The Mesoamerican Evidence

Guernsey and Kidder found tentative support for the fending stick hypothesis in artifacts and art from Chichén Itzá on the Yucatan Peninsula of Mexico. Dredged from the Sacred Cenote at this site were flat curved sticks with longitudinal grooves, artifacts that resemble the Basketmaker II examples. Moreover, some monumental art at this site depicts these artifacts in the hands of warriors that also hold atlatls and spears (Guernsey and Kidder 1921:89). In a clear case of circular reference, the speculative fending interpretation about the Basketmaker II artifacts that got bolstered by the Mesoamerican evidence became enshrined in the literature of Mesoamerica as a functional label: the artifacts and their depictions in art became known as fending sticks (e.g., Berlo 1989; Charlot 1931; Coggins and Shane 1984; Mastache et al. 2009; Tozzer 1957).

Several authors have disputed that the grooved curved objects (*arma curva*) in the hands of warriors at Chichén Itzá and elsewhere were used to knock aside atlatl darts; they have also rejected the notion that the sticks were similar to, or connected in any way,

to the artifacts found in the Southwest. Ross Hassig is a strong critic of the fending interpretation, arguing that the Mesoamerican grooved curved sticks are short swords (e.g., 1988:294–295, note 36; 1992: 226, 244, notes 77 and 127). He argues that their true offensive role has been overlooked because they were “mislabeled” as fending sticks for defensive purposes. Hassig (2001:810–811) sees the grooved curved stick as “a primary” Toltec innovation in warfare technology after AD 900 because it provided an offensive shock weapon that “improved troop mobility” and “doubled the offensive power of the army.” This short sword innovation meant that “soldiers could throw darts with their atlatls and shift to swords for hand-to-hand combat once they closed on the enemy” (Hassig 2001:811). He also claims that the artifact was “clearly bladed, as were similar later weapons” and is shown being used for human sacrifice. He envisions the grooved curved stick as the forerunner to the later Aztec sword (*macuahuitl*).

Cervera Obregón (2007:52–53) partly sides with Hassig: “It has been inferred that this curved stick or defensive weapon functioned to intercept darts and arrows, which of course is quite absurd” (*Se ha inferido que este palo defensivo o arma curva tuvo como función interceptar dardos y flechas, lo que por supuesto resulta bastante absurdo*). Cervera Obregón does not elaborate on why he finds the idea of deflecting darts with curved sticks to be “absurd,” but presumably this has to do with the notion that atlatl darts can be deflected with such sticks; i.e., that this act is even possible. The Xingu ethnographic evidence mentioned above shows that it can be done with a bundle of poles and I demonstrate in the next part of this chapter that dart deflection is, indeed, quite possible with just a small curved stick. If the absurdity lies with the notion that the stick would be so used rather than as another element of war, then this thought is not logically followed by Cervera Obregón’s argument. Acceptance of Hassig’s shock weapon interpretation would be consistent, but Cervera Obregón considers the artifacts to be boomerang-like throwing sticks for hunting small game (i.e., rabbit sticks). As such, why would rabbit sticks consistently be associated with warriors and form part of the “Toltec weapon assemblage?”

Hassig (1992:226, note 77) credits Charlot (1931) for the initial erroneous identification of fending sticks at Chichén Itzá: “The principal defensive weapon that appears is the curved stick with which darts can be batted out of their deadly course

(Figure 161a). One or two of these weapons are carried by each of the warriors, and it appears no less than seventeen times in its normal form” (Charlot 1931:252). Yet Jean Charlot worked at this site with Earl Morris, who directed excavation of the Temple of the Warriors for the Carnegie Institution of Washington (Morris et al. 1931), and A.V. Kidder served as the Chairman of the Institution’s Division of Historical Research. Charlot’s interpretation that grooved curved sticks were used for fending probably originated with either Morris or Kidder. The latter seems most likely since Kidder had already called attention to the similarities between the Basketmaker II grooved sticks and the items depicted in Chichén Itzá art. Moreover, Morris recovered two examples of the Basketmaker II grooved sticks from Southwestern sites in 1929 after finishing the field work in Mexico and in both cases he referred to them as rabbit sticks rather than fending sticks. It was not until somewhat later that Morris referred to the artifacts as fending sticks, perhaps also from Kidder’s influence.

Apparent physical support for Hassig’s argument has recently come from an analysis of injuries on the skulls of prehistoric Mayans recovered from the northwest part of the Yucatan peninsula (Serafin et al. 2014). This study found that blunt force trauma, such as that resulting from being struck by stones or wooden clubs, was the principal means of violent death for the Maya in this area.

Additional evidence of warfare is provided by five healed head wounds in males that appear to have been inflicted by clubs with small, hafted points. While clear archaeological examples of such weapons have yet to be identified, “fending sticks,” which were originally interpreted as defensive weapons, are good candidates. They consist of wooden implements with a curved end from which several points project. They are commonly depicted in the Codex Borgia as well as the art of Tula and Chichén Itzá being carried by warriors who also bear atlats, darts, small shields, and occasionally, arrows, which suggests they were used in the hand-to-hand combat that followed the initial volleys of projectiles. (Serafin et al. 2014:148)

I do not doubt the validity of death by blunt force trauma or the identification of healed head wounds inflicted by clubs with hafted sharp cutting edges, but the equation of these with the grooved curved sticks seen in rock art and recovered from the Sacred Cenote is another matter, one that requires consideration of the artifacts themselves. Were cutting edges (blades) or projectile points of stone hafted to these wooden tools? Even if they

lacked stone attachments, could the curved sticks have been sufficiently heavy alone to deal a lethal blow? If the sticks served to crush skulls, is the evidence of such use registered on the tools themselves as is reasonable to expect? Answering this evidence requires consideration of the only extant examples of this artifact type from Mesoamerica.

Chichén Itzá Artifacts

Figure 6.5 shows the grooved sticks from the Sacred Cenote that are in the collections at the Peabody Museum. By matching up characteristics of wood grain, stick shape and size, and groove number and treatment, it seems evident that the total count of individual artifacts represented is just three: a distal end alone for one (a); proximal, distal and midsection for another (b), but with an unknown amount of the middle missing; and a nearly complete specimen represented by five portions (c). The latter example is shown by Coggins (1984a:49, Figure 24) in the same layout sequence; this artifact is currently mounted to an acrylic glass sheet by ties. Coggins believes that at least two sticks are represented by these five portions: “the two narrow end pieces here belong to one stick and the three wider ones to another, if indeed three different sticks are not represented.” She reports that there are “six to eight fending sticks in the Peabody Museum Cenote collections” (Coggins 1984a:49), but the nine fragments that I studied derive from just three specimens.

The stick represented by the distal end was made from a split branch, which is why it has one distinct convex face while the other is flat. The other two sticks were made from branches worked in from both faces but centered on the pith. The paraffin-impregnated wood is variably warped and distorted, with the middle specimen of Figure 6.5 exhibiting the best overall preservation. Consequently, the dimensions of this stick are probably the most representative of what they were originally but it was also the widest and heaviest of the three specimens: at the distal end it measures 4.7 cm wide and 1.3 cm thick and at the handle end it is 3.7 cm wide and 1.3 cm thick. The specimen represented by five fragments is 3.8 cm wide by 1.3 cm thick at the distal and 2.3 by 0.8 cm at the handle; the distal fragment alone measures 3.7 by 1.2 cm. Stick length can be estimated based on the one nearly whole specimen, which suggests that it measured



Figure 6.5. Flat curved sticks dredged from the Sacred Cenote at Chichén Itzá, nine fragments from three separate artifacts (collections of the Peabody Museum of Archaeology and Ethnography; photos by Phil R. Geib).

about half a meter, a distance that seems likely as well for the stick represented by the three fragments. The sticks have close to rectangular cross-sections, with squared-off edges that are nearly as thick as the stick midline. Unlike the Southwestern examples of similar sticks described in Chapter 8, the longitudinal grooves on the Chichén Itzá examples are shallow, carved by a single pass or two of an engraving tool. They also number 5, 7 and 11 rather than the 3 or 4 grooves common to the Southwest. Coggins notes that the purpose of the grooves is unknown, but suggest that “possibly they made the wood more flexible, without weakening it” (1984a:49). Increased flexibility is unlikely to result from the shallow cuts on these artifacts.

Stick weight is unknown, not only because of the fragmentation but also the wood preservative. Nonetheless, based on the weight of comparable ethnographic rabbit sticks from the Southwest reported in the next chapter, such as those of the Hopi, it is likely that they weighed no more than about 300 g, and perhaps no more than about 250 g. A likely dense hard wood for these sticks such as Zapote (*Manilkara zapota*) is no denser on average than the Gamble oak used for the Hopi sticks, so the comparison is likely valid. If this weight was concentrated into a small distal mass as with Mohave war clubs (e.g., Bell and Castetter 1937:44–45), then the sticks might qualify as shock weapons but this is not the case; there is no forward mass of any appreciable amount. If stone blades or points were inset on stick edges or faces then perhaps they would still qualify as useful weapons for close fighting. This is Hassig’s argument: “Mesoamerican swords were based on a wooden form with obsidian blades glued into grooves along the edges. But like Old World swords, this combination produced a light weapon, approximately half a meter long, with a continuous cutting surface that relied on speed and sharpness for effect, rather than weight and crushing power of mass impact” (2001:810–811). But the grooved curved sticks from Chichén Itzá do not qualify as swords because they lack edge grooves for blade inserts. The sticks have longitudinal grooves, but these occur on the faces, not the edges, and are not for attaching stone cutting or piercing implements. Moreover, the Maya already had quality weapons for close fighting in the form of axes, clubs, and even items that seem to resemble true prototypes for the *macuahuitl* (e.g., Madrid codex; numerous Mayan vases available for viewing at <http://research.mayavase.com/kerrmaya.html>; images shown in Rodríguez 2006; Morris et al. 1931:297–298,

especially Figure 220 for a probable bladed club shown on Stela 5 at Uaxactun; see www.peabody.harvard.edu/cmhi/detail.php?num=5&site=Uaxactun&type=Stela). The blunt force trauma on Mayan skulls reported by Serafin et al. (2014) are likely the result of these other true offensive weapons and not grooved curved sticks.

As detailed in Chapter 9, use-wear is a useful means for assessing speculations about stick function, but unfortunately this cannot be done with any reliability for the Cenote artifacts because of the crude method of recovery. The artifacts exhibit scratches, gouges and areas of crushed wood, but water-saturated wood is easily damaged no matter how dense it is and given that the waterlogged sticks were dredged up with a large steel grappling bucket with four converging teeth, considerable damage to the artifacts likely would have occurred in the process. The paraffin wax mixture that the artifacts were subsequently soaked in prevented me from distinguishing recovery damage from any use-related damage present on the sticks at the time of deposition.

Lacking interpretable use-wear, and absent the weight for an effective bludgeoning weapon or the edge grooves for blade or point inserts, what other evidence can be brought to bear about the use of these artifacts? The two sources consist of iconography and an early ethnographic account of Diego de Landa Calderón (e.g., Tozzer 1941; cf. Restall and Chuchiak 2002).

Iconography

There are two aspects of iconography that can inform about the potential function of grooved curved sticks in Mesoamerica: depictions that show the sticks in the hands of individuals and those that do not where the sticks would be expected if they had a specified purpose. The latter is obviously a form of negative evidence, but it can be informative in this case. For example, if the sticks had functioned as short swords, then it is expectable that they would occur in scenes depicting warfare, with the tool deployed offensively slashing opponents or bludgeoning them. This same argument might also be extended to the fending argument unless such defensive use did not actually occur in the context of true warfare but rather in more controlled, ritual settings, such as among the Kamayurá. Still there is an expectation for the portrayal of such duel-like contests if they occurred.

Figure 6.6 shows a few examples of grooved curved sticks in Mesoamerican art. Images like this first occur with the appearance of “Toltec” militarism and the rise of the Chichén Itzá as an important urban center on the Yucatan peninsula in the ninth century AD (Kowalski and Kristan-Graham 2007). The warrior columns at Chichén Itzá provide great examples that are nearly duplicated at the central Mexican highlands site of Tula; these massive statues show warriors that hold an atlatl in the right hand and darts, grooved stick, and bag in the left hand. Mayan art of the previous Classic Period lacks this easily recognizable object in the hands of any individuals. As shown in Figure 6.6 the sticks are held in the hand of individuals but they are never being used in any obvious way, not for clubbing or slashing individuals nor for batting away atlatl darts. An association with atlatls and darts is obvious and has consistently been commented upon since the early 1900s, but a functional link between the two is not evident from the art itself, it is mere co-occurrence. What is not in doubt is that the individuals holding the sticks are warriors and the sticks were “an integral part of the characteristic Toltec weapon assemblage” (Coggins 1984a:49).

At Chichén Itzá there are excellent murals of warfare between massed forces on the walls of the inner chamber of the Upper Temple of the Jaguars. Although poorly preserved, the artist Adela Breton thoroughly documented them at a 1:1 scale over several years at the start of the 1900s (Miller 1989) and subsequently made 1:4 scale reproductions of the paintings that were illustrated in Coggins (1984b) and Ringle (2009; see also Finegold 2012). Similar murals also adorned the wall of the structure atop the Temple of the Warriors. Although this building had collapsed sometime in the past, by plotting and refitting hundreds of shattered wall fragments, portions of several murals were eventually reconstructed, allowing Ann Morris to create watercolor renditions similar to those of Breton (Morris et al. 1931).

The murals in both structures appear narrative of different battles and the aftermath thereof. I accept Ringle’s (2009) argument that murals document historical or mythico-historical battles rather than being allegorical. Warriors are shown armed with atlatls and darts and with shields for defense. Shields are carried strapped to the forearm of the hand that holds spare atlatl darts and thus would not be an impediment to effective atlatl use. In most of the active battle scenes none of the warriors carry a grooved curved

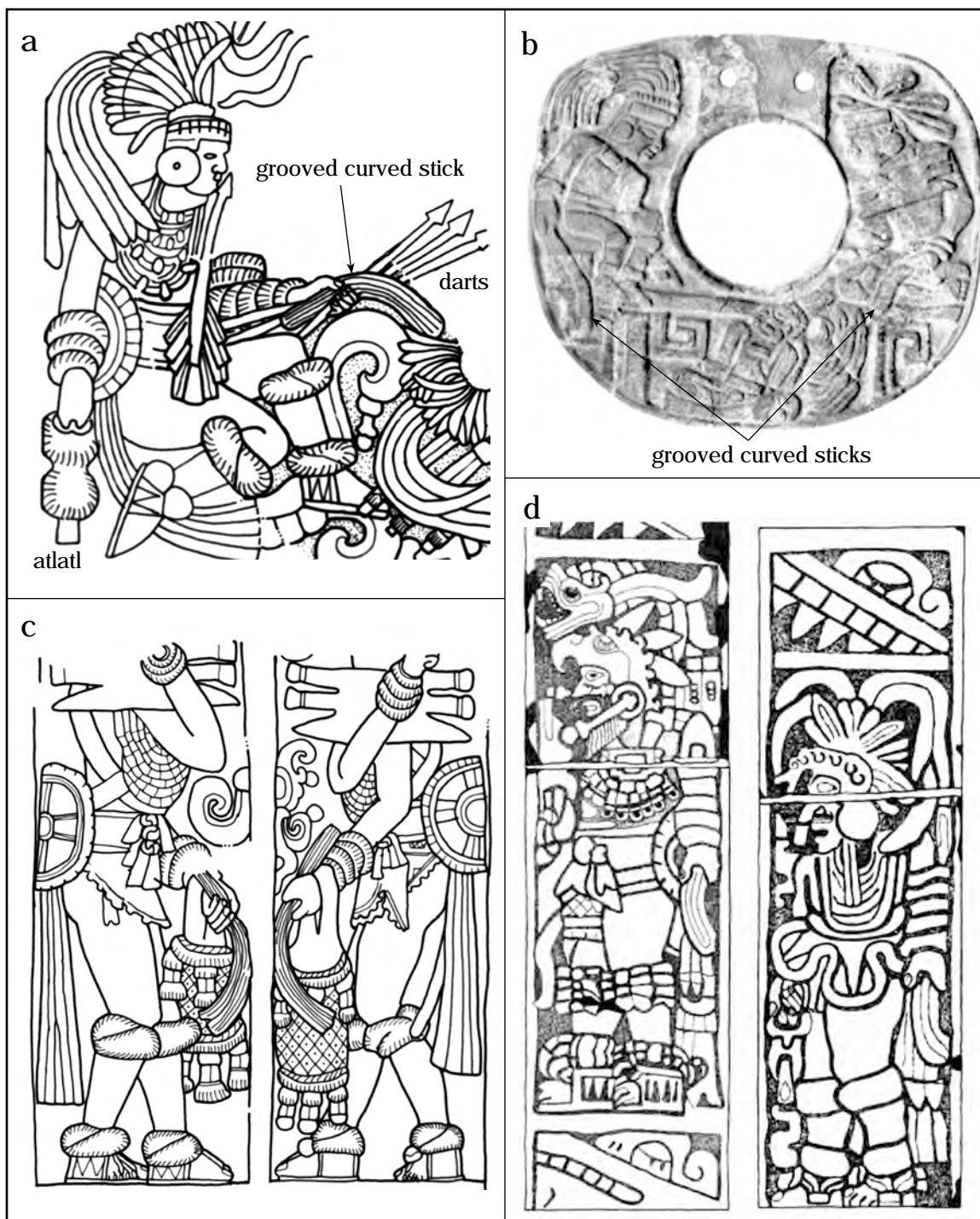


Figure 6.6. Flat curved sticks depicted in art at Chichén Itzá and Tula: (a) altar top, Upper Temple of the Jaguar (Schele Number 5041 Schele and Mathews 1998:241, Figure 6.38.B8); (b) jadeite plaque from Sacred Cenote (modified from Coggins 1984a:Figure 29); (c) Pier 5, South Temple, Great Ballcourt (Schele Number 5056, Schele and Mathews 1998:245, Figure 6.43, C4); (d) Pillars 3 & 4, Pyramid B, Tula (from Mastache et al. 2009:Figures 6 and 7).

stick although they are armed with atlatls and darts. If this artifact functioned as a short sword like Hassig claims, one that was so critical to close-quarters fighting, then it is nowhere in sight in the depictions of this sort of armed conflict. This same argument could also be extended to the purported fending use, but only if one actually wants to argue that the sticks would be useful in this sort of frenzied warfare. This might be what some authors think, but it is not my position. A stick for dart deflection has little worth in such a context whereas a shield is an asset, and some figures in the murals show darts or spears actually protruding from shields, testimony of their defensive value.

The murals show warriors with the curved sticks (scale precludes illustration of grooves as in the monumental art), and in some cases the individuals are in active poses, but most of the scenes are not readily interpreted as those of active combat. The most aggressive-looking scene is shown in Figure 6.7a, which occurred on the back wall of the outer chamber, left side, of the collapsed Temple of the Warriors. The reconstructed scene shows an evident raid on a village that resulted in the capture of warriors that were bound and led away. Morris et al. (1931:392) reports the right-hand side of the scene this way:

In and about a village standing beside a lake, a battle is in progress between the striped inhabitants and a force of black-painted warriors. The latter have the upper hand, as may be judged from events in the foreground, where, upon the broad, red-paved highway which passes both lake and village, moves a procession of the outlanders, each herding before him a leashed and naked captive.

The curved sticks that the striped figures hold aggressively, poised to defend their city with, are not specifically identified by Morris et al., who simply note that the warriors are “armed and ready for combat” (1931:393). The warriors indeed appear to be brandishing flat curved sticks, but they are not squared off against any immediately obvious combatants. They do not engage with each other since they face away from the closest other figure. If the black-painted warriors are the enemy, which seems likely, they also carry examples of these artifacts but do not brandish them. One caution about this image is that it was badly fragmented and thus Morris’s reconstruction might have some degree of artistic license, especially as concerns small details such as the objects held in the hands.

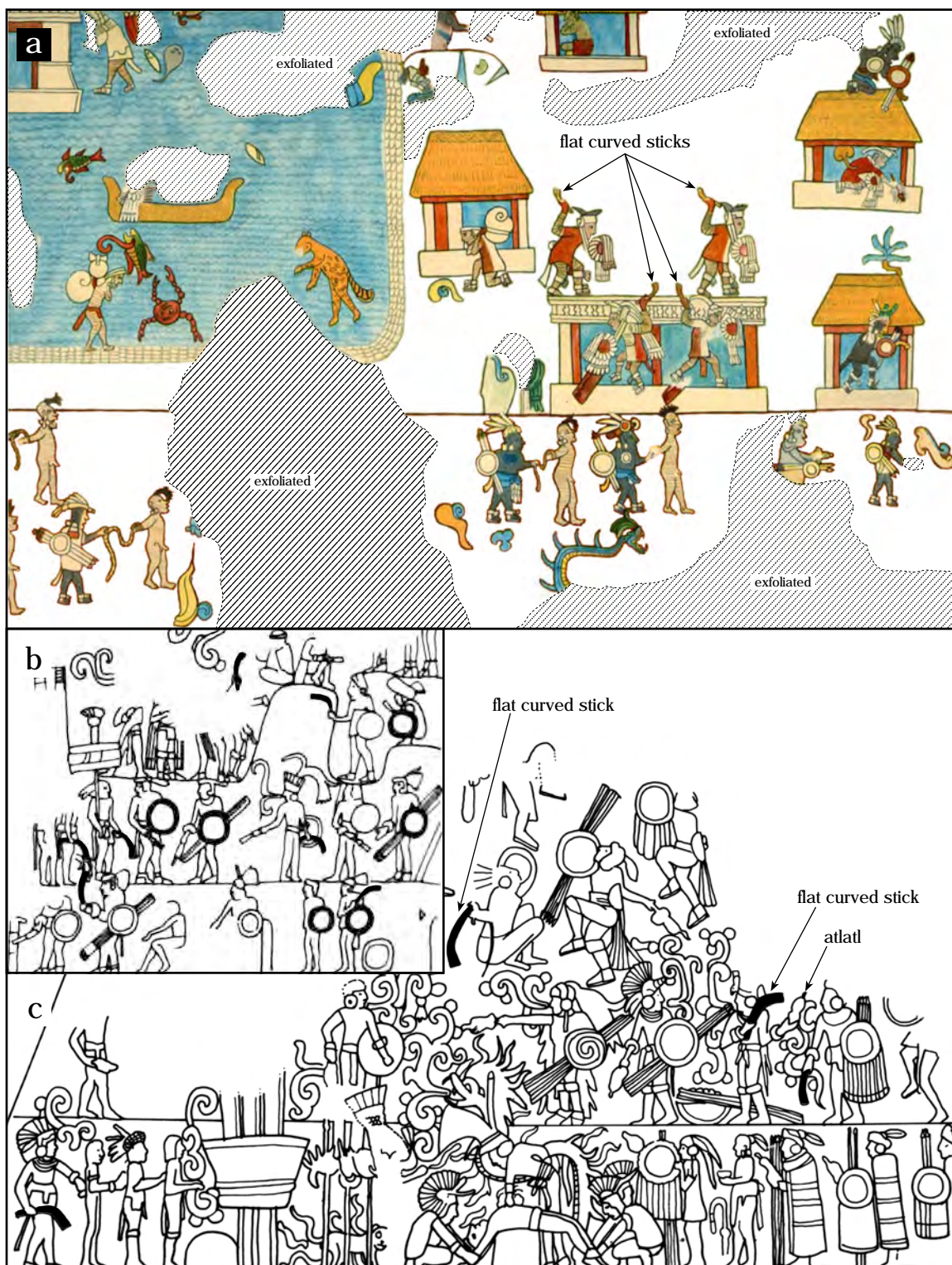


Figure 6.7. Flat curved sticks depicted in murals at Chichén Itzá: (a) north portion of east wall, outer chamber, Temple of the Warriors (painting by Ann Axtell Morris; modified from Morris et al. 1931:Plate 139); (b) portion of Southeast Panel, Upper Temple of the Jaguar (Schele Number 5069, Schele and Mathews 1998:33, Figure 6.31, B7B); (c) Upper register, South Panel, Upper Temple of the Jaguar (Schele Number 5060, Schele and Mathews 1998:239, Figure 6.37, B7H).

The contrast pointed out by Finegold (2012:54, notes 58 and 308, Figure 51) between what is shown in Ann Morris's reconstruction and what it was based on reveals the degree of informed artistic license that she used. Nonetheless, at least one of the striped figures on a mural fragment is clearly shown brandishing a flat curved stick as shown in her painting. This holding technique, with the concave side facing outward, is actually how rabbit sticks are cocked back in readiness to throw. This also might have been a customary stance of readiness for defense against atlatl darts, yet each of the fighters also carries a shield, which implies that the curved stick has an offensive role not a defensive one. If these sticks were used in close fighting as swords then they were evidently ineffective in this instance for the striped group.

The other images of Figure 6.7 come from the Upper Temple of the Jaguar, where the buildings still stood into the historic period, allowing accurate recording of the painted images that were intact. As previously mentioned, the war scenes show abundant use of atlatls and darts but do not show the flat curved stick in use as an actual weapon. The one instance of a flat curved stick included in what looks like actual warfare (Figure 6.8c) shows a fighter crouched with a shield but not holding the stick in a position effective for defense or offense. The fact that warriors are shown holding the stick and also holding shields implies that they have something other than a purely defensive role. Based on the evident throwing stance of the one Temple of the Warriors mural this might have been as a stick that was hurled at enemies. The problem with this interpretation is that once thrown, whether for offense or defense, your implement is gone.

Coggins (1984b:164) implies that the grooved flat curved sticks were symbolic of warrior title and reserved for "Toltec officers" and that "ordinary warriors" did not have these artifacts. If true, it is no wonder that the sticks do not appear in the battle scenes as a weapon since these active engagements largely show the rank and file, with the important figures occurring around the margins. A badge of office would not have been a short sword of the common foot soldier. The depiction of defense against invisible foes at the Temple of the Warriors might be seen as fitting this interpretation in that the elite with their insignia offered protection of the temple. Ringle's proposal that the cenote ceremony and use of the entire Great Plaza including the buildings with the murals was

for rites of military investiture also fits the idea that the curved sticks were emblems of military rank (Ringle 2009; Ringle and Bey 2009).

One potentially significant aspect is the occasional depiction of an individual holding two of the grooved sticks, one in each hand. The reason for holding them is not apparent but these individuals are not otherwise armed, although they are dressed similar to warriors. These depictions are significant because of an account by Diego de Landa of a certain ritual dance performed by the Maya that appears to involve dart deflection. It is also interesting that paired grooved sticks occur in Basketmaker II rock art and also burial contexts (discussed later). Perhaps these sticks have relevance in Mesoamerica as symbols of military rank because of their ancient association with atlatl fights.

Ethnography

Diego de Landa's *Relación de las cosas de Yucatán* reports on a Maya dance that might be interpreted as providing evidence in support of the fending hypothesis:

Two of their dances are especially virile and worth seeing; one is a game of reeds, whence they call it *colomché*, the word having that meaning [a 'palisade of sticks']. To perform it they make a large circle of dancers, whom the music accompanies, and in time with which two come into the circle; one of these dancers erect, holding a handful of reeds, while the other dances is squatting, both keeping time around the circle. The one with the reeds throws them with all his force at the other, who with great skill catches them with a small rod. When all are thrown they return, keeping time, into the circle, and others come out to do the same. (Gates 1937:70, SEC. XXII)

Schmidt (1990:202) accepts that the small rod used to "catch" the reeds was a fending stick that "must have been a direct descendant" of the Chichén Itzá examples. A ritual dance like this recalls the words mentioned previously that a Melanesian informant uttered to Scott about their war dance: they were not simply dances but practice for warfare and specific movements simulated the fending of spears (Scott 2013:246).

Experimental Fending Sticks

Experimentation in making and using prehistoric technology is central to developing well-grounded interpretative frameworks for inferring human behavior from material remains. There is a certain understanding of technology that is difficult to achieve without experience in replicating and using tools and documenting the results

(see Clark and Wood [2015] for an informed perspective of the limitations and potential this approach). Obviously fending lethal darts is not an experiment to be undertaken lightly and certainly not without sufficient protection of life and limb. Moreover, it is entirely speculative whether flat curved sticks were actually used this way. This is totally different from some types of experimental and replicative studies such as Folsom fluting, where we know that an activity actually occurred (flutes were detached) and the goal behind the work is to determine *how* this might have been done.

I had two main experimental goals for flat curved sticks: (1) to determine if they were actually effective at deflecting atlatl darts (also the most useful body movements and stick handling methods for achieving this) and (2) to determine what sort of use-wear pattern(s) might result from such use. The first goal was very simple: to answer the basic question whether atlatl darts could be fended away using flat curved sticks like the prehistoric specimens of the Southwest. An affirmative answer obviously says nothing about whether such sticks were used this way in prehistory, but a negative answer would be quite defeating to the fending hypothesis. The second goal of documenting use-wear resulting from atlatl dart fending is central to determining if this activity actually occurred in the past. This goal was admittedly difficult to fully realize without using dangerously armed darts, which was not done. Nonetheless, it seemed that experimentation with nonlethal darts would inform about the sorts of use-wear that could develop and provide a basis for making inferences about the use-wear documented on prehistoric artifacts.

Simultaneously, Justin Garnett and Devin Pettigrew also experimented with using flat curved sticks for fending darts, with results reported by Garnett (2015), including a detailed analysis of fending success rate. The focus of their experiment was not use-wear, but whether the flat curved sticks actually functioned well for defense—whether they effectively or efficiently deflected atlatl dart.

Methods

The replicated equipment for the experiment was provided by Chuck LaRue of Flagstaff, Arizona, an accomplished producer of prehistoric technology of various kinds and someone who has manufactured a few dozen replicas of prehistoric flat curved sticks and ethnographic rabbit sticks. The fending equipment consisted of two replicas of

different S-shaped grooved curved sticks from the Colorado Plateau and one replica of a single-bend grooved stick from the Chihuahuan Desert. The artifacts were made by carefully following the dimensions and traced plans of the prehistoric artifacts: one from Moqui Canyon, SE Utah, one from Heaton Cave, NW Arizona, and one from Ceremonial Cave in far western Texas. LaRue made the sticks using locally harvested stems of Gamble oak of appropriate size, which is important for matching the proper weight and durability of authentic artifacts (commercial lumber is not suitable). The weapons consisted of replicated examples of Basketmaker II artifacts using appropriate materials and dimensions: five willow stems 1.5–1.6 m in length for the atlatl dart main shafts, each fletched with three feathers, hardwood foreshafts tipped with bone and hardwood bunts, and two atlatls of gamble oak worked down to the shape and dimensions of the whole atlatls from Sand Dune Cave and Broken Roof Cave. The only exception to traditional materials for the weapons was the addition of soft foam tubing around the bunts, which was secured in place by string. This precautionary step was taken to limit potential risk of injury to the individual on the defensive side who was trying to deflect the atlatl darts.

The actual fending experiment consisted of two parts. First was a trial run where two participants got familiar with using the tools in a simulated, one-sided duel. For this trial, Chuck LaRue was on offense armed with an atlatl and darts and the author was on defense holding a flat curved stick. LaRue had the task of tossing darts directly at Geib who attempted to knock them aside without moving his position; the goal was to fend darts away rather than dodge them. A distance of about of 15 m was maintained between the two opponents. LaRue is an experienced atlatlist, so he did not need to get familiar with using the weapons but he did need to get used to throwing darts directly at another individual, since this activity was somewhat outside his comfort zone. Geib needed to experiment with the best way to hold and handle the flat curved sticks for defense against darts. The bunts combined with the foam tube worked quite well to prevent being inadvertently skewered by a dart, but they still struck with force, especially for the large and heavy wooden bunt. Consequently, early in the trial, Geib donned a clear plastic face shield to help limit a direct hit to that part of his head; this seemed like the most dangerous aspect for the defender. Roughly two hours were spent during the trial run and

during this time the number of darts tossed was perhaps around 60. Some of these were not directly on target so probably slightly more than half needed to be deflected. Each of the three flat curved sticks were experimented with but most of the time the Moqui Canyon replica was used since it is the type of artifact that was in regular use by Basketmaker II occupants of the Four Corners region.

The second part of the fending experiment was the actual test per se, which was professionally filmed to document the action (Figure 6.8). LaRue was again on offense as was William Bryce of Flagstaff, Arizona, another accomplished atlatlist. Geib defended against darts thrown by both of these individuals; Bryce also tried his hand at defense from darts thrown by LaRue. The distance between opponents during this experiment was 11 m, which means that darts were at or near full acceleration, requiring quick reflexes to knock aside those that were on target. As during the first trial, all three flat curved sticks were used, but the Moqui Canyon replica was used most frequently. Nicholas Geib filmed the experiment using a combination of two different digital cameras: a GoPro that was attached to some portion of the thrower or fender and a tripod-mounted 35 mm camera that was usually positioned at an angle close to the defender or thrower but also sometimes behind the thrower. Approximately 3 hours were spent in the experiment, during which time an estimated 100 darts were thrown at defenders. The Moqui Canyon replica was used to fend against the vast majority of these darts with limited use of the other two sticks for comparative purposes. The protective face shield was worn some of the time but after gaining more confidence with using the flat curved sticks for fending, Geib put it aside.

Results

The first observation to make is that flat curved sticks are effective at deflecting atlatl darts, even at 11 m distance. Are they the best defensive tool for that task? Certainly not! Both defenders received one or two potentially lethal hits to the upper body had the foreshafts been tipped with stone dart points. A shield would have been far more effective than the sticks, even a narrow one like the Australian *hielaman* (or *yeelaman*). This was also a conclusion reached by Garnett (2015); he concluded that since the efficacy of dart defense was low and a better defense could be designed that these sticks were therefore not used this way. But ease or efficiency at defense might not



Figure 6.8. Images captured from filmed experiment using flat curved sticks to deflect atlatl darts: (a) Byl Bryce throwing dart at Phil Geib; (b) Chuck LaRue throwing dart at Byl Bryce; (c) Geib's view of dart approaching thrown by Byl Bryce; (d) deflection to outside (right); (e) deflection to inside (left); (f) deflection to outside; (g) deflection with stick edge; (h) failed deflection with dart striking rib cage (film by Nicholas A. Geib).

be a consideration if the objective is to defend against a dart in a fashion that seems inherently risky. If this was true, then the flat curved sticks are perhaps quite suitable—they seem like an improbable defensive tool, yet they work.

Both defenders (Geib and Bryce) found that the crescent-shaped stick, which was about 1/3 longer than the Moqui Canyon stick, was psychologically more comforting to hold up as a defensive weapon when facing atlatl darts (not all prehistoric examples of single curve sticks are long, but many from the Chihuahuan Desert are, some almost 1 m in length). The extra length gave the perception that it could encounter the dart slightly farther away from the body. The comparatively short Moqui Canyon stick seemed like it allowed darts to get uncomfortably close prior to making contact. Given the speed of atlatl darts, the difference was only slight in actual use and the Moqui Canyon stick turned out to be effective for fending darts. Nonetheless, if I had to choose a defensive weapon, I would likely opt for the longer single-bend stick and Bryce reached the same conclusion.

It is difficult for a defender not to try and dodge the oncoming atlatl darts and it is probably impossible to totally eliminate some degree of flinching; even if the feet do not move the upper body involuntarily shifts to avoid the projectile; Garnett (2015) discusses this same issue. The hardest darts to deflect seemed to be those headed for the pelvic region, but this might be a simple matter of learning the best stick use technique. It was also apparent that darts thrown with a slight sidearm toss rather than straight overhand caused problems with visual tracking. This has to do with the pronounced flex that occurs with atlatl darts when they are released and the fact that the fletching tends to be the most visually obvious part, yet it is the dart tip that a defender needs to focus on. A defender that focuses more on the trailing part of the dart might not strike the shaft at the right time, but after the leading part has made bodily contact.

Geib had a side stance when defending against the atlatlist, with his right arm holding the stick forward and his right leg leading. Bryce, in contrast, fended left handed and used a more open stance with his upper body turned more squarely toward the atlatlist. Obviously the manner we found best to use the sticks for defense is not necessarily the way that prehistoric people would have done so, though it is potentially informative. In the images of Xingu atlatl duels individuals on defense commonly

presented a side-on target to their opponent. Not only does a side stance present the narrower target, but the vital organs are somewhat more protected by an arm and ribs.

Both defenders found that the crescent-shaped stick was best held like a samurai sword when used for fending purposes, with the convex side down or toward the opponent and the concave side facing up. This is the opposite of how such an artifact would be held when throwing at rabbits (see the hunting discussion of Chapter 7). For fending purposes, the S-shaped sticks were also best held in the same manner but, because of the recurve, the concave distal part of the stick faced the opponent. This also happens to be the optimal way of holding the S-shaped sticks if using them for throwing at rabbits or hares. This is actually the only comfortable way to hold S-shaped sticks because of the pitch-covered cordage knob or bumper on the grip, a feature described in detail in Chapter 8. The bulge created by this wrap only feels comfortable when gripped against the fingers rather than when held against the palm. As such, the sticks with grip knobs were doubtless held exactly in the same way whether in prehistory or today.

Because of the consistent means of holding the sticks when used for defense they developed a distinctive pattern as to where all the use-related damage occurred. This is seen in Figure 6.9 which shows the Moqui Canyon stick replica including some close-ups. All of the use-wear is concentrated along the edge that faced the opponent, with most of it concentrated on the concave portion, especially the proximal part leading into the bend. The wear consists chiefly of places where contact with the atlatl dart shafts had worn away the brownish stain that LaRue had applied to the oak wood after finishing the stick. This sort of wear is unlikely to have been discernible on patinated and post-depositionally stained prehistoric artifacts. There are however some other use-traces consisting of depressions or dents in the wood, one of which is a crease on an angle across the stick edge, along with a few areas of subtle abrasion. The two largest dents on the stick are where atlatl dart bunts directly struck the edge. Had the darts been armed with stone points, the edge would have been significantly gouged. Although most of the other defensive strikes were to dart main shafts, sometimes a dart tip was struck with a glancing blow, so it is easy to conceive how darts tipped with stone projectile points instead of bunts would nick or gouge the stick edge.

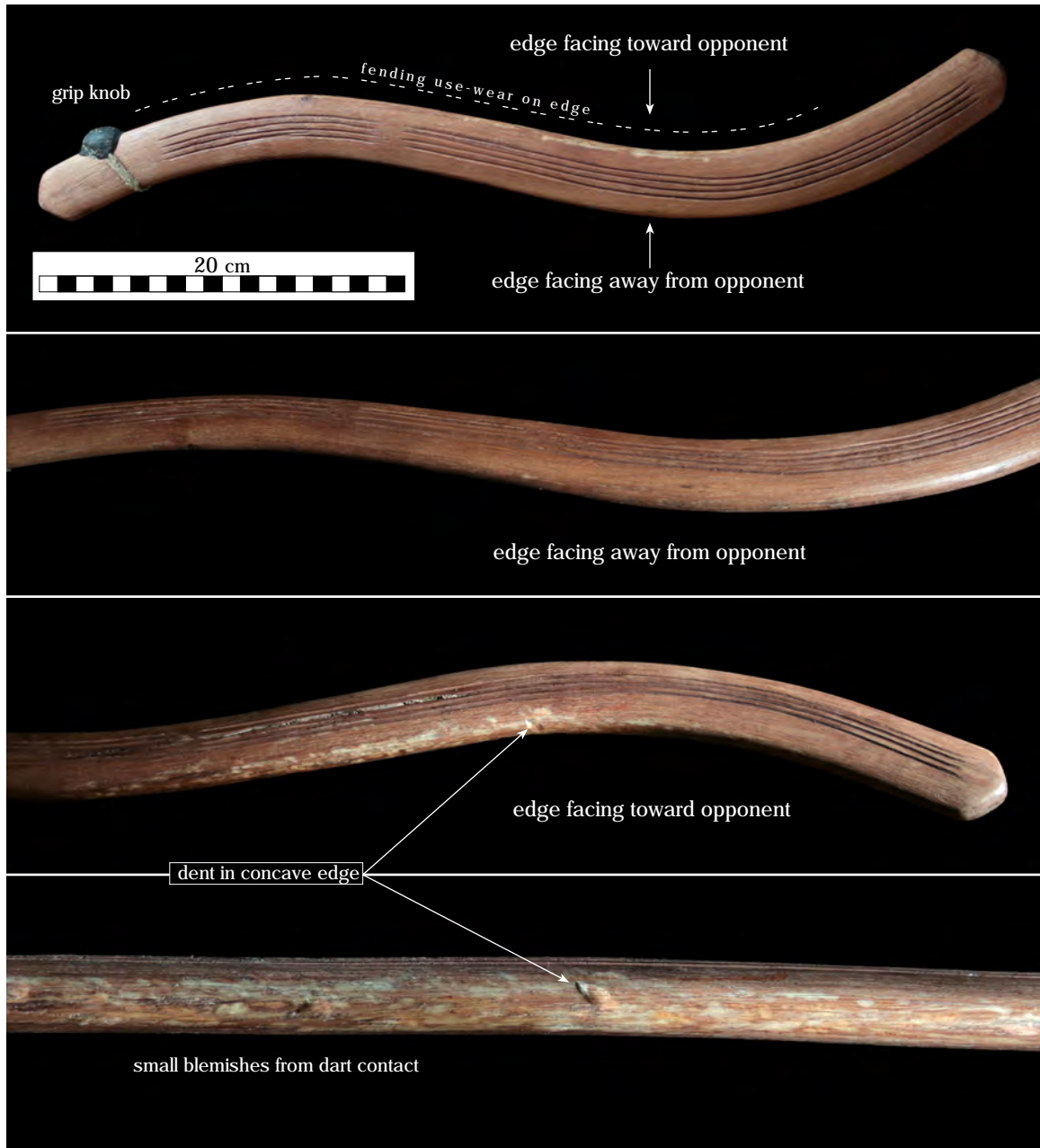


Figure 6.9. Use-wear on replicated flat curved stick used for deflecting non-lethal atlatl darts; stick is copy of the specimen from Moqui Canyon Cave 2, SE Utah and was made by Chuck LaRue.

A key finding is that any use-wear from fending atlatl darts with the flat curved sticks occurs in a limited area on one edge and slightly onto the faces adjoining that edge. The opposite edge, both ends, and most of both broad faces with the grooves are unblemished. Continued use of the sticks for fending would only strengthen this pattern by adding additional damage to the limited areas already impacted. As discussed earlier, the pitched cordage knob on S-shaped sticks means that this specific form had only one practical way of holding it; thus the place where use-wear occurred in the fending experiment should also be seen on prehistoric specimens if they were indeed used for deflecting atlatl darts. Flat curved sticks lacking grip knobs, like most of those with a single-bend, might have been held by prehistoric people differently than by modern defenders, with the concave edge forward. Nonetheless, this should still result in a highly patterned set of use traces if used for fending, with simply one edge substituted for the other. The obvious complicating factor is if the sticks had other roles besides fending that could have resulted in use-wear, such as from hunting small game.

Summary

Guernsey and Kidder assigned no specific use for the Basketmaker II flat curved sticks that they called grooved clubs but they are credited with the notion that these artifacts perhaps played a defensive role in batting away atlatl darts. This speculative interpretation was evidently based on a poorly suited Solomon Island analogue, yet experiments show that it is feasible to deflect atlatl darts in a duel-like setting even when combatants are only about 10 m apart. Native Americans in South America still conduct joust-like ritual fights with atlatls and darts although by using a small bundle of poles for defense. A venue like that of the Kamayurá and other groups of the upper Xingu Region is the sort of context where defending against atlatl darts with short sticks makes sense. Deflecting darts in a somewhat controlled setting, even if there was a serious intent to kill, allows a combatant to focus on a single incoming projectile. Fending sticks would lack utility in a murderous melee or surprise attack where numerous darts might be thrown from very short range and attention is divided. Moreover, having a fending stick in one hand is an encumbrance to efficient reloading of an atlatl; when life is on the line it makes little sense to carry a stick inessential to the fight. A wrist cord might be seen to remedy this problem and Guernsey and Kidder (1921:88–89) suggested that the grooved

sticks that they found had such a strap, an inference that Heizer (1942) continued with, but they were mistaken in this as I document in the Chapter 8. *No* known flat curved stick, whether S-shaped or crescent-shaped, had a wrist cord.

A controlled duel-like atlatl fight provides a risky challenge suitable to a status arena, but one where chances of death are attenuated, especially when compared to actual warfare. Yet, such a role would also generate use-wear, especially if darts were tipped with stone projectile points. As I show in Chapter 9, use-wear consistent with the fending hypothesis is present on a small proportion of prehistoric flat curved sticks from throughout the Southwest. At least one stick from the southern Southwest exhibits split and splintered wood that seems an exact match for the type of damage that would result from penetration by an atlatl dart tipped with a stone projectile point. Other examples of prehistoric flat curved sticks likewise display impacts that are consistent with fending, though in a less clear-cut manner. Yet, there is no functional exclusivity since even the stick that provides the best support for the fending hypothesis also exhibits evidence consistent with rabbit stick use.

The temporal depth for the Kamayurá practice of ritual atlatl duels remains unknown but given the implements involved it could well have precontact roots; it also might have had potentially more lethal consequences prior to pacification of warring tribes. The Chichén Itzá evidence coupled with Landa's account hints that similar ritual atlatl duels might well date back to at least AD 800 in Mesoamerican. Assuming that the flat curved sticks at Chichén Itzá are derived from the comparable and very ancient specimens from the Southwest, which seems highly likely, then this pattern might well have very ancient roots indeed and been quite widespread in the Americas.

CHAPTER 7

ANALOGUES FOR HUNTING USE

When archaeologists find flat curved sticks, they might initially assume that such artifacts were used for throwing to hunt small game. After all, this is what various ethnohistoric groups throughout the world used such artifacts for, with the tools frequently glossed by the name throwing stick, rabbit stick, or non-return boomerang. Such an assumption is even extended to items other than wood, such as a crescent shaped tool of mammoth ivory found in Poland that dates to the Upper Paleolithic, more than 20,000 years ago (Valde-Nowak et al. 1987). Whether it was actually thrown to kill game remains unknown and depends on the evidence that can be mustered in support of such use. As a relatively simple tool form that is easily made and whose aerodynamic properties are readily grasped, independent invention of throwing sticks may have happened several times around the world. One place this might have occurred is the Southwest where many Native American groups used flat curved sticks for hunting rabbits, hares, and other game. The progenitors for these artifacts might be the comparable prehistoric specimens from the Southwest that are now known to have considerable time depth (see Chapter 10). Yet, ethnohistoric utility or function might not equate with past utility or function. Just like in biological evolution, the reasons behind the origin and initial spread of a cultural trait or behavior can be distinct from the reasons that a trait or behavior was maintained and proliferated. Flat curved sticks are clearly well suited for throwing to kill small game but were the very ancient Southwest specimens designed for this purpose or for some other reason altogether? One means to assess this is to consider what makes for a good throwing stick. This is done by examining ethnographic specimens of rabbit sticks from the Southwest and also what can be considered optimal sizes and shapes for this purpose. This chapter also examines the use-wear characteristics on ethnographic and experimental rabbit sticks as a means for interpreting any traces of use that are evident on prehistoric specimens.

Ethnographic Rabbit Sticks of the Southwest

Many Native American groups in the southwestern part of North America hunted rabbits, hares, and other game with flat curved sticks. This includes tribes living in the

Southwest proper and the adjoining areas of the southern Great Basin and southern California, including Baja (Table 7.1). All Puebloan groups used these sticks and many museums around the country have ethnographic examples collected during the 1900s or earlier, especially from the Hopi. Both before and during the course of this research I inspected numerous ethnographic rabbit sticks with 19 of them analyzed in detail according to the procedure for the prehistoric artifacts that is described in Chapter 8 and in Chapter 9 for use-wear. These 19 artifacts are listed by tribal affiliation in Table 7.2 with Table 7.3 providing some basic measurements of stick weight and size.

Table 7.1. List of Native American groups in the southwest part of North America that used flat curved sticks to hunt rabbits, hares, and other small game.

Region	Tribal Group	Reference
Colorado Plateau	Hopi	Gifford 1940:123 Kennard 1979:556–557 Stephen 1936:1:99–100
	Puebloan	Amsden 1949:73 Gifford 1940:33, 123 Harrington 1933:120 Parsons 1918:384–385 Spier 1928:121
	Navajo	Spier 1928:121
	Apache	Gifford 1940:33
	Southern Ute	Gifford 1940:123
	Yavapai	Gifford 1936:288 Khera and Mariella 1983:50
Desert Southwest	Colorado River Yuman	Kroeber 1925:632 Smith 1977 Stewart 1947
Desert Southern California	Kitanemuk	Harrington 1942:15
	Great Basin Chemehuevi	Galvin 1967:32 Sherer 1994:5
	Cahuilla & Cupeno	Bolton 1931:131 James 1960:58 Kroeber 1925:704
Coastal Southern California	Chumashan	Harrington 1942:15 Simpson 1961:54
	Northern Uto-Aztecan	Curtis 1926a:8–9, 159 Davidson 1873:233 Duhaut-Cilly 1929:220 Drucker 1937 Heizer 1968:62 Kroeber 1925:632 Sparkman 1908:198
	Yuman	Drucker 1941:99 Gendar 1995:86 Shipek 1968:35 Spier 1923:337
Northern Baja California	Paipai and Kiliwa	Aschmann 1959:67 Drucker 1941:99 Koerper et al. 1998 Meigs 1939:28–29, 1972:36

Table 7.2. List of intensively studied rabbit sticks by ethnographic group.

Tribe	n	%
Unknown Chihuahua	1	5.3
Kumeyaay (Diegueño)	5	26.3
Gabrielino	1	5.3
Hopi	8	42.1
Mohave	1	5.3
Navajo	1	5.3
Zuni	2	10.5
Total	19	100.0

Table 7.3. Measurements for ethnographic rabbit sticks; proximal width and thickness excludes the tab-like handles for Hopi and Zuni artifacts, features absent on other sticks.

Variables	Stats	Hopi	Zuni	Navajo	Chihuahua	Diegueño	Gabrielino	Mohave	Total
Count	n	8	2	1	1	5	1	1	19
Weight (g)	aver	253.8	218.5	272.9	234.8	287.5	296.0	148.5	255.6
	std dev	29.6	32.6	–	–	60.0	–	–	49.1
	min	226.2	195.4	272.9	234.8	218.8	296.0	148.5	148.5
	max	320.0	241.5	272.9	234.8	350.0	296.0	148.5	350.0
Chord Length (cm)	aver	60.5	61.6	56.0	62.9	74.9	67.2	58.5	64.5
	std dev	1.3	0.9	–	–	4.5	–	–	7.1
	min	58.1	60.9	56.0	62.9	68.7	67.2	58.5	56.0
	max	62.7	62.2	56.0	62.9	78.6	67.2	58.5	78.6
Bend Length (cm)	aver	63.3	63.4	57.5	64.0	80.0	71.0	77.5	68.6
	std dev	1.8	0.0	–	–	5.2	–	–	8.5
	min	60.7	63.4	57.5	64.0	71.1	71.0	77.5	57.5
	max	65.2	63.4	57.5	64.0	84.1	71.0	77.5	84.1
Distal Width (cm)	aver	4.9	4.1	4.0	4.0	4.0	6.0	3.6	4.4
	std dev	0.7	0.6	–	–	0.5	–	–	0.8
	min	3.9	3.6	4.0	4.0	3.1	6.0	3.6	3.1
	max	6.3	4.5	4.0	4.0	4.4	6.0	3.6	6.3
Distal Thickness (cm)	aver	1.1	1.5	1.6	1.3	1.5	1.3	1.3	1.3
	std dev	0.1	0.4	–	–	0.3	–	–	0.3
	min	0.9	1.2	1.6	1.3	1.1	1.3	1.3	0.9
	max	1.2	1.8	1.6	1.3	1.7	1.3	1.3	1.8
Proximal Width (cm)	aver	4.5	3.1	3.6	3.50	3.5	4.1	2.9	3.9
	std dev	0.7	0.5	–	–	0.7	–	–	0.8
	min	3.7	2.7	3.60	3.5	2.5	4.1	2.9	2.5
	max	5.7	3.4	3.60	3.5	4.5	4.1	2.9	5.7
Proximal Thickness (cm)	aver	1.2	1.6	1.30	1.4	1.4	1.0	1.1	1.3
	std dev	0.1	0.2	–	–	0.2	–	–	0.2
	min	1.1	1.4	1.30	1.4	1.1	1.0	1.1	1.0
	max	1.4	1.7	1.30	1.4	1.7	1.0	1.1	1.7

I emphasized Hopi rabbit sticks because their use-wear was more directly relevant to my interest in Basketmaker II artifacts from the Four Corners region. Zuni specimens are also relevant but there were simply fewer specimens available, especially ones that seemed used. The rabbit sticks of groups residing in other regions provided useful points of comparison given the different environments that the artifacts were potentially used in. It is important to mention that some Puebloan tribes not only had sticks for throwing at rabbits but also had knobbed cudgels (rabbit clubs) used to dispatch them (e.g., Curtis 1926b:127, *The Keres*). The latter were usually made from lignotubers with the stem as the handle end and numerous prehistoric examples came from the Correo site in New Mexico (Sandberg 1950).

There are obvious morphological differences in rabbit sticks according to tribal group, even for the limited area of the Colorado Plateau represented by Hopi and Zuni (Figure 7.1). Hopi sticks are more robust than those of Zuni with nearly all being made from split halves of modestly large diameter oak logs. In contrast, Zuni specimens, both the two that I analyzed in detail and a half dozen more that were examined cursorily, are made of whole stems worked in from both faces like nearly all of the prehistoric sticks considered in Chapter 8. Just one of the eight Hopi rabbit sticks that I studied was made from a whole stem. I could not positively identify the wood for the two analyzed Zuni specimens, but one appears to be oak. Since the Hopi sticks are made from logs split in half, they have one face that is quite flat (the split one) and one that is more curved from where the wood was worked in by what was probably a combination of chopping/adzing, scraping and abrasion. The Hopi sticks are wider but thinner on average than the Zuni sticks and they usually weigh more with none less than 220 g; they are far heavier than most examples of the prehistoric flat curved sticks described in the next chapter. This is even true for one of the Zuni rabbit sticks, though the other is less than 200 g and more within the range of prehistoric specimens.

Both Hopi and Zuni rabbit sticks have tab-like handles where stick width has been reduced, a feature that is peculiar to the sticks of these tribes. In the Zuni case this is clearly not a consequence of a need for an easier-to-hold grip, since the proximal width is not all that great. In contrast, because of their common production from split logs, the proximal width of Hopi sticks is often more than 4 cm and can exceed a comfortable grip.

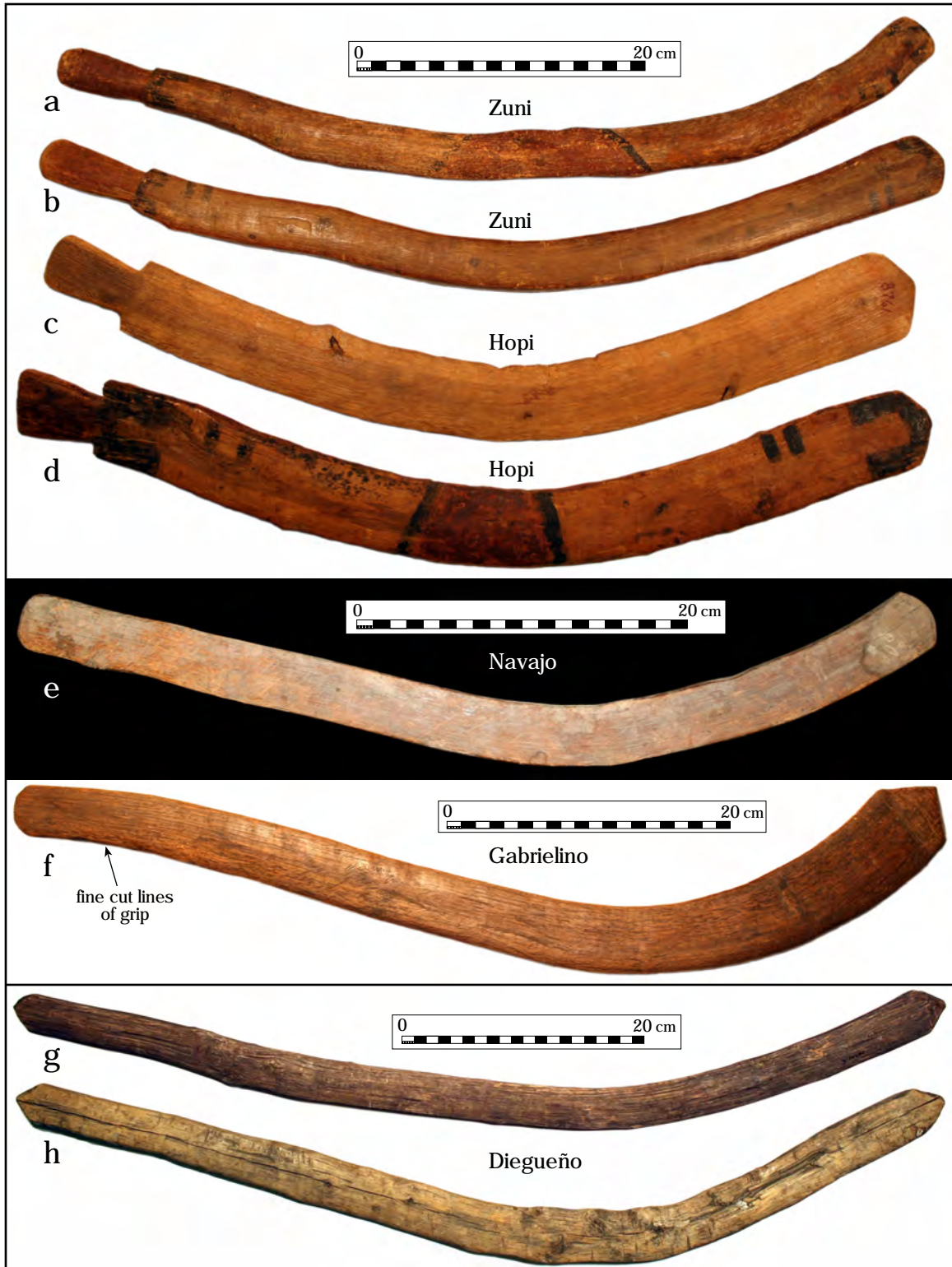


Figure 7.1. Rabbit sticks used by Native Americans of the Southwest and California: (a, b) Zuni (Geib 1009 & 1010, PHMA 2-33540 & 2-33541); (c, d) Hopi (Geib 1007 & 1008, PHMA 2-51855 & 2-48551); (e) Navajo (Geib 270, AMNH 29.1/838); (f), Gabrielino (Geib 1006, PHMA 67253); (g, h) Diegueño (Geib 1012 & 1011, PHMA 3-14541b & a). (Collections of the Phoebe A. Hearst Museum of Anthropology [a-d & f-h] and the American Museum of Natural History [e]; photos by Phil R. Geib.)

Even so, merely tapering the wood could have achieved the same result. The cut grip appears more like a “stylistic” convention, one that was not common to all Puebloan groups. The grips of all Puebloan rabbit sticks and indeed all ethnographic specimens that I have examined, consist of smooth wood lacking pitch or wraps that form knobs or bulges. This is a marked difference from the prehistoric specimens. (A Diegueño specimen at the Metropolitan Museum of Art [Accession # 1978.412.43] has a thin hide strip wrapped around the grip but it does not form a bulge.)

The ethnographic record provides ample documentation that Puebloan groups on the Colorado Plateau regularly hunted rabbits with flat curved sticks. Nonetheless, detailed accounts are virtually nonexistent about how rabbit sticks were made and used and by whom and how hunting was done. From living at Hopi, Stephen (1936:100) stated that he found “much reluctance to tell anything concerning this weapon,” which was called broad stock (*püchko ’hü*). He learned that the painted designs on them denote rabbit ears and eyes, and he describes how they are used in war to injure, kill, or disrupt an opponent aiming a bow and arrow (e.g., Stephen 1936:99). Hopi rabbit sticks could be effective as an offensive weapon because of their weight and aerodynamic properties combined with an acute edge in some cases.

No Puebloan ethnography that I am aware of actually details how the sticks were thrown, although a historic photograph of three Hopi men (Figure 7.2) shows one of them holding the stick in the correct position just prior to cocking his arm back and slinging it sidearm. Hurling the stick with a sidearm motion rather than overhead, so that it spins horizontal to the ground surface, ensures that it cuts the widest possible path in flight and thus has the greatest opportunity of striking the target, be that a rabbit, human or otherwise (Figure 7.3). This throwing motion is well documented for groups of southern California and Baja California as reported by Campbell (1999:349—361) and Meigs (1972) and in some action photos of a Kumeyaay man (Adolpho Ruiz) taken in the 1920s at La Huerta, in northern Baja (Koerper et al 1998:Figures 2—4). Photos of Hopis or other Puebloans in the act of actually throwing rabbit sticks are unknown to me, but there is no reason to doubt that a sidearm motion was the usual method.

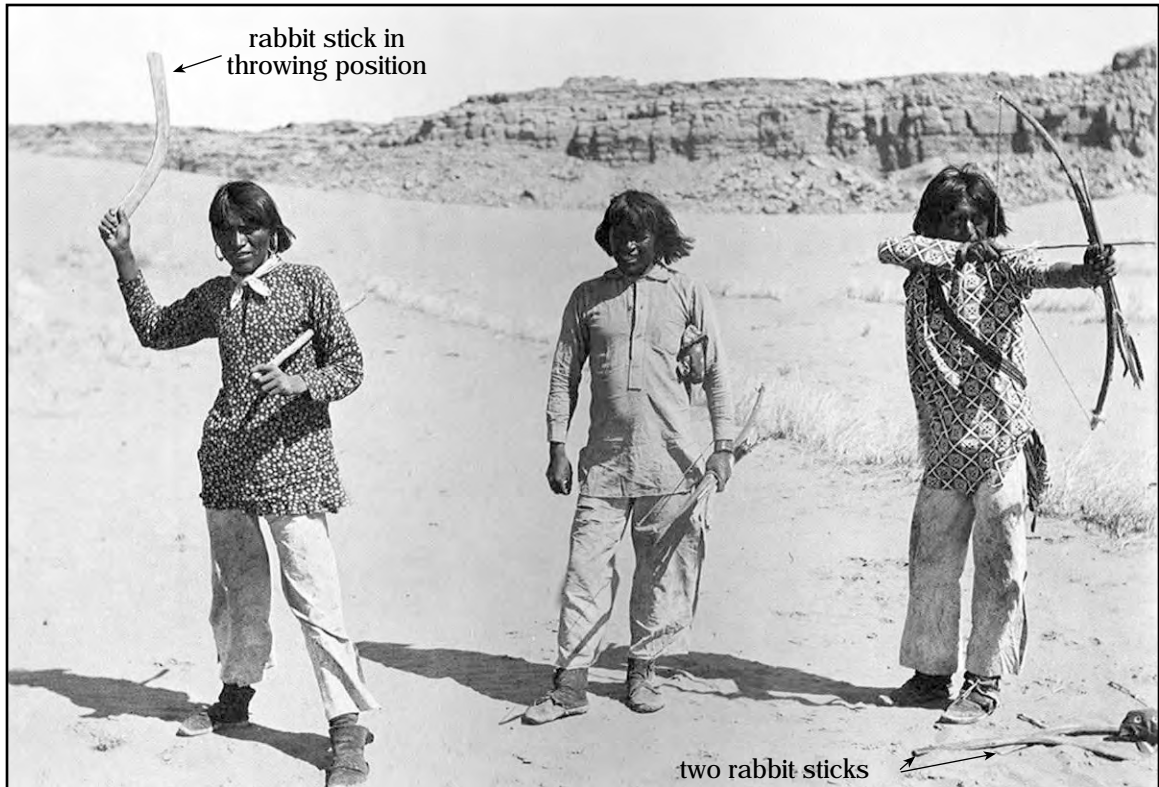


Figure 7.2. Hopi men with bows and arrows and rabbits sticks (photo by Sumner W. Matteson, 1900; courtesy of the Milwaukee Public Museum).

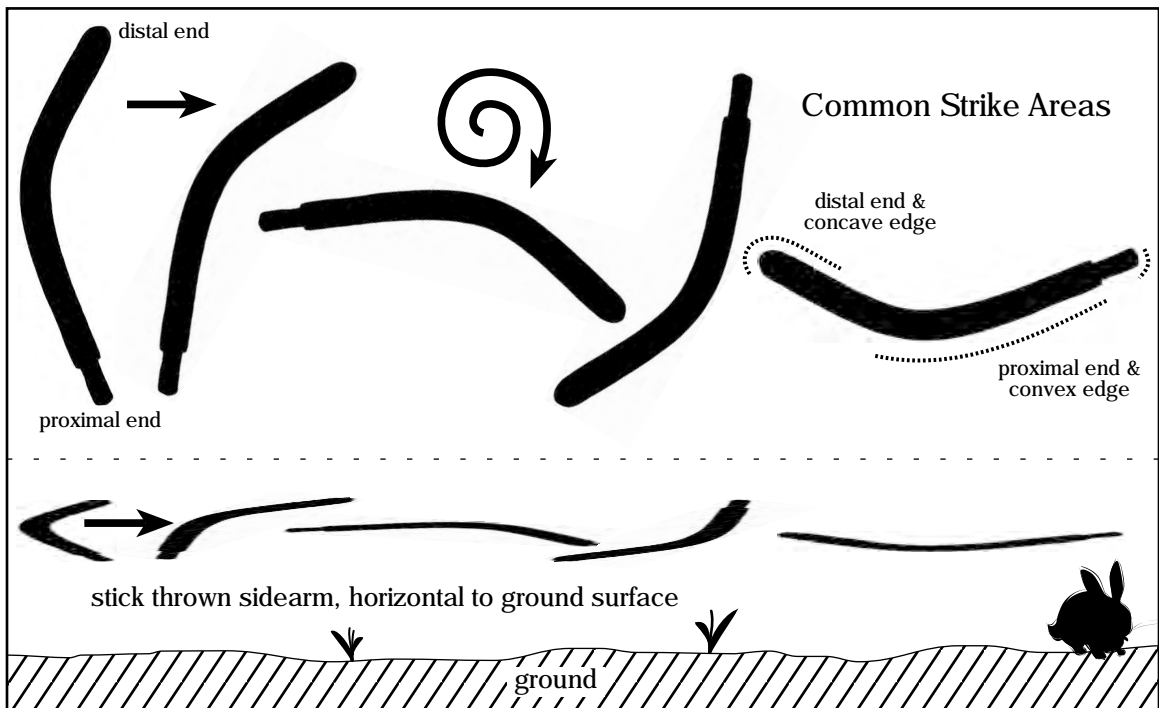


Figure 7.3. Method for throwing a rabbit stick so that it flies horizontally above the ground surface to cut the widest possible swath (drawing by Phil R. Geib).

“Optimal” Design Parameters

Flat curved stick function can also be considered from the aspect of tool design—if these artifacts had a specific function, then how should they have been constructed to best satisfy this need? Basic questions include the following: what are optimal dimensions, optimal bends, and optimal woods? Any discussion of *optimality* has to specify a function—optimal for what purpose? And, are there any competing demands that require a compromise solution? The flat curved sticks of Australia, known as boomerangs, can be considered from this perspective—should they be designed for optimal killing of ground animals or for optimal flight that returns the artifact to the thrower? Either requires sticks with certain shape properties in both plan and section as well as weight, with the former a heavy stick and the latter one that is not only relatively light, but that has wing-like bevels on alternate edges to generate lift. In the case of rabbit sticks, the known primary purpose was throwing to kill small game animals on the ground, principally lagomorphs (rabbits and hares).

The ranges for the dimensions of ethnographic throwing sticks given in Table 7.4 are presumably what those groups found suitable for hunting rabbits, hares, and other small game through a combination of trial and error and within the constraints of cultural tradition. As such, the means of size and weight for all 19 sticks might be assumed to represent approximate optimal values for throwing sticks. Obviously the averages could be refined with the measurement of additional artifacts, but they provide a useful point of comparison with prehistoric flat curved sticks. This argument can be extended using Errett Callahan’s (1992:25–27, 29) “optimal” values and ranges for the size, weight, bend, and other attributes of non-returning boomerangs, data that are summarized in Table 7.4. He based the optimal values on experimental research calibrated against data on ethnographic throwing sticks, which presumably included Australian specimens as well as those from the North American Southwest. The ethnographic specimens that I analyzed have mean values that are generally close to Callahan’s optimums except for weight, since the ones that I examined have a mean that is 84 g lighter. This is partly a consequence of ethnographic sticks that are shorter and narrower on average than Callahan’s optimum values for stick length and width. Weight is a significant variable since it plays an important role in killing power. Callahan (1999:214) claims that “A

solid 12 oz non-returning boomerang is easily capable of snapping the foreleg of a deer or comparable-sized animal at great distance.” This would be a stick that weighs 340 g, his optimum weight, which is greater than all but one of the ethnographic sticks that I analyzed, a Diegueño specimen; the heaviest Hopi rabbit stick is 20 g less than his optimum and most weigh significantly less.

Table 7.4. Errett Callahan’s (1992:29) optimal specifications for rabbit sticks or non-returning boomerangs along with data from Table 15 for ethnographic specimens.

Variables	Optimum	Range	Ethno Mean	Ethno Range
Length (cm)	68.5	40–90	64.5	56–79
Width (cm)	5.7	3.8–10.2	4.4	3.1–6.3
Thickness (cm)	1.0	0.6–1.9	1.3	0.9–1.8
Weight (g)	340	140–680	255.6	148–350
Angle of Bend (degrees)	135	123–145		
% Curvature	140	115–175		

It is doubtful if snapping the foreleg of a deer or other large game was ever a consideration for the Hopi. Nonetheless, both weight and degree of bend are important considerations when it comes to stability in flight. According to Callahan, “non-returners that are too light cease rotating and ‘come untied’ flipping face-over-face instead of cutting a horizontal slice through space” (1999:216). This is probably why the Mohave specimen that I analyzed, which had a weight of just 148.5 g, had such a pronounced bend, almost half of a circle; lacking that it never would have flown correctly. Coming untied in flight can also occur for sticks that are heavy but that lack an adequate bend. According to Callahan the optimal bend angle is 135 degrees with an acceptable upper limit of 145 degrees. As can be appreciated by Figure 7.1, the ethnographic sticks that I analyzed have variable bend angles with many close to Callahan’s optimal range but some less so and a few that have angles above 145 degrees. As I illustrate in the next chapter, some of the prehistoric flat curved sticks have very little bend.

Rabbit Stick Use-Wear

Before considering the evidence of use on prehistoric artifacts it is appropriate to establish a relevant interpretive context by considering traces of use on both ethnographic and experimental rabbit sticks. Ethnographic specimens are important for rather obvious reasons but one significant limitation is a lack of documentation for such factors as history of use, environment(s) of use, methods of use, and extent and nature of secondary

uses. For example, information about who used the artifact and for how long is known for only a single Southwestern ethnographic specimen that I examined—a rabbit stick used for about 15 years by Ned Lomayestewa, a Hopi man living at Shungopavi on Second Mesa of NE Arizona (Figure 7.4a). The records for other examples merely list tribal affiliation such as Zuni or Hopi, who collected the specimen, and when the collection was made. Experimental sticks can help flesh out the interpretive lacunae by providing details on use history.

Each of the 19 ethnographic rabbit sticks that I studied in detail were examined for use-wear and inclusions just like the prehistoric specimens. As I discuss in greater detail in Chapter 9 for prehistoric artifacts, the two principal kinds of inclusions consist of embedded rock fragments and cactus spines, or thorns of various shrubs and trees. Use-wear consisted of crushing of wood grain on ends and edges and linear gouges, nicks and abrasions/scratches to faces and edges. It seemed quite evident that some of the sticks, especially those from California, had not been used and were perhaps simply made on commission for museum collectors (e.g., Dominguez 1986). Not only did they lack throwing-related damage but also did not exhibit handling polish or smoothing. Koerper et al. (1998:66) lament that such commercialism has diminished the aerodynamic qualities of the sticks since they are no longer made for actual use. All of the Hopi specimens exhibited handling polish that was often extensive and this also occurred with other obvious traces of use including repairs of stress cracks (sinew and hide lashings). The two Zuni specimens did not have the same level of obvious use as the Hopi specimens and both were painted so they might have had more of a ceremonial role in dances; the one elaborately painted Hopi stick that I examined also had less evidence of utilitarian use.

Unlike the prehistoric artifacts considered next, none of the ethnographic rabbit sticks exhibited embedded cactus spines, so this variable is not listed in Table 7.5, which presents a summary of use evidence for the 19 analyzed ethnographic sticks. Embedded rock fragments were observed in five of the sticks, four of the Hopi specimens and the one Navajo example. Use-wear intensity, excluding smoothing or polish from handling, was evaluated on a relative scale from heavy to none. Three sticks of western tribes

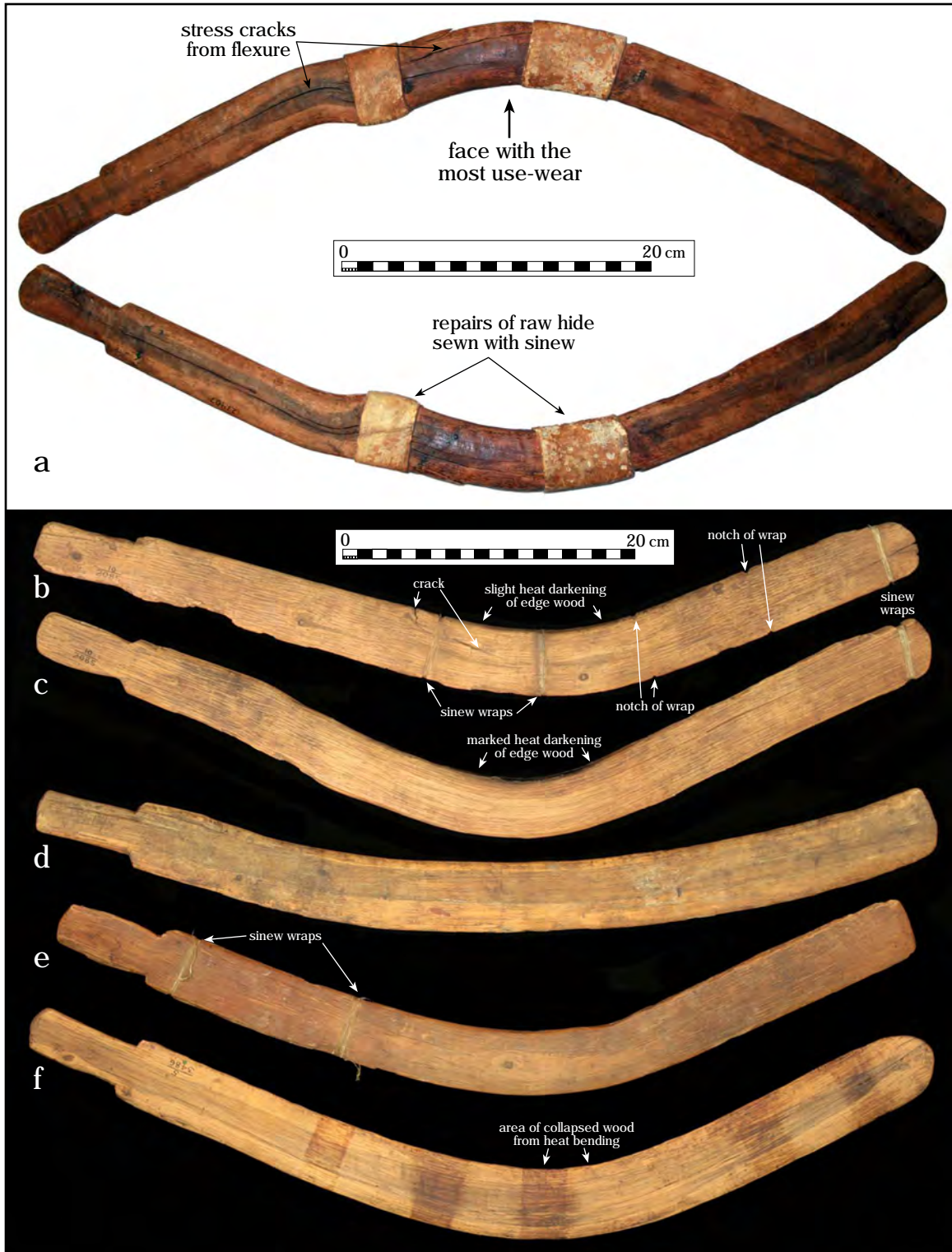


Figure 7.4. Hopi rabbit sticks: (a) well-used and repaired specimen of Ned Lomayestewa (Hopi), Shungopavi, AZ (used about 15 years; Geib 1014, SDMM 1958.15.12); (b-f) well-used specimens, three have sinew repairs and three have paint (Geib 1001-1005 respectively; NMAI 102085a, 102085b, 211006, 010215, & 053486). (Collections of the San Diego Museum of Man [a] and National Museum of American Indians [b-f]; photos by Phil R. Geib.)

Table 7.5. Summary of use evidence for 19 ethnographic rabbit sticks that were examined in detail like the prehistoric flat curved sticks.

Variables	Values	Hopi	Zuni	Navajo	Chihuahua	Diegueño	Gabrielino	Mohave	Total
Embedded Rocks	absent	4	2	0	1	5	1	1	14
	present	4		1	0	0	0	0	5
Use-wear Intensity	none	0	0	0	0	1	1	1	3
	light	6	2	0	1	4	0	0	13
	moderate	1	0	1	0	0	0	0	2
	heavy	1	0	0	0	0	0	0	1
Throwing?	no	0	0	0	0	1	1	1	3
	equivocal	1	0	0	0	1	0	0	2
	probable	2	2	0	1	3	0	0	8
	yes	5	0	1	0	0	0	0	6
Total		8	2	1	1	5	1	1	19

lacked any obvious throwing-related use-wear or inclusions; consequently my conclusion as to whether or not they had been used for throwing based on physical evidence was *no* for two cases and *equivocal* for the third (this is the *Throwing?* variable of Table 7.5).

The equivocal specimen is the large and heavy Gabrielino stick pictured in Figure 7.1f, which was collected in 1872 from Santiago Canyon, Orange County, CA. Although lacking definitive traces of having been thrown, this artifact exhibits extensive handling polish such that there seems little doubt that the artifact had a long history of use and was not made for sale, but used in an environment that was largely free of damaging rocks. The same can be seen on the one Hopi stick that Ned Lomayestewa used for about 15 years; the stick was so extensively used that large stress fractures got repaired by hide bindings. Nonetheless, the stick exhibits only light use-wear traces clearly related to throwing and no embedded rock fragments. The ends and edges of this artifact are rounded and extensively smoothed/polished from handling, which is fully consistent with the reported 15 years of service. Despite this, based on the physical traces I could only conclude probable use as a rabbit stick, a conclusive “yes” was not possible. The most telling traces of use besides the repaired stress fractures were subtle abrasion and fine scratches on the flattest face of the stick rather than the other face.

Such differential use-wear on faces is expectable for rabbit sticks, since they are thrown in a particular way with one face always down and thus with a much greater chance of having ground contact. Given how the sticks were thrown with the concave side forward, the wear traces on this artifact indicate that Ned Lomayestewa was right

handed (a ca. 90% chance—the approximate odds of such handedness in the general population). The lack of extensive throwing damage to his stick is indicative of the environment that he regularly hunted in with this artifact, which was likely his corn fields on the alluvial floodplains of Oraibi and Pollaca Washes or adjacent dune fields (see background of Figure 7.2). In such a use setting there would be little opportunity for inadvertently hitting rocks, so only subtle use-traces are likely to result and the fine sands and silty sediments of these settings might well work to further smooth stick ends and edges.

Not all Hopi sticks are like this and one exhibits heavy use-wear that is totally consistent with throwing (Figure 7.4b) as does another with moderate use-wear (Figure 7.4e). This includes not just the nature of the damage but differential attrition when comparing one face to the other (again right-handed individuals are indicated). Most damage occurs on both the distal concave edges (leading parts of the sticks) and proximal convex edge (trailing part of the sticks)—this matches the direction of stick rotation. Both sticks also have sinew bindings used to hold them together because of stress cracks. Figure 7.5a and d shows part of the convex edge of these sticks alongside other examples of Hopi sticks in the same sequence as Figure 7.4b–f. These are all of oak, doubtless Gamble oak, so the differences in use-wear likely are partly a reflection of the duration of use but also the environment of use, which evidently varies even for people who inhabit the same area. Differences in hunting technique or accuracy of throw might also be involved but the places where one regularly hunts for small game will play the largest role.

The convex edge of the heavily used stick exhibits crushed and splintered wood which imparts an irregular and jagged profile, especially from the exterior apex of the bend back to the handle (see Figure 7.4b). The comparable convex edges of the other two sticks shown next to Stick 1001 exhibit little if any obvious damage and both sticks overall have light throwing-related use-wear even though their extensive handling polish suggests a long history of use. The middle specimen (Stick 1002) exhibits a very pronounced medial bend and evidence of intensive heating on the concave side to achieve this, and the wood fibers on the exterior (convex) edge are stretched and compromised with some splinters of wood removed as a result. Nonetheless, this edge is not chipped



Figure 7.5. Apex of the convex edge for five Hopi rabbit sticks showing contrasts in use-wear; sticks are shown in the same sequence as Figure 7.4b-f (Geib 1001-1005 respectively, NMAI 102085a, 102085b, 211006, 010215, & 053486). (Collections of the National Museum of American Indians; photos by Phil R. Geib.)

and gouged at the apex of the bend like 1001; farther back toward the handle on this edge there is some impact crushing including an embedded quartz grain. Like 1001, this stick has more use damage on one face than the other, in both cases the flat split side: such differential facial use-wear is also indicative of rabbit stick use (and a right-handed thrower as before).

The edge of stick 1003 is even less use damaged than 1002, though the stick overall is heavily smoothed and polished from handling, implying extensive use. The use-wear consists of minor crushing and angular dents along the middle of the convex edge but the ends are rounded and highly smoothed with no evidence of contact against rocks. Smoothing and polish of edges and ends is even more extreme on stick 1005; this stick has very acute edges that are almost knife-like in places and thus easily damaged by hitting rocks, yet they are essentially pristine. Figure 7.5e shows the apex of the bend on the convex side, a portion that is readily damaged yet it is smoothed and unblemished by nicks or crushed wood. The chief diagnostic traces of throwing use for this specimen are rock fragments embedded in both the distal ($n = 4$) and proximal ($n = 1$) ends and a minor impact chip from one corner of the handle along with some crushing. This artifact provides an excellent example of how extensive use as a rabbit stick does not necessarily result in “typical” throwing-related damage since this is highly dependent upon the environment that one hunts in. Without close inspection it would be easy to mistakenly conclude that this stick had not been used for throwing.

Experimental Rabbit Sticks

A key benefit of experimental rabbit sticks is acquisition of detailed knowledge about how long artifacts were used and in what sorts of environments. The focus of this effort was on sticks that resemble those of prehistory rather than ethnographic specimens, in particular sticks that differ markedly from the ethnographic sticks such as those with an S-shape and those with considerable length yet relatively little bend. As I will examine in Chapter 8, some prehistoric specimens from the Southwest not only are longer than most ethnographic specimens but they have a rather gentle bend or arc. Given two sticks of equal lengths but different bends, the one with the gentler arc will have a slower rotation no matter the amount of wrist snap that can be imparted and thus more difficulty in achieving a straight flight. Indeed, some of the elongated, narrow and

relatively light prehistoric specimens with slight bends appeared like they would be incapable of functioning as rabbit sticks since they would come untied in flight.

Chuck LaRue was instrumental in this aspect of the research because he replicated dozens of prehistoric flat curved sticks, both S-shaped and single-bend, based on the metric dimensions and stick outlines that I provided him. He was prolific in his efforts and managed to replicate more than a dozen examples of these artifacts, most with shapes and dimensions nearly identical to the original specimens. One key aspect was simply being able to throw the replicas to determine their aerodynamic properties or lack thereof. Another aspect was to examine the development of use-wear by trying pristine specimens on somewhat stony ground.

Figure 7.6 shows examples of use-wear that developed on two S-shaped sticks with pronounced bends that match the two prehistoric specimens from Doughnut Alcove in SE Utah (Geib 1990). Unlike the Hopi specimens considered in detail previously, the shape of these sticks limits throwing-related use-wear from developing on either the distal leading or proximal leading edges, both of which are markedly concave. The places of significant impact are the ends and the convex edges, especially the apex of the more proximal bend. The damage shown in Figure 7.6 resulted from no more than roughly 2 hours of hunting, during which time the sticks were thrown no more than 40 times each. The terrain was level and open with sparse pinyon-juniper trees, generally low shrubs and scattered grasses and forbs. The ground was dry silty sand mixed with small gravel and some basalt cobbles but not rocky per se. At the end of their flight the sticks struck the dirt often with the ends “digging in” and then causing another part of the stick to twist and also hit hard, usually a convex edge and adjoining face. No large rocks were directly hit but striking the ground meant contact with cobbles and gravel. The sticks quickly became use damaged on their distal and proximal ends but also some on their faces. The end damage consisted of crushing and angular dents. Facial damage consisted mostly of scattered and random scratches and nicks with some areas of abrasion and a few gouges; most facial damage occurred on the side that faced the ground when thrown. This experiment demonstrated how rapidly use-wear can develop when used in an environment with gravely soil and scattered rocks. If these had been prehistoric artifacts I would have concluded that both definitely had been used as rabbit sticks.

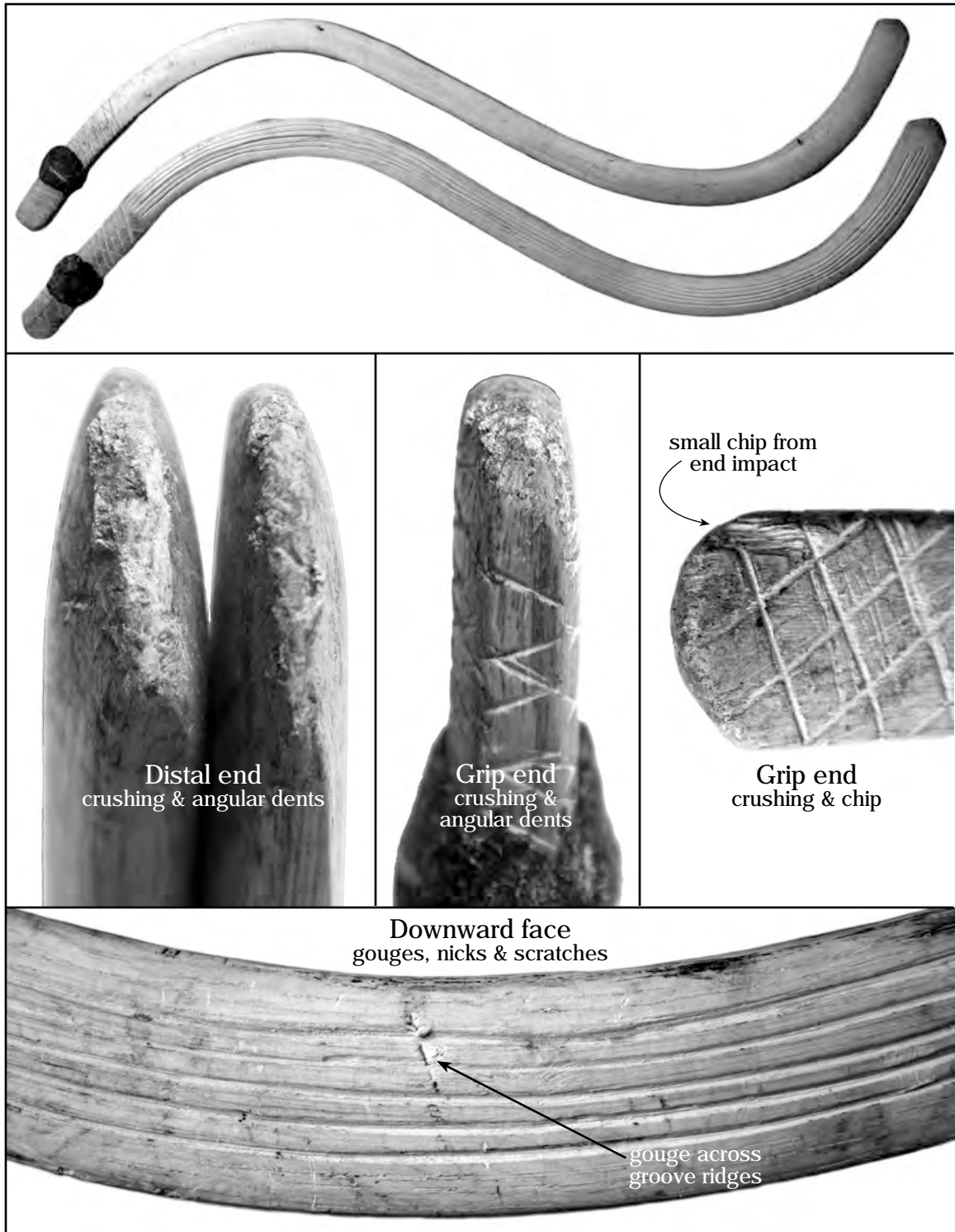


Figure 7.6. Replicas of S-shaped flat curved sticks from Doughnut Alcove, Lower Glen Canyon, Utah made by Chuck LaRue that were used for rabbit hunting; use-related damage on distal and proximal ends and one face from no more than 40 throws (photos by Phil R. Geib).

Summary

Rabbit stick or non-returning boomerang is a plausible functional alternative to the fending interpretation for the prehistoric flat curved sticks from the Southwest. After all, these artifacts look quite similar to ethnographic rabbit sticks, especially the crescent-shaped examples. The double recurve or S-shaped form that is typical of Basketmaker II artifacts, and also seen elsewhere in the Southwest, does not interfere with straight-line horizontal flight. Throwing experiments with replicated examples of S-shaped sticks demonstrate that their aerodynamic properties are as good as single-bend sticks. Flight capacity is only part of the equation since the sticks also have to be effective at killing game. Ethnographic specimens of rabbit sticks from the Southwest and non-returning boomerangs from around the world provide a basis for judging what is optimal for hunting purposes. Even if prehistoric specimens are a perfect match for an optimal rabbit stick, form similarity alone is insufficient for a functional inference. This is why damage from use (wear and inclusions) provides critical clues to support or reject a plausible use. Ethnographic and experimental rabbit sticks provide a good basis for evaluating the use traces and use-inclusions that occur on prehistoric specimens.

CHAPTER 8

ANALYSIS OF PREHISTORIC FLAT CURVED STICKS

This chapter presents the findings from a detailed analysis of the prehistoric artifacts that might or might not have functioned as defensive implements in atlatl fights. These are the flat, curved, and frequently grooved wooden tools commonly designated in the literature and museum collections as either rabbit sticks or fending sticks. Since determining function was a key part of this research, I use flat curved stick as a strictly descriptive name for this artifact class rather than a functional label, which also excluded Guernsey and Kidder's term of grooved club. Examples of flat curved sticks come from at least 80 archaeological sites throughout the greater North American Southwest (Figure 8.1). Comparable specimens occur as far south as Chichén Itzá on the Yucatan Peninsula in Mesoamerica, as far east as the Milam Peat Bog in central Texas, as far northeast as Kenton Cave in western Oklahoma, as far northwest as Fish and Lovelock Caves in west-central Nevada, and as far west as the coast of southern California and Baja Mexico. The sample of flat curved sticks that I studied totals almost 500 specimens, with nearly all of these from the Southwest. The variable nature of this artifact type is considered in detail in this chapter. Some of the variability is spatially patterned and may well relate to cultural tradition/learning networks; some appears to be idiosyncratic; some has a temporal component, which is explored in Chapter 10.

Stick Sample

In any analysis, deciding which artifacts or other items of interest to include or exclude has an important bearing on the conclusions or interpretations that are reached. My interest was with the prehistoric flat curved sticks briefly characterized in Chapter 2 and described in considerable detail below. At the start of this study I had to decide whether to restrict my focus to the S-shaped grooved sticks that Guernsey and Kidder (1921) first described, or whether I should include other examples that lacked grooves or an S-shape but otherwise seemed to comprise part of a larger suite of items that formed a single tradition, perhaps one that became differentiated through time and across space.



Figure 8.1. Map of the southern half of North America showing the greater Southwest region and some of the important sites therein that have yielded flat curved sticks; also shown are several sites in adjacent regions that have yielded prehistoric examples of comparable artifacts including Chichén Itzá in Mesoamerica.

A single find location near the edge of the Colorado Plateau known as the Correo Site provides an example of the conundrum of what to include or exclude, especially if we are dealing with a trajectory of material change through time. From this site, which is described in greater detail below, came both S-shaped and crescent-shaped sticks, and both of these forms might have grooves or lack them; indeed, a few sticks have them on a single face only. Whether a stick is one shape or the other or whether or not it has grooves did not seem critical to a general commonality among these artifacts.

Farther afield from the Southwest are flat grooved sticks from the Milam Peat Bog in central Texas (Chelf 1946). The largest and most intact specimen from this location was essentially straight, and the smaller fragments hint that they too had little if any curvature. Aside from this they seem no different from flat curved sticks in far western Texas. In the far southwestern part of the Great Basin adjacent to the Southwest there are prehistoric examples of flat curved sticks that are S-shaped or single-bend with grooves but farther to the west the sticks are single-bend and lack grooves (e.g., Fish Cave [Tuohy 2002] and Lovelock Caves [Loud and Harrington 1929]).

I ended up including in my analysis all artifacts that are commonly classified as rabbit sticks, fending sticks, or grooved clubs; these are the flattened, single-bend or S-shaped sticks that might or might not have longitudinal grooves. A few of the single-bend specimens have such a slight curvature that they appear almost straight although without having whole items this is difficult to judge. Whether or not they are grooved or whether they are single-bend or double-bend might have temporal or spatial significance, but provided no basis for exclusion. Many of the sticks have longitudinal grooves on both faces and this was a useful characteristic for identifying small fragments, but it was not essential for inclusion. Some of the prehistoric artifacts seem quite close in comparison to ethnographic rabbit sticks—namely, rather expediently produced, single-bend, roughly finished wood surface, lacking longitudinal grooves, and having a plain grip. There are also specimens that are so finely crafted that it hardly seems to make economic sense that they would be used for throwing at small game given the time investment in production, including such easily damaged features as finely incised grooves.

Sample Size

The sample of flat curved sticks available for study is highly winnowed for several reasons: 1) perishability limits chances for recovery; 2) high production value (time investment) limits disposal since items were likely curated—even hastily produced rabbit sticks of the recent past were known to be maintained for 15 or more years; 3) valuable hard wood resulted in common recycling of broken artifacts into other tool forms; and 4) potential ritual significance might mandate specific forms of disposal away from settlements. The net result is that few flat curved sticks might ever survive in the archaeological record for recovery and of this limited number archaeologists or looters have retrieved just a small proportion. The fourth point above actually may have increased recovery chances if disposal included placement in sheltered settings such as caves, which seems to have been a relatively common occurrence in the Southwest.

With this caution in mind, it might be surprising to learn that there are more than 500 flat curved sticks currently in museum collections around the country. This number comes from a thorough museum and literature search that I conducted over two decades, with an actual detailed analysis of most specimens in the past decade. Twenty-three institutions were visited in the course of this research and 20 of these had prehistoric sticks that I analyzed (Table 8.1). Additional institutions were contacted but according to catalog records they lacked the artifacts of interest. The validity of a negative response depends upon how well the specimens are cataloged, supplemented by the institutional knowledge of collection managers, which can be excellent in those places where staff have been in place for decades, such as the Arizona State Museum, but sometimes far less in cases with new staff. The total count of flat curved sticks so far recovered remains unknown, principally because I was unable to visit every institution that may have such artifacts (e.g., the Witte Museum) and because some collections were inaccessible at the time of my study (e.g., the Autry National Center, which I know to have such artifacts from absorption of the Southwest Museum of the American Indian). There is also a problem with vague or inaccurate catalog descriptions and specimens might be overlooked for cases where I was limited to a catalog search rather than a physical search. A records search at the Natural History Museum of Utah failed to reveal any prehistoric item designated as a rabbit stick, throwing stick, or fending stick, but my cabinet by

cabinet inspection eventually turned up a whole S-shaped flat curved specimen, designated simply as “shaped stick.” The same occurred at the Field Museum of Natural History—nothing reported in a records search but then after I had finished my museum visits a colleague who was studying Basketmaker collections there came across a small handle fragment of a typical Basketmaker II grooved curved stick (Laurie Webster, personal communications 2012). There were also a few cases where time restrictions at an institution, coupled with preservation issues, limited the extent or nature of my observations. Most notable in this regard was a burned specimen (MEVE 35838/709) from a Basketmaker III pit structure at the site of Step House (5MV1285) on Mesa Verde. More will be said about this item later since it resembles an ungrooved throwing stick similar to ethnographic rabbit sticks and provides a good indication of quick change in stick form and production expediency for the Four Corners area.

Table 8.1. Count of artifacts analyzed by the author, both prehistoric flat curved sticks and ethnographic rabbit sticks. Examples of ethnographic rabbit sticks occur at most museums and I examined many of these but only those studied in detail are listed here. All prehistoric specimens at these museums were studied in detail.

Institution	Prehistoric	Ethnographic	Total
American Museum of Natural History (AMNH)	16	1	17
Arizona State Museum (ASM)	15		15
Centennial Museum (CM)	10		10
Glen Canyon National Recreation Area (GLCA)	2		2
Lincoln National Forest (LNF)	1		1
Museum of Indian Arts and Culture (MIAC)	5	1	6
Maxwell Museum of Anthropology (MMA)	252		252
Museum of the Big Bend (MBB)	11		11
Mesa Verde National Park (MEVE)	1		1
Museum of Northern Arizona (MNA)	2		2
National Museum of the American Indian (NMAI)	10	5	15
National Museum of Natural History (NMNH)	23		23
Nevada State Museum (NSM)	9		9
Penn Museum (Penn)	3		3
Phoebe Hearst Museum of Anthropology (PAHMA)	1	8	9
Peabody Museum of Archaeology and Ethnology (PMAE)	50		51
San Diego Museum of Man (SDMM)	3	4	7
Texas Archeological Research Laboratory (TARL)	71		71
Natural History Museum of Utah (NHMU)	1		1
Yale Peabody Museum of Natural History (YPM)	6		6
Grand Total	492	19	512

The bottom line is that tracking down all extant examples of flat curved sticks proved an impossible task. What this means in practical terms is that I had to content myself with those artifacts that I could reasonably access with due diligence. Ultimately, I have to work with the data collected from whatever sticks I could analyze, being fully cognizant of sampling problems at all levels as I interpret results.

Analysis Methods

I individually described most flat curved sticks using a form developed over several years of analyzing such artifacts (see Appendix A). This form has places to record basic measurements (length, width, thickness) and weight, including handle dimensions, and observations of condition, wood preservation, breakage and repairs, decoration and other production characteristics, and wear-traces, inclusions, or other damage resulting from use. The form ensured that I made standard observations on each artifact with special attention to evidence that might relate to past use(s). The form included a place for a general overall sketch of the artifact as well as a scale drawing of the stick cross-section. I made a full outline trace to scale of most sticks, sometimes of both faces, in order to document in detail the overall stick form, use-wear traces, and other observations. I used a digital camera to document the artifacts overall along with details of production and use for specific portions. Close-up images were taken for a few artifacts using a macro lens or an adaptor fitted to a binocular microscope. When pressed for time I sometimes analyzed small fragments using a short form that had a limited set of observations. This was especially useful for sticks that were not only broken but also poorly preserved or recycled for some other use and therefore less informative as to primary function. When using the short form, only those stick fragments that exhibited relevant details were traced and photographed.

Wood identification requires fresh cuts to expose transverse, radial and tangential sections or planes (see Hoadley 1990:12–13). Although optimal for distinguishing one wood type from another, such a destructive technique was infeasible, so I attempted to identify general wood types to the extent possible using existing surfaces. In a few rare cases, artifacts already had cut surfaces from prior sampling or fresh breaks and this greatly facilitated identification (Figure 8.2). Usually I had to work with observable surfaces. These often included near radial planes because of how the sticks were



Figure 8.2. Cut transverse section of a flat curved stick handle fragment from the Correo Site (Geib 98, MMA 564.8) revealing the annual growth rings and rays that allow clear identification of the wood as oak, likely *Quercus gambelii*. (Collections of the Maxwell Museum of Anthropology; photo by Phil R. Geib.)

produced from limbs thinned down on two opposing faces to create a rectangular or oval cross-section and sometimes the pith was exposed. The opposing edges of the sticks consist of the unworked sides of the limbs and usually exhibited an unbroken cambium layer for the length of the stick except if the handle end had been worked to create a narrower grip. As a result, I did not have a true tangential plane to look at, but the cambium surface provided clear views of rays, especially for species such as oak that have obvious examples of these cells. True cross-sections occur on the ends of the sticks but were usually obscured by residue, abrasion, or crushing of the wood grain. Some whole sticks with well-finished ends, especially those polished from extensive handling, provided clear transverse views of the wood grain while the same was obtained on some stick fragments, especially those with fresh breaks, even if small in size.

The information recorded on the analysis form was entered into an Access database that also included embedded digital images. As I entered the data I assigned a sequential stick number to each artifact. I use these numbers prefixed by Geib for identification of specific sticks in the descriptions that follow, but also include museum accession numbers prefixed by the institution abbreviation listed in Table 8.1.

Geographic Distribution

The 492 prehistoric flat curved sticks that I analyzed include 471 from almost 60 sites throughout the greater Southwest of North America plus 21 from nine sites of other areas such as the Great Basin, southern California, and Mesoamerica. Table 8.2 presents the number of sticks analyzed by site organized by general region of the Southwest and beyond and by state of Mexico or the United States. There are other sites that have yielded these artifacts but that for one reason or another I was unable to examine. Missed sites were mainly those that occurred in areas already adequately sampled. Some of the site locations are shown in Figure 8.3 but those that could not fit because of space limitations are located with reference to nearby plotted sites as listed in Table 8.2.

Table 8.2. Count of analyzed prehistoric flat curved sticks by region, state, and site.

Region, State and Site	Map #	Count
Four Corners Region		15
Arizona		9
Battle Cave, Canyon del Muerto	12	1
Boomerang Cave, Carrizo Mts	10	1
Cave 6, Marsh Pass	9	1
Cave 9, Prayer Rock	11	1
Pine Tree House, Tsegi Canyon	9	1
White Dog Cave, Kayenta Valley	9	4
Utah		6
Doughnut Alcove, lower Glen Canyon	4	2
GG-C5-1, Cedar Mesa	8	1
Cave, Grand Gulch	8	1
Cave 2, Moqui Canyon	6	1
Shelter, Natural Bridges	7	1
Virgin Region		11
Arizona		7
Heaton Cave, Mt Trumbull	3	7
Utah		1
Cave, upper Kanab Canyon	4	1
Nevada		3
Black Dog Cave, Moapa Valley	2	2
Salt Cave, lower Moapa Valley	1	1
Mogollon Highlands		12
Arizona		6
McEuen Cave, Gila Mts.	32	6
New Mexico		6
Cliff House, Saddle Mountain	31	1
Deer Creek Cave	31	1
Doolittle Ranch Cave	31	3
unnamed cave	31	1
Upper Rio Grande Region		243
New Mexico		242
Correo Shrine (<i>Wahaniak Shukuk Shtuitauwa</i>)	13	234
Isleta Cave 1 (?)	15	1
Isleta Cave 2	15	7
Lemitar Cave	15	1

Table 8.2. cont.

Region, State and Site	Map #	Count
Chihuahuan Desert Region		184
New Mexico		23
Cave 10, Hueco	21	1
Cave near Carlsbad	21	1
Cave near Lava	16	1
Chavez Cave	19	7
Craven Cave	17	2
Dark Canyon Cave	21	1
Fresnal Shelter	18	1
Goat Cave	21	1
Hermit's Cave (LA 4992)	21	2
Shattuck Cave	21	2
U-Bar Cave (LA5689)	30	2
Warren Cave	16	2
Texas		140
Unknown sites		3
41VV214	24	1
Babb Cave	24	1
Bat Cave 3 (poss Bear Creek 3)	24	1
Bee Cave Canyon (41BS8)	25	4
Caldwell Cave 1 (41CU1)	22	5
Caldwell Cave 2 (41CU2)	22	13
Cartledge Cave	25	3
Ceremonial Cave	20	51
Ceremonial Cave?	20	14
Eagle Mts. Cave	23	4
Fate Bell Shelter (41VV74)	24	4
Goat Cave	24	2
Horseshoe Cave (Martin Kelly, 41VV171)	24	3
Marfa 2:10	24	1
McAlpine Cave (41CU6)	22	4
Moorehead Cave	24	3
Perry Calk Site (41VV87)	24	1
Shelby Brooks Cave (41CU7)	22	26
Shumla Caves	24	1
Shumla Caves (?)	24	2
Sunny Glen	23	1
Yarbro Cave	23	1
Coahuila		4
Fat Burro Cave (CM24)	26	2
Frightful Cave (CM68)	26	2
Chihuahua		7
Sierra del Pajarito	29	2
Unknown sites	29	5
Unknown State		1
Unknown site		1

Table 8.2. cont.

Region, State and Site	Map #	Count
Sonoran Desert Region		3
Arizona		3
Ventana Cave, AZ Z:12:5	34	3
Southwest Region Unspecified		3
Unknown States		3
Unknown sites		3
Great Basin		10
Nevada		10
Fish Cave		8
Lovelock Cave		2
California Coast		5
California		4
Cave near Coyote Wells		1
Site 2		1
Unknown shelter		1
Walker Canyon Cave		1
Baja California Norte		1
Unknown cave		1
Southern Plains		3
Texas		3
Milam Peat Bog (Gause Peat Bog)		3
Mesoamerica		3
Yucatán		3
Chichén Itzá		3
Grand Total		492

An exact count of Southwestern sites that have yielded flat curved sticks is impossible because some of the sticks were recovered by amateurs and the housing institutions have vague or no records concerning item provenience. The bulk of the artifacts are from the traditional Southwest cultural area—from northern Mexico (southern Coahuila) to southern Utah and from far eastern Nevada to central New Mexico and western Texas. The notable exceptions include three flat grooved sticks recovered from a peat bog in the central eastern part of Texas (Chelf 1946) and portions of three grooved curved sticks unceremoniously dredged from Sacred Cenote at Chichén Itzá by Edward H. Thompson (Chapter 6; Coggins and Shane 1984). At least one additional site on the southern plains known as Kenton Cave also yielded a single fragment of a flat curved stick (Lintz and Zabawa 1984), but I was unable to study this specimen.

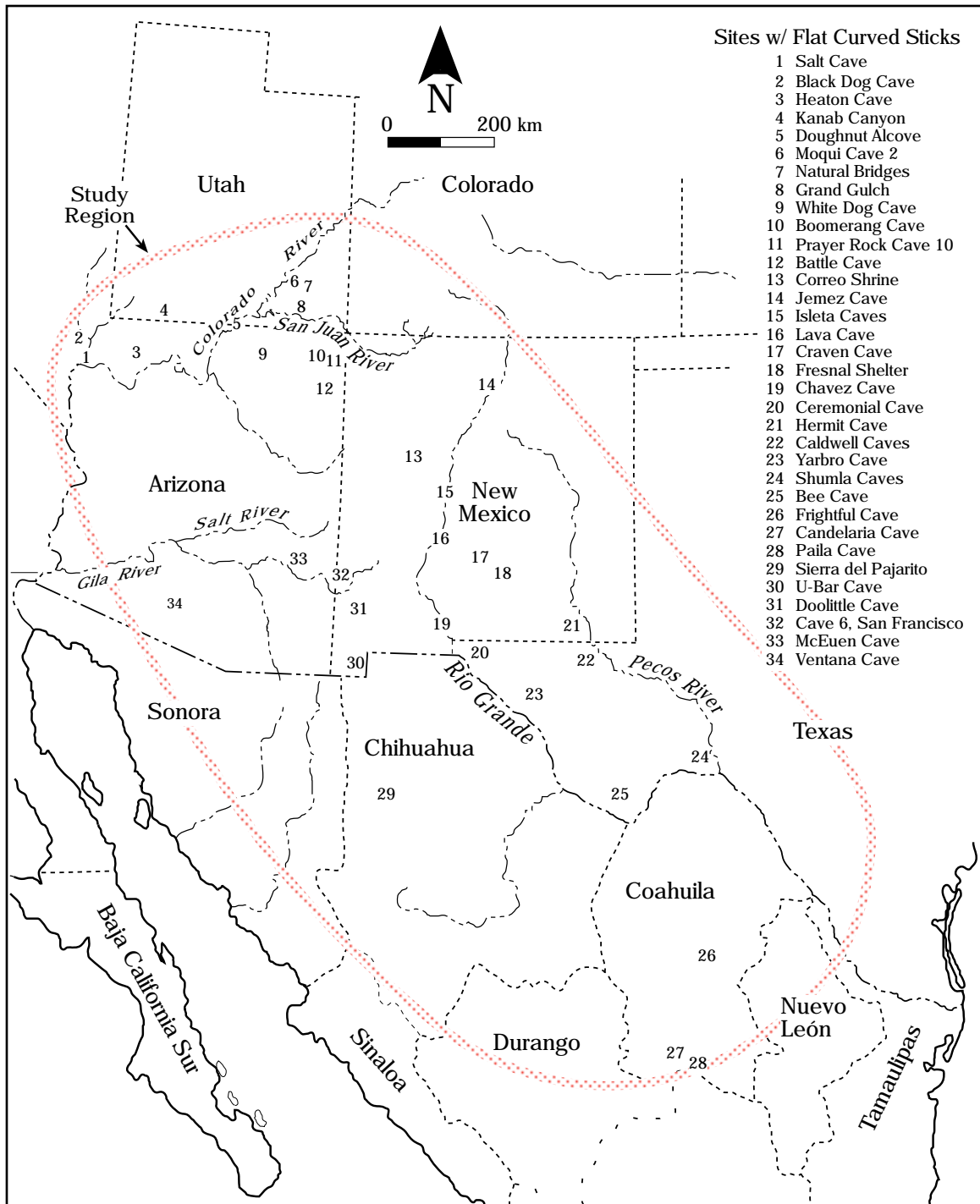


Figure 8.3. Map of the North American Southwest showing some of the sites that have yielded flat curved sticks. Site numbering starts in the far NW (lowland Virgin area) and proceeds eastward to the Four Corners then southward along the Rio Grande down into Coahuila, Mexico before turning back northward and ending in southern Arizona.

There are as well some specimens from far western Nevada that are quite old—Fish Cave (Tuohy 2002) and Lovelock Cave (Loud and Harrington 1929)—and several from southern California extending into Baja that are relatively recent.^x

The spatial pattern of where flat curved sticks occur is to a large extent a result of where bedrock geology is conducive to the formation of dry shelters. On the Colorado Plateau across northern Arizona and southern Utah, numerous alcoves and caves occur within sandstone, while in far western Texas and adjoining areas of New Mexico and Mexico dissolution of limestone and dolomite formations has resulted in karst topography with numerous sink holes, shelters and caves. Because of excellent preservation of organic remains in numerous shelters, both areas have provided large samples of flat curved sticks. In contrast, the bedrock geology of the southern Basin and Range of Arizona is poorly suited to shelter formation and few protected sites are known from the area. Nonetheless, given that the one shelter of significant size excavated in this region—Ventana Cave (Haury 1975)—yielded flat curved sticks, it is probable that this artifact type was equally important in this area, just that suitable preservation contexts are too few to reveal this fact.

The distribution of flat curved sticks embraces vast ecological diversity; in just the Southwest this includes the arid Chihuahuan and Mohave Deserts to the comparative lushness of the Mogollon Highlands and the Colorado Plateau. Whatever function these artifacts served must have been important in all of the diverse environments. Since various species of Leporids (rabbits and hares) occur across this entire area, use as a throwing stick would be consistent in this regard. Yet, other simple correlations could no doubt be found and regardless of these it is the use-wear on sticks that is critical for inferring function. The area with flat curved sticks also encompasses vast cultural and linguistic diversity of Native Americans during the historic period (e.g., Ortiz 1979, 1983; d’Azevedo 1986), diversity that likely has considerable time depth although certainly with different particulars as to cultural and linguistic entities and with different spatial configurations.

The count of flat curved sticks at any single site ranges from solitary examples to a high of 234. The latter is a true outlier, an exceptional site designated as the Correo Snake Pit by a University of New Mexico field school that excavated there in 1949

(Sandberg 1950). The Correo Site was and still is one of the most important shrines for the Laguna Tribe of New Mexico in whose language it is known as *Wahaniak Shukuk Shtuitauwa* (Parsons 1918:381). Parsons reports that medicine men and war captains were the principal users of the shrine but other men might use it as well, including those from the more distant villages of Acoma and Zuni. Many of the 234 specimens of flat curved sticks from the Correo shrine are just fragments, portions of once whole artifacts that have fallen apart from weathering. Based on my detailed analysis I estimate that the fragments come from a minimum of 180 sticks deposited there and this from just partial excavation of the site.

Another site with a large number of flat curved sticks and an obvious special depositional context is Ceremonial Cave, located in the Hueco Mountains of far western Texas (Cosgrove 1947; see review by Creel 1997 and summary information at <http://www.texasbeyondhistory.net/ceremonial/index.html>). There are a minimum of 51 flat curved sticks from Ceremonial Cave with perhaps another 14 that could be from there but poor catalog records limit certainty. Wood preservation at Ceremonial Cave was even better than at the Correo shrine and many of the sticks are whole or large portions. Although the site is easily entered (a direct walk in) and would seem to provide an ideal living shelter, many of the different types of remains recovered are exceptional and not worn out, which is consistent with shrine offerings. Yet the site also contains broken and heavily used materials as well as abundant feces; thus the site also likely served as a residential location, perhaps early in its use history. Unraveling this will require many direct dates on recovered remains since any stratification at the site was destroyed long ago and no remains were recovered by natural layers.

Seemingly related to ritual use of Ceremonial Cave is the finding of miniature versions of flat curved sticks, the only site in the sample that yielded such items. There are five in museum collections, with four of these recovered by C.B. Cosgrove (1947:130, Figure 72, e-g). Four whole specimens are shown in Figure 8.4; the fifth specimen consists of a small handle fragment. Like their larger counterparts the miniature sticks mostly have incised longitudinal lines although one lacks them and another has a rather elaborate decoration of paralleling zigzag lines running lengthwise that are further embellished on one face by short angled hachure marks that have the



Figure 8.4. Miniature flat curved sticks from Ceremonial Cave: (a) Geib 323, PMAE 96727b; (b) Geib 322, PMAE 96727a; (c) Geib 316, PMAE 96728; (d) Geib 299, TARL GP-46812. The top three specimens were coated by Cosgrove to make the designs more visible. (Collections of the Peabody Museum of American Archaeology and Ethnology [a-c] and Texas Archeological Research Laboratory [d]; photos by Phil R. Geib.)

effect of creating a fringe along the zig-zag (Figure 8.4a). Cosgrove filled the incised lines of one face with white paint so that they would clearly show in his photos and this pigment still lingers. One of the miniature sticks is S-shaped but the other whole specimens are single-bend and the handle fragment also might be this but it is too small to be certain. Cosgrove thought that these items “must necessarily be classed either as toys, or, more likely, as cult objects” (1947:130) with the latter interpretation more in line with the large amount of other ritual-like paraphernalia from the site. The unusual aspect is that two of these miniatures exhibit traces of use consistent with having been thrown like rabbit sticks, which would seem to support the toy interpretation. Cosgrove identifies the wood for the four specimens that he recovered as oak, but I could not verify this and given that some of the large sticks from the site that he also considered oak are probably ash (cf. *Fraxinus velutina*), he may well be wrong in his wood identification.

Although the Four Corners area of the Colorado Plateau is where flat curved sticks were initially found and first reported, becoming one of the diagnostic Basketmaker II traits, this artifact type is actually quite rare in that area. This is especially true considering the abundance of caves and shelters in the Four Corners and the large amount of excavation that has occurred at those dry settings. Indeed, there are probably more depictions of flat curved sticks in rock art within the Four Corners than actual physical specimens of the artifact. This stands in marked contrast to the Chihuahuan Desert extending upstream along the Rio Grande where several hundred whole and fragmentary flat curved sticks are known. Based simply on frequency of occurrence, the Chihuahuan Desert appears like a primary origin area for this artifact type, perhaps one with a long history of use, whereas the Four Corners area seems like a secondary area, perhaps with a shorter history of use. The relative rarity of flat curved sticks in the Four Corners area compared to the Chihuahuan Desert might also result from differences in how sticks entered the archaeological record (means of disposal). One way to explore this issue is by considering stick condition.

Stick Condition

The condition of flat curved sticks varies by region (Table 8.3), largely on account of probable differences in *how* these artifacts entered the archaeological record. For example, 10 of the 15 specimens from the Four Corners region of the Colorado

Plateau are whole (67%) whereas this is true for just 30 of 181 specimens from the Chihuahuan Desert (17%). This contrast would be even more dramatic if not for post-depositional fragmentation of what were evidently whole sticks originally, such as many examples from the upper Rio Grande area, the vast majority of which originated from the Correo shrine (Sandberg 1950). This is also true for sticks collected by Guernsey and Kidder from White Dog Cave and related sites of the Marsh Pass area in NE Arizona. All of the sticks that they found were evidently whole when originally deposited since all were with burials, but dry rot or burning reduced some to portions.

Table 8.3. Condition of prehistoric flat curved sticks organized by general region of recovery. The incidence of evident recycling or reuse of sticks is also noted, something that was quite common for sites of the Chihuahuan Desert.

Region	Fragment	Nearly whole	Whole	Total	%	Recycled	%	R%
Southwest, nsf	2	0	1	3	0.6	1	1.1	33.3
Four Corners	4	1	10	15	3.0	0	0.0	0.0
Upland Virgin	3	1	4	8	1.6	1	1.1	12.5
Lowland Virgin	1	0	2	3	0.6	0	0.0	0.0
Mogollon Highlands	11	0	1	12	2.4	4	4.4	33.3
Upper Rio Grande	218	11	14	243	49.4	9	9.9	3.7
Sonoran Desert	3	0	1	4	0.8	2	2.2	50.0
Chihuahuan Desert	148	4	32	184	37.4	73	80.2	39.7
Great Basin	8	2	0	10	2.0	0	0.0	0.0
California Coast	1	2	1	4	0.8	0	0.0	0.0
Southern Plains	2	0	1	3	0.6	1	1.1	33.3
Mesoamerica	2	1	0	3	0.6	0	0.0	0.0
Total	403	22	67*	492	100.0	91	100.0	18.5
%	81.9	4.5	13.6	100.0		18.5		

* Seven of these are refit as whole items, most with recovery or post-depositional breaks, but a few with prehistoric breaks, some that are purposeful looking.

From the numerous excavations of Basketmaker II shelters on the Colorado Plateau that have occurred over the past 120 years, fragments of flat curved sticks are exceedingly rare finds, almost nonexistent. From the extensive looting of shelters and caves in the Southwest during the late 1800s and early 1900s by the likes of the Wetherill brothers, Graham and McLoyd, Charles Lang, and Bernheimer's expeditions, I am aware of just a single handle fragment that was recovered. Yet these men retrieved at least seven whole specimens. From personal experience of having excavated and screened deposits at Old Man Cave and Atlatl Rock Cave, which were rich with Basketmaker II artifacts, I can attest to the lack of flat curved stick fragments. J. Richard Ambler's

complete excavation and screening of the deposits from Sand Dune and Dust Devil Caves likewise turned up no flat curved sticks. The same can be said of the screening of extensive looter backdirt and some undisturbed deposits at various sites along Comb Ridge by Francis Smiley and Mick Robins (personal communication, 2012). Smiley's excavations at Three Fir Shelter on northern Black Mesa likewise did not recover any fragments of flat curved sticks but numerous other Basketmaker II perishables were recovered (Francis Smiley, personal communication 2013). Based on all the evidence, it is abundantly clear that Basketmaker II populations living in the Four Corners region disposed of flat curved sticks in a specialized manner. The sticks occur as whole items in graves or caches and seldom were they recycled for other uses.

The general lack of fragmentary specimens on the Colorado Plateau stands in marked contrast to shelters of the Trans-Pecos region westward into southern New Mexico and Arizona, basically those shelters of the southern deserts of the Southwest. At sites of this area, except for the notable exception of Ceremonial Cave, whole flat curved sticks are less frequently found than fragments, and indeed many sites only yielded fragments, often very small portions. Not only are the sticks regularly represented by fragments but in many cases these portions show unmistakable traces of recycling or reuse. Some of the fragments were purposefully removed and discarded as waste while the other stick part was probably recycled; often as not these scraps were small handle ends.

Figure 8.5 shows examples of repurposed stick portions from Ceremonial Cave and one from Shumla Cave. Included are four stick portions reused as dart shaft wrenches, evidently a common occurrence. One example like this from Hermit's Cave in the Guadalupe Mountains (see Ferdon 1946:Plate XIj) is dated 5470-5210 cal. BC (see Chapter 10); reuse of this stick may have happened hundreds or even thousands of years later but no doubt the original producers also repurposed them. The upper series of four items in Figure 8.5 are distal ends, two of which were detached and discarded as waste—they exhibit traces of where the original artifact had been hacked circumferentially with a stone chopper or adz to create a breaking point. Two of these have carbonized ends and might have been used as fire pokers, something that was commonly seen with stick fragments from the Chihuahuan Desert.



Figure 8.5. Flat curved stick fragments common at sites of the Chihuahuan Desert that exhibit recycling and reuse: (a) distal ends from Ceremonial Cave (Geib 337 thru 340, PMAE 96710a-d), the central two have been hacked and snapped, the other two are charred; (b) stick portions (3 midsections and 1 distal end) from Ceremonial Cave used as dart wrenches (Geib 343, 342, 341 & 344, PMAE 96703c, b, a, & d); (c) a proximal portion from Shumla Cave that was used after the distal end snapped off at a knot (Geib 31, MMB 1702A). (Collections of the Peabody Museum of American Archaeology and Ethnology [a & b] and the Museum of the Big Bend [c]; photos by Phil R. Geib.)

There are a few instances where a large proximal portion of a flat curved stick evidently continued to function after the distal end broke off or was purposefully removed. The bottom specimen of Figure 8.5c shows an example; that this stick was originally longer is indicated by how the grooves run off the hacked end (an abrupt termination to the grooves rather than a gradual taper). The distal ends in cases like this might have broken off accidentally from use or been removed because of a distal crack, something seen frequently enough with whole specimens. Shrinkage cracks from drying a cut stave commonly occur down the pith and provide an inherent weak point for the propagation of longitudinal splits. Knots where lateral stems grew are another critical weak point and the distal end of the stick in Figure 8.5c snapped at such a location. In many cases the recycled large portions like 8.5c exhibit embedded cactus spines or rocks consistent with having been deployed as rabbit sticks. Such small throwing sticks are easily explained as those used by children.

Item completeness is also important because it influences the amount of information relevant to an evaluation of primary stick function that can be gleaned from each artifact. This is especially true for recycled fragments since the observable use-wear or residues might pertain to secondary use and not the primary form. For example, a large stick fragment from Craven Cave in south-central New Mexico (Figure 8.6) had been recycled as a food stirring stick: one end is coated with a gruel-like residue that includes insect parts (Figure 8.6c) and farther up on the stick there are numerous carnivore teeth marks, perhaps from chewing by a domestic dog (Figure 8.6b). Obviously attributing any use-wear on this stick to the initial function of the artifact is highly suspect. This is not always the case and it depends upon the depositional context. While some small fragments contained far fewer descriptive data overall, some were still quite informative as to original function. Proximal and distal portions of sticks contained the most information, about both stick morphology and function. Based on use of replicated rabbit sticks and examination of ethnographic specimens, it is evident that both ends become damaged in various ways from impact, hence these portions can be quite revealing. Moreover, variability in the specific techniques of grip preparation and, to a lesser extent, end shape, might be culturally or temporally diagnostic.



Figure 8.6. Distal fragment of a flat curved stick from Craven Cave (Geib 444, MMA 64.54.21) that had been repurposed as a cooking utensil to stir food; stick exhibits carnivore chew marks (b) along its length, especially in the middle part and one end is coated with food residue (c) that includes insect parts. (Collections of the Maxwell Museum of Anthropology; photos by Phil R. Geib).

The Southwest Sample

This part of the chapter provides a detailed description of flat curved sticks from the Southwest excluding those from other regions. There are 471 examples in my database from the Southwest, but five of these are miniatures and are also excluded from this presentation since they have such different dimensions and doubtless had a different functional role. The flat curved sticks from areas outside the Southwest that I studied for comparative purposes will be mentioned as needed or as contrasts. The specimens from Chichén Itzá were previously discussed in Chapter 6 since these are the only known examples from Mesoamerica where this artifact type is portrayed as an accompaniment of warriors with atlatls and darts.

Wood Selection

As I discussed in the methods section, wood identification was complicated by an inability to make fresh cuts. I had to base my identifications (Table 8.4) on any portions that were sufficiently visible, and quite a few sticks suffered from post-depositional staining, weathering, or rot. There were also several cases where surfaces were not obscured but the wood remained unknown because it did not match any of my comparative samples; invariably these were sticks from the southern deserts.

Table 8.4. Wood identification of prehistoric flat curved sticks from the Southwest; adjusted percent excludes the unidentified or unknown specimens.

Wood ID	Count	%	Adj. %
Oak	302	64.8	84.6
Oak?	19	4.1	5.3
Ash	31	6.7	8.7
Box Elder	1	0.2	0.3
Box Elder?	1	0.2	0.3
Willow/Cottonwood	3	0.6	0.8
Unknown/Unidentified	109	23.4	--

Oak was clearly the preferred species for flat curved sticks throughout the Southwest (Table 8.5). On the Colorado Plateau this means Gambel oak (*Quercus gambelii*) but in the southern deserts there are various other oak species available for use. Oak is a hard and dense wood generally, but Gambel oak is quite dense and heavy, with tight rings, likely because of slow growth under the drought conditions common to the

Southwest. Because the species commonly spreads from root sprouts that grow from lignotubers, they often create dense shrubby thickets that make for small-diameter trunks ideally suited to making this artifact class. Small diameters make for moderately easy detachment of the stick blank (with a crude hand chopper I was able to cut through oak stems 4.5 cm in diameter in less than ½ hour) and allow for the efficient creation of the flattened cross-section by working in opposing faces rather than having to split a timber in half lengthwise. Shrubby habit also helps limit major branching, which is useful since the knots created by lateral growth become inherent weak points in the finished artifacts at which fractures initiate. In nearly all cases where the reason for post-production breakage of a prehistoric artifact could be identified, the source of failure occurred at a knot, especially those along artifact edges.

Table 8.5. Wood identification of prehistoric flat curved sticks by Southwest region.

Wood ID	Four Corners	Virgin	Mogollon Highlands	Up Rio Grande	Chihua. Desert	Sonoran Desert	SW	Total
Oak	15	8	4	228	47	0	0	302
Oak?	0	0	1	9	9	0	0	19
Ash	0	0	1	1	28	0	1	31
Box Elder	0	0	1	0	0	0	0	1
Box Elder?	0	0	0	0	1	0	0	1
Willow/Cott	0	0	1	0	1	0	1	3
Unk/Unid	0	3	4	5	93	3	1	109
Total	15	11	12	243	179	3	3	466

Unlike on the Colorado Plateau, the flat curved sticks from the southern deserts are of diverse trees and shrubs. Oak was still used but many artifacts were clearly of other wood including many that I could not identify. More than half of the flat curved sticks from the Chihuahuan Desert were of unknown wood. Identified woods include probable ash (*Fraxinus* sp.), boxelder (*Acer negundo*), and willow or cottonwood (Salicaceae); walnut (*Juglans major*) seemed possible for a few specimens but I lacked comparative samples. I had comparative samples for mesquite and locust but did not identify any sticks that matched these genera. A moderate number of the long crescent-shaped sticks from Ceremonial Cave and other sites of the Chihuahuan Desert region were made of a hard wood that I identified as ash since it closely matched a sample of velvet ash (*Fraxinus velutina*) from east of Tucson, Arizona. All of these sticks have dense wood but very wide, hence few, growth rings.

Stick Shape

Ethnographic rabbit sticks, like traditional non-return boomerangs of Australia, have but a single-bend, which might be sharply angled or a continuous arc. Numerous prehistoric flat curved sticks from the Southwest are also like this, although with few sharply angled specimens since most single-bend sticks have a gentle continuous arc. But there are also many examples that have a double-bend and are commonly designated as S-shaped or recurved. The ability to distinguish between these two basic stick forms, whether single-bend or S-shaped, depends largely on item completeness. Stick shape is obvious for entire sticks that have not been recycled or warped. Classification of fragments is where misidentification can occur, especially for small portions. In some cases small midsections can be classified as S-shaped because both sides of inflection are discernible. Also, some small portions might have such pronounced bends that an S-shaped form is also highly probable as long as post-depositional weathering is not to blame. Proximal or distal fragments representing half or more of the original artifact can also often be accurately classified as either S-shaped or single-bend. Rather than hazard a guess, I designated portions lacking any indication of finished stick form as unknown. I listed those portions that seemed complete enough to make a tentative designation with a “?” following the stick form.

Table 8.6 presents the count of basic stick form according to regions of the Southwest; as with other data tables for this part of the chapter, miniature sticks are excluded. Just under 40 percent of the sticks could not be classified as to basic stick form because of fragmentation and poor condition. If we exclude these from consideration and look at adjusted percent, then almost 30 percent of the Southwest sample are single-bend with another 42 percent that are probably single-bend. Thus, the stick form that is the only ethnographic type was also most frequently represented in prehistory. Still, 10 percent of the sticks are S-shaped and another 18 percent are probably of this recurved form. This form is predominant in the Basketmaker II area of the Colorado Plateau and indeed it is the only form documented from Basketmaker II contexts. S-shaped sticks occur in the southern deserts of the Southwest but they are comparatively rare, with definite single-bend sticks outnumbering definite S-shaped sticks 8.6:1 in the Chihuahuan Desert.

Table 8.6. Basic form of prehistoric flat curved sticks by Southwest region.

Region	Unknown	Single-bend?	Single-bend	S-shaped?	S-shaped	Total
4 Corners	0		3	1	11	15
Virgin	2	1	2	0	6	11
Mogollon Highlands	4	4	2	1	1	12
Upper Rio Grande	106	37	58	16	26	243
Chihuahuan Desert	71	39	52	11	6	179
Sonoran Desert	1	2	0	0	0	3
Southwest	1	0	1	0	1	3
Total	185	83	118	29	51	466
Percent	39.7	17.8	25.3	6.2	10.9	100.0
Adjusted Percent	--	42.0	29.5	18.1	10.3	100.0

Bending to Shape

One of the great aspects of wood is that it can be bent to a desired shape, a technique that people have used around the world for millennia to create curved forms and also to straighten items such as dart shafts (e.g., Navi and Sandberg 2012:17-54). Some wood can be bent to shape when it is green as long as the curvature is not too great, as with some of the single-bend sticks from the Southwest, but the more common and useful means of achieving a bend is by application of heat, by increasing moisture (soaking), or both. This serves to “soften” the wood and make it more pliable (see Navi and Sandberg [2012] for a review of the process in theory and practice). Wood that is heated and bent to shape and then allowed to cool will hold its form. Either dry heat, such as from hot coals, or wet heat (steam) can be used and the wood can also be either dry or green/soaked, with the latter usually providing superior results.

Ethnographic rabbit sticks were bent to shape by using a fire to heat staves that had been either freshly cut or cut and dried, usually with the bark still on as a protective cover. Bending a freshly cut stave is easier since the limb already has high moisture content and a combination of both heat and moisture helps soften the wood sufficiently to allow bending. Use of rather direct heat by Hopi producers is indicated by the light browning of the wood surface in the area of the bends that I observed on the many of the ethnographic specimens. Because ethnographic rabbit sticks had only a single-bend this was more easily achieved than the double-bend of some prehistoric specimens. Hopi rabbit sticks tend to have a rather sharply angled bend in the middle such that just a very limited area needed to be heated. Some of the prehistoric specimens are slightly this way

but most tend to have more gentle broad arcs and therefore would have required heating across a much longer area of the stick, likely achieved by heating and bending sections in sequence. Evidence for bending of ethnographic rabbit sticks and prehistoric flat curved sticks consists of heat discoloration of the wood, crumpled wood grain on the inside of the bend, and stretched wood grain on the outside of the bend.

Heat bending was probably commonly done to create the proper shape for many of the prehistoric flat curved sticks of the Southwest. There is no doubt of purposeful bending for most if not all of the S-shaped sticks, since nature rarely produces a stem of this form, at least not like those of the archaeological specimens. It is possible that some of the single-bend sticks that have rather gentle arcs might have been selected this way directly from nature, but in many cases where a determination was possible, purposeful bending was evident. There were a few prehistoric S-shaped sticks that exhibited lightly browned wood (heat discolored) at the bends, but in general this was not the case or could not be determined because of the post-depositional staining or decay. It is possible that heating was done more indirectly than appears to have happened for some Hopi rabbit sticks, such as heating a limb portion covered by a thin berm of sand.

It might seem more efficient to bend the wood after working it into near finished form since there is less wood to heat and force into shape, but it is doubtful that this was done. Doing so means that there is no protective covering of the wood surface and this risks direct carbonization and consequent weakness of the stick at this location. It is best to heat wood for bending purposes with the bark left on. Also, once a stick has been thinned on opposing sides it is very difficult to prevent the stick from twisting—the softened wood will naturally want to give way where there is less resistance, the faces where wood has been removed, but the bends need to occur where the wood is thickest, the edges that have not been modified. Bending a round stave means that there are no obvious places of less resistance and what minor ones there are from knots or other imperfections can be compensated for during the bending process or afterward when removing wood from the faces to thin a stick.

As mentioned, Chuck LaRue of Flagstaff Arizona has experimented extensively with duplicating S-shaped sticks; indeed, he has attempted to directly match the bends of given archaeological specimens such as those from Moqui Canyon Cave 2, White Dog

Cave, and Doughnut Alcove (the latter has pronounced bends). He has been very successful in this, especially when working with freshly cut staves and when the fire and all the necessary gear such as support blocks, stakes, and straps are ready at hand. He has also learned that it is far easier to exert the force necessary for bending using a stick that is much longer than needed for the final product. An example of this is shown in Figure 8.7 with a finished replication of the S-shaped flat curved stick from Cave 2 of Moqui Canyon, Utah resting on top of an oak stave that has been heat-bent into the appropriate configuration. When making this stick roughly 2/3 of the cut limb was removed, with just the central part retained, yet having this much excess was important to ensure sufficient leverage during heat bending. Whether prehistoric producers “wasted” this much wood as well is impossible to say but since it was no easier back then to bend wood to shape, this seems probable. Since single-bend sticks can be formed with less leverage, there would be no need for staves much longer than the final finished length of the artifacts.

LaRue (personal communication, 2102) learned the importance of sufficiently heating the wood in a slow and sustained way, making sure not to char it and to work gradually in the bending process. If a stave is heated directly in a bed of coals then it is also critical to keep the bark wet in the process. Once hissing steam emits from the ends, the log is sufficiently heated to be bent, something that takes about 10 to 20 minutes depending on log diameter and heat intensity of fire/coals. Sticks with a simple curve can be bent to shape in a single, if slow effort of continuous exertion, then staked or weighted with stones and left to cool and dry. With S-shaped sticks you need to achieve the opposing bends in stages, bending first one part of the stick and then the other, and then perhaps going back to the first in a continuous process of slowly getting the desired arc for both bends. Having a form to bend the stick around is important and this easily could have been done prehistorically using trees, indeed at the very grove where the artifact blank was cut. After bending it is critical to allow sufficient time for cooling and drying so that the stick will hold its form. Some degree of rebound might occur and this is also evident for sticks impacted by post-depositional weathering.

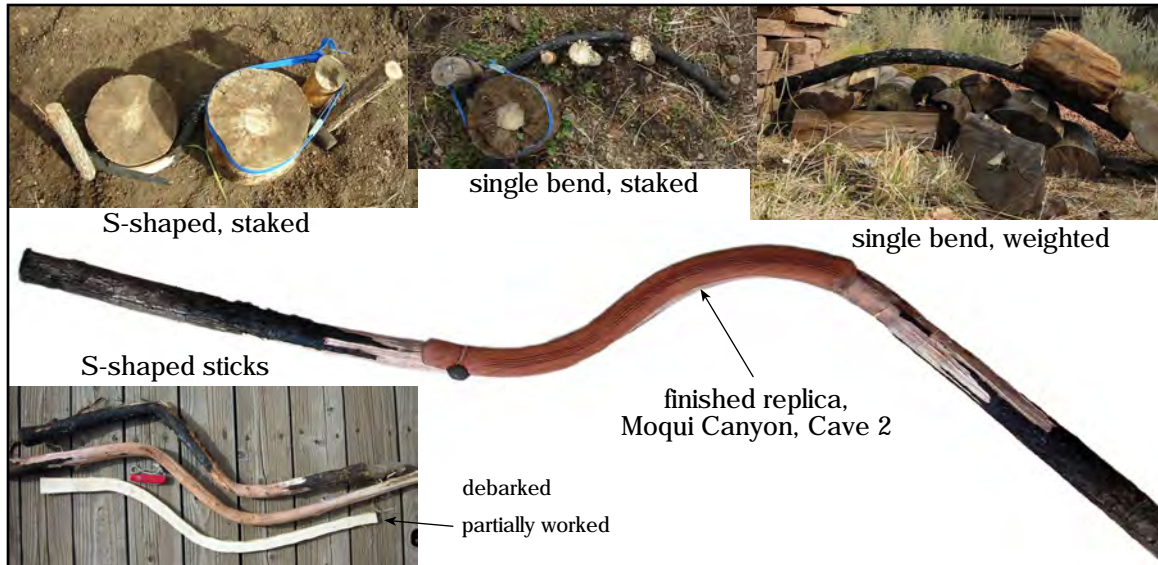


Figure 8.7. Examples of bending heated oak staves to the appropriate form, both S-shaped and single bend, using logs and stakes as forms and rocks and stakes to secure the ends while letting the sticks cool and dry. The sawed log forms shown here could have been growing trees and these would have provided more secure (less movable) support. Also shown is a finished replica of the Moqui Canyon S-shaped flat curved stick superimposed on an oak stave heat-bent to the appropriate conformation (photos by Chuck LaRue).

Stick Dimensions

Table 8.7 presents summary data for basic measurements of the prehistoric flat curved sticks from the Southwest according to the two basic stick forms as well as the sticks overall. Length and weight are given for whole sticks only; consequently there are no unknown or suspected stick forms for these variables. There are a few occurrences of missing length or weight data for sticks, where this information could not be obtained because of museum display. The proximal measurements for width and thickness exclude the grip portion, as they were taken immediately above this feature; in many cases grip width and thickness was the same or similar as proximal width and thickness. The widest and thickest portions of many sticks are often 6-10 cm from the distal end since there is frequently a taper in both dimensions toward the very end of the stick, especially for thickness. Indicative of this is that average medial thickness is greater than average distal thickness; average medial width is less than for average distal width but there were at least 27 cases where distal width was less than medial width. Single-bend sticks are on average wider and thicker than S-shaped sticks, although the ranges almost totally overlap and both types of sticks can be quite narrow and thin, far more so than ethnographic rabbit sticks, at least for width. The weight of prehistoric sticks is notably less than ethnographic rabbit sticks and Callahan's optimal specification for non-return boomerangs (see Tables 7.3 and 7.4).

Stick Production

Flat curved sticks of the Southwest invariably have a somewhat flattened cross-section that is oval to subrectangular (Figure 8.8). They do not have an airfoil section on alternating edges as do returning boomerangs to generate lift and thus lack a true "flight" capacity. As such, although some reports and museum entries list flat curved sticks as boomerangs it seems best to avoid the potential confusion that could result from such a label. Adding the qualifier "non-return" or non-returning" to boomerang helps prevent confusion but this term also has clear functional implications by definition.

Table 8.7. Average, standard deviation, and range for width and thickness measurements of proximal, medial and distal portions of prehistoric flat curved sticks of different form.

Stick Dimensions	Variable	Unknown	Single-bend?	Single-bend	S-shaped?	S-shaped	Overall
Proximal Width (cm)	Average	2.73	2.94	2.95	2.81	2.69	2.85
	Std Dev	0.53	0.56	0.61	0.38	0.34	0.54
	Range	1.8-4.0	2.1-4.0	2-5.3	2.1-3.4	2.1-3.3	1.8-5.3
	n	38	18	73	13	25	167
Proximal Thickness (cm)	Average	1.24	1.31	1.39	1.31	1.27	1.33
	Std Dev	0.17	0.19	0.17	0.14	0.16	0.18
	Range	1.0-1.6	1.0-1.6	1.0-1.7	1.1-1.6	1.0-1.6	1.0-1.7
	n	39	18	76	11	25	169
Medial Width	Average	3.33	3.40	3.23	2.83	2.91	3.22
	Std Dev	0.80	0.78	0.65	0.49	0.51	0.71
	Range	1.8-5.4	2.2-5.6	2.0-6.2	2.3-4.0	1.8-3.9	1.8-6.2
	n	65	53	109	14	42	283
Medial Thickness	Average	1.33	1.43	1.50	1.29	1.31	1.41
	Std Dev	0.22	0.18	0.18	0.14	0.18	0.20
	Range	0.9-2.0	1.0-1.8	0.9-1.9	1.0-1.6	1.0-1.8	0.9-2.0
	n	64	53	111	16	43	287
Distal Width	Average	3.47	3.47	3.39	3.13	3.29	3.39
	Std Dev	0.79	0.63	0.64	0.42	0.77	0.69
	Range	1.9-5.6	2.2-4.4	2.1-5.0	2.5-3.8	2.2-5.1	1.9-5.6
	n	185	83	118	29	50	465
Distal Thickness	Average	1.32	1.34	1.34	1.11	1.20	1.30
	Std Dev	0.23	0.26	0.24	0.19	0.19	0.24
	Range	0.8-1.8	0.9-1.7	0.7-1.8	0.9-1.5	0.9-1.7	0.8-1.9
	n	52	38	82	10	36	218
Chord Length	Average	-	-	68.5	-	60.1	66.3
	Std Dev	-	-	16.1	-	7.8	14.8
	Range	-	-	33.2-95.3	-	51.3-80	33.2-95.3
	n	-	-	44	-	16	60
Bend Length	Average	-	-	70.1	-	62.8	68.1
	Std Dev	-	-	16.1	-	9.1	-
	Range	-	-	33.2-97.0	-	51.7-82.8	33.2-97.0
	n	-	-	44	-	16	60
Weight	Average	-	-	211.3	-	171.8	201.4
	Std Dev	-	-	49.7	-	29.5	48.4
	Range	-	-	113-330	-	115-220	113-330
	n	-	-	45	-	15	60

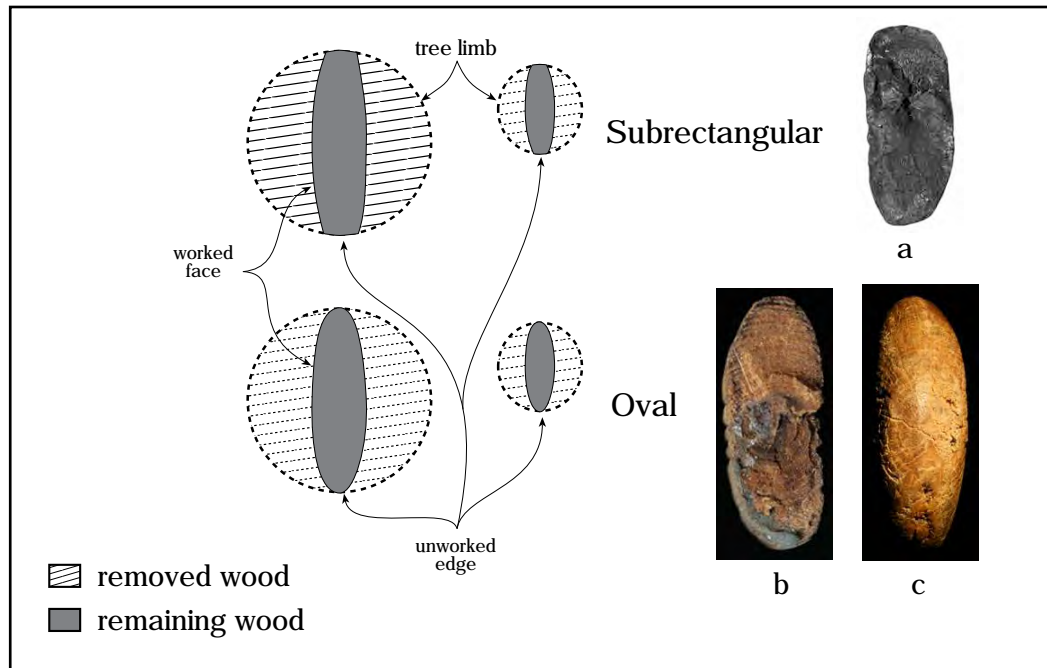


Figure 8.8. Cross-sections of flat curved sticks range from oval to subrectangular depending on how wood was removed from the faces; edges are generally left unworked aside from peeling bark: (a) Fat Burro Cave (Geib 290, NMNH 565272); (b) White Dog Cave (Geib 489, NMNH 349192 [PMAE A2731]); (c) Prayer Rock Cave 9 (Geib 14, ASM 1183, A-13,388). (Collections of the National Museum of Natural History [a & b] and the Arizona State Museum [c]; photos by Phil R. Geib.)

Most flat curved sticks were made using a full-diameter trunk or limb of a tree or shrub with the flattened cross-section created by removing wood on opposing faces. Wood removal probably occurred by adzing/chopping followed by scraping/planing and then abrasion. Although most sticks were fashioned from whole timbers, in some cases trunks or limbs were split in half longitudinally with the split surface naturally serving as one of the flat faces, thereby necessitating thinning from one side only.

Of the 466 prehistoric flat curved sticks from the Southwest that I analyzed, 445 (95.5%) were made from whole stems with just 20 (4.3%) from split stems and one that was indeterminate. The 20 sticks made of split stems include five that are single-bend and four that are also probably this way, 10 that are indeterminate, and one that is S-shaped. The latter consists of the distal fragment (Geib 66, Correo 257.1) that was perhaps just partially split at the widest portion. Sticks clearly made from split stems tend to be wider on average than those made from whole stems and the same can be seen for ethnographic Puebloan rabbits sticks when comparing those of Hopi (mostly split stems) against those of Zuni (mostly whole stems).

The worked (or split) faces define stick thickness, which is variable but generally between 1 and 2 cm. Depending on how the faces were worked and finished relative to the edges, the resulting cross-sections range from ovals, often somewhat elongated ones, to subrectangular. Even those sticks with nearly true rectangular cross-sections usually have a maximum thickness on the midline tapering in both directions from there towards the edges such that their faces were never totally flat but convex to varying extents. The “squared” edges of the subrectangular cross-sections were not prepared this way but rather consist of the natural curvature of the tree limb with the square-like look merely a visual effect of the intersection of the flattened worked faces with the arc of the unworked edges. The greater the diameter of the original limb the more the edges appear flat and hence square.

Although the faces of flat curved sticks are extensively worked, the edges tend not to be. The wood grain on stick edges usually remains unbroken and unworked except for peeling of the bark. A cut limb, once debarked, defined the width of the finished artifact. In other words, if a cut debarked limb had a maximum diameter of 3.8 cm, then the widest portion of the finished stick is 3.8 cm. This widest portion, which is naturally the

proximal part of the original tree or shrub, almost invariably became the distal end of the stick, with the apical and narrower part of the tree or shrub forming the handle end (proximal part of the artifact). By doing this the narrower portion became the grip and the wider, heavier part became the distal end.

Finishing

Many of the artifacts are well finished and extensively handled such that most production traces are nearly obliterated. On such sticks the wood surface appears even and smooth and exhibits a luster as though polished. All evidence of rough hewing, such as marks from adzing or chopping along the grain, are obscured by more refined shaping techniques that involved scraping/planing followed by abrasion, perhaps with a graded series of sandstones proceeding from coarse to fine. Given the very fine finish in some instances, it seems possible that surfaces were burnished with a hard object such as a water-worn pebble or a piece of bone. Burnishing compacts the wood fibers and thereby creates a lustrous surface. Contact with wood, such as from striking atlatl darts during a fight, could also result in burnishing but on very select surfaces or edges. Restricted burnishing like this was not observed but handling polish might obscure such wear.

The fine finishing, which can take 4 hours or more with traditional stone tools, reflects a degree of production investment that appears inconsistent with creating sticks for throwing at game animals since after finishing they will soon become scarred and battered, ruining the smoothed surface that took so long to produce. Moreover, the production time does not include creating the common longitudinal grooves, which are themselves easily damaged by contacting rocks and other hard objects. These features are described in greater detail next, but in my experiments with making them, the carefully done grooves seen on many sticks require an estimated minimum of 3 hours for both faces. Ethnographic rabbit sticks made for use rather than the tourist trade, as most were prior to the mid 1900s, tend to be coarsely finished. The evidence for hasty production occurred despite the use of metal tools that made fabrication far more efficient than using stone, yet fine finishing of ethnographic rabbit sticks is uncommon. Expedient fabrication seems consistent with a throwing function.

Some prehistoric sticks were produced in an expedient manner; they were shaped only by adzing/chopping, with little or no refinement of surfaces by scraping/planing or

abrasion. Few in number ($n = 14$), these artifacts have a rough appearance with obvious hewing marks on faces. Most of these sticks also lack the longitudinal grooves, perhaps because the rough surface texture prevented execution of these features. From my experiments with creating such grooves in oak sticks, a smooth surface greatly facilitates their creation whereas a rough surface of adzing marks and coarse abrasion make it almost impossible to incise the grooves and certainly prevents doing the sort of neat job seen on many prehistoric specimens.

Incised Longitudinal Grooves

Most prehistoric flat curved sticks from the Southwest have parallel longitudinal grooves, three or four in number, incised into both faces. They tend to be V-shaped, although there are some that are U-shaped, and measure 0.6-1.5 mm wide and up to 1 mm deep or slightly more, although many are shallower than this. Depending on how closely the grooves were spaced and how they were cut, the intervening ridges of wood can be peaked (\wedge), slightly rounded (\cap), or flat topped (\sqcap). No matter their form, the thin ridges are delicate and easily damaged. The care that went into creating these features should not be underestimated, and this care seems especially unfathomable if the final result was to simply throw the sticks, thereby likely crushing these features.

Longitudinal grooves occur on the vast majority of prehistoric artifacts, especially those from Basketmaker II contexts on the Colorado Plateau, but with some exceptions. Of the 466 prehistoric sticks analyzed from the Southwest, just over 86 percent are grooved (Table 8.8), with almost 8 percent indeterminate due to either poor wood preservation or being such a small fragment that this feature could not be evaluated (mainly small handle portions). As discussed before, a lack of grooves was not grounds to exclude sticks from the overall class of artifact considered here. Sticks without grooves appear no different in general from those that have this feature. In nearly all cases where stick form could be determined or inferred, it was those with a single-bend that lacked longitudinal grooves: this was true for 11 percent of certain single-bend sticks and 8.4 percent of possible single-bend sticks. All but two certain or probable S-shaped sticks have longitudinal grooves (97.5%); the two exceptions are from Doughnut Alcove, of lower Glen Canyon in southern Utah (Geib 1990). There are several cases with sticks that have grooves on only one face with the other left plain, including S-shaped sticks,

such as one from the Correo site (e.g., Geib 87, MMA 561.1). Since no ethnographic specimens have longitudinal grooves there might be a chronological pattern to this treatment and omitting any ungrooved specimens from consideration would prematurely preclude studying such a possibility. Whether or not there are grooves appears to be part of the variability within this artifact class, just like the means of grip preparation and whether a stick is S-shaped or crescent-shaped.

Table 8.8. Incidence of longitudinal grooves on prehistoric flat curved sticks from the Southwest.

Stick Form	Indeterminate	Ungrooved	Grooved	Total	% Grooved
Unknown/Indeter.	31	6	148	185	96.8
Single-bend?	4	7	72	83	91.6
Single-bend	1	13	104	118	89.0
S-shaped?	1	0	28	29	100.0
S-Shaped	0	2	49	51	96.1
Total	37	28	401	466	94.0
Percent	7.9	6.0	86.1	100.0	
Adj. %	--	6.5	93.5	100.0	

For those sticks with grooves, there is variability in the quality of their execution, in their number, and whether or not they extend continuously along stick length or with varying numbers and sizes of gaps. Figure 8.9 shows examples of different quality grooves and their relative frequency of occurrence in the Southwestern stick sample, excluding those artifacts too poorly preserved or fragmentary to make such a determination. I made a four-rank subjective assessment as to “quality” based on such factors as depth of groove, consistency in width and depth of groove, degree of parallelism, and whether or not the obstacles presented by knots were cut through. In making this judgment I ignored use damage to the grooves and post-depositional factors such as wood shrinkage cracks and recovery damage. Grooves that wander about and exhibit cross-cuts from one channel to another exhibit a low degree of parallelism. Shallow grooves are much easier to create than deep ones, especially deep grooves that have consistent depths and widths and are truly parallel. Creating deep grooves with stone tools necessitates repeated incision—going back over the same groove or track time and time again until the proper depth is obtained. Knots are difficult since they present wood grain at different directions and hence resist easy straight line incision.

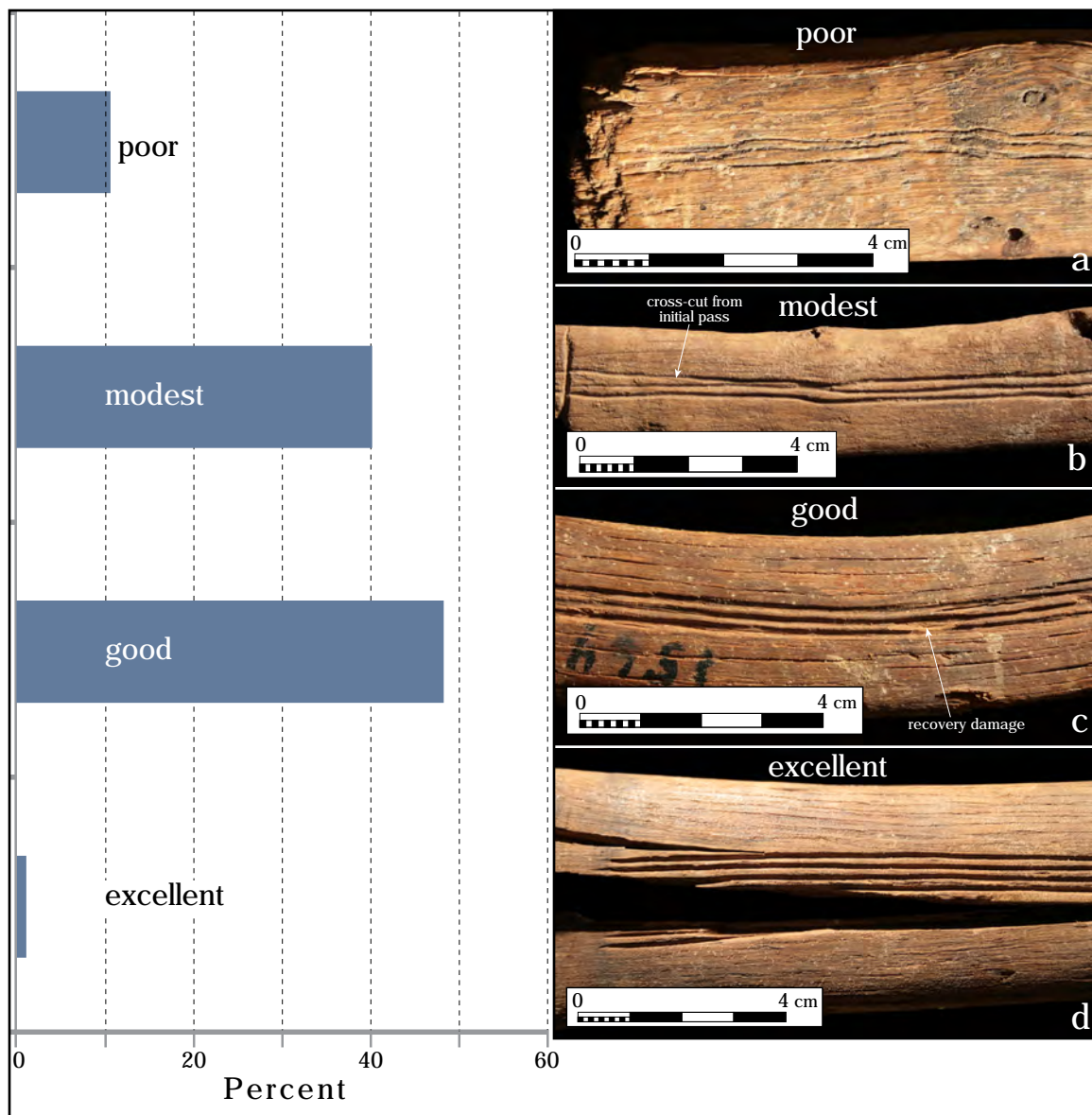


Figure 8.9. Proportional representation of incised longitudinal groove quality for flat curved sticks from the Southwest excluding those that could not be evaluated ($n = 254$). Images on right provide examples of what these subjective values correspond to: (a) Ceremonial Cave? (Geib 430, MMA 66.27.17); (b) Correo Site (Geib 64, MMA 250.1); (c) Correo Site (Geib 91, MMA 564.1); (d) Correo Site (Geib 116, MMA 631.1). (Collections of the Maxwell Museum of Anthropology; photos by Phil R. Geib.)

Indeed longitudinal grooves are only practicable with stone tools because of cutting with the wood grain (parallel to it) rather than against it, but at knots the confused grain presents great difficulties to cutting straight channels with stone tools.

As Figure 8.9a illustrates, poor grooves are those that are shallow and meandering with cross-cuts and fluctuations in both depth and width. These account for just over 10 percent of the Southwest sample (10.6%) and there is some indication that they are more frequent on sticks with a late date. Indeed, the example shown has the latest direct date for any artifact in my sample (cal. AD 1040–1265). A poorly done set of grooves is almost invariably the result of a single pass with whatever incising tool was being used, likely just a simple unmodified flake in most cases. It is important to point out that the first pass is what controls or channelizes subsequent passes. Hence, there would have been no way for the producer of the stick in Figure 8.9a to have corrected or cleaned up the messy grooves. Additional passes with the incision tool would deepened the grooves but they would have remained meandering and with cross-cuts; basically with more work they might have resembled the modestly done grooves of Figure 8.9b.

Modestly done grooves are those that have a depth that indicates multiple passes with an incision tool. The grooves meander and are variable in both depth and width and there can be obvious cross-cuts, although these tend to be from the initial passes and thus tend to be stranded at higher elevations outside the main grooves. Just over 40 percent of the sticks had grooves of this quality (40.2%). The only part of the Southwest that did not have a good representation of modestly done grooves is the Four Corners area where most were of good quality, with a few considered excellent.

Grooves of good quality are generally even and parallel with similar depths and widths along their length; they are often closely spaced but can also be more widely spaced but with equal distances between the grooves and essentially no meandering and no cross-cuts. Production of grooves like this requires very careful attention during the initial cutting of the lines and then continued close attention as they are deepened. It also requires more careful attention to the actual shape of the incision tool so that depth can be achieved without over-widening the grooves. There are cases where this degree of control was exercised even when cutting through knots created by lateral stems (Figure 8.10). Anyone who has tried incising such grooves in dense woods like oak can readily



Figure 8.10. Variation with incising longitudinal grooves through knots: (a) the common bypassing of knots, resulted by a gap or break in the lines (Correo Site, Geib 65, MMA 251.1); (b, c) the less frequently and labor-intensive approach of cutting through a knot (Correo Site, Geib 102, MMA 566.1 and Moqui Canyon Cave 2, Geib 5, MEVE 1857). Both b & c are of oak and c exhibits grooves through several knots. The grooves of the Moqui Canyon specimen are rated as good quality whereas those of the Correo specimen are rated as moderate quality. (Collections of the Maxwell Museum of Anthropology [a, b] and Mesa Verde National Park [c]; photos by Phil R. Geib.)

appreciate how difficult it is to obtain ones that match those of good quality, yet almost half of the prehistoric specimens from the Southwest have grooves like this (48%).

Only three sticks were rated as having grooves of excellent quality. This number might have been higher if more artifacts had been complete and better preserved. A key distinction for excellent grooves is their depth and evenness. The example shown in Figure 8.9d has grooves that are deeper than they are wide and nearly perfectly parallel; the precision of these cuts is evident despite the post-depositional damage to the stick (splitting along the pith and a lateral stem).

Sticks from the Southwest generally have three or four incised grooves, with the latter accounting for almost two-thirds of the sample after excluding indeterminate examples (Table 8.9). Two grooves are rare, with just three examples, two from the Correo site and one from Caldwell Cave 2 in Texas which lacks any grooves on the other face. Groove number is to some extent related to stick width, since those with three grooves are narrower on average than those with four grooves (average midsection width of sticks with three grooves is 3.06 ± 0.97 cm [n = 60] whereas for sticks with four grooves it is 3.20 ± 0.59 cm [n = 154]). The three sticks with two grooves are quite narrow, with an average midsection width of 2.53 ± 0.59 cm. Yet, there are wide sticks with just three grooves and also narrow sticks with four grooves, so there is more to the count than just the available width. Although the sample size is small, the Four Corners region of the Colorado Plateau and the Mogollon Highlands only have sticks with four grooves (Table 8.9).

Table 8.9. Count of sticks with two, three and four longitudinal grooves by region of the Southwest (excludes those sticks for which a groove count could not be made).

Region	2	3	4	Total
Four Corners	0	0	11	11
Virgin Area	0	3	5	8
Mogollon Highlands	0	0	7	7
Upper Rio Grande	2	63	89	154
Chihuahuan Desert	1	48	96	145
Sonoran Desert	0	1	2	3
Southwest, nfs	0	1	2	3
Total	3	116	212	331
Percent	0.9	35.0	64.0	100.0

Three grooves are common in the Upper Rio Grande area and Chihuahuan Desert, accounting for just over 41 percent of 154 artifacts from the former area that had a determinable number of grooves and 33 percent of 145 artifacts from the latter. It is also worth mentioning that the flat curved sticks originating from the Cenote at Chichén Itzá have a higher groove count and all odd numbers: 5, 7, and 11 (see Chapter 6).

Knowing what to make of the number of grooves is to some extent dependent upon having some clue as to their function or purpose. As of yet I cannot suggest a practical reason for these features. One suggestion is for flight stabilization much like the small divots in golf balls. This of course assumes that the sticks were designed to be thrown and, even if true, no ethnographic group needed to employ such details in order to have effective rabbit sticks. This is something that might ultimately be tested in a wind tunnel but even if it could be shown that there is some slight flight advantage this cannot compensate for the vast increase in labor costs to make these features, especially when the payoff is merely small game. Another speculation is that the grooves somehow helped to prevent the sticks from warping. If true, then it seems peculiar that ethnographic groups did not likewise score their rabbit sticks. If grooves were dropped along the way in the temporal development or change of this artifact, which seems to be the case, then if grooves were so useful in maintaining stick straightness, why would this trait have been dropped as well? Also, there are other flattened sticks such as atlatls and digging sticks that were not grooved to prevent warping. If grooves actually worked this way then simply having some expediently made ones should suffice rather than the labor intensive examples that occur.

The function of the grooves may appear inscrutable simply because there was none in any practical sense. The grooves and their number may well have had some sort of ritual meaning and the painting of grooves with black and red pigment on a stick from Grand Gulch (see Figure 9.3) fits such an interpretation. Parsons (1939:1028) sees the customary four grooves of Basketmaker II sticks as representing a predilection for this number that is carried through to the modern Pueblos of the west (the Hopi, Zuni and Keres) but not the Tanoans. Basketmaker II sites of the Four Corners always have four grooves, but the flat curved sticks from the Correo shrine near Laguna and Acoma often have three grooves.

The longitudinal grooves usually extend for almost the full length of the sticks, starting just above the handles and ending just short of the distal end. The grooves extend into the grip area on several sticks and in a few rare cases they run directly off the end of the sticks. Although there are examples with continuous grooves, the general pattern is for two or more obvious breaks and in some cases the gaps are so numerous that the grooves consist of a series of short segments, up to nine in number (Figure 8.11). Sometimes the gaps occur at knots, features that are very difficult to incise through with stone tools owing to the confused grain pattern. But, gaps in the grooves also occur where there are no knots, such as with the stick of Figure 8.11, hence a strictly production-related explanation for them is not valid. It is also clear that such gaps are not related to where the sticks were wrapped with sinew to repair or reinforce cracks, since in the vast majority of cases gaps occur without sinew wraps and vice versa. The reason(s) for the interruption in the incised grooves remains elusive and at present I am inclined to think that some of the variability is idiosyncratic and with some regional differences from learning networks, since most sticks from the Colorado Plateau have a single medial gap.

Other Cut “Decoration”

Twenty-four sticks from the Southwest excluding miniatures exhibit cut patterns other than the longitudinal grooves (5.2% of the sample). These mainly occur on distal or proximal ends either as crisscross incisions that form a diamond pattern (see Figure 9.3) or as simple encircling lines, sometimes on an angle (examples of diamond cross hachure outside the Southwest occur at Fish Cave, NV). In many cases these cut lines were then slathered with pitch and it could be that the cuts were done principally as a means to ensure good adherence of the pitch, which would have more readily flaked from a smoothly finished wood surface. As such, these cut lines are perhaps not decoration per se.

There are, however, a few cases of other cut lines that do appear decorative, with Figure 8.12 showing two examples. One has shallow cuts that form what resemble “fringed” zigzag lines across the areas where there are breaks in the longitudinal grooves, with four such decorated gaps on one face and three on the other; this stick comes from northern Mexico near Paquimé. Another example that is not illustrated has a similar sort



Figure 8.11. Example of longitudinal grooves, three in number, executed as a series of short segments; distal half of probable single bend stick from Shelby Brooks Cave (Geib 402, TARL IW-42-35b). The breaks in the execution of the grooves do not coincide with knots from lateral stems. (Collections of the Texas Archaeological Research Laboratory; photos by Phil R. Geib).



Figure 8.12. Examples of cut decoration on prehistoric flat curved sticks from the Southwest: (a) midsection of single bend stick with a design at gap between longitudinal grooves (stick has four gaps on one face and three on the other and similar decorations occur across each), unknown cave, Sierra del Pajarito, Chihuahua, Mexico (Geib 442, MMA 66.9.45); (b) handle end of single bend stick showing two layers of decoration—an upper layer of fine cuts forming zigzag lines and some diamonds and an older layer of broader and pitch-filled lines that also seem to form a zigzag pattern, Correo Site, New Mexico (Geib 116, MMA 631.1). Both sticks are radiocarbon dated: (a) has a two-sigma date range of 395-200 cal. BC; (b) has a two-sigma date range of cal. AD 70-250. (Collections of the Maxwell Museum of Anthropology; photos by Phil R. Geib.)

of treatment of cut zigzag lines across a groove break and comes from Chavez Cave also in the Chihuahuan Desert region. The other pictured example of Figure 8.12 exhibits two different “layers” of cut zigzag decorations: an original set of lines (1 mm wide and shallow) that run up the stick from the grip wrap for a short distance and are filled with pitch, and a superimposed set of fine cuts that form a larger set of zigzags some of which crosscut to form small diamonds. This artifact comes from the Correo shrine, and another example from the same site (Geib 40; MMA 532.2) had handle decoration similar to the illustrated specimen. Another example of a single-bend flat curved stick with an incised decoration of zigzag lines running down the face on the convex side comes from the site of la Cueva de la Paila (Aveleyra 1956:Lám IX).

Paint/Stain

Modern rabbit sticks are almost always painted, at least to some extent, and old ethnographic specimens also frequently have some traces of paint. Paint or stain was recognized on fewer than 8 percent of the non-miniature flat curved sticks from the Southwest. By stain I mean an overall coloration of a stick whereas paint denotes the application of color to specific areas to form some sort of design. Determining if there is an actual design depends of course on how much of an artifact is present. None of the flat curved sticks seemed to have any specific designs painted on them, just broad areas of color that were either black or red. Some appear to have been stained brown or brownish red and at least one appeared to have an overall black stain. Flat curved sticks coated with black resin are also known from Cueva de la Candelaria and Cueva de la Paila (Aveleyra 1956:141 and 188).

It could be that far more prehistoric sticks were stained/painted than the numbers indicate. Identification of paint or stain on prehistoric specimens was problematic because of poor wood preservation, post-depositional staining from rodent urine and other organic residue (bat urine and feces, spider feces, etc.), and patina. In the case of an exceptionally well preserved stick from Grand Gulch there was black and red pigment filling longitudinal grooves (see Figure 9.3).

Grip or Handle Treatment

The grip or handle end of flat curved sticks was prepared in several distinctive ways with Table 8.10 presenting a listing of these broken down by general region of the Southwest. Some grips were wrapped with either cordage or hide strips while others were left unwrapped or plain; the latter is characteristic of ethnographic rabbit sticks. Grips without a wrap might have a smooth surface, as do almost all ethnographic specimens of rabbit sticks, or one that was roughened with the surface either pitched or not. Invariably, if cordage or hide was wrapped around the grip then a coating of pine pitch or other plant resin was added over the wrapping. When evaluating whether a grip had been wrapped or left plain it was important to factor in post-depositional processes that could have removed specific organic remains. More will be said about this below but this accounts for the headings of “Cordage?” and “Hide?” in Table 8.10—these were grips that had other evidence indicating that one of these types of organic wraps was once present although no remnant portions of actual cordage or hide now remain.

The simplest form of plain grip is one with little or no preparation. Given the lack of special treatment, identification of which end was actually held is less clear cut. The main means of distinguishing proximal from distal included the direction of plant growth, with the grip almost always at the apical end (the narrowest and thinnest part of the stick) combined with indications of having been held, such as smoothing and polish, often accompanied by staining (sweat and hand grime). Key in this was how such indications differed from what occurred on the opposite end. As in all aspects of analyzing these artifacts, whole, well-preserved specimens informed the interpretation of fragments and less-well preserved specimens. A variety of plain grip was one slathered with pitch or some other plant resin. This coating allowed for more certain identification of the grip end, especially when it exhibited handling smoothing/polish. Sometimes this coating was accompanied by shallow cut lines. There were a few cases of extra wide sticks where the pitch coating occurred with a restriction in stick width, something of a tab-like handle, but not to the extreme like Hopi and Zuni rabbit sticks.

Table 8.10. Grip type for prehistoric flat curved sticks from the Southwest by general region of recovery (there were no proximal portions from the Sonoran Desert).

Grip Type	Four Corners	Virgin Area	Mogollon Highlands	Up Rio Grande	Chihuahuan Desert	General SW	Total	%
Indeterminate	0	0	1	6	0	0	7	3.8
Unknown wrap	0	0	0	9	13	1	23	12.6
Plain?	0	0	0	2	7	0	9	4.9
Plain	2	2	2	6	11	0	23	12.6
Hide?	0	0	1	28	35	1	65	35.7
Hide wrap	0	0	0	7	2	0	9	4.9
Hide knob	0	0	0	0	2	0	2	1.1
Cordage?	2	2	0	14	3	0	21	11.5
Cordage wrap	2	1	0	0	0	0	3	1.6
Cordage knob	6	6	0	6	2	0	20	11.0
Total	12	11	4	78	75	2	182	100.0

There are two major types of prepared grips, both of which involve wraps of either plant fiber cordage or hide strips that were coated with pine pitch or similar mastic (Figure 8.13). The pitch probably served the dual purpose of helping to secure the wrap as well as providing a weatherproof coating. The wraps were done such that they resulted in either a marked bulge around the entire stick circumference or a knob on one side of the stick, always the convex edge, which Cosgrove (1947:58-59) called a “bumper.” Almost invariably the knob type grips were made of cordage, but there are two examples from different sites in Texas of a knob constructed of hide or hide and sinew. In contrast, the wraps that created a bulge around the entire stick circumference were nearly always made of hide, but with three examples of cordage. Presumably these wraps allowed for more effective gripping. Based on throwing experiments, Chuck LaRue (personal communication 2011) believes that the ridge formed by the wrap also allows greater spin to be imparted upon release of the sticks when used for throwing, a conclusion also reached by Devin Pettigrew (personal communication 2015). The fingers catch on the ridge and help to impart a spin.

No matter whether the wrap was of cordage or hide there was always some sort of preparation of the wood in order to seat the wrap and this treatment was specific to the type of material used. For hide, this consisted of a rough hacking of the wood around the entire stick circumference to be wrapped. This sometimes resulted in a slight waist from reduction in stick diameter. The hacking resembles that achieved by striking the wood



Figure 8.13. Pitch-coated hide and cordage-wrapped grips for prehistoric flat curved sticks from the Southwest: (a, b) simple hide wraps, Correo Site (Geib 116 & 102, MMA 631.1 & MMA 566.1); (c, d) hide knobs, Sunny Glen (Geib 30, MBB Tarl 120) and Shelby Brooks Cave (Geib 387, TARL 110); (e–h) cordage knobs, Heaton Cave (Geib 274, NMNH 315489), Battle Cave (Geib 269, AMNH 29.1/8598), and Correo Site (Geib 432 & 87, MMA 529.3 & MMA 561.1). (Collections of the Maxwell Museum of Anthropology [a, b, g, h], Museum of the Big Ben [c], the Texas Archaeological Research Laboratory [d], National Museum of Natural History [e], and American Museum of Natural History [f]; photos by Phil R. Geib).

with an axe or adz-like stone tool, probably the same tool that was used to roughly shape the overall stick. The rough texture created this way is well suited to “seating” the initial layer of hide strips wound around to create the grip wrap. In every case where it could be determined, the hide strips were coated with pitch or other mastic (perhaps hide glue?), which would have served to adhere the strips together and create a cohesive mass.

Only 11 sticks had traces of hide still remaining, two knob type and nine regular, whereas there were 65 sticks that are thought to have once had such grip treatment. In contrast, there were actually more sticks with cordage wraps still present ($n = 23$) than are thought to have once had such grip treatment ($n = 21$). This reflects the more perishable nature of animal hide over the hard fibers of yucca or agave used for the cordage grip wraps. Animal hide is not only subject to decay from ground moisture but is also prone to consumption by insects and rodents. Hide is even more susceptible to consumption than sinew since there are examples of grips that retain sinew wraps but that lack any trace of the hide wraps that were once present.

Figure 8.14 illustrates the handle end of four flat curved sticks from Ceremonial Cave, all of which are the elongated single-bend variety that are common to this site. Only the top specimen retains a poorly preserved remnant of the hide strips that once wrapped the grip for a distance of about 3.5 cm. The leather was wound around purposefully roughened wood and then pitch coated just like the well-preserved specimens of Figure 8.13a, b; this pitch coating accounts for the sharp line of demarcation where the hide strips once were. Hide strips are totally absent from the other three handles even though sinew bindings remain for two of these. The original existence of the hide wraps is indicated by the unstained bands of rough wood, each about 3.5 cm long, sharply bounded by areas of pitch staining. On the bottom handle, sinew bindings are also absent but the original presence of two is indicated by the unstained bands. The areas that were wrapped with hide had been coarsely hacked, which provided a rough surface that helped to prevent the hide strips from slipping out of place. The combined traits of a hacked and unstained wood surface bounded by pitch staining on either side and often accompanied by a minute pitch ridge right along the sharp juncture line are sufficient for inferring that hide wraps were once present.



Figure 8.14. Probable hide-wrapped grips for prehistoric flat curved sticks from Ceremonial Cave, Texas: (a) example with a tiny hide remnant still in place (Geib 305, CM A36.3.173); (b, c) examples lacking the hide although sinew bindings remain (Geib 294 & 295, TARL GP 46811a, & GP 46811b); (d) example with both the hide wrap and sinew bindings gone but indicated by unstained bands, with the area of the hide wrap also hacked (Geib 296, TARL GP 46811c). (Collections of the Centennial Museum [a] and the Texas Archaeological Research Laboratory [b–d]; photos by Phil R. Geib.)

As mentioned, the grip area wrapped by hide strips for most of the Ceremonial Cave sticks measured around 3.5 cm long and the wraps do not seem to have formed a significant bulge. In other cases the wrapped portions were much narrower, measuring 2-3 cm, but forming more of a bulge. The Correo Site mainly had sticks with these narrower but thicker hide grip wraps. Figure 8.13a shows a well-preserved example while Figure 8.15 shows two less well preserved examples; the latter allow the width of the hide strips to be seen and also the preparation of the underlying wood surface. On the better preserved specimen the grip area with the hide wrap has a maximum thickness of 2.5 cm whereas the adjacent unwrapped wood surface has a thickness of 1.2 cm, so over 1 cm of thickness was added by the hide strips.

Preparation of the wood to seat the cordage wraps was totally different from that of the hide, consisting of either a series of rather narrow cut or sawn transverse grooves for single or double cordage strands or just one somewhat wider groove for all of the cordage wraps bunched together. The wood surface into which these grooves were cut lacked a roughened hacked area and instead was well smoothed like the rest of the stick. The grooves were often cut to a sufficient depth that the cordage was sunk below or at the level of the wood. In some cases a notch was cut on the convex side of the stick to help seat the wrap and the knob; this was common for sticks from the Four Corners area of the Colorado Plateau. Different examples of cordage wraps are shown in Figures 8.16–8.18. There is every indication of regional differentiation in the specifics of how the cordage wraps and knobs were executed with a potential for a temporal component since the sticks with cordage wraps from the Correo Site (Figure 8.16) are the oldest and those from the far western sites of the Virgin region (Figure 8.18) are the youngest, with those from the western Basketmaker II sites of the Four Corners area (Figure 8.17) in between in age but closer to and overlapping with the temporal span of the Virgin region sticks (see Chapter 10).

The pitch-covered cordage knob always projects from the convex side of a stick. The exact means of creating the cordage knobs could not be determined with certainty without dissection, but it appears that there are some regional differences. The clearest evidence for how knobs were constructed comes from the Correo Site where the pitch



Figure 8.15. Examples of narrower but thicker-hide wrapped grips for prehistoric flat curved sticks from the Correo Site, NM (Geib 71 & 106, MMA 328.1 & 5771). (Collections of the Maxwell Museum of Anthropology; photos by Phil R. Geib.)

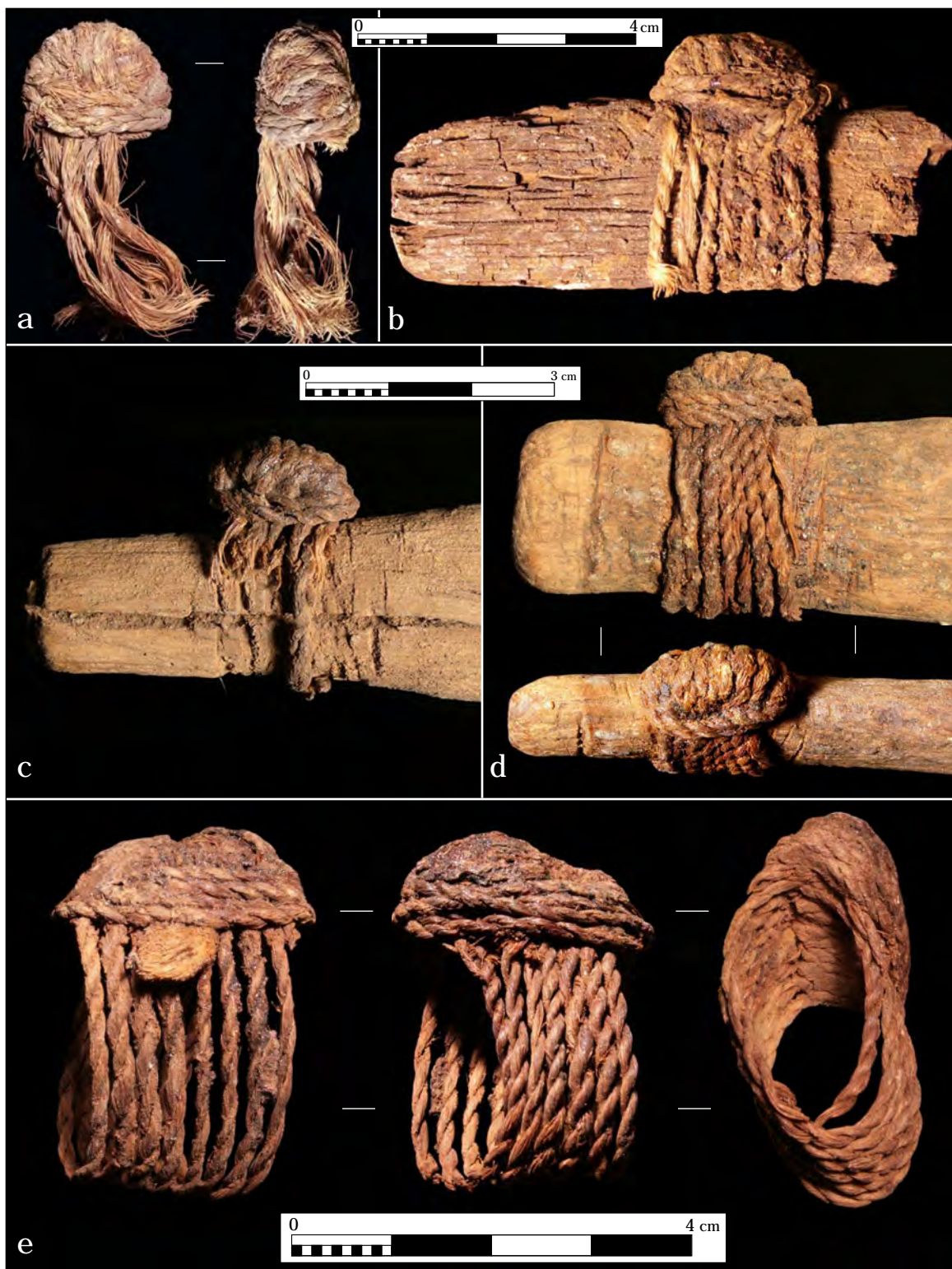


Figure 8.16. Cordage wraps for prehistoric flat curved sticks from the Correo Site; pitch weathered away to expose the string and some construction details: (a) loose wrap 2; (b) poorly preserved handle fragment (Geib 160, MMA 76.4); (c) handle of whole S-shaped stick (Geib 87, MMA 561.1); (d) handle of proximal half of S-shaped stick (Geib 83, MMA 529.2); (e) loose wrap 3 (from Geib 160, MMA 76.4). (Collections of the Maxwell Museum of Anthropology; photos by Phil R. Geib.)



Figure 8.17. Typical grips on western Basketmaker II flat curved sticks of the Four Corners area; these examples are from two sites in Grand Gulch, Utah: (a) grip of beautifully preserved stick from unknown site (Geib 460, NMAI 051421, see Figure 9.3); (b) small handle fragment from unknown site with loose cordage wrap therefrom (FMNH 21573). (Collections of the National Museum of the American Indian [a] and the Field Museum of Natural History [b]; photos by Phil R. Geib [a] and Laurie D. Webster [b]).

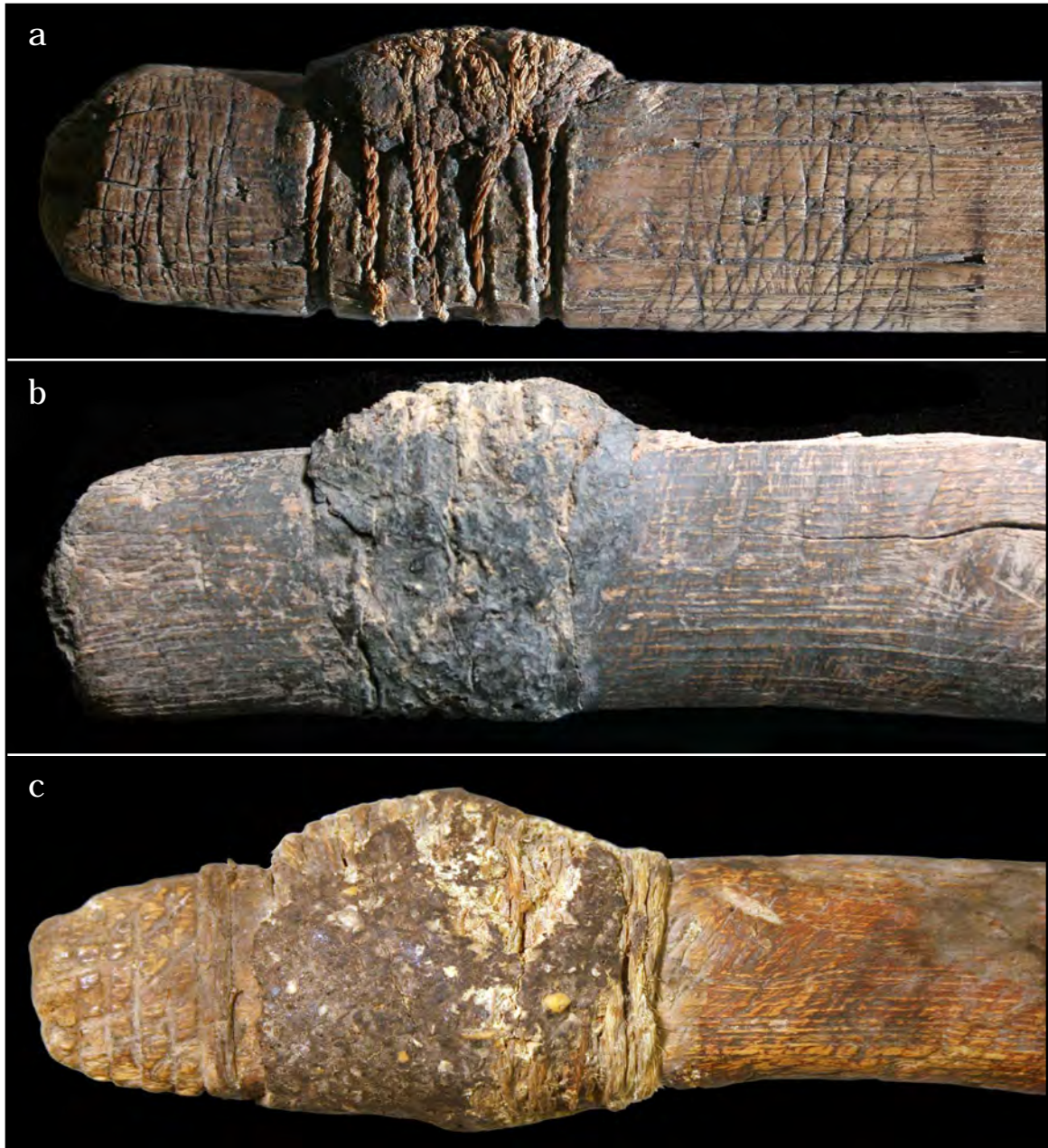


Figure 8.18. Cordage wraps for prehistoric flat curved sticks from three far western Basketmaker II sites on the Colorado Plateau and adjacent basin and range country of Nevada and Arizona: (a) unknown site along upper Kanab Creek, Utah (Geib 4, NHMU 8089); (b) Heaton Cave specimen that appears similar to western Basketmaker II sticks (Geib 277, NMNH 315578a); (c) Black Dog Cave example with crushed maize kernels mixed in with pitch (Geib 6, MNA NA4058.21). (Collections of the Natural History Museum of Utah [a], National Museum of Natural History [b], and Museum of Northern Arizona [c]; photos by Phil R. Geib.)

coating has weathered off, exposing the cordage and in several cases these cordage wraps have fallen from the sticks allowing detailed inspection of the interior portions that were in contact with the wood (see Figure 8.16). It appears that a bundle was created by tightly wrapping a length of cordage looped back and forth several times, then this initial creation was lashed to the stick by a series of vertical wraps (perpendicular to stick length) followed by a series of horizontal wraps (parallel to stick length). The vertical wraps appear to encircle the stick and then the knob individually in a figure 8 fashion, rather than being a simple wrap around both combined, although there appears to be the occasional overall encircling wrap. In the Four Corners area the construction seems similar but without the horizontal wraps paralleling the stick. Some of the knobs in the Virgin region seem more simply constructed. In all cases, the knob was then finished by coating it in a layer of pitch, with the pitch usually extending slightly onto the stick. In a few instances the pitch clearly contained crushed maize kernels.

A cross-tabulation of grip type by general stick type, whether single-bend or S-shaped, shows that S-shaped sticks almost invariably have a cordage wrap and usually a cordage knob (Table 8.11). Indeed, there were no definite S-shaped sticks that did not have a cordage grip wrap for certain although two possibly had a hide wrap. One of these is from Chavez Cave and it consists of a stick that had been recycled after the original grip broke off or was removed; consequently it had a makeshift grip so it remains unknown what the original preparation was. The other specimen (Geib 490, YPM 55306) is a whole stick that is well preserved except for the lack of a grip wrap. The stick resembles those that usually have cordage wraps but the area that had been wrapped, as indicated by differential staining, measures 5.4 cm and consists of roughly finished wood. Cordage wraps were never this long and were invariably seated in transverse cuts or a deep groove, so hide is strongly indicated. Unfortunately this stick lacks provenance other than the Southwest but the wood appears to be ash and is certainly not oak, thus an origin in the southern deserts is indicated since it is in southern New Mexico and Texas that flat curved sticks of probable ash were frequently observed.

Table 8.11. Type of grip or handle for prehistoric flat curved sticks from the Southwest by general stick form.

Grip Type	Unknown	Single-bend?	Single-bend	S-shaped?	S-shaped	Total
Indeterminate	3	0	2	1	1	7
Unknown wrap	11	4	4	3	1	23
Plain?	4	1	3	1	0	9
Plain	2	2	18	1	0	23
Hide?	20	9	30	4	2	65
Hide wrap	1	2	6	0	0	9
Hide knob	0	0	2	0	0	2
Cordage?	9	0	2	5	5	21
Cordage wrap	0	0	1	0	2	3
Cordage knob	1	1	1	2	15	20
Total	51	19	69	17	26	182

Grips of crescent-shaped sticks were mostly either hide wrapped or plain, although with a few notable exceptions. There is a cordage-wrapped single-bend stick from Bernheimer's Boomerang Cave in the Four Corners area (Geib 268, AMNH 29.1/8971) and two single-bend sticks from western Texas that have cordage knobs with a heavy overwrapping of sinew: one from McAlpin Cave (41CU6) and another from Shelby Brooks Cave (41CU7). These exceptions all date between roughly 2000 and 800 cal. BC, so earlier than most of the hide-wrapped or plain grips. As a point of comparison, the two sticks with hide knobs from western Texas date to the cal. AD 600–770 range, so much more recent. There is no stick with a hide wrap still in place that dated earlier than the time of Christ and of those that probably once had a hide wrap all but one are younger than 400 cal. BC. The exception is a stick on display at the Maxwell Museum of Anthropology (Geib 447, MMA 66.9.39), which is discussed in greater detail below because of its use-wear.

Hide grip wraps are an attribute of the Chihuahuan Desert and the Upper Rio Grande areas with none represented at sites of the Four Corners region on the Colorado Plateau extending westward into the lowland Virgin area of far southern Nevada. All grip wraps in these areas are cordage and there are no even suspected hide wraps. Aside from cordage wraps, there are plain grips but these all appear to be relatively recent, basically after the advent of pottery production, and the sticks are simple single-bend types that more closely resemble ethnographic rabbit sticks. A temporal trend toward

single-bend sticks that ultimately lack any specialized grip preparation is also seen in the upper Rio Grande region at the Correo site.

Wrist Cord?

When Guernsey and Kidder (1921:88-89) first reported on grooved curved sticks from NE Arizona they suggested that the notch cut into the handle end may have served to seat a wrist cord. Some have accepted this inference as fact and see such a cord as an essential aspect of the fending argument since it would free up both hands for effective reloading of atlatl darts. LeBlanc (1999:106) made this argument in his book on warfare in the prehistoric Southwest and a web posting by Justin Garnett, an individual who replicates prehistoric technology, demonstrates how such a wrist cord would work while using an atlatl (paleoplanet69529.yuku.com/topic/36678). Although it is true that two hands are essential for loading an atlatl, one to place the dart while the other holds the atlatl, and a fending stick would be a real encumbrance, the inference that the notch was for a wrist cord is in error. Had at least one of the sticks that Kidder and Guernsey recovered been better preserved such that the cordage wraps were intact, or had they inspected any well-preserved examples from other sites for comparative purposes, it is unlikely that they would have suggested that the sticks had a wrist cord.

Figure 8.19 shows the grip end of one of the whole but rotted flat curved sticks that Guernsey and Kidder recovered from White Dog Cave of NE Arizona along with the grip end of a beautifully preserved specimen that Earl Morris recovered from a cave in Moqui Canyon of SE Utah. The remnants of the fiber cordage wrap that Kidder and Guernsey observed on the White Dog Cave specimen are still plainly visible as are remnants of a sinew wrap at the end to prevent splitting along the pith (glue can also be seen in the pith crack from an early museum repair). In all cases where the grip wraps are well preserved, such as the Moqui Canyon stick, it is abundantly clear that a wrist loop is simply not present. Indeed, there are no loose cordage ends whatsoever since the wraps are invariably coated with pitch or other mastic. The notch was cut into the stick handles to seat cordage for a grip knob, and not for a wrist strap. The cordage was wrapped around the grips to lash on the bundle of cordage, or in some cases folded fibers,



Figure 8.19. Handle end for one of the whole but rotted S-shaped flat curved sticks from White Dog Cave (a) showing the notch that Guernsey and Kidder thought was used to seat a wrist cord (Geib 354, PMAE A-2811). For comparison is the handle end of the whole and well preserved S-shaped flat curved stick from Moqui Canyon Cave 2 (Geib 5, MEVE 1857) that clearly reveals the true function of the notch—to seat the pitch-covered cordage knob. (Collections of the Peabody Museum of American Archaeology and Ethnology [a] and the Mesa Verde Museum Mesa Verde National Park [b]; photos by Phil R. Geib).

which form the knob on the convex edge of the stick. In most cases the cordage was used both to create this protuberance and to simultaneously fasten it to the stick so that it would not move.

If the flat curved sticks functioned for fending as Guernsey and Kidder hinted at, then this had to have occurred with the stick either put on the ground or tucked under the arm or in a belt while loading darts into the atlatl. Such an impediment does not disprove the fending function. Indeed, if these artifacts were used for fending purposes, this was likely a viable option only in a controlled fight setting with clear rules of engagement—basically an atlatl-dart duel similar to that practiced in the upper Xingu region of Brazil as described earlier. In such a setting, the stick would not have been an encumbrance at all, especially if turns were taken in the throwing of atlatl darts as among the Kamayurá. In a deadly melee a fending stick would be worthless and not just because it would limit the ability to quickly rearm an atlatl, but more importantly because deflecting darts is only practicable when combatants are at a distance and one can focus on one dart at a time. Had Basketmakers or other early groups of the Southwest required an effective club for close-quarters combat then other designs readily come to mind, and it is possible that they already had this in the form of oak billy clubs (see Chapter 4).

Sinew Bindings

Another common feature of flat curved sticks is the presence of sinew wraps such as seen on the grip end of the White Dog Cave specimen in Figure 8.19, although preservation is poor on that specimen. Figure 8.20 provides a better example of these on one stick with two other sticks illustrating how the sinew strips often do not survive at sites even with perfectly dry conditions as this animal protein is readily consumed by rodents and insects such as dermestids. Consequently, the original presence of these wraps has to be inferred from traces that survive on the sticks. These traces consist of the following three aspects: 1) fine cut lines perpendicular to stick length, sometimes just on the edges but sometimes around the entire circumference, lines that served to seat the sinew in place; 2) an actual groove cut into the edges or around the entire circumference that not only securely seated the sinew but sunk the wrap below the surface of the wood such that it would be less likely to be inadvertently damaged (this same technique is seen on sinew bindings of ethnographic rabbit sticks); and 3) bands of unstained areas on the

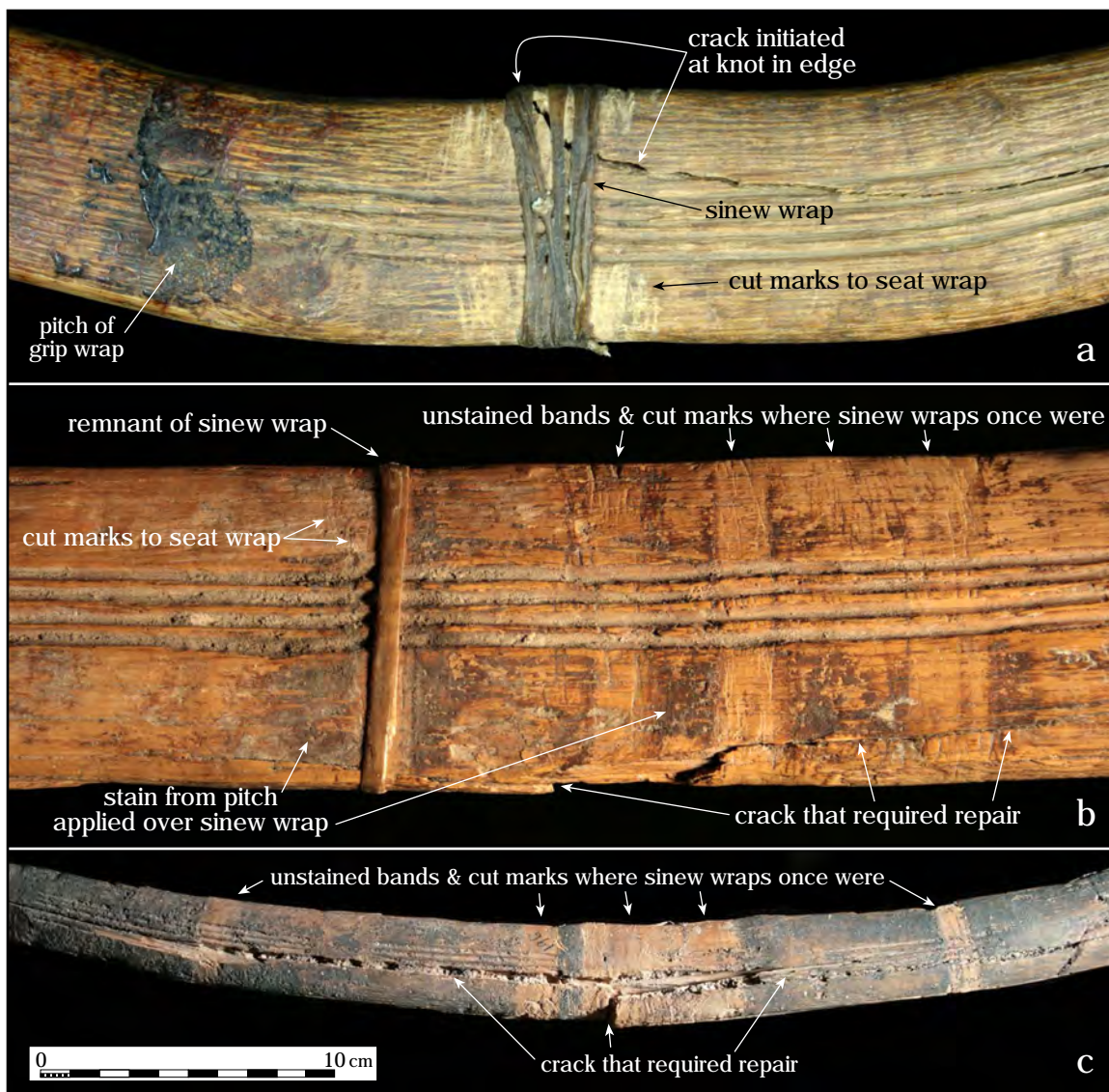


Figure 8.20. Sinew repair/reinforcement wraps or traces of such wraps on several prehistoric flat curved sticks: (a) Prayer Rock Cave 9 (Geib 14, ASM 1183, A-13,388); (b) Ceremonial Cave? (Geib 441, MMA 66.9.37); (c) Ceremonial Cave (Geib 303, CM A36-20-50). The cuts to seat the sinew on the Prayer Rock stick disrupt the use-patina of the wood, suggesting that this wrap occurred at a later time; since the cordage grip knob had also been removed from this stick it might well have been recycled for a different purpose (use-wear indicates as a rabbit stick). (Collections of the Arizona State Museum [a] and the Maxwell Museum of Anthropology [b & c]; photos by Phil R. Geib.)

wood that formed when some sort of residue accumulated on the stick surface when the sinew wraps were in place. Sometimes all three traces occurred together on single sticks and frequently the first and last as shown in Figure 8.20.

The staining that resulted in the formation of color bands seems to be derived in two ways—one was the purposeful addition of some sort of staining material by the stick creator and the other was a post-depositional accretion, such as by rodent or bat urine. A chief means of adding stain over the sinew wraps seems to have been by applying a coat of pitch after securing the sinew. This makes sense to further prevent the bindings from slipping, even in the dry Southwest, since moisture readily loosens sinew. In some cases pigment appears to have been applied to sticks, including pigment mixed with plant resin. The stick in Figure 8.20c is an example of one painted black, perhaps using charcoal mixed with a plant resin, after the sinew bindings were in place; this specimen also exhibits packrat urine which complicates the issue as well as other post-depositional organic adhesions such as insect feces, something common to these artifacts.

Sinew bindings were added either to repair a crack or as preventive reinforcement of areas susceptible to splitting. The former commonly occur at stick ends because it is here that drying cracks form after cutting a stave. The sinew wrap on the handle end of the specimen from White Dog Cave shown in Figure 8.19 is this sort of preventative binding. Sinew wraps were even added to ends when no cracks were evident and the wood was solid, such as the beautifully preserved specimen shown in Figure 9.3, which had a wrap at the widest part of the distal end and another just above the cordage knob of the grip (see Figure 8.17a). These might be special cases of using sinew in more of a “decorative” way or out of custom about what a proper stick should look like, but sinew wraps largely had a functional role in extending the use-life of these artifacts.

Sinew bindings seem most consistently used as a means of “repairing” cracks that occurred at weak places. A common crack initiation point are the knots where lateral stems were removed, especially when these occur along stick edges. Such cracks can ultimately lead to complete breakage if left unattended. This is clearly what happened with the specimen of Figure 8.20a, which is made of oak: a crack originated at a prominent knot in the concave edge of this S-shaped stick just above the grip and carried forward at an angle along the center of the lateral stem until intersecting the pith, where it

continued to propagate longitudinally along the original growth axis. The sinew binding in this case helped to prevent leverage-like forces from extending the crack forward to the distal tip of the stick, which would have detached almost half of this artifact.

Cracks also develop on the outside or convex edge of sticks, in part because when sticks are heated and bent to shape the wood on the convex edge is placed under tension whereas wood on the concave edge is compressed. Wood fibers can start to pull apart and cracks develop during the process of bending, especially if there are small imperfections in the wood surface of the convex edge. Impacts to this stressed edge can compound the problem. Since the wood is already under tension, impacts create initiation points for cracks to develop, which, depending on the wood type, can have serious consequences. The stick of Figure 8.20b is an example of this. The wood for this specimen is oak and the convex edge exhibits extensive impact damage from contacting rocks, including small cracks. One of these cracks propagated on an angle in both directions away from the point of initiation, with one crack carrying some 20 cm or more toward the distal end. It doesn't appear to have intersected the pith, perhaps in part because it did not start at a node, but the heavy sinew lashing certainly worked to prevent this and hold the stick together. An area measuring 16 cm along the stick was bound with sinew strips although now just a single strand remains, the rest having been consumed by insects and perhaps rodents (rodent nibbling of sinew strips is clearly indicated on several sticks by incisor chewing marks in the wood). Originally this stick had six separate sinew lashings between 0.5 and 1 cm in width.

Cracks from bending even result on the concave edge where the wood is compressed, especially if the bend is considerable and the wood not "softened" enough by heat, wetting, or both. An example of this is shown in Figure 8.21, a close-up of the proximal bend on an S-shaped stick with very pronounced curves. The wood buckled under compression and a crack initiated, perhaps exacerbated by the lateral stem present on one face at the bend. Since the wood buckled during the heat-bending process and at that time would have looked similar to how it does in the photo, this obvious weak point was wrapped with two sinew strips to prevent breakage. Even if a crack was not present at the time of heat bending, the crumpled wood probably would have necessitated a preventative sinew binding.

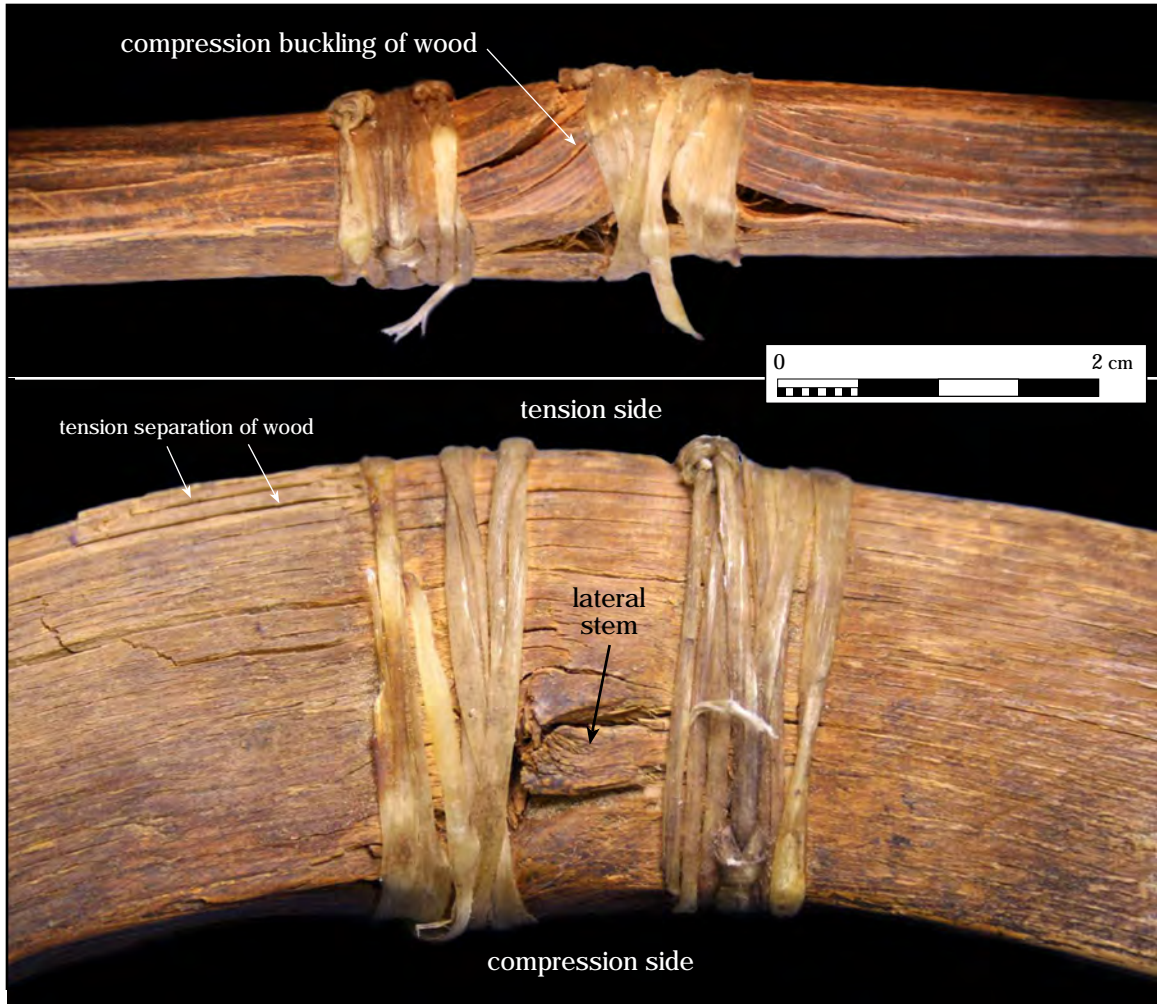


Figure 8.21. Sinew repair/reinforcement wraps on an S-shaped flat curved stick from Doughnut Alcove (Geib 2, GLCA 765) that exhibits a compression crack on the concave edge from where the wood buckled while heat bending to form the S-shape (a lateral stem on the face likely exacerbated this failure); this stick also exhibits the pulling apart of wood fibers on the convex edge because of tension. (Collections of the Glen Canyon National Recreation Area; photos by Phil R. Geib).

Another way for cracks to develop is directly down the pith. Drying cracks frequently occur here and the forces from heating and bending might compound this tendency. Consequently a common means for stick failure is longitudinal splitting and this is evidently why distal and proximal ends were frequently sinew lashed as a preventative measure. Such splitting can also initiate medially and expand outward in either or both directions. This is what appears to have occurred for the specimen shown in Figure 8.20c. The stick has a longitudinal split along the pith that measures over 30 cm. It is intersected by a perpendicular crack originating on the convex edge which released the tension in the wood, with one side springing back to its original shape (this is likely a post-depositional change). The midsection of this stick was heavily bound with sinew almost continuously across a distance of 8 cm and additional reinforcing wraps were placed at both ends of the developing longitudinal split. No sinew lashings currently remain on this stick although their original positions are obvious from the unstained bands and cut lines.

In the sample of Southwestern sticks, sinew lashings are evident on 40 percent (Table 8.12); this includes those that still retain some sinew ($n = 39$) and those that only exhibit the obvious traces of the wraps having once been present ($n = 150$). This number is no doubt too low because poor preservation and stick fragmentation prevented an accurate identification of this feature in 157 cases, almost 35 percent of the sample. Excluding the indeterminate cases, then those sticks that once had sinew wraps comprise more than 60 percent of the sample. Even this is probably too low of a percentage since the frequency of sticks with sinew wraps varies by stick condition: for stick fragments the proportion with sinew lashings was 57 percent but for whole or nearly whole sticks this was more than 70 percent, with an average of 75 percent. Not all sticks had sinew wraps since 19 whole or nearly whole sticks lacked them (or traces thereof), but it seems that these bindings were an important means of extending the use-life of the artifacts. The technique was used throughout the Southwest, with all regions having some sticks that were bound with sinew. The technique is also seen on ethnographic rabbit sticks from the Southwest, especially those from Hopi.

Table 8.12. Sinew binding occurrence by stick condition for prehistoric flat curved sticks from the Southwest (excludes miniatures). The final rows give the count and percent (within column) of whether or not there is any evidence of sinew lashings (No or Yes) after excluding indeterminate artifacts (those too poorly preserved to make this determination).

Sinew Bindings?	Fragment	Nearly Whole	Whole	Total	Percent
Indeterminate	154	3	0	157	33.7
Absent	101	3	16	120	25.8
Present ¹	11	3	25	39	8.4
Traces ²	123	8	19	150	32.2
Total	389	17	60	466	100.0
Percent	83.3	3.6	13.1	100.0	
No	101	3	16	120	
% No	43.0	21.4	28.6	38.7	
Yes	134	11	45	190	
% Yes	57.0	78.6	80.4	61.3	
Total	235	14	56	310	

¹ "Present" means that sinew strands are still in place.

² "Traces" denote sticks where post-depositional processes have removed the sinew but their original existence is certain.

Summary

This chapter documents in considerable detail the variability that occurs within prehistoric flat curved sticks of the Southwest. In addition to the two basic stick forms of single-bend or crescent-shaped and double-bend or S-shaped, there are some significant differences in these two forms such as stick length and width, the shape of the ends, and the degree of refinement in wood finishing. There is variability in the presence or absence of longitudinal grooves and in their number and quality of execution when present. There are differences in how grips were prepared, with some having pitched cordage knobs but with others having pitched hide wraps or plain handles. There are also minor differences that are perhaps idiosyncratic or reflect distinct learning traditions. The latter is evident in gross-level geographic patterning of certain traits. S-shaped sticks like those that Guernsey and Kidder initially described are the typical Basketmaker II style of this artifact in the Four Corners area. These also occur elsewhere in the Southwest but single-bend sticks are far more numerous in the southern deserts of the Southwest. Elongated crescent-shaped sticks that are rather narrow and resemble a samurai sword in general form are characteristic of far western Texas (Ceremonial Cave) and adjacent portions of New Mexico and Chihuahua. Grips with pitched cordage knobs are typical of the Four Corners area, and although they also occur elsewhere, grips with

pitched hide wraps are common in the southern deserts of the Southwest. Aside from geographic patterning, variability resulting from change through time seems probable, either from stylistic drift (e.g., Dunnell 1978) or for functional reasons (cultural selection of shapes and sizes that worked). The latter would certainly apply if there had indeed been a distinct shift in what the sticks were used for—purpose X at one time and purpose Y at a later time. Temporal variability is explored in Chapter 10 and is shown to be a significant factor.

Guernsey and Kidder (1921:88-89) suggested that the grooved sticks that they found had a strap for attaching to the wrist. Heizer (1942) accepted this inference, and if true it would seem to support the fending stick interpretation by freeing the second hand for atlatl loading. A wrist cord would also seem to disprove the rabbit stick role for rather obvious reasons. As this chapter documents, Guernsey and Kidder were mistaken in their inference of a wrist cord. This alone does not disprove the fending stick hypothesis but it at least allows the sticks to be thrown quickly upon sighting a game animal, if indeed that was their purpose.

CHAPTER 9

FUNCTIONAL ANALYSIS OF PREHISTORIC FLAT CURVED STICKS

Two principal lines of evidence can be brought to bear concerning the functions of prehistoric flat curved sticks: use-wear on the surface of the artifacts and embedded inclusions. Both can justify a functional label by providing independent corroborating evidence consistent with an inferred use. Inclusions such as cactus spines and rocks are consistent with use of the sticks for throwing to kill game; an embedded projectile point would be consistent with the fending hypothesis. Similarly, certain types of use-wear and the position of such traces on a stick can be seen as corresponding with the expected use-wear of a rabbit stick; a similar argument can be made for wear resulting from batting away atlatl darts. Both lines of evidence are considered in this chapter, with the ethnographic and experimental findings reported in Chapters 6 and 7 used as an interpretive lens.

Characterization of Use-Wear and Inclusions

Wear traces, inclusions, and breakage patterns all provide important clues about artifact function and each requires observation and documentation. Macroscopic observation is an obvious first step, but increased magnification can be quite informative and provides for improved imaging capabilities. High magnification under light or by the scanning electron microscope (SEM) is useful for small tools such as those of stone (e.g., Keeley 1980; Vaughn 1985) and for identifying pollen or plant fibers that might adhere to objects, but such “high mag” approaches are impractical given the large size of flat curved sticks. Rather, I used a binocular microscope of low magnification (10-35x), which was usefully complimented with a binocular headband magnifier at 1.5–2.5x accompanied by a strong light. Illumination by raking light is especially useful for bringing out minute variations in topographical details (Figure 9.1). An artifact surface illuminated from one side, with the light source placed almost parallel to that surface, clearly reveals scratches, abrasions and other surface qualities that might otherwise remain undetectable. Rotating the light source around the artifact and using different angles of obliqueness revealed details and allowed the most informative images.



Figure 9.1. Three views of the same area on a whole flat curved stick from Ceremonial Cave (Geib 301, CM A36.2.106) showing how different angles and orientations of racking illumination bring out different details of use-wear. A rock is embedded at the leading end of a linear cut that, which I thought resulted from use of the stick for throwing purposes; this would be a good candidate to pull for close examination to verify that it is a natural rock and not chipped stone. (Collections of the Centennial Museum; photos by Phil R. Geib.)

I recognized several different categories of use-wear as described in Table 9.1; Figure 9.2 shows examples of these wear traces. I devised the list of wear traces based on study of archaeological, ethnographic, and experimentally used sticks. Although certainly not exhaustive, it covers a range of commonly observed use-wear. A key aspect to interpreting the use-wear is where on the sticks these traces primarily or only occur, whether on convex edges and ends, faces, concave edges, etc. The intensity or abundance of such traces is another aspect. Since use-wear intensity is not easily quantified, I used a three-part ranking from “light wear” to “heavy wear;” sticks that lacked use-wear were so designated and there was an indeterminate category for sticks too poorly preserved or too encrusted by residue to make an evaluation.

Table 9.1. Definitions of use-wear observed on flat curved sticks.

Use-Wear	Description
Smoothing/Polish	Wood surface is smoothed and often reflective from extensive handling; not production related.
Dent	Wood tissue is compressed down but not chipped out; on deep depressions there can be tearing of the cellulose along margins of the depression.
Nick	Wood is both compressed and chipped out.
Gouge	Similar to a nick but differentiated by greater size and depth to the wood dislocation.
Split	A rare category characterized by penetration of the wood with a sharp object such that the wood grain is split apart for some distance and depth.
Scratch	A very surficial linear mark created by shallow cutting of the wood grain; these occur singly rather than in clusters.
Abrasion	Basically a cluster of scratches; these are not to be confused with production abrasion.
Cut	A linear gash through the wood grain that has more depth than a surficial scratch; cellulose fibers are separated to a measurable depth
Crushing	Distortion (smashing) of the wood tissue on ends and edges by percussion blows; most easily seen on the ends by compression of the wood with the grain or cell structure.

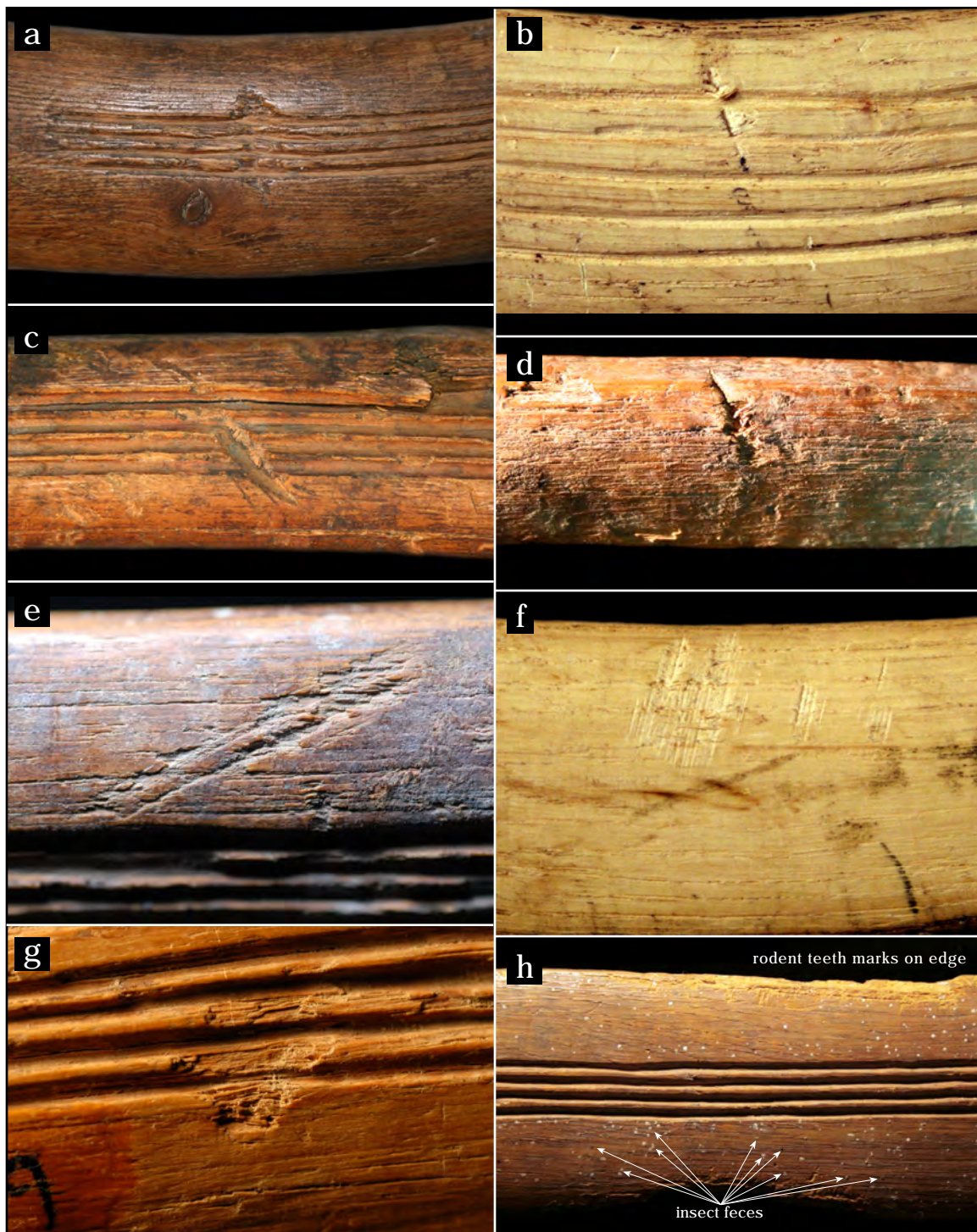


Figure 9.2. Examples of use-wear on flat curved sticks: (a) smoothing/polish that has rounded off the edges of an angular dent; (b) nick across face and grooves; (c) large facial gouge through grooves; (d) nick through edge; (e) cuts across face; (f) abrasion to face; (g) crushed area of face and grooves; (h) organic spray from insect feces and rodent gnawing (photos by Phil R. Geib).

The extent of wood preservation is a critical variable in the evaluation of use-wear, and this aspect is quite variable, even on a single artifact. Some ancient archaeological specimens are exceptionally well preserved such that the wood surface is like new except patinated from age (Figure 9.3). Other artifacts are variably preserved (Figure 9.4) with surfaces obscured by packrat urine, adhering sediment, mineral encrustation, or other residue, and the wood itself can be badly decayed by brown rot or white rot (see Hoadley [1990:190] for a description of these wood decay types). Sticks with rotted wood or obscured surfaces limit the utility of use-wear analysis. I ranked wood preservation according to four categories that ranged from excellent to poor, with a fifth option for artifacts with variable preservation, where some surfaces have good preservation but others are modest or poor (the example shown in Figure 9.4 was designated this way). Any artifact evaluated as having excellent wood preservation almost invariably has this across all surfaces. The extent of preservation has an important bearing on the reliability of use-wear observations, with poorly preserved wood essentially precluding a functional inference based on wear traces.

Inclusions

Inclusions and damage patterns relatable to use are central to making informed inferences as to the past function of flat curved sticks. The two inclusions that are most directly linked to throwing sticks at game animals are embedded rock fragments and spines/thorns. Tiny rocks embedded in human bone are indications of impact (wounding) by stone projectile tips (Patricia Lambert personal communication 2015) and the same might also be true of rocks in flat curved sticks. The rock fragments that I observed did not appear to be from chipped stone tools and I have experience with identifying tiny flaked stone fragments in horn tools for flintknapping (Geib 2002), but without extracting the fragments in some cases it is possible that I overlooked evidence that might support the fending interpretation.

Spines/Thorns

A common use-inclusion in prehistoric flat curved sticks shown are spines from cactus (cf. *Opuntia* spp. or *Cylindropuntia* spp.) and agave (*Agave* spp.) or the thorns of



Figure 9.3. Perfectly preserved wood surface on a flat curved stick from an unknown site in Grand Gulch, Utah (Geib 460, NMAI 051421); artifact lacks use-wear beyond handling polish and contains red and black pigment in adjacent grooves with the colors alternating to the opposite side of the stick at the medial gap in the grooves. (Collections of the National Museum of the American Indian; photo by Phil R. Geib.)

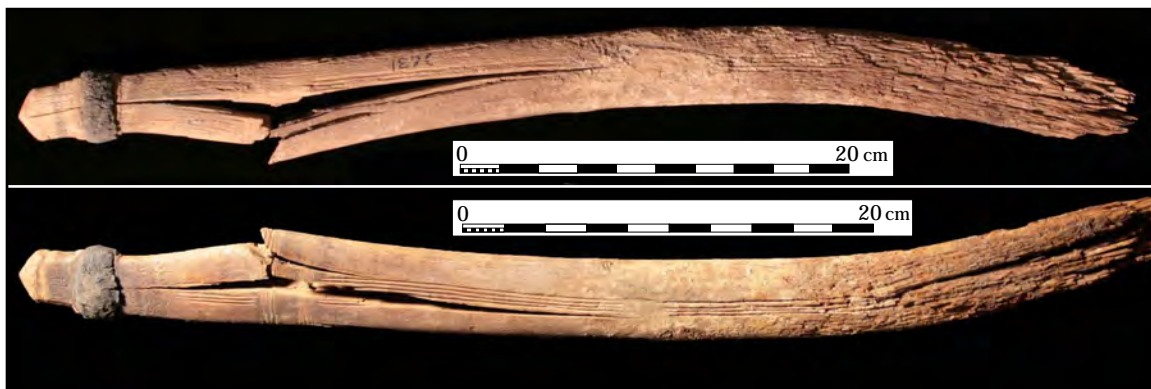


Figure 9.4. Both sides of a variably preserved flat curved stick from the Correo Site (Geib 116, MMA 631.1); all sticks from this site were affected to some extent by moisture and some by salt precipitation, with one face always more poorly preserved than the other. (Collections of the Maxwell Museum of Anthropology; photo by Phil R. Geib.)

various leguminous trees or shrubs such as mesquite (*Prosopis* spp.) or catclaw acacia (*Acacia* spp.). Examples are shown in Figure 9.5. Differentiating between spines and thorns or between genera was not possible visually, especially without extracting the embedded items and doing so has no significance with regard to the issue at hand. For the sake of simplicity, therefore, I use the term spines as a generic referent for these items and most are likely cactus spines. Thorns could be included as well and based on the diameter of some embedded items or the holes that they left, agave is also indicated in a few instances.

I had been looking for embedded rock fragments well before the start of this research, but cognizance of spines/thorns developed during the course of analyzing artifacts. Since I had seen no previous mention of spines embedded in flat curved sticks, I was not specifically looking for such remains at the start of my research. These tell-tale yet minute and subtle traces are often easily overlooked and required careful inspection to detect them. Moreover, without microscopic examination of the sticks, this important use-residue could have remained undetected, since most are less than 1 mm in diameter and thus difficult to see with the unaided eye and virtually impossible to confidently identify without magnification except for the largest specimens. I had noticed the spines as small dark dots on several sticks in the Maxwell Museum collections, but it wasn't until seeing a particularly obvious spine on one of these artifacts that I keyed into what the dark dots actually were. It is especially important to differentiate dots that are spines from those that represent some sort of post-depositional organic residue that appears to be waste from spiders, bats and the like.

Post-depositional organic spray is a common occurrence on prehistoric sticks and can be quite abundant, serving both to physically obscure spines and to detract attention away from them. The spray consists of small slightly raised dots that are black, grey, brown, tan and off white. I have observed such an organic "spray" on other types of prehistoric wooden and non-wooden artifacts from sheltered sites. I also observed similar residue on a sandstone slab stored for several years in my garage. Since the slab lacked such residue prior to placement in the garage it is a safe assumption that the organic dots accumulated in place from some agent(s) and the likely culprits were spiders, several nests of which occurred over and around the slab. Some of the contexts



Figure 9.5. Examples of spines embedded in three prehistoric flat curved sticks: (a) spines in face and groove ridges of Stick 445 (MMA 64.54.20), Craven Cave, wood is likely ash; (b, c) Stick 443 (MMA 66.27.15), probably Ceremonial Cave, abundant spines in distal concave edge (also post-depositional organic droplets) and spine in face near convex edge at distal end as originally embedded within the early wood of a growth ring and then pulled for examination. (Collections of the Maxwell Museum of Anthropology; photos by Phil R. Geib.)

for the prehistoric artifacts made them susceptible to such an accumulation since they were not buried but consisted of surface accumulations, such as at Ceremonial Cave and the Correo shrine.

It is also important not to confuse insect holes for the holes left by spines or the spines themselves. Flat curved sticks of probable ash from Ceremonial Cave were especially prone to consumption by some burrowing insect with many specimens riddled with their tunnels. It was generally far easier not to confuse these intrusions with spines or the holes thereof; the latter come to conical terminations while the insect tunnels meander on.

The incidence of sticks with spines is more than 50 percent when indeterminate specimens are excluded (Table 9.2). Sticks that were poorly or modestly preserved with the wood surface degraded have little or no chance to retain the even more delicate remnants of spines. Consequently, the only fair measure of how frequently spines are embedded in flat curved sticks is provided by adequately preserved specimens. Single-bend sticks are more likely to have embedded spines than S-shaped sticks with almost 70 percent of definite single-bend sticks exhibiting them compared to just 46 percent of definite S-shaped sticks. These proportions almost reverse themselves for those sticks of less definitive form but it's hard to know what if anything to make of this.

The incidence of cactus spines by region of the Southwest (Table 9.3) shows that sticks from the Chihuahuan Desert and middle Rio Grande Valley are far more likely to have spines (58% and 55% respectively) than the Four Corners or other areas. This is likely a consequence of the generally more spiny/thorny vegetation in the Chihuahuan Desert and middle Rio Grande areas including larger and more heavily spined cacti, especially when compared to say the Four Corners or Mogollon Highlands. The Sonoran Desert lacks a sufficient sample size to make meaningful statements in this regard.

The data that I coded from my forms merely noted whether spines were present or absent and not their abundance, but this is something that varied greatly. None of the artifacts from the Colorado Plateau contained an abundance of spines yet there were several examples from the Chihuahuan Desert that were literally peppered with spines. This included specimens from Ceremonial Cave that Cosgrove (1947:59-60) insisted had never been thrown. Some of the sticks that were spine-studded are quite long and gently

Table 9.2. Incidence of spines/thorns observed in the two basic forms of prehistoric flat curved sticks from the Southwest; indeterminate are those sticks insufficiently preserved to make a determination of whether or not spines are present. The final column gives the percent of each stick type with spines (within row) excluding indeterminate specimens.

Stick Type	Indeter.	Absent	Present	Total	%	% P	% P by row
Unknown	132	31	22	185	39.7	16.9	39.6
Single-bend?	39	24	19	82	17.6	15.3	44.2
Single-bend	35	27	56	118	25.3	45.2	67.5
S-shaped?	12	7	11	30	6.4	8.9	61.1
S-shaped	14	20	17	51	10.9	13.7	45.9
Total	232	110	124	466	100.0	100.0	53.0
%	49.8	23.6	26.6	100.0			
% adjusted	--	47.0	53.0	100.0			

Table 9.3. Incidence of spines/thorns observed in prehistoric flat curved sticks from different regions of the Southwest. The final column gives the percent of each stick type with spines (within row) excluding indeterminate specimens.

Row Labels	Indeter.	Absent	Present	Total	%	% P	% P by row
Four Corners	3	8	4	15	3.2	3.2	33.3
Virgin area	1	7	3	11	2.4	2.4	30.0
Mogollon Highlands	3	6	3	12	2.6	2.4	33.3
Upper Rio Grande	187	25	31	243	52.1	25.0	55.4
Chihuahuan Desert	37	62	80	179	38.4	64.5	56.3
Sonoran Desert	0	2	1	3	0.6	0.8	33.3
General Southwest	1	0	2	3	0.6	1.6	100.0
Total	232	110	124	466	100.0	100.0	53.0

arched such that prior to conducting this study I would have thought them incapable of effective use as throwing sticks and thus not likely to have exhibited inclusions or use-wear indicative of such a function.

Spines are significant since it is difficult to envision how these might become embedded if not for use as throwing sticks. After all, most flat curved sticks are made from hard and dense wood such as oak and thus not easily penetrated by cactus spines and certainly not without some impact force. In my experiments with using replicated flat curved sticks I found it difficult to embed spines into them although this did occur when striking prickly pear and cholla and it is easy to believe that hunting in areas of dense cactus or thorny bushes would result in spine-embedded sticks. It could also be that projecting cactus pads and fruits provided handy targets for practice throws.

A rather implausible reason for the spines is use of the sticks for harvesting cactus pads or fruits by knocking them free. Such a practice has not been documented ethnographically; instead many tribes commonly used large tong-like sticks to pick cactus fruit. If the flat curved sticks had been used to harvest cacti, then I would expect to see spines embedded in the very distal end only and not all the way down both faces and edges including the grip. The presence of cactus spines embedded in the handles of flat curved sticks is totally inconsistent with use in cactus harvesting but an expectable part of use as a rabbit stick. Furthermore, a stick designed for harvesting cacti parts by striking would be far better suited to the task if it had sharp edges rather than the square or rounded ones of the flat curved sticks or to have a hook-like device at one end like what the O'odham use for harvesting saguaro fruit.

Whether spines are embedded in sticks depends not only on the types of cacti or spiny shrubs that thrive in the area of residence but also on the type of wood used to make flat curved sticks. Not only do different woods have different density and thus susceptibility to penetration by spines, but the nature of growth rings also varies, especially as these are exposed in the radial section of the stick faces. The ring-porous early wood (that produced first in the growing season) of some species is far easier to penetrate than the late wood, especially when there starts to be separation along the early wood and late wood interface (annual ring separation) as is shown in Figure 9.5c. The probable velvet ash that was frequently used for flat curved sticks in the Chihuahuan Desert area tends to have widely spaced growth rings thus relatively few per stick (around 5-6) and the large and thin cells of the early wood is easily penetrated, and in the radial section of stick faces the early wood presents natural openings for spine tips. Oak, in contrast, often grows under drought conditions in the Southwest and has very tight annual rings, often more than 20-25 per stick, and far smaller diameter cells than ash for both early and late wood. Consequently, oak is less easily penetrated by spines than ash. Non-dense woods such as willow, cottonwood, and boxelder are easily penetrated, but this material is easily broken as well so there might be less opportunity to accumulate many spines.

Rocks

It is easy to imagine how rock fragments could become embedded within sticks that are thrown along the ground at small game, especially in some of the rocky areas that people occupied. Some portions of the Southwest are not only stony but the rocks are commonly sharp edged or jagged such as the weathered limestone of west Texas. Yet it is worth factoring in what sort of environments people commonly hunted in with their rabbit sticks. This is also relevant to whether or not spines are present. It is possible to envision that some hunters mainly used rabbit sticks in areas that were free both of rocks and cacti or other thorny bushes. Ethnographically this is readily appreciated by Hopi men who hunted with rabbit sticks on the flood plains of Oraibi, Pollaca, and Jeddito Washes where they went to tend their fields. As reported previously, some of the extensively used Hopi rabbit sticks that I studied had use-wear seemingly consistent with throwing on an alluvial floodplain since the sticks were smoothed and polished from handling but lacked embedded rocks or the sorts of damage that occurs from striking rocks.

This said, the occurrence of rock fragments in prehistoric flat curved sticks is a significant piece of evidence regarding function. Figure 9.6 shows examples of rocks embedded in two sticks, one with excellent preservation and one with poorly preserved wood. This contrast serves to illustrate that, unlike spines, it was sometimes possible to positively identify embedded rocks even with some poorly preserved wood. Consequently, I did not adjust the proportion of sticks with embedded rocks by considering some as indeterminate. Doubtless this has underrepresented the proportion with embedded rocks since poor preservation or a thick post-depositional accretion of organic stain and sediment certainly limited my ability to observe rock intrusions. The number identified is also doubtless less than what it truly is because tiny rock intrusions were overlooked in microscopic inspection. I inspected sticks thoroughly under the microscope and always used the highest magnification possible (35x) to scrutinize any possible foreign intrusion, but given the large areas inspected, the potentially minute size of rock fragments, and post-depositional staining, I could have overlooked some embedded rocks. As such, I see the number of sticks identified with rock inclusions as less than the overall number that actually have inclusions.

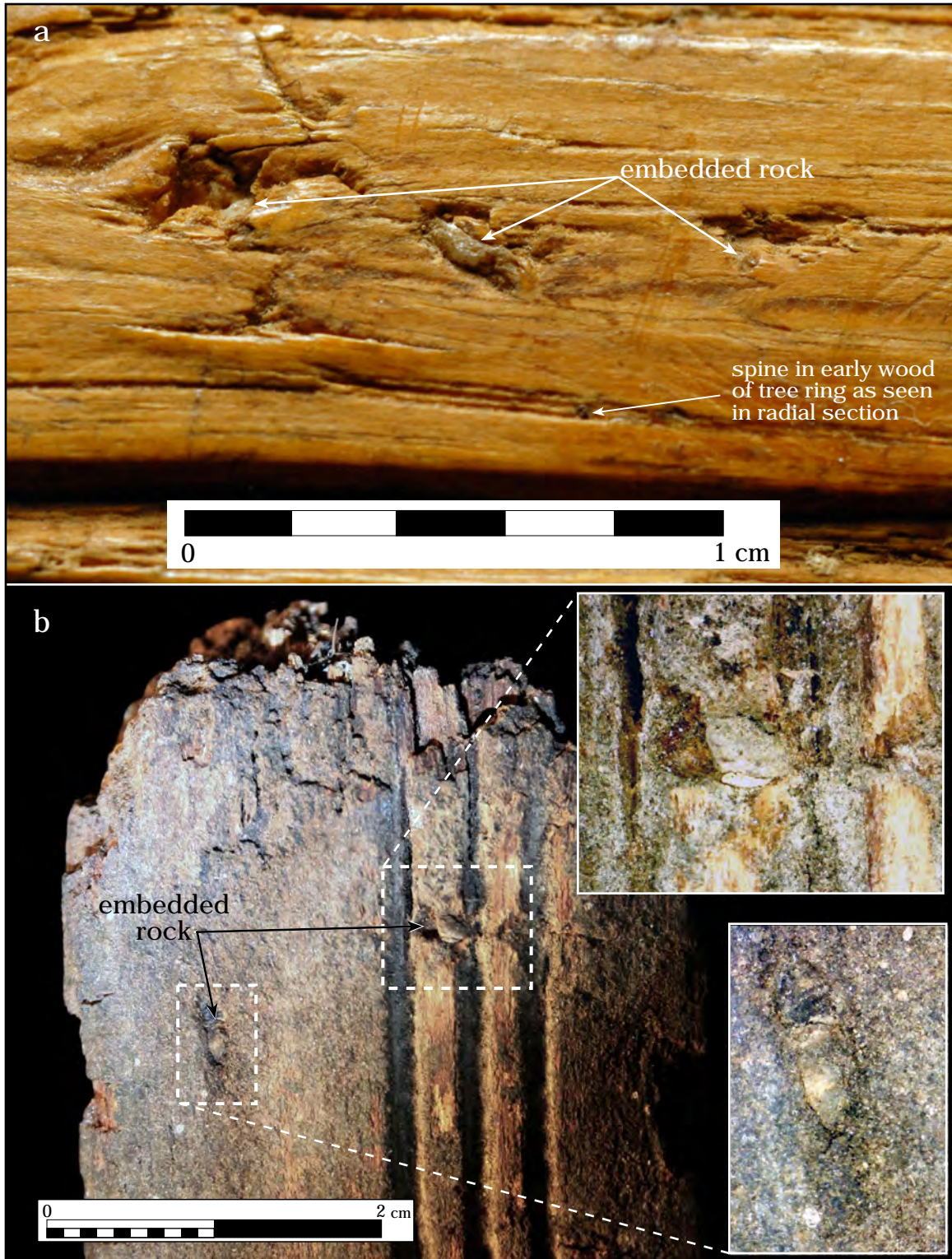


Figure 9.6. Rock fragments embedded in two prehistoric flat curved sticks: (a) distal end of whole stick from Ceremonial Cave, well-preserved oak (Geib 441, MMA 66.9.37); (b) poorly preserved fragment from Shattuck Cave, unidentified wood (Geib 362, PM 32.25.54). (Collections of the Maxwell Museum of Anthropology [a] and Penn Museum [b]; photos by Phil R. Geib.)

The rock fragments that I identified as embedded are those intruded deeply within the wood, usually within angular pits or at the leading ends of linear gouges. Loose grains of sand or rock that merely adhered to sticks or rested within cracks or other spaces were ignored. Also ignored in the specific case of sticks from the Correo Site were occasional embedded chunks of calcite, some of which appeared relatively recent. This site is a sinkhole-like feature formed by an ancient geyser and is both rimmed with calcite and contains abundant calcite boulders in the fill that have fallen from the ceiling. Stick deposition in the site involved tossing them down the 9 m deep shaft, an act that easily could have embedded calcite fragments. This also could have occurred by the common rock falls from the sinkhole ceiling and then during the process of recovery by field school students. I made no attempt to specifically identify embedded rock fragments although some of the grains closely resembled quartz and feldspar while others appeared like carbonate such as limestone; none resembled the chipped stone fragments that I have seen in organic flaking tools from the Southwest.

Less than 16 percent of the flat curved sticks from the Southwest have embedded rock fragments obvious at low magnification and of these the single-bend sticks have a far greater representation when looking at the within row percentage (Table 9.4), which in effect excludes unidentifiable fragments. Indeed, single-bend sticks have more than twice the incidence of embedded rocks as S-shaped sticks. Of the seven definite S-shaped sticks with embedded rock, four appear to have been rejuvenated and perhaps repurposed, which for three of these evidently occurred after some portion of the stick broke. The incidence of embedded rocks by region of the Southwest is presented in Table 9.5. Some areas have too few sticks to be meaningful and some with numerous examples, such as the upper Rio Grande, have relative few examples with embedded rock.

A cross-tabulation of whether or not spines and rocks are embedded in flat curved sticks (Table 9.6) shows that there is some degree of co-occurrence especially after excluding those sticks that could not be evaluated for spines because of poor preservation. There are four sticks indeterminate for spines that have embedded rock, one of which was shown previously in Figure 9.6b. This illustrates that not all sticks with poor preservation can be treated as indeterminate when it comes to observing embedded

rock but it is nonetheless likely that the count of sticks with such inclusions is far less than what it would be if all artifacts were well preserved. It seems clear that if sticks lack embedded rocks then there is a good probability that they will also lack embedded spines and conversely if rocks are present then there is a good probability that spines will be too. There are far more sticks that have embedded spines but not rocks than vice versa but not more than might be expected based on proportional representation. A chi-square test based on the absence/presence data (excluding indeterminate) is 22.08, which greatly exceeds the value required for significance at the .001 level ($p = .000003$).

Table 9.4. Incidence of embedded rock fragments observed in the two basic types of prehistoric flat curved sticks from the Southwest (excludes miniatures).

Stick Type	Absent	Present	Total	%	% P	% P by row
Unknown	174	11	185	39.7	15.3	5.9
Single-bend?	69	13	82	17.6	18.1	15.9
Single-bend	82	36	118	25.3	50.7	30.5
S-shaped?	26	4	30	6.4	5.6	13.3
S-shaped	44	7	51	10.9	9.7	13.7
Total	395	71	466	100.0	100.0	15.2
%	84.8	15.2	100.0			

Table 9.5. Incidence of embedded rock fragments observed in prehistoric flat curved sticks from different regions of the Southwest (excludes miniatures).

Row Labels	Absent	Present	Total	%	% P	% P by row
4 Corners	11	4	15	3.2	5.6	26.7
Virgin	6	5	11	2.4	7	45.5
Mogollon Highlands	10	2	12	2.6	2.8	16.7
Upper Rio Grande	236	7	243	52.1	9.9	2.9
Chihuahuan Desert	127	52	179	38.4	73.2	29.1
Sonoran Desert	3	0	3	0.6	0	0
General Southwest	2	1	3	0.6	1.4	33.3
Total	395	71	466	100	100	15.2

Table 9.6. Cross-tabulation of embedded rock fragments and spines in prehistoric flat curved sticks from the Southwest (excludes miniatures). Proportions on the right are based on adjusted totals after excluding sticks that were indeterminate for spines.

Rocks	Indet.	Absent	Present	Total	Adj Tot	% A	% P	Total %
Absent	228	95	72	395	167	40.6	30.8	71.4
Present	4	15	52	71	67	6.4	22.2	28.6
Total	232	110	124	466	234	47.0	53.0	100.0

Throwing Use-Wear

Making an informed interpretation about use-wear on sticks depends on several factors. Foremost is the degree of preservation both of the overall stick and also of the wood surface as it pertains to use traces. Table 9.7 presents that data about both of these aspects for the prehistoric specimens from the Southwest excluding miniatures. Just because a stick was quite well preserved (good or excellent) does not mean that it had informative use-wear. There are cases with well-preserved sticks where the wood is solid and not rotted in any way but that nonetheless have a surface obscured by rodent urine or other residue such that it is impossible to see much if any use-wear. A good example of this is the darkly stained stick shown previously in Figure 8.20c, which I rated as variably preserved since some of the wood surface was visible (in the “good” range) and some totally obscured (“poor”).

Other important considerations include whether an artifact is whole and if fragmentary then the overall size of the portion that is present. For rather obvious reasons whole artifacts provide the most conclusive inferences as to stick use based on wear traces, at least for those cases with good or excellent preservation of the wood surface. There are 34 examples like this and another four nearly whole sticks that also have good or excellent preservation of use-wear (Table 9.8). Another complication is stick recycling or repurposing—an artifact might be well preserved and exhibit traces of use but these might have little or nothing to do with its original function. The recycled sticks described and illustrated in Chapter 8 provide good examples and for the one used as a stirring stick the adhering food gruel obscures use-wear (see Figure 8.6). The Southwest sample of flat curved sticks includes 89 that exhibit evidence of recycling and these account for 20-30 percent of the artifacts with excellent or good wood surface preservation (Table 9.8 last column); only two of these are whole artifacts.

A cross-tabulation of use-wear preservation by use-wear intensity (Table 9.9) shows that the majority of sticks that can be evaluated (excluding those that are indeterminate) only exhibit a light degree of use-wear (59%) and 12 percent have no obvious use-wear. Both these figures are likely too high because of preservation issues, so just considering the sticks that have variable or better use-wear preservation, the proportion of those with no wear traces drops to 7 percent (6.6%) although those with

Table 9.7. Cross tabulation of overall wood preservation (row) by use-wear preservation (column) for prehistoric flat curved sticks from the Southwest (excludes miniatures). Poorly preserved sticks were so fragile that they could not be turned over; modestly preserved sticks could be handled but the wood surface could be totally degraded.

Wood Condition	Excellent	Good	Variable*	Modest	Poor	Total	%
Excellent	58	31	22	1	0	112	24.0
Good	0	15	57	51	48	171	36.7
Modest	0	0	8	15	158	181	38.8
Poor	0	0	0	0	2	2	0.4
Total	58	46	87	67	208	466	100.0
Percent	12.4	9.9	18.7	14.4	44.6	100.0	

* Sticks with variable use-wear preservation had some wood surfaces that were informative (good) but others that were only minimally so (modest) or not at all (poor).

Table 9.8. Cross tabulation of use-wear preservation (row) by stick condition (column) for prehistoric flat curved sticks from the Southwest (excludes miniatures). Last column lists the proportion of sticks within row that were recycled (n = 89) and thus might exhibit use-wear unrelated to primary stick function.

Preservation	Fragment	Nearly Whole	Whole	Total	% Recycled
Excellent	30	2	26	58	27.6
Good	36	2	8	46	34.8
Variable (G to P)	59	7	21	87	26.4
Modest	64	0	3	67	22.4
Poor	200	6	2	208	9.1
Grand Total	389	17	60	466	19.1

Table 9.9. Cross tabulation of use-wear preservation (row) by use-wear intensity (column) for prehistoric flat curved sticks from the Southwest (excludes miniatures); proportions in last row exclude sticks with indeterminate use-wear intensity, mostly those with poor preservation.

Preservation	Indeter.	None	Light	Moderate	Heavy	Total	%
Excellent	2	3	28	16	9	58	12.4
Good	2	3	25	9	7	46	9.9
Variable (G to P)	6	6	51	18	6	87	18.7
Modest	20	13	29	5	0	67	14.4
Poor	191	5	11	1	0	208	44.6
Total	221	30	144	49	22	466	100.0
%	47.4	6.4	30.9	10.5	4.7	100.0	
% adjusted (n = 245)	--	12.2	58.8	20.0	9.0	100.0	
% adjusted (n = 181)	--	6.6	57.5	23.8	12.2	100.0	

light use-wear still account for more than half (57.5%). Sticks with both moderate and heavy use-wear intensities increase slightly (up from 20% to 24% and 9% to 12% respectively). Wear intensity means the extent of presumably throwing-related damage that each stick exhibits, yet it is worth recalling the use-wear evidence for Hopi rabbit sticks—extensive use did not necessarily result in heavy or even moderate use damage since the context of use is a critical variable but an unknown one for the prehistoric specimens.

As might be expected, there is a clear relationship between the extent of use-wear and the presence of embedded rocks and spines (Table 9.10). Almost 65 percent of the sticks with heavy use-wear exhibited embedded rocks and nearly 75 percent had embedded spines. These proportions drop slightly for sticks with moderate use-wear intensity but still represent more than half—53 percent and 69 percent respectively. Sticks with embedded inclusions account for a far higher proportion of the artifacts with moderate to heavy use-wear than would be expected by chance alone, especially for rocks. Sticks with rocks account for 56 percent of those with heavy to moderate use-wear instead of the 15 percent expected. This is logical in that frequent rock contact would result in readily observable use-wear traces.

Table 9.10. Incidence of embedded rocks and spines by the extent of use-wear development for prehistoric flat curved sticks from the Southwest (excludes miniatures). The proportions for spines are based on excluding sticks that could not be evaluated for this residue (adjusted total).

Use-wear Intensity	Rocks	%	Row %	Total	Spines	%	Row %	Adj Total
Heavy	14	19.7	63.6	22	16	12.9	72.7	22
Moderate	26	36.6	53.1	49	34	27.4	69.4	48
Light	26	36.6	18.1	144	61	49.2	42.4	118
None	0	0.0	0.0	30	4	3.2	13.3	16
Indeterminate	5	7.0	2.3	221	9	7.3	4.1	30
Total	71	100.0	15.2	466	124	100.0	26.6	234

Crushing of the wood grain on stick distal and proximal ends is an expected consequence of throwing to kill small game, especially when hunting in rocky environments. Table 9.11 lists the incidence of this on the sample of prehistoric specimens from the Southwest. Indeterminate specimens are those that lack an end or are too poorly preserved to evaluate this variable. There is clearly a strong trend for sticks

either to lack crushing on both ends or to display such evidence. The experimental sticks mentioned in Chapter 7 show that if crushing is present on one end then it is likely to be seen on the other as well. This is because it is impossible to selectively damage just one end and not the other when throwing the sticks since which end strikes first is essentially a random process. Sticks that exhibit heavy use-wear traces almost invariably have crushed ends (Table 9.12) but even those with a light degree of use-wear will exhibit crushing in at least 40 percent of cases. Only a single unusual stick that otherwise lacked any evidence of use-wear had distal crushing and in this case it was difficult to know what to attribute the end damage to; otherwise sticks without obvious evidence of throwing use also lacked end damage. Table 9.13 presents data on the incidence of stick end crushing by different regions of the Southwest.

Table 9.11. Incidence of wood crushing on the proximal (row) and distal (column) ends of prehistoric grooved curved sticks from the Southwest (excludes miniatures). The most informative proportions are those adjusted by excluding those that could not be evaluated for these attributes because of poor preservation.

Proximal Crushing	Indeter.	Absent	Present	Total	%	Adj %
Absent	24	27	5	56	12.0	47.9
Present	34	3	24	61	13.1	52.1
Indet	257	46	45	348	74.9	--
Total	315	76	75	466	100.0	100.0
Percent	67.6	16.3	16.1	100.0		
Adj %	--	50.3	49.7	100.0		

The two general forms of flat curved sticks had different proportions of crushed ends, with single-bend sticks having the highest incidence (Table 9.14). Definite S-shaped sticks had the lowest frequency of such damage with fewer than 30 percent having distal crushing and 22 percent with proximal crushing. The overall low representation of proximal and distal crushing for S-shaped sticks is even more remarkable given the delicate nature of many of the ends for these artifacts. Prime examples of this include the small and thin tab-like ends on some S-shaped sticks at the Correo shrine (see Figure 1.1a, f), the thin and delicate ends of some grips (see Figure 8.16c, d), or the pointed but uncrushed proximal or distal ends of various sticks (see Figures 8.13a, e and 9.3).

Table 9.12. Incidence of end-wood crushing by use-wear intensity for prehistoric flat curved sticks from the Southwest (excludes miniatures). The most informative proportions are those adjusted by excluding sticks that could not be evaluated for use-wear intensity (adj %) or crushing (row %).

Use-Wear Intensity	Total	Proximal Crushing				Distal Crushing			
		Present	% P	Adj %	Row %	Present	% P	Adj %	Row %
Heavy	22	9	14.8	18.8	90.0	15	20.0	21.4	100.0
Moderate	49	15	24.6	31.3	30.6	19	25.3	27.1	53.1
Light	144	24	39.3	50.0	42.1	35	46.7	50.0	43.8
None	30	0	0.0	0.0	0.0	1	1.3	1.4	7.1
Indeter.	221	13	21.3	--	--	5	6.7	--	--
Total	466	61	100.0	100.0	51.7	75	100.0	100.0	49.3
Adj. n	245	48			32.7	70			63.1

Table 9.13. Incidence of end-wood crushing of prehistoric flat curved sticks by general region of the Southwest (excludes miniatures). The row % is based on the adjusted count of sticks after excluding those that could not be evaluated for crushing.

Region	Total	Proximal Crushing				Distal Crushing			
		Present	Adj n	% P	Row %	Present	Adj n	% P	Row %
Four Corners	15		11	0.0	0.0	2	12	2.7	16.7
Virgin	11	7	9	11.5	77.8	4	7	5.3	57.1
Mogollon Highlands	12	0	2	0.0	0.0	2	2	2.7	100.0
Upper Rio Grande	243	13	37	21.3	35.1	13	55	17.3	23.6
Chihuahuan Desert	179	41	57	67.2	71.9	53	72	70.7	73.6
Sonoran Desert	3	0	0	0.0	0.0	0	1	0.0	0.0
General Southwest	3	0	1	0.0	0.0	1	2	1.3	50.0
Grand Total	466	61	117	100.	52.1	75	151	100.0	49.7

Table 9.14. Incidence of end-wood crushing by general type of prehistoric flat curved sticks from the Southwest (excludes miniatures). The row % is based on the adjusted count of sticks after excluding those that could not be evaluated for crushing.

Stick Type	Total	Proximal Crushing				Distal Crushing			
		Present	Adj n	% P	Row %	Present	Adj n	% P	Row %
Unknown	185	14	23	23.0	60.9	12	29	16.0	41.4
Single-bend?	82	6	8	9.8	75.0	7	17	9.3	41.2
Single-bend	118	31	52	50.8	59.6	42	67	56.0	62.7
S-shaped?	30	5	11	8.2	45.5	5	7	6.7	71.4
S-shaped	51	5	23	8.2	21.7	9	31	12.0	29.0
Total	466	61	117	100.0	52.1	75	151	100.0	49.7

Based on a combination of all evidence for use, I made an inference as to whether or not each artifact had been used for throwing—i.e., as a rabbit stick. Table 9.15 presents this information according to general stick type for the entire Southwest sample excluding miniatures. Sticks listed as indeterminate are those for which such an

Table 9.16. Cross tabulation of summary inference about throwing use for prehistoric flat curved sticks by general regions of the Southwest (excludes miniatures); proportions are calculated within column by excluding sticks for which a use inference was indeterminate (based on adjusted total).

Throwing Use?	Four Corners	Virgin	Mogollon Highlands	Upp Rio Grande	Chihuahuan Desert	Sonoran Desert	General Southwest	Total
Indeterminate	1		4	164	55		1	225
No	2			15	4			21
Equivocal	7	3	3	18	18	3		52
Probable	1	2	3	21	24		1	52
Yes	4	6	2	25	78		1	116
Total	15	11	12	243	179	3	3	466
Adjusted total	14	11	8	79	124	3	2	241
No, adj %	14.3	0.0	0.0	19.0	3.2	0.0	0.0	8.7
Equivocal, adj %	50.0	27.3	37.5	22.8	14.5	100.0	0.0	21.6
Perhaps, adj %	7.1	18.2	37.5	26.6	19.4	0.0	50.0	21.6
Yes, adj %	28.6	54.5	25.0	31.6	62.9	0.0	50.0	48.1
Sum %	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Fending Use-Wear

Establishing a relevant interpretive context for the identification of use damage resulting from fending away atlatl darts is more problematical than for throwing at rabbits and other small game. For one, there are no known ethnographic examples from the Southwest or elsewhere in North America that can serve as use-wear analogs. The parrying clubs of the Solomon Islands, especially the sickle-shaped ones from San Cristóbal Island, might serve this purpose but most of the specimens in museums appear to be more ceremonial in nature (*roromaraugi*), being very well finished and not displaying obvious use-traces. The specimens known as *qauata* look more strictly functional in nature and based on photos appear to have use damage, but I was not able to locate any of these for close inspection. Even if I had, there are confounding issues to consider such as the nature of the projectiles that they were used against (hand thrown vs. atlatl thrown), the projectile tips (wood or bone in Melanesia vs. stone for the most part in the Southwest), and wood hardness/density. Finally, because of the obvious risk of injury or worse, I have been unable to generate experimental use-wear signatures for lethal darts. As reported in Chapter 6, atlatl darts can be deflected with both S-shaped and single-bend sticks. Since the sticks are held and used in a consistent fashion when deflecting darts, the sticks develop highly patterned use-wear that is distinct from that generated by throwing at small game. Ultimately it would be beneficial to devise a safe

experiment that would allow the generation of use-wear while fending away stone tipped atlatl darts but until then I have to base my inferences on supposition about what sorts of damage might occur from lethal darts.

From my experience with fending away atlatl darts it is evident that in the vast majority of cases knocking aside projectiles results in wood-on-wood contact alone. Wood-on-wood contact smoothes and polishes the wood, and can result in an intense polish if sufficient force is exerted. Force is fleeting when parrying away darts and is focused on very small areas of the stick, but a polish does result. At the present time it is difficult to make interpretive use of this information because of the many other ways that smoothing and polish can develop on sticks, including post-recovery handling and museum curation/display. Nonetheless, the patterning of where the polish and a few other wear traces developed on the experimental fending sticks is useful. Since flat curved sticks are held and used in a consistent fashion when fending darts, the polish or other wear traces occur on the edge facing the opponent and those portions of the face adjacent to that edge. In essence, any use-wear should be quite limited to one side of a stick, which in the case of an S-shaped example would include the convex side with the grip knob and the distal concave part of that same edge. Fending use does not result in crushing of the wood grain on the ends but it can result in dents, nicks and gouges to the edge held toward the opponent.

Wood-on-wood contact is common with fending. Rare will be the occasion when the stone tip of a dart point strikes the wood. Rarer still will be having a stone tip embed itself in a stick. Nonetheless, even in my limited trials with fending atlatl darts there were several occasions when the foam-covered dart bunts directly hit the flat curved sticks; in at least three cases the bunts dented the wood. Had the darts been tipped with stone tips rather than bone or wood bunts then serious damage to the flat curved sticks would have resulted. There were also a few cases where the fending stick glanced across an atlatl dart bunt tip, which, if it had been of stone, also would have registered a cut or nick in the stick edge.

The strongest support of the fending stick hypothesis would be a flat curved stick with an embedded dart point. Such an artifact is not within my sample but I did locate one specimen that seems almost as conclusive—a stick that probably was pierced by such a

projectile tip. Figure 9.7 illustrates this specimen and shows both the entry hole, which occurs at one corner of the concave edge just slightly distal from the midpoint, and the resulting split in the opposite side of the stick. The penetrating object clearly did not pass entirely through the stick since the wood is only split and lifted up on the “exit” and if it had gone entirely through the wood fibers would be pulled out in that direction. The penetrator entered the wood at a slight angle and from the nature of the hole it seems evident that the object was pointed, sharp-edged and lenticular. The hole measures 6 mm wide and 3 mm high and the wood is badly damaged on the entry side. The wood for this specimen appears to be ash, thus relatively dense and hard, which indicates considerable impact force; this is further suggested by the nature of the wood damage on the entry side. All of the physical evidence is consistent with penetration by a dart point tip, one that embedded up to the wood of the foreshaft. The fact that this penetration occurs near the middle of the concave edge, a place that rarely if ever gets damaged by throwing, is further consistent with dart penetration. That this damage is ancient and not the result of recovery is indicated by weathering and patina. Fresh cuts or damage to sticks from the time of recovery or thereafter were immediately evident. Further support that this damage occurred before deposition in the site comes from the organic droplets (insect feces) that occur on the crushed wood of the entry hole and within the split of the other face; these also occur on the stick overall and resulted after the artifact entered the archaeological record.

Figure 9.8 shows the entry hole on this stick along with hafted dart points from Ceremonial Cave at the same scale for comparative purposes. These points have direct radiocarbon dates of cal. AD 20–220, 400–210 cal. BC, and 1690–1530 cal. BC respectively in the sequence shown in this figure (<http://www.texasbeyondhistory.net/ceremonial/hafted.html>). Since the flat stick has a direct date of 1295–935 cal. BC (AA89974, -24.7‰), the far right point is closest in age. The X-ray computed tomography density image (CT scan) of one of these hafted points illustrates how projectile penetration of the stick likely would have come to a rather abrupt halt at the foreshaft, although with splintering of the wood around the hole. Unless the point snapped across the notches, a pull on the foreshaft would have withdrawn the tool hence no portion was left within the gaping hole, not even any minute fragments.



Figure 9.7. Projectile-like damage to the midsection of Stick 447 (MMA 66.9.39), which is probably from Ceremonial Cave, Texas. Damage consists of an angled entry hole in the corner of the concave edge that created a large split on the opposite face (exit); the penetrating object clearly did not pass entirely through the stick. (Collections of the Maxwell Museum of Anthropology; photos by Phil R. Geib).

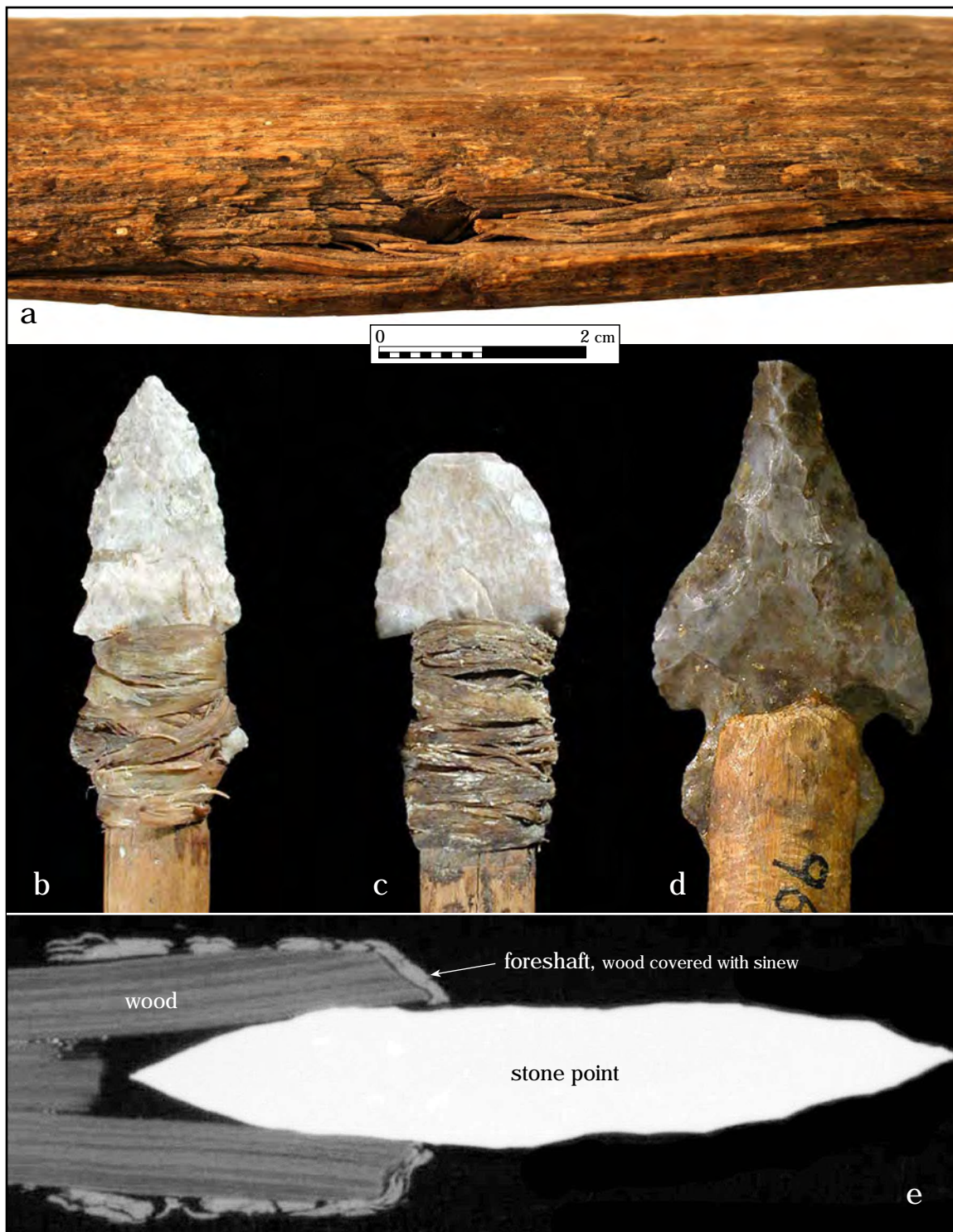


Figure 9.8. Comparison between the entry hole (a) of Stick 447 (MMA 66.9.39) and hafted dart points from Ceremonial Cave shown at the same scale: (b) TARL 46808-707, dated cal. AD 20-220; (c) TARL 46808-705, dated 400-210 cal. BC; (d) TARL 96746, dated 1690-1530 cal. BC; (e) CT scan of the lateral view of point b. (Collections of the Texas Archaeological Research Laboratory; images b and c by Milton Bell, d by Laura Nightengale, and e by Matthew Colbert and Jessie Maisano.)

Stick 447 constitutes the best case of direct physical evidence from use that is fully consistent with a fending interpretation. Nonetheless, this was clearly not the sole purpose of this artifact since some use-wear and a few embedded cactus spines indicate that the artifact was also thrown, likely as a rabbit stick. In addition to the hole, Stick 447 also exhibits another wear trace that seems potentially relatable to fending—sharp-edged cuts or nicks. This use damage seems especially significant when it occurs on the concave edges of sticks, especially the moderately pronounced bends on S-shaped sticks, or other areas not normally prone to ground contact. Concave edges are not prone to being damaged by throwing use and indeed sticks that exhibit heavy damage consistent with throwing have concave edges that are essentially unscathed (Figure 9.9). What damage there is tends to occur on the edge-face juncture rather than right on the edge itself and on the face that was toward the ground when the stick was thrown, just like the example shown. If there is damage to concave edges or corners resulting from rock contact then this should be like that seen on faces and the convex edges rather than just sharp-edged cuts. Yet, cuts like this are exactly what would be expected if a stone projectile tip was struck while batting away an atlatl dart.

Examples of cuts like this are shown in Figures 9.10–9.13 for both single-bend and S-shaped sticks. Again these cuts are not recent recovery related or thereafter but occurred before site deposition; all are patinated, stained, or weathered and in some cases the cuts have been partially smoothed over by handling and further use (e.g. Figure 9.10b). Some of these occur on sticks that otherwise display little use-wear, such as the S-shaped sticks shown in Figures 9.10–9.13. Figure 9.10 shows the distal half of an S-shaped stick from the Correo shrine (Stick 72) that has a distinct angled cut in one corner of a convex edge, simultaneous with this cut was the removal of a small wood chip. This edge is otherwise undamaged even though it would be most susceptible to this from throwing use. The distal end of this stick is likewise undamaged, lacking any obvious throwing-related use-wear (this is clear despite the dry rot). The cut extended several millimeters at an angle into the wood and has a somewhat stepped-like conformation on one side. The concave edge of this stick also exhibits a cut in one corner and two small angular dents, damage that is difficult to square with throwing, especially since the stick lacks obvious evidence for such use. This damaged area exactly matches the area on the



Figure 9.9. Contrast in use-wear between convex and concave edges of a single bend flat curved stick from Fresnal Shelter (Geib 13) that exhibits heavy use damage consistent with throwing, including embedded rock fragments and cactus spines: (a) oblique view showing the convex edge and face that was down when thrown; (b) oblique view showing the concave edge and face that was up when thrown; (c) close-up of concave edge showing some throwing-related damage at transition to the down face. (Collections of the Lincoln National Forest Museum; photos by Phil R. Geib.)



Figure 9.10. Cuts on single bend sticks potentially indicative of fending use: (a) cut to the convex edge just above grip wrap, Correo Site (Geib 116, MMA 631.1); (b) smoothed over cut to concave edge near distal end, Correo Site (Geib 84, MMA 532.1); (c) cut in face and corner of concave edge with chip removed, Ceremonial Cave (Geib 295, TARL 46811b); (d) cut in corner of concave edge with raised splinter, Ceremonial Cave (Geib 294, TARL 46811a). (Collections of the Maxwell Museum of Anthropology [a,b] and the Texas Archaeological Research Laboratory [c,d]; photos by Phil R. Geib).



Figure 9.11. S-shaped flat curved stick from the Correo Site (Geib 72, MMA 329.1) that exhibits cuts and nicks but lacks any obvious throwing-related use-wear: (a) distal half snapped at midsection showing two areas of detailed images; (b) close-up of the concave edge showing a cut and two angular dents; (c) angled cut into corner of convex edge that also removed a small chip. (Collections of the Maxwell Museum of Anthropology; photos by Phil R. Geib.)

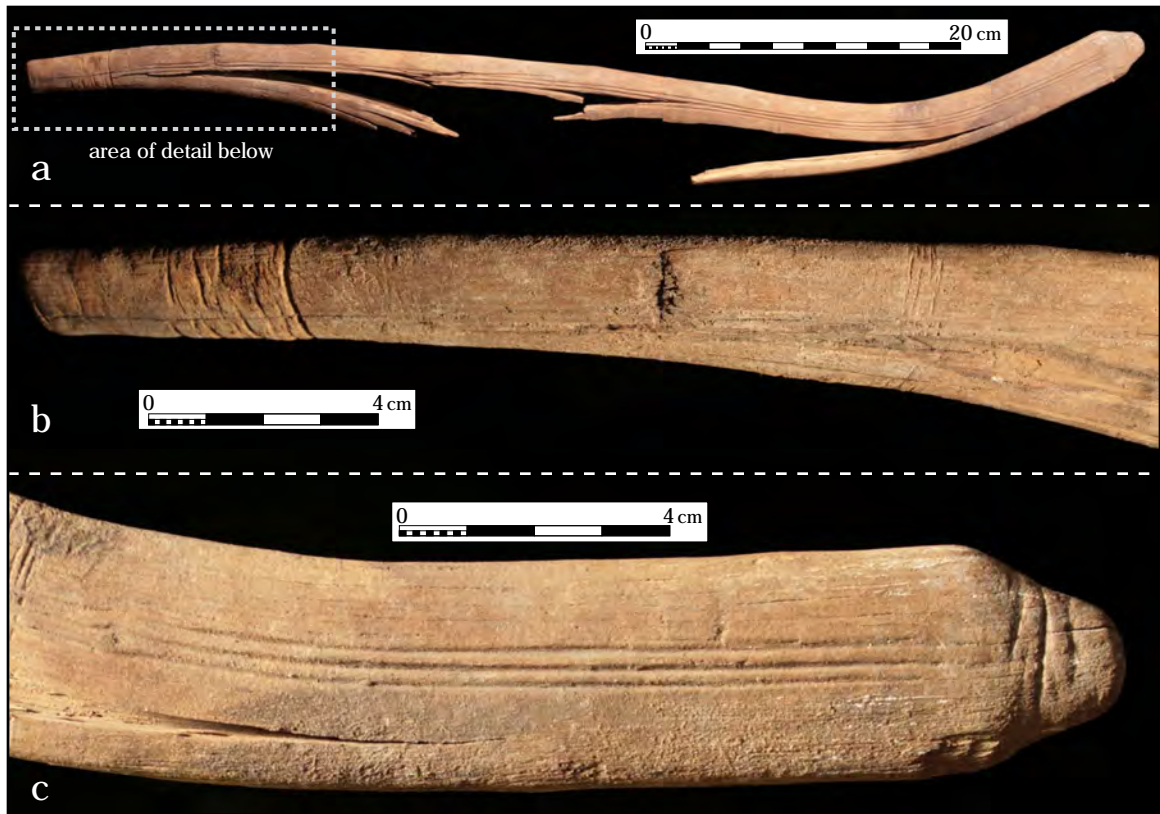


Figure 9.12. S-shaped flat curved stick from the Correo Site (Geib 62, MMA 221.1) showing large cut near the handle: (a) entire stick, which displays weathering separation of the midsection along the pith but lacks any obvious throwing-related use-wear; (b) close-up of grip end showing the large transverse gash in the face and corner of the convex edge; (c) close-up of the thin and delicate tab-like distal end that is not crushed or otherwise damaged. (Collections of the Maxwell Museum of Anthropology; photo by Phil R. Geib.)



Figure 9.13. S-shaped flat curved stick from Doughnut Alcove (Geib 2, GLCA 765) that lacks any obvious throwing-related use-wear but exhibits a nick on the concave edge: (a) distal half of stick showing the two areas with detailed images; (b) angled nick across concave edge; (c) undamaged convex edge of distal portion. (Collections of the Glen Canyon National Recreation Area; photos by Phil R. Geib.)

experimentally used S-shaped stick replica that exhibited the most fending-related use-wear (see Chapter 6). The Correo artifact has a direct date of 1430–1260 cal. BC (AA98915, -22.7‰) making it somewhat older than the example of Figures 9.7 and 9.8, which has the probable projectile hole.

Figure 9.12 shows another example of an S-shaped stick from the Correo Site (Stick 62) that likewise lacks any obvious throwing-related damage but exhibits a substantial gash above the grip. The cut is through the corner of the convex edge and onto the adjacent face extending through the incised grooves. The cut extends around 6 mm into the wood. This stick has a very thin and delicate grip end and distal tip, ones that would have been easily damaged if the stick had been thrown and yet these appear unscathed, though weathered post-depositionally. This damage location is similar to one that occurred during the fending experiment when an atlatl dart bunt directly struck the stick edge just above the grip, denting it slightly; had a stone point been used rather than a bunt the sort of damage shown in Figure 9.12 seems likely. The damage occurs on that portion of the stick that was always held toward the opponent in the fending experiments because of the cordage knob that was always present on S-shaped sticks like this at the Correo Site and most other sites of the Colorado Plateau.

One final illustrated example is the whole S-shaped stick with pronounced bend that comes from Doughnut Alcove in Glen Canyon, SE Utah (Figure 9.13). This is yet another specimen that lacks the sort of use-wear that is consistent with throwing, having a very thin yet undamaged proximal end and convex edges that likewise are not damaged (see Chapter 2). Indeed, the one obvious use-trace on this stick is a small angled nick across the concave edge of the distal bend. This is a slim piece of evidence but again it is the sort of damage that is inconsistent with throwing, especially when the rest of the stick appears unscathed. This artifact also has a few even more minor nicks on the corner of the concave edge. The experimental use of sticks like this for fending resulted in use-wear on the interior of the distal concave edge, so the evidence is far more consistent with use in dart deflection.

Table 9.17 presents the count and percent of sticks in the Southwest sample that I thought might have been used for fending based on a combination of all evidence. In making such an inference there were only three possibilities: indeterminate, no, and

possibly. Indeterminate sticks are those for which a fending inference was impossible because of poor wood preservation or other factors such as extent of fragmentation. Just 11 percent of the sample (adjusted %) exhibits use traces potentially indicative of fending. In more than 40 percent of these cases (12 of 27 or 44.4%) the evidence for fending use also occurred on sticks that displayed clear use damage from throwing (i.e., use as rabbit sticks). Almost another 20 percent (5 of 27 or 18.5%) of the sticks possibly used for fending had use-wear indicative of throwing. For the rest of the sticks with possible evidence of fending use, the wear traces for throwing were equivocal or lacking. There is no evident difference between definite single-bend and S-shaped sticks in the evidence for fending use, with both occurring at around 17-18 percent.

Table 9.17. Cross tabulation of summary inference about fending use for prehistoric flat curved sticks of the Southwest (excludes miniatures); adjusted proportions are calculated by excluding indeterminate sticks and percents at right are within row.

Stick type	Indeter	No	Possibly	Total	Adj Total	No adj %	Perhaps adj %
Unknown	125	60	0	185	60	100.0	0.0
Single-bend?	43	34	5	82	39	87.2	12.8
Single-bend	34	69	15	118	84	82.1	17.9
S-shaped?	9	21	0	30	21	100.0	0.0
S-shaped	10	34	7	51	41	82.9	17.1
Total	221	218	27	466	245	89.0	11.0
%	47.4	46.8	5.8	100.0			
% adjusted	--	89.0	11.0	100.0			

When parceled out by region of the Southwest, the count of sticks with possible indications of fending use is so low that there is little reason to believe that the variable proportions are meaningful (Table 9.18). Perhaps the 10-11 percent representations from the middle Rio Grande and Chihuahuan Desert regions are telling given the overall adjusted totals for these areas. If so, and if the sticks listed as possibly used for fending were indeed used this way, then what needs to be factored in is the large unknown concerning how frequently sticks might become visibly damaged when they are used for fending purposes. If fending rarely results in damage or at least rarely results in damage that can be distinguished from that of throwing use, then an incidence of 11 percent would represent substantial use of the sticks for this purpose. This remains a hypothesis in need of further experimental work. The experimental results reported previously

indicate that some significant damage to flat curved sticks could occur on the edges during the course of deflecting 100 or so darts if stone projectile tips were used.

Table 9.18. Cross tabulation of summary inference about fending use by general stick type for prehistoric flat curved sticks from the Southwest (excludes miniatures); proportions are calculated within column by excluding sticks for which a use inference was indeterminate (based on adjusted total).

Region	Indeter	No	Possibly	Total	Adj Total	No adj %	Perhaps adj %
Four Corners	1	12	2	15	14	85.7	14.3
Virgin	0	11	0	11	11	100.0	0.0
Mogollon Highlands	4	6	2	12	8	75.0	25.0
Upper Rio Grande	160	74	9	243	83	89.2	10.8
Chihuahuan Desert	55	112	12	179	124	90.3	9.7
Sonoran Desert	0	2	1	3	3	66.7	33.3
General Southwest	1	1	1	3	2	50.0	50.0
Grand Total	221	218	27	466	245	89.0	11.0

Summary

When Guernsey and Kidder (1921:88) concluded that Basketmaker II grooved clubs were not rabbit sticks like those used among the Puebloans, they evidently did so principally because of a lack of bruises or battering on ends and edges. Presumably, the ethnographic rabbit sticks that they were familiar with exhibited such use-wear but, as I documented in Chapter 7, scarring of the wood surface from throwing use is dependent on environment of use. Even if cognizant of this subtlety, Guernsey and Kidder still might have been unwilling to assign a specific use to the sticks. They also note that ethnographic rabbit sticks differ from the Basketmaker II specimens “in some details” noting that this is especially true for Hopi sticks (Guernsey and Kidder 1921:88-89), specifying the cut hand grip and painted designs. Other aspects actually seem more functionally relevant such as stick shape (single-bend vs. S-shaped), size and weight, grip wrapping, plus the longitudinal grooves and investment in wood surface preparation on the prehistoric specimens. Many of these aspects are difficult to square with throwing at small game.

Guernsey and Kidder were clearly on the right track by calling attention to evidence of use history registered on the artifacts. This evidence consists of damage to the wood and the inclusion of foreign materials such as rock fragments and spines. The

most conclusive support of the fending hypothesis—a dart point embedded in a stick—was not observed. Nonetheless, one artifact exhibited an impact rent from a sharp pointed object that is nearly as conclusive since this damage is easily accounted for by a projectile point impact but not by use as a throwing stick. Other flat curved sticks exhibited less dramatic forms of use damage that match the sorts of wear to be expected from fending atlatl darts, but not throwing. Yet, far more of the prehistoric flat curved sticks exhibited evidence that is fully consistent with use as a rabbit stick. This includes embedded cactus spines and rocks and surface damage that is typical of ethnographic and experimental rabbit sticks. Yet there is no reason why a stick used to kill rabbits couldn't have performed equally well to bat away darts should the need arise or vice versa.

CHAPTER 10

DATING OF PREHISTORIC FLAT CURVED STICKS

As should be obvious by the descriptive details provided in Chapter 8, there is significant variability within the class of Southwestern prehistoric artifacts that comprise flat curved sticks. This variability seems partially accounted for by geography and likely relates to learning networks (cultural tradition). But change through time, either from drift or for functional reasons, perhaps as the principal role of the artifact evolved, is also likely to be an important factor so knowing the temporal placement of the artifacts seems essential. A temporal sequence of morphological change for functional reasons could result from “fine tuning,” where artifacts are refined to better match a new role or an increasingly emphasized role. A further consideration concerns where the Basketmaker II S-shaped grooved sticks originated. An innovation by Basketmaker II groups living on the Colorado Plateau is possible but if an earlier history of use could be documented elsewhere in the Southwest, then the artifacts might provide evidence of trait-unit intrusion to the Four Corners and might well comprise one line of support to argue for a site-unit intrusion.

In situations of controlled archaeological recovery, examples of the S-shaped variety of flat curved sticks have come from preceramic contexts and were associated with the atlatl and dart. Consequently, they are generally assumed to date prior to AD 500, the approximate introduction time for the bow and arrow. On the Colorado Plateau they are considered a temporal diagnostic of the Basketmaker II period. The few prior instances of direct dating (e.g., Geib 1990; Winslow and Blair 2003) have verified the assumed preceramic temporal estimate of S-shaped flat curved sticks on the Colorado Plateau. Poorly controlled excavations in the Chihuahuan Desert have led some to suggest that single-bend flat curved sticks were also used during the ceramic period alongside bows and arrows (e.g. Taylor 1966:71). Yet, such an inference was based on simple co-occurrence within the same shelter rather than true association. Atlatls and darts have rather specific terminal times of use in the Southwest (reviewed in Chapter 4 and see Whittaker 2012), so the temporal placement of flat curved sticks is relevant to the interpretation of their function. To move beyond the realm of speculation and establish

the temporal distribution of flat curved sticks across the Southwest, a significant part of this study involved AMS radiocarbon dating. Direct dating also allows the temporal distribution of sticks to be compared against the known temporal pattern for other relevant variables such as the spread of agriculture, direct evidence for war, and environmental conditions that could have intensified or reduced conflict (factors that limited or favored food production). I directly radiocarbon dated a sizable sample of flat curved sticks, both S-shaped and single-bend. The results, which I detail below, surprised me, because they revealed a far greater time depth for this artifact than I ever anticipated.

Sample Selection

Stick selection for dating was judgmental in order to adequately cover the spatial distribution of sites that have yielded these artifacts, while simultaneously taking into account provenience information, important associations, stick condition (suitability for sampling), and such aspects as evidence of use and stick form. There were also a few constraints such as unavailability of some specimens for minimally destructive sampling or overly long consultation procedures coupled with a lack of knowledge beforehand about which artifacts might be excluded. I gave highest priority to those artifacts with secure recovery context and those providing both wide geographic coverage and representation of variability in stick form and use characteristics. Sample submission occurred in stages so that the developing chronological knowledge could help prioritize additional submissions and refine the dating for given sites, areas, or aspects of stick morphology and use-wear. Given the number and variability of flat curved sticks from the Correo site it seemed that adequate representation would require numerous dates; Ceremonial Cave also merited numerous dates although its sticks were far less variable than those from Correo.

Samples for radiocarbon dating mainly consisted of minute interior wood splinters removed from cracks or breaks with no visible impact to the artifacts (Figure 10.1). Sampling from interior wood also helped eliminate the possibility of contamination from handling or other extraneous additions that might have occurred since deposition and recovery. In some cases, carbonized wood from burned ends was removed and in a few instances samples consisted of loose sinew fibers of repair wraps. When it seemed that

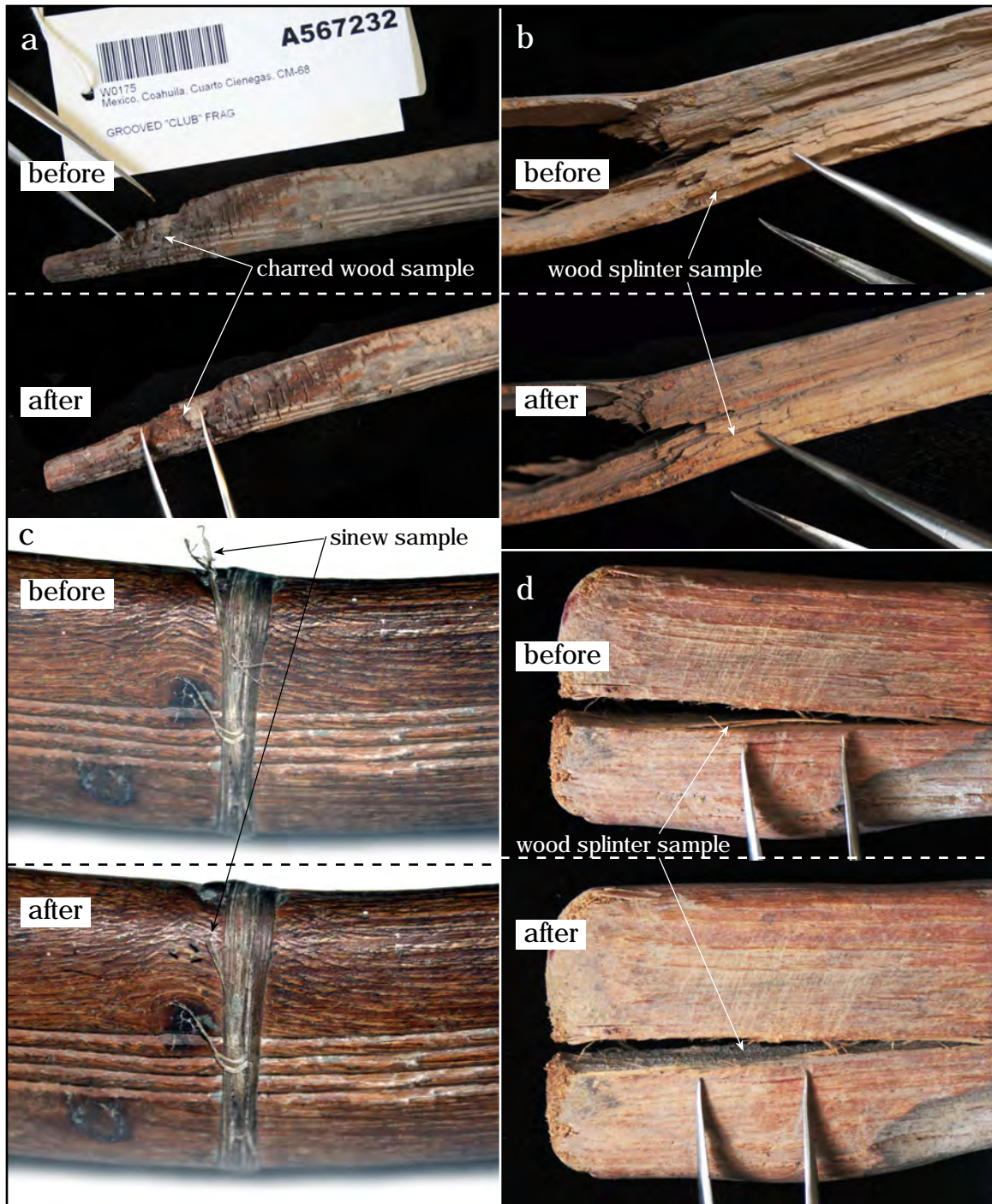


Figure 10.1. Examples of radiocarbon sampling locations showing before and after images: (a) charred wood from midsection fragment, Frightful Cave (Geib 291, NMNH A567232); (b) wood splinter from interior split surface of handle fragment, Heaton Cave (Geib 279, NMNH A315578); (c) sinew strand from binding at first bend above grip of complete stick, Moqui Canyon Cave 2 (Geib 5, MEVE 1857); (d) wood splinter from interior split surface of distal end of complete stick, Heaton Cave (Geib 275, NMNH A315576). (Collections of the National Museum of Natural History [a,b,d] and Mesa Verde National Park [c]; photos by Phil R. Geib.)

some sort of preservative or other residue had been applied to the wood, then sample pretreatment involved Soxhlet extraction (Bruhn et al. 2001) prior to the standard acid-base-acid (ABA) protocol. All steps of the radiocarbon analysis (pretreatment, combustion to carbon gas, delta ^{13}C measurement, and measurement of percent modern carbon) were performed at the NSF-Arizona AMS Facility at the University of Arizona in Tucson. The author pretreated and combusted about half the samples at the NSF-Arizona AMS Facility after being trained in their protocols and procedures.

Overall Dating Results

I obtained AMS radiocarbon dates on a total of 63 artifacts, the results of which are presented in Table 10.1 in sequence from oldest to youngest. Also included in this table are two previously obtained direct dates on flat curved sticks (Black Dog Cave [Winslow and Blair 2003:368] and McEuen Cave [Bruce Huckell, personal communication 2009]). Other relevant information in the table consists of sample material, pretreatment method, site of recovery, calibrated date range and the concordance between my artifact number and museum catalog number. The calibrated two-sigma calendar age is based on OxCal version 4.1 (Bronk Ramsey 2009) and the IntCal09 calibration curve for the Northern Hemisphere (Reimer et al. 2009). For some dates more than 90 percent of the two-sigma distribution is represented by a smaller date spread and for these this is also included in parentheses. For example, the oldest date has a two-sigma calibrated range of 7130–6640 cal. BC, but almost the entire area under the curve for this distribution (94.5%) occurs within the somewhat shorter range of 7085–6640 cal. BC. In other words there is vanishingly low probability of the stick being older than 7085 cal. BC. Figure 10.2 graphs these results and lists both the lab number and the site of recovery.

Unlike with dates on wood charcoal, there little or no possibility of age overestimation. Wooden tools tend to be made from freshly cut staves, which is when the wood is most easily worked with chipped stone tools, so there should be no “old wood problem.” The number of growth rings on these tools is no more than about 30 for some made of slow-growing oak and the sticks of probable ash have rings counts of less than 10. As a result there should be no serious concerns with inbuilt age.

Table 10.1. Radiocarbon dates on prehistoric flat curved sticks from the Southwest.

Lab #	¹⁴ C age	1 σ	$\delta^{13}\text{C}$	Material	Pretreatment	Site	Cal 2 σ	Geib #	Catalogue #
AA-98105	7974	89	-23.6	wood	ABA	Frightful Cave, Mex	7130-6640 BC (7085-6640 BC, 94.5%)	291	567232
AA-87863 & AA98913	7221	35	-23.3	wood	Sox & ABA	Ventana Cave, AZ	6210-6010 BC	27	A-4761
AA-87856r	6345	51	-23.7	wood	Sox & ABA	Hermit's Cave, NM	5470-5220 BC	11	27314/11
AA-98106	6022	54	-24.7	wood	ABA	Frightful Cave, Mex	5195-4780 BC (5060-4780 BC, 95%)	292	567371
AA-89951	4512	40	-25.4	wood	ABA	Ventana Cave, AZ	3365-3090 BC	26	A-8840x
AA-98104	4450	180	-22.7	wood	ABA	Fat Burro Cave, Mex	3635-2665 BC	289	565253
AA-89966	4441	59	-23	wood	ABA	Horseshoe Cave, TX	3340-2920 BC	413	240
AA-55481	3789	36	-27.3	wood	ABA	McEuen Cave, AZ	2345-2045 BC (2345-2130 BC, 92.1%)	19	67.01
AA-98101	3786	39	-24	wood	ABA	Heaton Cave, AZ	2400-2040 BC (2350-2040 BC, 94.9%)	276	315577
AA-89948 & 89949	3580	29	-22.1 & -19.3	wood & sinew	ABA	Fresnal Shelter, NM	2030-1820 BC (2030-1875 BC, 94.2%)	13	none
AA-98110	3552	39	-24	wood	Sox & ABA	Boomerang Cave, AZ	2020 -1756 BC (1985-1765 BC, 91.5%)	268	29.1/8971
AA-98109	3273	39	-23	wood	Sox & ABA	Correo Snake Pit, NM	1640-1450 BC	87	80.1.6
AA-87846	3269	39	-24.4	wood	Sox & ABA	Correo Snake Pit, NM	1635-1445 BC	432	66.9.50
AA-93106	3167	45	-25.5	wood	Sox, ABA	Correo Snake Pit, NM	1530-1315 BC (1530-1370 BC, 91.6%)	62	80.1.6
AA-98108	3128	38	-23.7	wood	Sox & ABA	Correo Snake Pit, NM	1495-1310 BC	82	80.1.6
AA-89962	3105	56	-23	wood	Sox & ABA	McAlpine Cave, TX	1500-1215 BC (1500-1255 BC, 93.5%)	384	105
AA-98915	3081	37	-22.7	wood	Sox & ABA	Correo Snake Pit, NM	1430-1260 BC	72	80.1.6
AA-89972	2966	57	-24.4	wood	ABA	Correo Snake Pit, NM	1380-1015 BC	48	80.1.6
AA-89974	2914	55	-24.7	wood	Sox & ABA	? Ceremonial Cave, TX	1295-935 BC (1295-970 BC, 93.2%)	447	66.9.39 (I.30.4.3)
AA-89964	2742	57	-23.4	wood	ABA	Shelby Brooks Cave, TX	1015-800 BC	389	IW-42-34 (141)
AA-98107	2673	38	-23.8	wood	Sox & ABA	Correo Snake Pit, NM	905-795 BC	64	80.1.6

Table 10.1. cont.

Lab #	¹⁴ C age	1 σ	$\delta^{13}\text{C}$	Material	Pretreatment	Site	Cal 2 σ	Geib #	Catalogue #
AA-87854	2545	38	-22.8	wood	ABA	Goat Cave, NM	805-540 BC	12	13457/11
AA-87862	2484	44	-25	wood	ABA	McEuen Cave, AZ	775-415 BC	21	A-4320
AA-87855	2477	39	-23.3	wood	ABA	U-Bar Cave, NM	770-415 BC	9	26601/11
AA-89950	2471	38	-23.7	wood	ABA	U-Bar Cave, NM	765-410 BC	10	26603/11
AA-89955	2324	84	-23.2	wood	ABA	? cave Chihuahua, Mex	755-195 BC	15	GP 43014-X-1 (a)
AA-87847	2288	38	-25.2	wood	ABA	Sierra del Pajarito, Mex	410-205 BC	433	66.27.18
AA-88480	2274	36	-24.7	wood	ABA	McEuen Cave, AZ	405-200 BC	23	A-4318
AA89952	2274	41	-24.5	wood	ABA	McEuen Cave, AZ	405-205 BC	24	A-4319
AA-89953	2259	42	-24.1	wood	ABA	McEuen Cave, AZ	400-200 BC	22	A-4321
AA-89975	2236	42	-20.8	wood	ABA	Sierra del Pajarito, Mex	395-200 BC	442	66.9.45 (I.44.4.9)
AA-98103	2233	42	-23.7	wood	Sox & ABA	White Dog Cave, AZ	395-200 BC	489	349192 (Peabody A2731)
AA-89961	2229	56	-24.6	wood	ABA	Ceremonial Cave, TX	400-165 BC	296	GP 46811c
AA-87848	2216	37	-24.5	wood	ABA	? Ceremonial Cave, TX	390-195 BC	438	66.9.38 (I.30.42.2)
AA-89971	2184	56	-25.6	wood	ABA	Warren Cave, NM	390-95 BC	456	200177 (?)
AA-86147	2148	42	-17.6	sinew	Sox & ABA	Moqui Cave 2, UT	360-50 BC	5	MEVE 1857
AA-87850	2126	37	-24.4	wood	ABA	? Ceremonial Cave, TX	355-45 BC	441	66.9.37 (I.30.4.1)
AA-87849	2116	37	-26	wood	Sox & ABA	? Ceremonial Cave, TX	350-40 BC	439	66.9.49 (I.30.4.12)
AA-87858	2085	38	-25.2	wood	ABA	Ceremonial Cave, TX	205 BC - AD 5	295	GP 46811b
AA-89960	2081	55	-24.7	wood	ABA	Ceremonial Cave, TX	350 BC - AD 55 (210- BC - AD 55, 90.8%)	297	GP 17508
AA-87861	2078	38	-22.3	wood	ABA	Prayer Rock Cave 9, AZ	200 BC - AD 5	14	1183, A-13,388
AA-98102	2077	36	-22	wood	ABA	Heaton Cave, AZ	195 BC - AD 5	279	315578c
AA-89973	2074	54	-25	wood	Sox & ABA	Isleta Cave 1, NM	350 BC - AD 55 (210- BC - AD 55, 92.9%)	448	none (I1 35/33 & I1 33/29)
AA-87857	2016	81	-24.6	wood	Sox & ABA	Ceremonial Cave, TX	350 BC - AD 210 (210- BC - AD 210, 92.9%)	294	GP 46811a
AA-98099	1974	30	-24.3	wood	Sox & ABA	Heaton Cave, AZ	45 BC-AD 85	273	315488

Table 10.1 cont.

Lab #	¹⁴ C age	1 σ	δ ¹³ C	Material	Pretreatment	Site	Cal 2 σ	Geib #	Catalogue #
AA-87852	1956	37	-26.6	wood	ABA	? cave Kanab, UT	45 BC - AD 125	4	8089
AA-98914	1897	36	-23.7	wood	Sox & ABA	Isleta Cave 2, NM	AD 25-220	449	79.38.104 (I2 35/31 & I1 35/33)
AA-98918	1847	39	-24.5	wood	ABA	Correo Snake Pit, NM	AD 70-250	116	80.1.6
AA-89957	1829	37	-24.9	wood	ABA	Shumla Caves, TX	AD 80-315 (AD 80-260, 93.7%)	31	1702A
AA-98916	1829	36	-22.8	wood	ABA	Correo Snake Pit, NM	AD 80-315 (AD 80-255, 94.2%)	77	80.1.6
AA-98917	1826	36	-22.7	wood	ABA	Correo Snake Pit, NM	AD 85-320 (AD 85-260, 93.2%)	103	80.1.6
AA-87860	1773	52	-24.9	wood	Sox & ABA	Shelby Brooks Cave, TX	AD 125-390	388	IW-42-32b (204)
AA-89954	1754	36	-24.2	wood	ABA	? cave Chihuahua, Mex	AD 140-390 (AD 210-390, 91.0%)	18	GP39819
AA-93105	1723	40	-23.3	wood	Sox & ABA	Correo Snake Pit, NM	AD 230-415	102	80.1.6
AA-87853	1704	37	-24.9	wood	ABA	Black Dog Cave, NV	AD 245-415	6	NA4058.21
Beta-160760	1620	40	-23.2	wood	ABA	Black Dog Cave, NV	AD 340-545	1	2-121-28
AA-89963	1479	56	-26.6	wood	ABA	McAlpine Cave, TX	AD 430-660	383	133
AA-88481	1457	35	-24.6	wood	Sox & ABA	Ventana Cave, AZ	AD 545-650	25	A-8824x
AA-89956	1365	35	-24.1	wood	ABA	Sunny Glen, TX	AD 605-770 (AD 605-710, 91.0%)	30	TARL 120
AA-87859	1305	36	-23.8	wood	Sox & ABA	Shelby Brooks Cave, TX	AD 655-775	387	110
AA-98100	1166	35	-23.1	wood	ABA	Heaton Cave, AZ	AD 775-975	275	315576
AA-89959	1091	55	-22.8	wood	ABA	Caldwell Cave 2, TX	AD 780-1030 (AD 805-1030, 94.1%)	380	IW-41-114d
AA-89965	1054	55	-23.5	wood	ABA	Shelby Brooks Cave, TX	AD 825-1155 (AD 865-1155, 95.0%)	392	IW-42-33a (109)
AA-89958	1043	34	-25.8	wood	ABA	Caldwell Cave 1, TX	AD 895-1035	368	IW-41-27d
AA-89976	855	45	-23.7	wood	Sox & ABA	? Ceremonial Cave, TX	AD 1040-1265	430	66.27.17

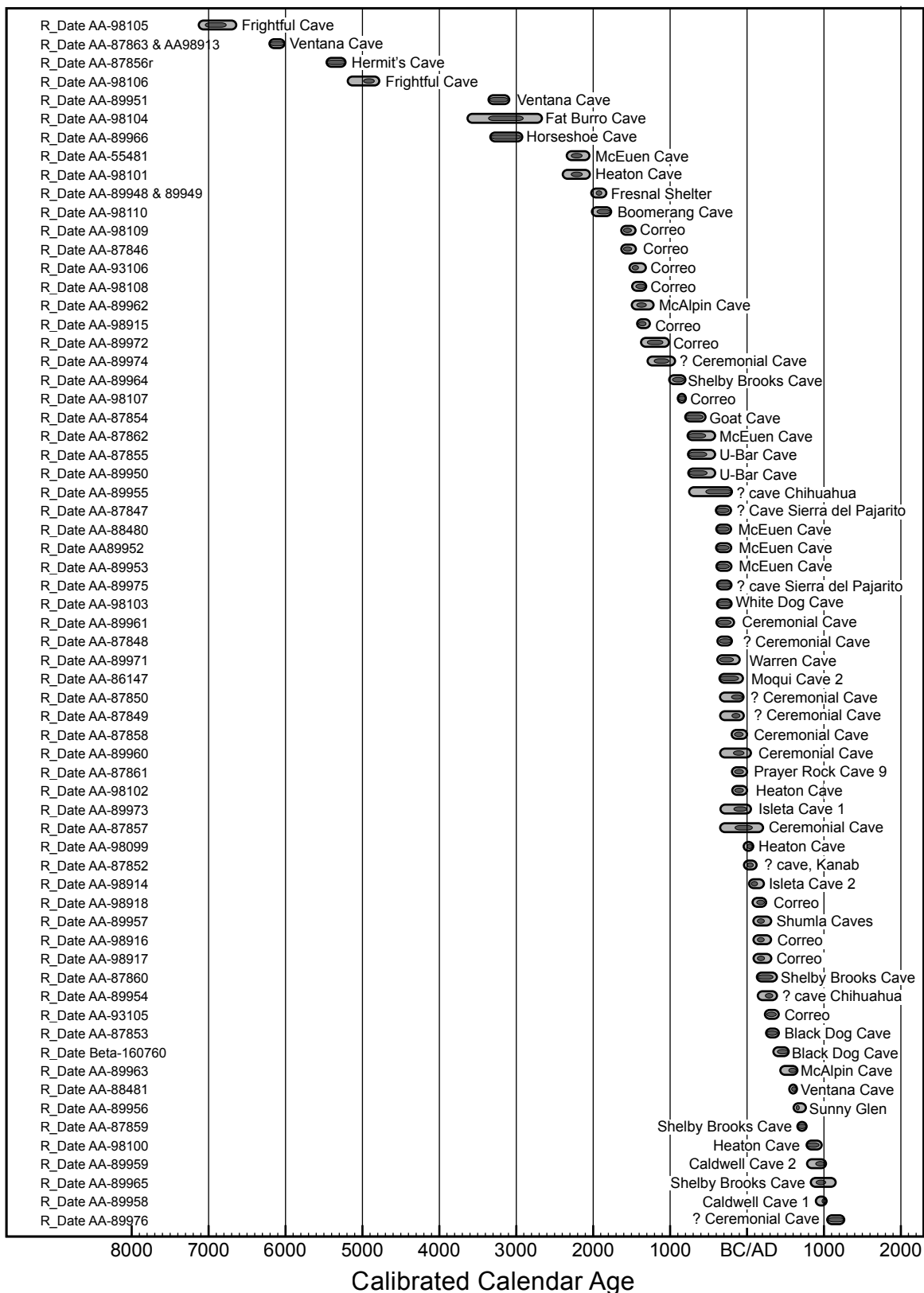


Figure 10.2. Distribution of radiocarbon dates on Southwestern flat curved sticks showing 1σ and 2σ ranges; calibrated with OxCal 4.1 (Bronk Ramsey 2009).

The sticks range in age from almost 8000 BP to 855 BP, a span of more than 7000 radiocarbon years. This was a surprise even though similar if ungrooved throwing sticks from the western Great Basin were directly dated to at least 4600 cal. BC (Tuohy 2004) and rock art images from central Arizona strongly suggest that S-shaped sticks were present during the Archaic period (reviewed in the next chapter). Indeed, the first two early dates that I obtained—one from Ventana Cave, AZ and one from Hermit's Cave, NM—were so unexpected that I was concerned about unobserved contamination of the samples by foreign carbon from preservative or other residues that had accumulated on the artifacts since their recovery, contaminants that standard ABA pretreatment did not remove. Even though I selected what appeared to be clean interior wood for the samples, the dates needed verification after Soxhlet pretreatment to extract any potential stubborn contaminants of the type that not only require organic solvents but that, if present, can add significant age to a sample (e.g., Bruhn et al. 2001). There was sufficient residual material from the Hermit's Cave sample for Soxhlet extraction and dating but since the entire Ventana Cave sample had been consumed, another splinter had to be removed from the artifact. Fortunately the Ventana Cave collections are housed at the Arizona State Museum near to the NSF-Arizona AMS Facility, so obtaining the sample was relatively simple since I was already pretreating and combusting samples at the Tucson lab.

The initial date for the Ventana Cave artifact (Geib 27, ASM A-4761) was 7145 ± 53 BP (AA87863) with standard ABA pretreatment. As shown in Figure 10.3a, this sample consisted of interior wood from one snapped end of this stick midsection. On one side of this stick there are traces of recent adhesions to the artifact evidently from a rather crude method of hanging it in a museum display. In two places, squares of cotton cloth with pins pushed thru had been glued into place, thereby allowing the stick to be hung without visible signs of support by simply pushing it into cork or cardboard. Exactly what this adhesive material consisted of remains unknown since there were no records at ASM describing it. There was no trace of adhesive on the sampled end, yet it was conceivable that some of this material permeated the entire stick and thus compromised the results. A subsequent sample was removed from the same end of the stick and given Arizona's Soxhlet extraction procedure (heated hexane, ethanol and methanol) followed by standard ABA pretreatment and a final distilled water rinse. This new sample

returned a date of 7277 ± 46 BP (AA98913), which is slightly older than the first submission although not statistically different ($df = 2$, $T = 3.5$, $\chi^2 = 3.8$, $\alpha = .05$). Because the samples are contemporaneous within the range of their error terms they were averaged (7221 ± 35 BP) to provide the best estimate for the antiquity of this artifact (ca. 6210–6010 cal. BC at 2σ).

The other initial early result seemed more likely to be contaminated since this artifact exhibited clear evidence of having been treated with some sort of preservative or protective substance that imparted an overall artificial gloss to the wood surface (Figure 10.3b). One side of the stick was also labeled with ink over white paint that was sealed in a clear lacquer and there were patches of adhesive apparently from when this artifact had been put on display by simply gluing it to a board. The artifact is a midsection of an S-shaped stick that had been recycled as an atlatl dart wrench, just like several from Ceremonial Cave shown previously (see Figure 8.5b). Despite the surface residue on this artifact I obtained what appeared to be a clean wood splinter for dating from one of the hacked and snapped ends. The initial assay for this sample was 6493 ± 50 BP (AA87856). After obtaining this result I pretreated the remainder of the sample by Soxhlet extraction and then obtained another AMS date. This time the result was almost 150 years younger based on the date mean (6345 ± 51 BP, AA87856r). This is not an overly significant discrepancy but a test for contemporaneity indicates that the dates should not be averaged ($df = 2$, $T = 4.3$, $\chi^2 = 3.8$, $\alpha = .05$). As a result I use only the slightly younger date based on the thoroughly pretreated sample as an estimate for the age of this artifact, which is 5470–5220 cal. BC at 2σ . This is still an early date and it, along with the previous sample, gave me full confidence in the potential great antiquity of this artifact class.

Early Archaic

The earliest examples of flat curved sticks, shown in Figures 10.3 and 10.4, are all small fragments, three of which have clearly been recycled or had some portion repurposed since they have at least one end that was purposefully hacked and then snapped to create smaller artifacts. One of these (Figure 10.3b) was reused as a dart wrench but the other two lack any obvious evidence for secondary use and might merely represent the discarded ends with the other portions being those that were repurposed.



Figure 10.3. Two flat curved stick fragments that provided the initial early dates of 7145 ± 53 and 6493 ± 50 BP: (a) mid-section from Ventana Cave (Geib 27, ASM A-4761); (b) recycled mid-section used as dart wrench from Hermit's Cave (Geib 11, MIAC 27314/11). (Collections of the Arizona State Museum [a] and the Museum of Indian Arts and Culture [b]; photos by Phil R. Geib.)



Figure 10.4. Two flat curved stick fragments from Frightful Cave, Coahuila that also produced early dates of 7974 ± 89 BP and 6023 ± 54 BP: (a) midsection fragment (Geib 291, NMNH 567232); (b) distal end fragment (Geib 292, NMNH 567231). (Collections of the National Museum of Natural History; photos by Phil R. Geib.)

The width of these specimens is 2.5 cm, 2.4 cm, 3.2 cm and 2.8 cm in age from oldest to youngest while in thickness they measure 1.0 cm, 1.0 cm, 1.3 cm and 1.1 cm respectively. As a group they are both quite narrow and thin and would have been very lightweight sticks, hardly items that seem designed for rabbit and hare hunting. None of these fragments exhibited any use-wear to suggest that they had been used as throwing sticks and none exhibited embedded rocks or spines. Two of these fragments are from S-shaped sticks (the recycled wrench that includes the points of inflection and the distal fragment that has such a pronounced bend) but the other two are of indeterminate form. The earliest stick fragment has so little curve that it might have come from a single-bend stick, but there are good examples of S-shaped sticks with portions of this length that are this straight. The widest and thickest specimen has four grooves but the others have three grooves.

Middle Archaic

The distribution of dates on flat curved sticks reveals a slight gap of about 1500 radiocarbon years between about 6000 and 4500 rcybp or 4800–3400 cal. BC. This might be simply a sampling issue, although it is perhaps not a coincidence that this gap corresponds closely to declines or gaps in radiocarbon dates that occur more generally for portions of the Southwest (e.g., Berry and Berry 1986; Geib 1996, 2011) and the Great Plains (Meltzer 1999), a time that appears to have been the warmest and driest part of the Holocene. Regardless of this aspect, the flat curved sticks that date to just after the gap (Figure 10.5), around 4500-4400 radiocarbon years ago, also come from sites in the southern deserts—Ventana Cave, Fat Burro Cave, and Horseshoe Cave. These sticks are also narrow and thin like the earlier group, ranging from 2.3 to 2.5 cm wide and 1.1 to 1.5 cm thick. Despite their delicate nature, one of them displays a moderate degree of use-wear consistent with throwing, including embedded rock. This specimen (Figure 10.5b), from Horseshoe Cave of the lower Pecos River region, consists of the proximal half of a stick that clearly had been recycled. The distal end of this stick had been purposefully removed, with throwing use occurring after this since the wood of the hacked and snapped end is crushed from impact and is embedded with a rock. Whether the stick was used for throwing prior to removal of its distal end remains unknown and indeed this reuse could have occurred well after initial production. That is, the date pertains to stick



Figure 10.5. Three flat curved stick fragments from southern deserts of the Southwest that date 4500-4400 radiocarbon years ago: (a) Fat Burro Cave, Coahuila (Geib 289, NMNH 565253); (b) Hoseshoe Cave, Texas (Geib 413, TARL 240); (c) Ventana Cave, Arizona (Geib 26, ASM A-8840x). (Collections of the National Museum of Natural History [a], Texas Archaeological Research Laboratory [b], and Arizona State Museum [c]; photos by Phil R. Geib.)

production during the middle Archaic whereas modification for throwing use could have occurred thousands of years later when the artifact was recycled. Reuse for throwing purposes could have motivated removal of the recurved distal end, which might have been seen as unnecessary or even an impediment to effective use. With recycled sticks it is important to be careful about not attributing use-wear from the secondary use with the primary stick form. There would be no chance of this with a stick portion recycled as an atlatl wrench, but this can easily occur with evidence for sticks recycled for throwing.

Both of the other two sticks lack any obvious use-wear related to throwing, although the split distal end portion from Ventana Cave exhibits embedded cactus spines that strongly indicate such use. The handle end from Fat Burro Cave (Figure 10.5a) is perhaps too small of a portion to reliably interpret wear traces, but it is notable that the thin and pointed end is not crushed (this item is mistakenly listed as an atlatl in the NMNH catalog). Aside from the Horseshoe Cave specimen that was originally S-shaped, the form of the other two sticks is indeterminate.

Late Archaic/Early Agricultural Period

There is another shorter gap in the date distribution between 4400 and 3800 radiocarbon years ago that is likely a product of sampling, but the next group of four sticks after this, dating between 3800 and 3500 radiocarbon years ago, is temporally coincident with the first appearance of maize in the Southwest. In short, this is the first group of sticks that actually date to the Early Agricultural Period as defined by the presence of maize. The most securely dated early maize at around 2100 cal. BC comes from the Old Corn Site on the Colorado Plateau near the Arizona–New Mexico border south of Zuni (Huber 2005). It is perhaps not by coincidence that this is when the first flat curved sticks occur outside the Sonoran and Chihuahuan deserts. The four dated sticks between 3800 and 3500 rcybp are scattered across a much broader area of the Southwest: McEuen Cave in the Gila Mountains of central Arizona, Fresnal Shelter on the west side of the Sacramento Mountains of south-central New Mexico, and two different areas of the Colorado Plateau—Heaton Cave on the Arizona Strip and Boomerang Cave off the western slope of the Carrizo Mountains in NE Arizona (this site is different from Boomerang Shelter of SE Utah reported by Smiley and Robins 2005). Fresnal Shelter is the one site of this group in an area where flat curved sticks are known

to have considerable antiquity since Hermit's Cave is located only about 140 km to the Southwest in the adjacent Guadalupe Mountains. The specimen from Fresnal Shelter dates some 800 years or so before the earliest maize at this site (Tagg 1996); the age of the stick is based on an average of two contemporaneous assays, one on wood (3606 ± 39 BP, AA89948, -22.1‰) and one on sinew from a repair wrap (3552 ± 41 BP, AA89949, -19.3‰).

Whether the evident spatial spread of flat curved sticks occurred along with corn as a result of diffusion among existing forager populations throughout the Southwest (e.g., Merrill et al. 2009; Wills 1988) or via migrating populations as some have suggested (e.g., Berry and Berry 1986; Matson 1991, 2002) remains to be fully answered. Given the earlier widespread use of the flat curved sticks in the Sonoran and Chihuahuan deserts, the region through which maize would have come into the Southwest, it is possible to see this evidence as supporting a migration model. Yet the sticks occur at sites where maize is not known to date nearly as early. The evidence for Fresnal was just mentioned but for Heaton Cave on the Arizona Strip the stick dates to earlier than 2000 cal. BC yet the oldest corn in this area is younger than 1300 cal. BC if not 900 cal. BC (Heidi Roberts, personal communication 2015; until the recent Jackson Flat Reservoir excavation there was no evidence to suggest that maize use in this area dated earlier than the Common Era). The early Heaton Cave specimen is roughly finished, lacks grooves, and resembles what one might think of as a rabbit stick (see Judd 1926:Plate 51a), so it might have more in common with the ancient flat curved sticks from the Great Basin, like those at Fish Cave.

Three of the four sticks dated to the interval of 3800-3500 radiocarbon years ago are clearly single-bend sticks and one is too small of a fragment to determine (McEuen Cave). Two of the four exhibit unmistakable throwing use-wear including an embedded rock in one and cactus spines in another; the other two also appear to have been used for throwing, although the use-wear is less obvious. The whole and beautifully preserved stick from Boomerang Cave (Figure 10.6a) is nearly undamaged and none of the use traces seem obviously throwing related, yet it has a few embedded cactus spines and a tiny rock in the grip end. These sticks range from 2.4 to 3.8 cm wide and from 0.9 to 1.3 cm thick; the two whole specimens have weights of 115 and 238 g and the one fragment



Figure 10.6. Two flat curved sticks from the Southwest that date 3800-3500 radiocarbon years ago: (a) Boomerang Cave, Tsegi Ho Chon, Carrizo Mts (Geib 268, AMNH 29.1/8971); (b) Fresnal Shelter (Geib 13). (Collections of the American Museum of Natural History [a] and Lincoln National Forest [b]; photos by Phil R. Geib.)

from Fresnal Shelter has a weight of 102 g even though about half of this stick is missing. Most of these specimens from the start of the Early Agricultural Period seem more suited for use as rabbit sticks than the narrow, thin, and hence lightweight earlier specimens. This should not imply that delicate sticks seemingly poorly designed for rabbit hunting do not continue, since there are good examples from around 1000 years later (e.g., Stick 64 from the Correo site, which weighs just 113 g and has a maximum width of 2.7 cm and thickness of 1.2 cm).

After about 3300 radiocarbon years ago the date distribution is essentially uninterrupted for the next 1800 radiocarbon years. The Correo Site of west-central New Mexico accounts for many of the sticks from the start of this interval, sticks that were evidently deposited as ritual offerings into this inaccessible natural shaft in the earth. This marks a significant change in the nature of disposal practices, at least for portions of the Southwest, one that unintentionally resulted in significantly more information for archaeologists. Recycling of sticks still occurred in the southern deserts, but whole functional artifacts started to be treated as offerings and at the Correo site this occurred repeatedly over millennia. The same thing eventually occurred at Ceremonial Cave in far western Texas near the start of the Common Era.

Correo Site

There are 11 directly dated sticks from the Correo Site with all shown in the date distribution of Figure 10.7. The oldest six of these, prior to 1000 cal. BC, are S-shaped, whereas the other five are single-bend sticks, with the earliest one between about 900 and 800 BC and the rest dating to the first few centuries of the Common Era, prior to around AD 400. When the samples were selected there was no indication as to which sticks might be earlier and which later and certainly the degree of preservation or decay did not provide any indication, since stick 116 overall is quite degraded and yet it is one of the youngest (AD 70-250) whereas sticks 87 and 432 are better preserved yet over 1000 years older. Additional dating might eventually reveal that S-shaped sticks at this site extend more recently in time, close to the common era, since this is known to be the case for the Four Corners region of the Colorado Plateau. Single-bend sticks might also be

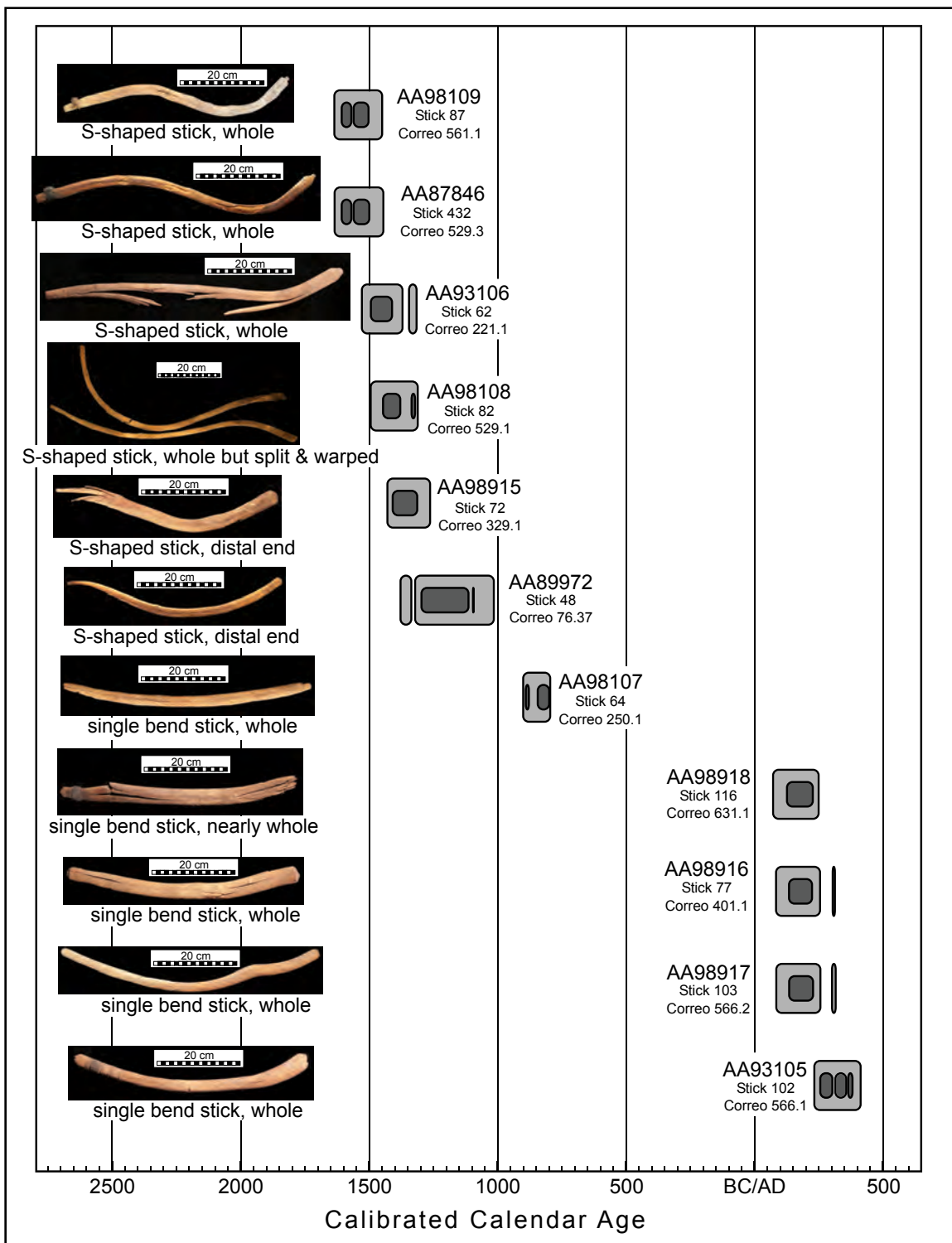


Figure 10.7. Graph of calibrated radiocarbon dates on flat curved sticks from the Correo Site, New Mexico, ordered from oldest to youngest.

shown to date earlier since this is clearly the case for the examples from Boomerang Cave and Fresnal Shelter, but the current suite of dates provides clear separation of stick forms at Correo and also reveals some distinct patterning in other stick attributes.

The Correo site clearly shows change through time in form and also in use-wear and other evidence that is directly related to function. This is also seen at a larger scale for the Southwest as a whole. Table 10.2 presents the count of radiocarbon-dated prehistoric flat curved sticks from the Southwest according to my summary inference as to whether or not they had been used as rabbit sticks. This inference is based on a combination of use-wear and embedded spines and rocks while factoring in wood preservation and condition. The sticks are grouped into temporal chunks using radiocarbon years. The first interval is 4000 radiocarbon years in duration in order to have a somewhat meaningful sample size, though it is still low ($n = 7$). There are then two intervals of 1000 radiocarbon years from 4000 to 2000 rcybp and then two intervals of 500 radiocarbon years. The final split was made at 1500 BP (~AD 570) since this provides a useful partition for before and after bow and arrow technology was well established. If flat curved sticks had a role to play in fending away atlatl darts, this would have occurred prior to this time rather than after, when it is likely that rabbit hunting was the primary if not sole function of the artifact. The percent of sticks with use damage or inclusions consistent with throwing (% yes) increases steadily through time, from just 14 percent in the 8000-4001 rcybp interval to almost 80 percent in the final interval of younger than 1500 rcybp. It is important to remember that the single artifact of the early period with evidence of throwing use is a recycled portion and the reuse of this part could well date much more recently in time.

Table 10.2. Summary inference about throwing use for the radiocarbon dated prehistoric flat curved sticks from the Southwest organized into temporal chunks (rcybp); percent yes is the proportion with damage or inclusions consistent with use as rabbit sticks.

¹⁴ C Date Range	Indeter	Equivocal	No	Probable	Yes	n	% yes
8000–4001 BP	1	5	0	0	1	7	14.3
4000–3001 BP	0	0	4	3	3	10	30.0
3000–2001 BP	4	5	1	4	13	27	48.1
2000–1501 BP	2	3	0	1	6	12	50.0
< 1500 BP	0	1	1	0	7	9	77.8
Total	7	14	6	8	30	65	46.2

A change in function clearly seems to be captured in the temporal patterning of Table 10.2; consequently, I would also expect to see changes in stick dimensions toward ethnographic examples of rabbit sticks. Table 10.3 presents descriptive statistics for maximum width and maximum thickness of the radiocarbon-dated prehistoric flat curved sticks from the Southwest. These data are presented according to the same temporal chunks (rcybp) as Table 10.2. Unfortunately there are not enough whole dated sticks, especially from the earliest times, to tabulate values for weight and length. Given that both width and thickness increase on average through time it is reasonable to suggest increasing stick weight as well. Maximum stick thickness increases through time although this measurement seems functionally less significant than width. Thickness increases from a mean value of 1.2 cm early on (8000-4001 rcybp) to a high of 1.57 cm during the 2000–1501 BP interval before declining slightly to a mean of 1.4 cm during the last interval of less than 1500 rcybp. The mean maximum thickness for ethnographic rabbit sticks is 1.3 cm and Hopi rabbit sticks average 1.1 cm thick (though they average 4.9 cm wide), so even the earliest prehistoric flat curved sticks of the Southwest seem sufficiently thick for rabbit hunting, at least if they also have sufficient width like the Hopi examples. Width presents a more notable increase through time and one that seems more functionally significant. Mean stick width increases from 2.7 cm during the 8000-4001 rcybp interval to 3.8 cm for the artifacts younger than 1500 rcybp. The latter value is far closer to the mean width of ethnographic rabbit sticks of 4.4 cm, whereas the first value is less than the smallest maximum width value of the ethnographic sticks (see Table 7.3). Greater width translates into greater weight, which means more effective killing of small game. Greater width is also perhaps helpful in limiting breakage from impact.

Table 10.3. Descriptive statistics for maximum width and thickness of the radiocarbon-dated prehistoric flat curved sticks from the Southwest organized into the same temporal chunks (rcybp) as Table 10.2.

Date Range	n	Maximum Width				Maximum Thickness			
		Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
8000–4001 BP	7	2.71	0.33	2.3	3.2	1.19	0.19	1.0	1.5
4000–3001 BP	10	3.31	0.69	2.4	4.5	1.27	0.15	1.0	1.5
3000–2001 BP	27	3.10	0.58	2.2	5.0	1.47	0.17	1.1	1.8
2000–1501 BP	11	3.28	0.60	2.7	4.2	1.57	0.23	1.2	1.8
< 1500 BP	9	3.79	0.60	2.9	4.8	1.40	0.16	1.2	1.6

Two trends are apparent: through time there are more physical traces on the sticks that indicate throwing use and they also become wider and thus more suitable for actually performing well in this role. In short, through time flat curved sticks become more like ethnographic rabbit sticks. Part of this change also involves a shift from S-shaped sticks to those that are single-bend, and simplification of how handles were prepared including a discontinuation of cordage or hide wraps, and, it seems, a cessation of the painstaking incision of longitudinal grooves.

Basketmaker II Dating Results

For the western Basketmaker II portion of the Four Corners area there are four radiocarbon dates directly on flat curved sticks and another four on materials in direct association with six of these artifacts. Table 10.4 presents the information on these other dates, three of which are on burials recovered by Guernsey and Kidder (1921), with one of the individuals, an adult male burial in Cist 27 of White Dog Cave, associated with two flat curved sticks. These artifacts, shown in Figure 2.1, comprise what can be considered type specimens of this artifact class for the White Dog Phase of the Four Corners, except that they are partially rotted such that the cordage knob on the handle is missing. In this regard, the well-preserved specimens from Moqui Canyon Cave 2, Battle Cave in Canyon del Muerto, and an unknown cave in Grand Gulch provide better examples (Figure 10.8); a specimen from Prayer Rock Cave 9 is also well preserved but the cordage grip knob was cut off at some later time, perhaps when a sinew repair was made to a crack originating from the concave side (this appears to be another case of stick recycling at a later time, an inference that can ultimately be tested by obtaining a direct date on the sinew repair).

All examples of S-shaped flat curved sticks depicted in Basketmaker rock art (next chapter) are clearly typical White Dog Phase specimens. All four flat curved sticks from White Dog Cave are dated between 2300 and 2200 rcybp, the sticks from Moqui Canyon Cave 2 and Cave 6 are slightly younger than 2150 rcybp, and that from Prayer Rock Cave 9 is just after 2100 rcybp and provides the youngest date for this artifact from Basketmaker II contexts. Consequently, it seems that the grooved, S-shaped flat curved sticks that Guernsey and Kidder first identified as a Basketmaker II trait are principally a characteristic prior to the start of the Common Era, before 50 cal. BC and extending back

to about 500 cal. BC. This temporal estimate can also be extended to the rock art depictions of this artifact type in the Four Corners area when the elements are clearly of the White Dog Phase stick style.

Table 10.4. Radiocarbon dates associated with prehistoric flat curved sticks from western Basketmaker II contexts of the Four Corners area.

Site	Context	¹⁴ C age	1 σ	Material	Cal 2 σ	Geib #	Comments/Reference
White Dog Cave, AZ	Cist 27	2288	44	collagen	415-200 BC	354 & 355	2 sticks with mummy 2, adult male, atlatl darts also included (Guernsey and Kidder 1921:17-19); date from Coltrain et al. (2007:Table 1)
White Dog Cave, AZ	Cist 22	2231	32	collagen	385-200 BC	356	1 stick with burial 3, adult male (Guernsey and Kidder 1921:15); date from Coltrain et al. (2007:Table 1)
Cave 6, AZ	Cist	2130	33	collagen	355-50 BC	357	1 stick with adult (Guernsey and Kidder 1921:30-31); date from Coltrain et al. (2007:Table 1)
Doughnut Alcove, UT	Cache	2320	80	grass	755-195 BC (595-195 BC, 83%)	2 & 3	1 whole stick and 1 recycled distal fragment cached together with digging stick (Geib 1990)

The earliest documented S-shaped sticks in the Four Corners come from Doughnut Alcove in lower Glen Canyon where they are associated with a date slightly older than 2300 rcybp (Geib 1990). These two specimens are not grooved and the one specimen with an intact handle end has a cordage wrap around the entire circumference of the grip rather than the knob that is typical for the White Dog phase specimens. Whether the Doughnut Alcove sticks represent an earlier pattern or just an idiosyncratic variation is impossible to know at present. Unfortunately, the assay for these artifacts has a counting error of 80 years, which means that the calibrated age range is quite broad, 560 calendar years. Much of the date distribution (83%) is younger than 595 cal. BC, but if this assay had an error term more like the other Basketmaker sticks, 40 years or less, then the age range would have started around 430 cal. BC. Given what is currently known about Basketmaker II occupation for the general area where the Doughnut Alcove artifact was found (see Geib 2011), occupation earlier than about 400 cal. BC is unlikely. Nonetheless, there are dates on other western Basketmaker II materials from farther south



Figure 10.8. Four examples of typical Basketmaker II S-shaped flat curved sticks from the Four Corners area of the Colorado Plateau: (a) Cave 2, Moqui Canyon, Utah (Geib 5, MEVE 1857); (b) Battle Cave, Canyon del Muerto, Arizona (Geib 269, AMNH 29.1/8598); (c) Cave 9, Prayer Rock, Arizona (Geib 14, ASM 1183, A-13,388); (d,) unknown site in Grand Gulch, Utah (Geib 460, NMAI 051421). (Collections of Mesa Verde National Park [a], American Museum of Natural History [b], Arizona State Museum [c], and the National Museum of the American Indian [d]; photos by Phil R. Geib.)

and east back to at least 2600 rcybp, so it would not come as a surprise if some flat curved stick from a Basketmaker II site of the Four Corners eventually returned a date several hundred years earlier than current evidence indicates.

Change from the Basketmaker II S-shaped flat curved stick to the single-bend variety that is closely analogous to modern-day rabbit sticks had evidently occurred by Basketmaker III times. The best case for this is provided by the carbonized artifact shown in Figure 10.9a, which comes from a burned Basketmaker III pit structure at Step House on Mesa Verde. This specimen measures just under 50 cm long (arch length), 3.6 in maximum width and 1.6 cm thick; since there is likely some carbonization shrinkage, the stick was probably somewhat wider and thicker than this, and even perhaps slightly longer. Besides having just a single-bend rather than the recurved S-shape, the stick lacks grooves and any specialized grip preparation, with the handle consisting of just plain wood. A fragmentary example of a narrower and thinner single-bend flat curved stick was also recovered from the same burned structure, with both identified as “rabbit clubs” (Nichols 1981). Tree-ring samples from the structure indicate construction sometime around AD 619-626 (Nichols and Harlan 1967), so only about 600 years after the last directly dated White Dog Phase S-shaped stick. The other specimen of Figure 10.9 comes from Pine-Tree House (Fewkes 1911), a Pueblo III cliff dwelling in Tsegi Canyon, Arizona that has a probable age of about AD 1220-1280.

Basketmaker II S-shaped flat curved sticks provide qualified support for Guernsey and Kidder’s (1921:112, 115) speculation that certain Basketmaker cultural traits originated in northern Mexico. My qualification is that it is the southern deserts of the Southwest regardless of international boundary and not Mesoamerica. Any grooved flat curved sticks on the Colorado Plateau clearly seem derivative from those of the Chihuahuan and Sonoran deserts, where they were in use since the early Archaic, almost 8000 radiocarbon years ago if not before. I extend this inference to the grooved flat curved sticks at Chichén Itzá and in the art there and at Tula. I would add a further qualification by noting that although this artifact type has great antiquity in the southern Southwest, the S-shaped form that typifies White Dog Phase sticks had been abandoned in the southern deserts for the single-bend form before the time that corresponds with the age of this artifact type in Basketmaker II contexts. Also, the exact details of White Dog



Figure 10.9. Two examples of flat curved sticks from Basketmaker III and Puebloan sites that closely resemble ethnographic rabbit sticks: (a) carbonized stick from a burned pit structure, Step House, Mesa Verde, CO (MEVE 35838/709); white bands are cloth bindings that hold the stick in place within its storage box; (b) Pine Tree House, Tsegi Canyon, AZ (Geib 280, NMNH 303259). (Collections of Mesa Verde National Park [a] and the National Museum of Natural History [b]; photos by Phil R. Geib.)

Phase stick style, such as method of grip knob construction, groove number, and distal end form, are not seen at earlier times in the south, but quite similar sticks occur at least 1000 years prior at the Correo shrine, such that it is easy to see the White Dog Phase examples as almost direct derivatives, though with slight changes. Gone are the delicate tab-like distal ends seen on Correo Site sticks, features that also evidently disappeared at Correo at least 800 years prior to the White Dog Phase specimens. Also, the pitch-covered grip knob that is so characteristic of White Dog phase sticks is clearly present on the Correo sticks some 1000 years earlier, though the specific means of creating and attaching this cordage construction differs somewhat. With such a time difference, it is no wonder that minor details of grip preparation vary. Correo is in an intermediate geographic location between the southern deserts and the Four Corners area.

I have no doubt that the Basketmaker II S-shaped flat curved sticks originated from the southern Southwest, likely via an intermediate area, but Guernsey and Kidder's (1921:112, 115) speculation about a Mesoamerican connection is doubtful for this artifact type. Mesoamerica seems unlikely since the grooved single-bend examples from the Cenote at Chichén Itzá and depicted on sculptures from the same site occur so late in time. If anything, these probably are derivative of examples that were used in the borderlands of the southern Southwest since the early Archaic but since the Chichén Itzá examples are single-bend they can probably be traced to the time period after S-shaped sticks had fallen from disfavor.

Summary

The direct dating of prehistoric flat curved sticks shows that this artifact class is very ancient in the southern deserts of the Southwest (Chihuahuan and Sonoran), dating back to at least 7000 cal. BC. The earliest sticks seem less suitable for use as rabbit sticks because of being narrow and thin. These early artifacts also lack use-wear and inclusions indicative of throwing to kill game. Through time the artifacts become more suited for use as throwing sticks: they get wider and somewhat thicker; the S-shape is discontinued for the single-bend form; grips become plain rather than wrapped with cordage or hide strips; and longitudinal grooves as well as fine finishing are dropped. As stick morphology changed through time the physical traces indicative of use as rabbit sticks also increase. These changes occurred in different portions of the Southwest at

different times, but by the time that the bow and arrow supplanted the atlatl and dart on the Colorado Plateau, at around AD 500, flat curved sticks closely resembled ethnographic rabbit sticks. They consist only of single-bend sticks that lack longitudinal grooves and grip wraps. In the southern deserts of the Southwest flat curved sticks with grooves continue to be used well into the Common Era, but they are always single-bend and are comparatively short in length compared to those of preceramic times. The longitudinal grooves also tend to become rather crudely executed later in time.

CHAPTER 11

EVIDENCE FROM BASKETMAKER II ROCK ART

The direct evidence for conflict provided by the physical remains considered in Chapter 4 shows that Basketmaker II violence occurred not only at an interpersonal level but at a social scale that qualifies as war. Indeed, the evidence makes a compelling case that war was a prevalent facet of Basketmaker II life and that other forms of violence stemmed from and were linked to intergroup conflict. Aside from the physical remains, testimony of violent conflict is also found within the rich corpus of Basketmaker II petroglyphs and pictographs. Basketmakers clearly portrayed violence and the consequences of violence. The most persuasive images in this regard are depictions of atlatl fights, full head scalps and possibly other war trophies, and death imagery (e.g., Cole 1984, 1985; Farmer 1997; Matson and Cole 2002; Schaafsma 2000, 2007). Basketmaker II artists adeptly portrayed everyday objects with realistic detail and sometimes executed scenes that have a narrative quality. Consequently, it is expectable that they might have shown S-shaped sticks in use if these played a role in atlatl fights or other forms of violence. Since rock art, like all forms of artistic expression, encodes cultural meanings, it provides one of the best means for accessing or inferring the worldviews and paradigms of past cultures, even if the specific meanings that images had for their creators are opaque. “Above all else rock art is visual dialogue, and the dialogue takes many forms, actively conveying meaning and communicating, whether or not its intended significance defies interpretation. Even for its creators, it was multivocal, symbolically and metaphorically” (Schaafsma 2013:1). Rock art served a significant role in social communication since its messages were inscribed onto the landscape, providing a visual record and mnemonic device for beliefs, history and myths that long outlived the creators. When placed in highly visible locations, rock art panels served like billboards, proclaiming status, knowledge, heritage, and the possession of powerful or prestigious items.

Background

The early excavators of shelters in Grand Gulch and elsewhere in SE Utah recognized pictographs as probably being Basketmaker II in age. Large, square-

shouldered human forms that often have hair ornaments or other headgear are doubtless the most distinctive aspect of Basketmaker II rock art. Kidder and Guernsey (1919:198, Figures 100, 101, and Plates 96, 97a) were the first to describe and illustrate such anthropomorphs. They recognized the similarity between the figures in their study area around Marsh Pass of NE Arizona and those in the canyons of SE Utah such as Grand Gulch and Butler Wash where Richard Wetherill and other diggers first identified Basketmaker II remains (Figure 11.1). Kidder and Guernsey's familiarity with the distinctive Basketmaker II style was even used as a simple sort of predictive model about where to excavate: "It was this square-shouldered pictograph that induced us to dig here, as our previous experience had shown these figures to be of Basketmaker origin" (Guernsey and Kidder 1921:34). The general association between Basketmaker II rock art and buried remains illustrated by this quote seems far more specific in some cases where depictions of anthropomorphs occur directly above where individuals were buried in shelters. Cole (1993:195) makes this case with regard to the Green Mask site based on Wetherill's written statements about finding mummies below painted human figures. The same occurred at Bernheimer Shelter (Sharrock et al. 1963) where Basketmaker II burials occurred immediately below Basketmaker II style pictographs.

As all authors since Kidder and Guernsey have acknowledged, Basketmaker II rock art emphasizes broad-shouldered, full-front human forms with enlarged dangling feet and hands and often elaborate headdresses and body ornamentation (Figure 11.2; Cole 1993, 1994, 2009; Grant 1978; Robins 1997a, b, 2002; Schaafsma 1980). These figures can be larger than life size (2 m) down to about 20 cm or even less. They are often massed together and surrounded by fairly realistic depictions of material culture such as animal skin bags, twined fiber bags, atlatls and darts, crooked staffs, baskets and ornaments. There are also depictions of animals, especially bighorn sheep, birds, and various plants, especially yucca. Hand prints in white, red and sometimes other colors are common at rock shelters, often in great profusion and placed adjacent and within anthropomorphs; these may signify participation in rituals (Grant 1978:168-169; Cole 1993:213-214). Small-scale human figures are also often depicted, either on their own or around the static larger anthropomorphs and these can be quite animated including such

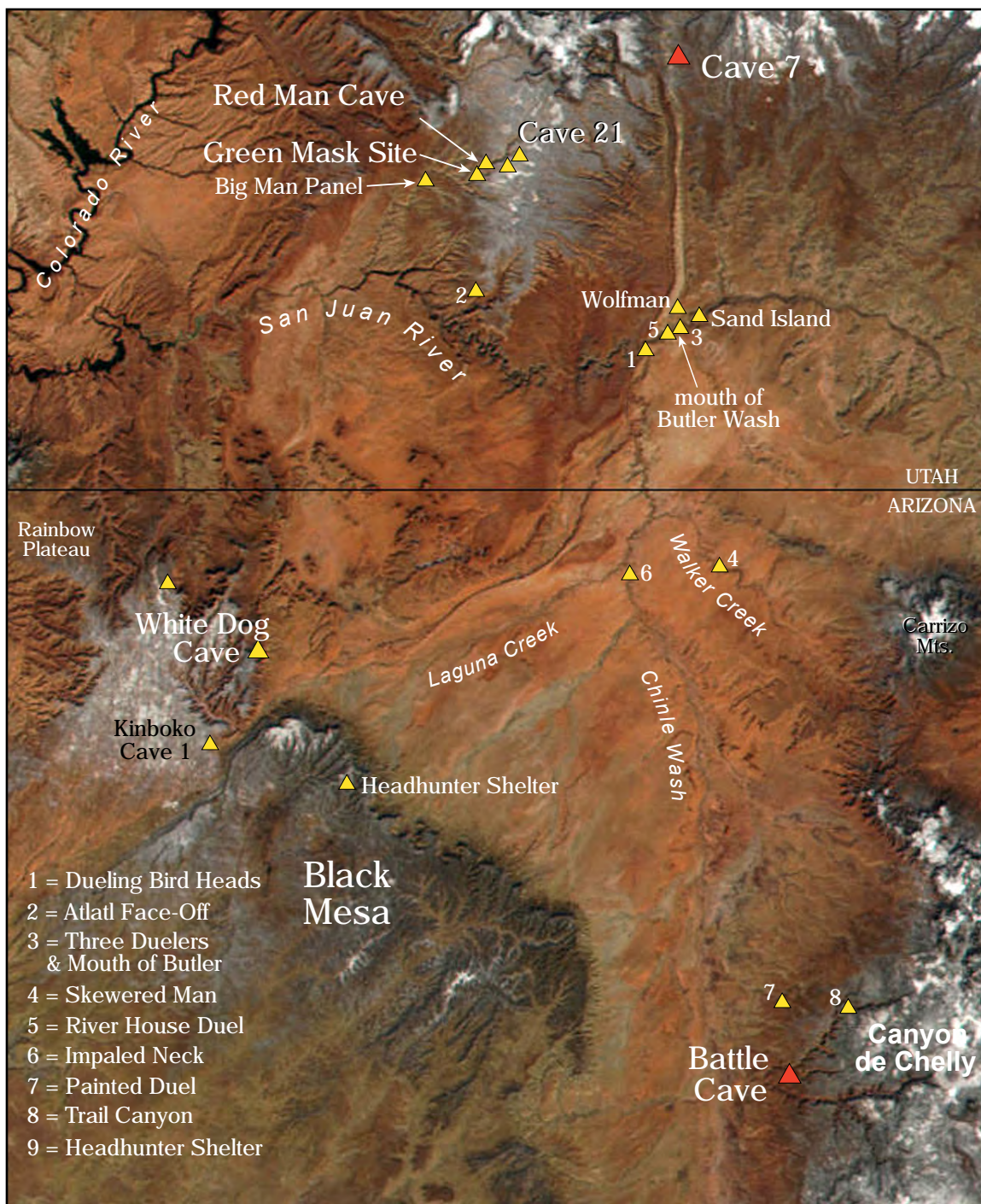


Figure 11.1. Location of Basketmaker II rock art sites discussed in text within the study area in SE Utah and NE Arizona (base image GrandCanyon.A2002019.1820.250m.jpg available at <http://visibleearth.nasa.gov>).

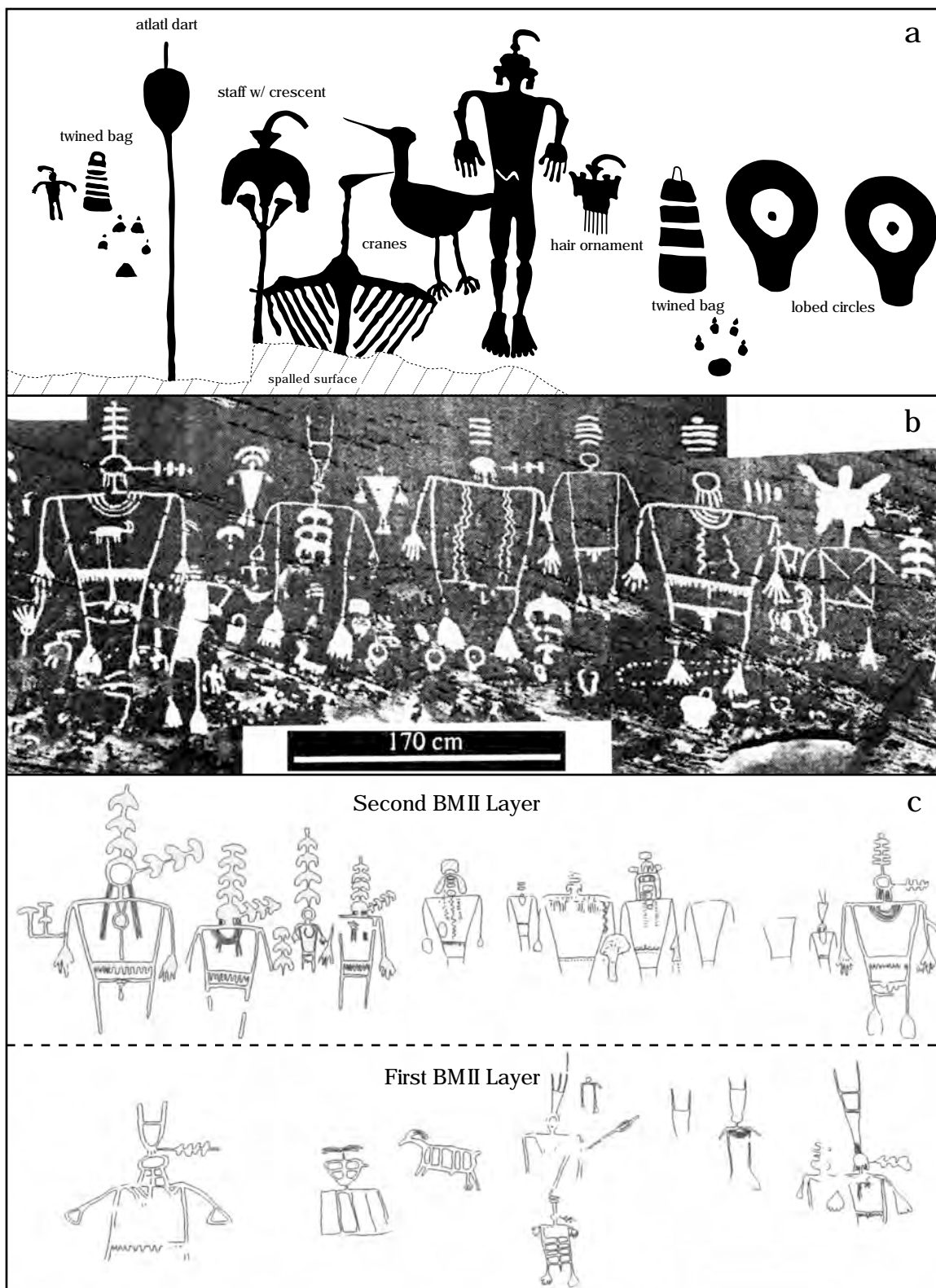


Figure 11.2. Basketmaker II petroglyphs, Butler Wash, SE Utah: (a) Wolfman Panel (42SA28571; drawing by Phil R. Geib); (b) mouth of wash, downstream side (42SA28484 [42SA5238], from Robins 1997b:Figure 3.3a); (c) relative age of Basketmaker II petroglyphs recognized by Robins (1997b) for Butler Wash area (from Robins 1997b:Figure 3.1).

tasks as conducting hunts, carrying sundry objects, and engaging in atlatl duels; the latter aspect is of particular relevance here and will be highlighted since it is largely unreported.

Style names for the large-scale “heroic” figures include early Basketmaker (Grant 1978) and San Juan Anthropomorphic with smaller figures often referred to as late Basketmaker or the Chinle Representational style (Schaafsma 1980). Recognizing the problem with “precise chronological distinctions” based on style, Cole (2009:118) lumps all Basketmaker rock art together but acknowledges that most images were probably made during the lengthy Basketmaker II period rather than the relatively brief Basketmaker III period. Detailed studies of superpositioning by Robins (1997a, b) for panels along the San Juan River at the mouth of Butler Wash allow clear separation of earlier from later Basketmaker II elements (Figure 11.2c). Robins shows how the initial Basketmaker II elements are distinctive from the overlying Basketmaker II elements that he refers to as the “classic” San Juan Anthropomorphic style. Whereas the former appear related to and perhaps derivative from an Archaic style rock art known as Glen Canyon Linear, the overlying petroglyphs are clearly derived from the underlying earlier Basketmaker elements. The Archaic age Glen Canyon Linear figures underlie the earliest of the Basketmaker rock art at Butler Wash and elsewhere along the San Juan River (Figure 11.3).

Robins’s inferences are sound about the stratigraphic and developmental relationships, but it remains to be seen whether the earliest of Basketmaker II styles can be attributed to the 1000-1500+ BC temporal span that he suggests (Robins 1997b:Figure 3.1). As of yet there is scant evidence of Basketmaker occupation of the Four Corners area prior to about 600 BC and none is known from the area around Butler Wash. Also, it is difficult to know how the stratigraphic distinctions that are evident along the San Juan River at Butler Wash apply in other parts of the Four Corners. For example, there are early looking linear style Basketmaker II figures less than 40 km away in Chinle Wash. Since these figures lack the tabular headdresses seen on the first layer of Butler Wash figures, do they correspond in age to them or are they later? Since the tabular headdresses appear to be specific to a rather local area (Robins 1997b:Table 4.1, Figure 4.10), it could be that early Basketmaker II anthropomorphs upstream along Chinle Wash

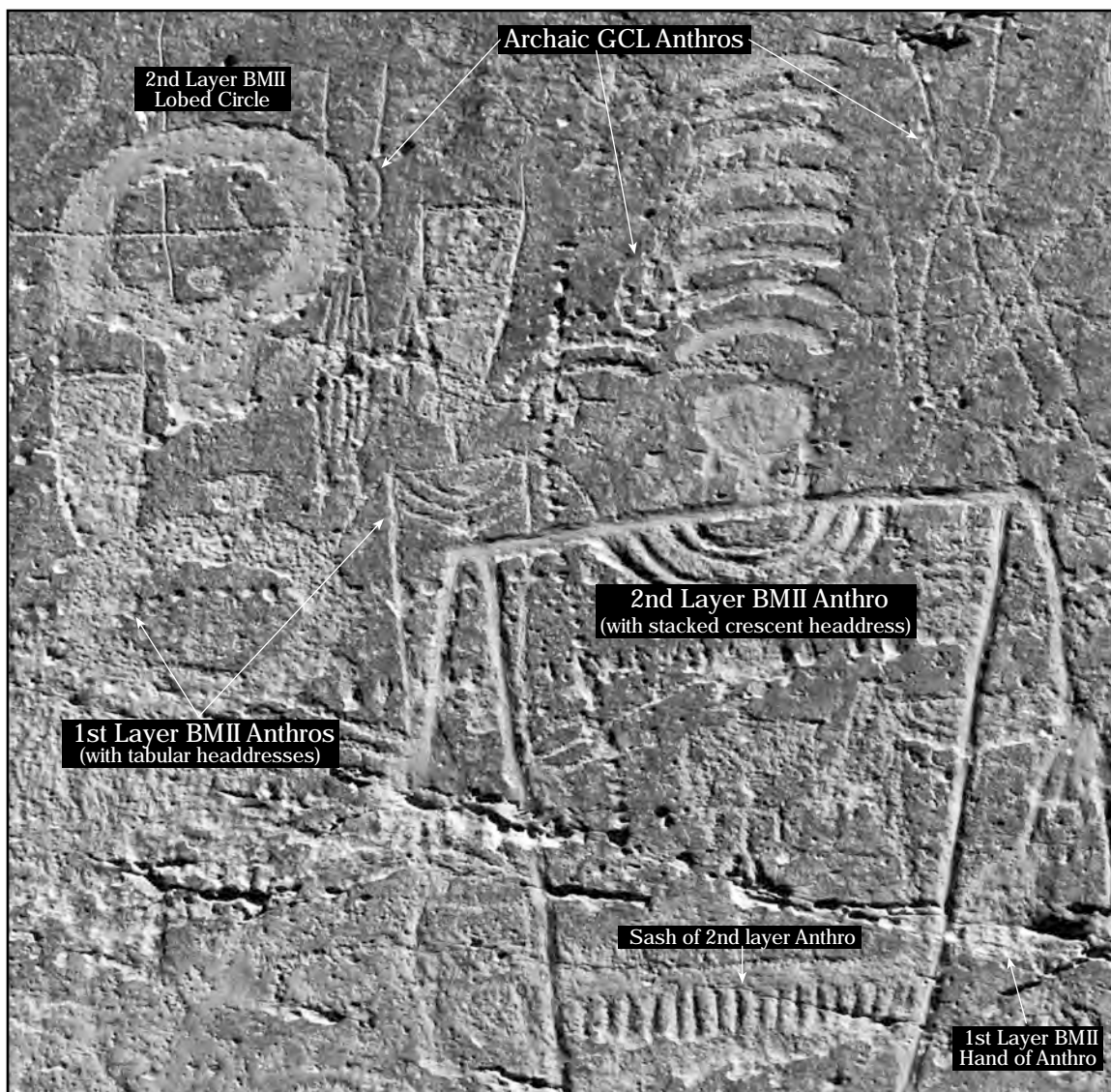


Figure 11.3. Small portion of the lower Butler Wash Panel (42SA28484) showing the superpositioning of elements from the Archaic Period (Glen Canyon Linear) and the Basketmaker II Period, with these clearly differentiated between early and late (see Robins 1997b; photo by Phil R. Geib).

have crescent headdresses. Also, the relative temporal ordering applies to the more static and larger anthropomorphs, so it is hard to know how smaller and more active figures that seem to have a narrative quality fit into the temporal scheme. Most authorities place such figures late in the Basketmaker sequence and might consider all to be part of the Basketmaker III Chinle Representational style. Since the latter developed from the preceding Basketmaker imagery and is unlikely to have appeared suddenly, a transitional late Basketmaker II phase is expectable. Based on how some of the rock art panels considered below were produced they seem like possible candidates for a probable late Basketmaker II transitional style, so after the start of the Common Era.

Meaning of Basketmaker II Rock Art

Rock art is a highly contested field of study, perhaps even more so than other aspects of archaeology. This may partially stem from poor chronological resolution but mainly from the fact that much rock art research is largely interpretive in nature concerning cultural meaning and relationships across space and time. There are perhaps few who would not agree that most rock art was the product of individuals but this does not necessarily imply that it was done in private for private goals and based on private visions. Yet, even if rock art was created as part of a community ritual, this does not necessarily preclude private goals such as asserting social status (Robins 2002). Kehoe (2000:71-80) suggested, much to the annoyance of Schaafsma (2013:44-45), that some rock art might have been the simple doodles of idle children. Though doubtless a possibility for some figures across the Southwest, adults with experience are indicated by the expert hand in evidence for most Basketmaker II elements at most panels, including the readily identifiable portrayal of various three-dimensional objects. The motivation for executing rock art includes five rather different interpretive scenarios that are not necessarily mutually exclusive: 1) representing mythic narratives about supernatural individuals; 2) documenting historic narratives/events about real individuals; 3) recording individual trance states and transformations of shamans; 4) documenting ownership and territorial boundaries; and 5) asserting status, as in Robins's (2002) argument that rock art functioned as "prestige technology."

Some Basketmaker rock art may well depict supernatural beings and mythic events rather than real personages (e.g., Cole 1990:111; Schaafsma 1980:117). Certainly

this is the case for some rock art around the world with a known ethnographic record (e.g., Bahn 1998), including the Southwest (e.g., Schaafsma 1980, 2000). This interpretation seems especially applicable for commonly repeated specific elements such as the twins with heads shaped like lobed circles (Cole 2009:123, Figure 67; Manning 1992:15-16, Figures 13, 22-26). But rock art is also known to have a biographic quality such as that on the northern Great Plains where there is a clear trend from realistic if stylized and static depictions of human figures to more naturalistic action scenes that documented key events in the lives of individuals and groups (Keyser and Klassen 2001).

Basketmaker II images show abundant realistic details and, although many are static and appear distinctly non-narrative, especially those involving large anthropomorphs, there are examples that clearly have a narrative quality and that seem to pertain to rather mundane events such as hunting or tracking animals. It is likely important that the static large anthropomorphs are usually *individualized* in various respects rather than in similar repetitious fashion as might be the case if depicting a set of supernatural beings. Also, as Cole (2009:124) points out, even panels of large static anthropomorphs have rows of dots and lines that often extend dozens of meters and serve to link together scattered elements and groups of elements thus suggesting that they too may have a narrative.

Even with seemingly realistic depictions such as atlatl duels, some might question whether these show exciting if mundane realities of life in the real world or are metaphoric. Metaphors are not distinct from experience but rooted in it (Lakoff and Johnson 1980:19), but did the duels that I illustrate below actually occur and get documented in rock art or are they symbolic of something else entirely? For example, Whitley (1998:155, 200) argues that scenes of sheep hunting in the Great Basin and California such as the Coso Range are not realistic depictions concerning the actual procurement of meat but metaphors for shamanic rain making. In Whitley's account, rock art is not connected with mythology, depicting neither myths nor their principal actors, but is the output of shamans emphasizing trance, metaphorical death, magical flight and transformation. He sees rock art as personal and executed by specialists who narrated otherworldly experiences rather than the mundane events of life.

In a critical review of such an interpretation Quinlan (2000:93) makes a valid point that “the shamanistic model frequently portrays the shaman’s interest in the supernatural as an end in itself (e.g., Turpin 1994b:76-77), rather than a means to an end (i.e., curing affliction).” Such an end can also include control or influence over fellow people both by achieving social renown and by fear of access to supernatural powers. There is no doubt that the shamanic argument has been overplayed and become something of a straight jacket to research, but whether it is a dead end as Bahn (2010:135) believes all depends on if the account ends where it starts. Even if one accepts that some rock art derived from the visions of “religious” specialists, this likely would have been highly sensitive to the social and ecological context of the time no matter who was producing it, shaman or other individuals (e.g., Garfinkel et al. 2010; Garfinkel and Austin 2011; Gilreath and Hildebrandt 2008; Turpin 2011). In any event, chief antagonists in the shamanism debate have taken to accusing each other of “cultural imperialism” (Schaafsma 2013:47), “racism” (Whitley et al. 1999:17), “patronizing neocolonialism” (Bahn 1998:244), “primitivism” (Kehoe 2000:72) and the like such that coming to some mutual understanding seems unlikely. Schaafsma (2013:45) makes the exorbitant claim that those who espouse non-shamanic interpretations of Basketmaker or other rock art do so out of some misguided attempt to act “ethically responsible” and in so doing “expunge the meaning of art, reducing it to palatable, simplified, and sanitized explanations grounded in myth, narrative, group rituals, and other social niceties.”

It is worth considering the previously shown Wolfman panel to illustrate these different arguments. The principal group of elements at the site in Figure 11.2a, and Cole (1989:Figure 3, also Cole 2009:Figure 57d, e) shows the entire panel, which includes various elements to the north (left side of the image shown). The fine execution of the principal elements in this panel all seem to be the product of a single hand and the panel occurs isolated from other rock art suggesting that it was a “private” space. This stands in marked contrast with the nearby panels that occur not too far downstream at the mouth of Butler Wash and along the San Juan River, which clearly represent the accretion of dozens if not hundreds of separate artists, even within the Basketmaker II interval (see Robins 1997b). The central figure of the Wolfman panel is the male anthropomorph flanked on both sides by various accouterments and two canid tracks. The latter are

thought to be wolf and provide the site name but dog or coyote are also possibilities. This panel could be interpreted as the product of a shaman in a trance state as suggested by his rigid stance, with the birds indicative of his “flight” and with the canid tracks perhaps symbolic of an animal helper spirit. Seemingly less supportive of such an account are the other objects and the occurrence of at least two female figures shown in more abstract manner just to the north. The individual might well be a shaman but one who is advertising his abilities and ownership of powerful symbols and knowledge of the myths and rituals of his society. In this sense the panel is a form of status assertion or advertisement and this might well derive from his role as healer or from other connections that he might have to the supernatural, but an esoteric depiction of some trance seems unlikely. Of interest with regard to the human figure is the one zigzag line left unpecked in the otherwise solidly pecked form, a line that occurs right at the waist. This is the same area where the male known as Cut-in-Two was severed and then sewn back together (see description in Chapter 4). It is also worth noting that the painting of anthropomorphs directly above burials, especially ones that were appropriately gender differentiated as at the Green Mask site (Cole 1993), seems to better accord with a biographic interpretation for some images than one based on shamanic trance states or mythic symbolism.

Another aspect that is important to consider is the gender responsible for art creation (Hays-Gilpin 2004). Kelley Hays-Gilpin (1996) makes a convincing argument that Broken Flute Cave had both male and female spaces and that rock art occurred in the male space. Certainly the themes that are most commonly portrayed in Basketmaker II rock art are male centric and seem dominated by male anthropomorphs. There are some unmistakable female depictions and others that are more questionable (e.g., the other large anthro at the Big Man panel in Grand Gulch), but female portrayals are infrequent overall whereas male depictions are common. Males are depicted with penises and scrotums and with their hair done in bobs; females are depicted with breasts and nipples and with menstrual aprons.

Hyder (1994) proposed that one purpose of Basketmaker rock art was to delineate individual and cultural identities and to fix these on the landscape. The basic idea was that rock art helped to mark territories, to stake claims to agricultural plots and productive

gathering areas, and that ownership was identified with nuclear families rather than specific lineages as was common among historic Puebloans. He saw the relationship to space and rock art as nested and with changing roles from mostly external communication (between groups) at the edges of territories (indicated by style boundaries) to mostly internal communication (within group) toward the center of territories. Communication within the group often involved a much wider range of topics than communication to external parties, which might or might not share identical ideologies, so he thought there could be greater functional diversity for rock art at centers of territories. External communication requires unambiguous messaging much like the universal symbols of today.

With that background I now turn to the description and illustration of specific rock art panels or elements that pertain to S-shaped sticks and conflict. This is not intended to be a catalog of conflict depictions since such documentation is far beyond my more modest goals of illustrating how Basketmaker II groups portrayed S-shaped sticks and whether they appear in scenes of violent acts where use of a fending stick might be expected. Some aspects of violence in Basketmaker II rock art have been well publicized such as flayed human head skin trophies (Cole 1984). Other aspects have not been, therefore I focus more on the latter. The rock art record further illustrates that violence was a facet of Basketmaker II life and allows some insights to emic motives.

S-Shaped Stick Depictions

The depiction of S-shaped sticks is the first aspect of the rock art record that I consider. As previously discussed, the significance of these artifacts regarding conflict or violence during Basketmaker II times concerns a suggested principal function—to deflect or bat aside atlatl darts. Hence, one common referent for these items is “fending stick.” An independent line of evidence concerning whether the sticks actually functioned this way comes from how Basketmakers depicted the artifacts in rock art.

Within the core Basketmaker II study area there are good examples of realistic depictions of S-shaped sticks (Figure 11.4). In addition to their S-shape, they usually appear with a distinct bulge on one side that represents the pitched cordage wrap of the grip (Figure 11.4b and see Chapter 8). The examples shown in Figure 11.4 occur at a rock art site known as the Skewered Man panel that is described in greater detail later,

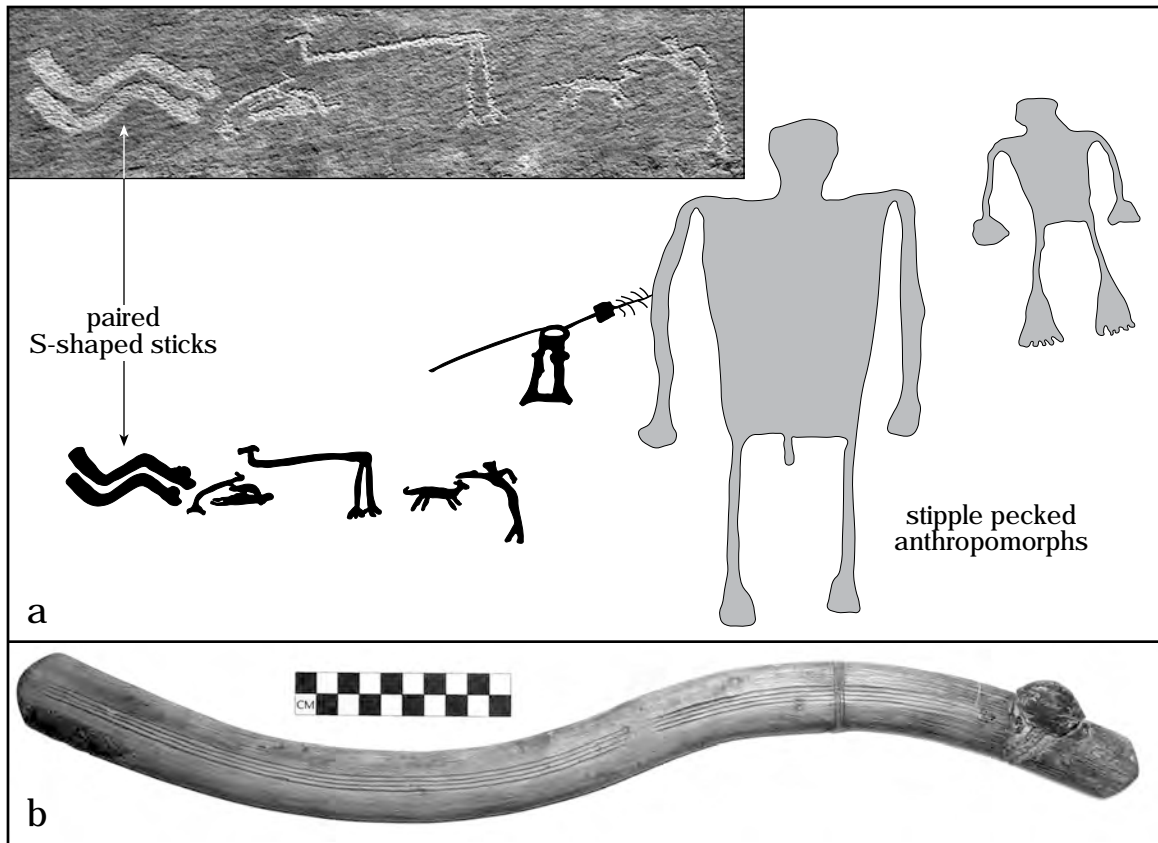


Figure 11.4. S-shaped sticks at a Basketmaker II rock art panel and an artifactual example for comparison: (a) part of the Skewered Man Panel, Walker Creek, NE Arizona (see Figure 11.26 for an overall illustration of the Basketmaker II elements); (b) grooved S-shaped stick from Cave 2, Moqui Canyon, SE Utah (Geib 5, MEVE 1857; Collections of Mesa Verde National Park; photos and drawings by Phil R. Geib).

since it shows a graphic scene of atlatl and dart violence (see Figure 11.26). The pair of S-shaped sticks at this site are depicted next to a small scene that includes two anthropomorphs, one of which appears to be actively engaged in some sort of ritual over what might represent a body; the other human figure seems to be in the act of throwing directly above a dog-like quadruped. The meaning of this group is of course enigmatic but there is no doubt as to the type of artifact that is shown by the S-shaped objects. Since this group of elements occurs distinct from the individual skewered by an atlatl it is impossible to know if there is any connection and certainly neither the victim nor the attacker with the atlatl hold an S-shaped stick.

A similar pair of S-shaped sticks occurs at a panel along the lower Chinle Wash (Figure 11.5); this panel is close to a site that shows an individual with a dart embedded in his neck—Impaled Neck panel (see Figure 11.28). This pair of sticks occurs with two other depictions of the artifact, one of which is superimposed across the upper legs of a Basketmaker II anthropomorph that has a stipple-pecked body. Not only does this element clearly overly the human figure but it is less patinated and solidly pecked. The solidly pecked paired sticks also seem less patinated and thus appear to be more recent additions, which also includes the smaller-scale anthros with three upright feathers or lines and three digits for fingers. The vertically positioned S-shaped stick is clearly older than the other three but it too appears to be superimposed over the feet of the older anthro. The pairing of S-shaped sticks is also known to occur with the actual items since Guernsey and Kidder recovered a pair together as burial goods with an adult male in Cist 27 of White Dog Cave. This burial has a radiocarbon date of 2288 ± 44 BP (Coltrain et al. 2007:Table 1) with a calibrated two-sigma age range of 410-205 BC.

Yet another example of paired S-shape sticks occurs in lower McElmo Canyon on a badly weathered sandstone face without any clearly associated elements (Figure 11.6). The sticks were fortunately pecked quite deeply such that they are obvious despite the centuries of erosion. The sticks in this instance lack the grip knob that is so characteristic of western Basketmaker II examples and they also have a more abrupt distal bend. Since the site location is the middle portion of McElmo Creek in Colorado, some 50 km east

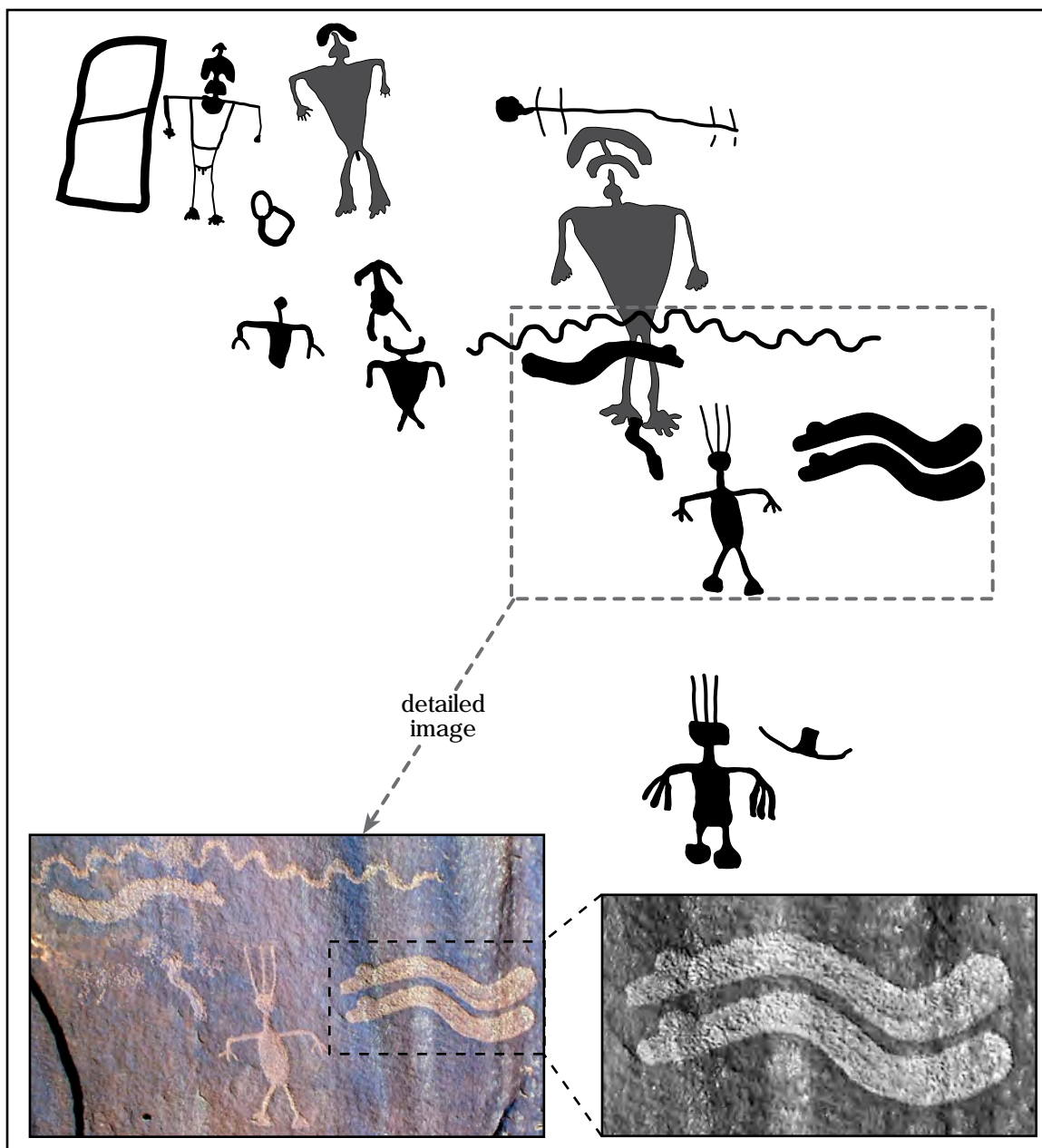


Figure 11.5. Paired S-shaped sticks and two additional S-shaped sticks at a separate Basketmaker II panel near the Impaled Neck Panel, lower Chinle Wash, NE Arizona. The one S-shaped stick that is superimposed across the human figure is also less patinated, indicating a slightly more recent origin (photos and drawing by Phil R. Geib).

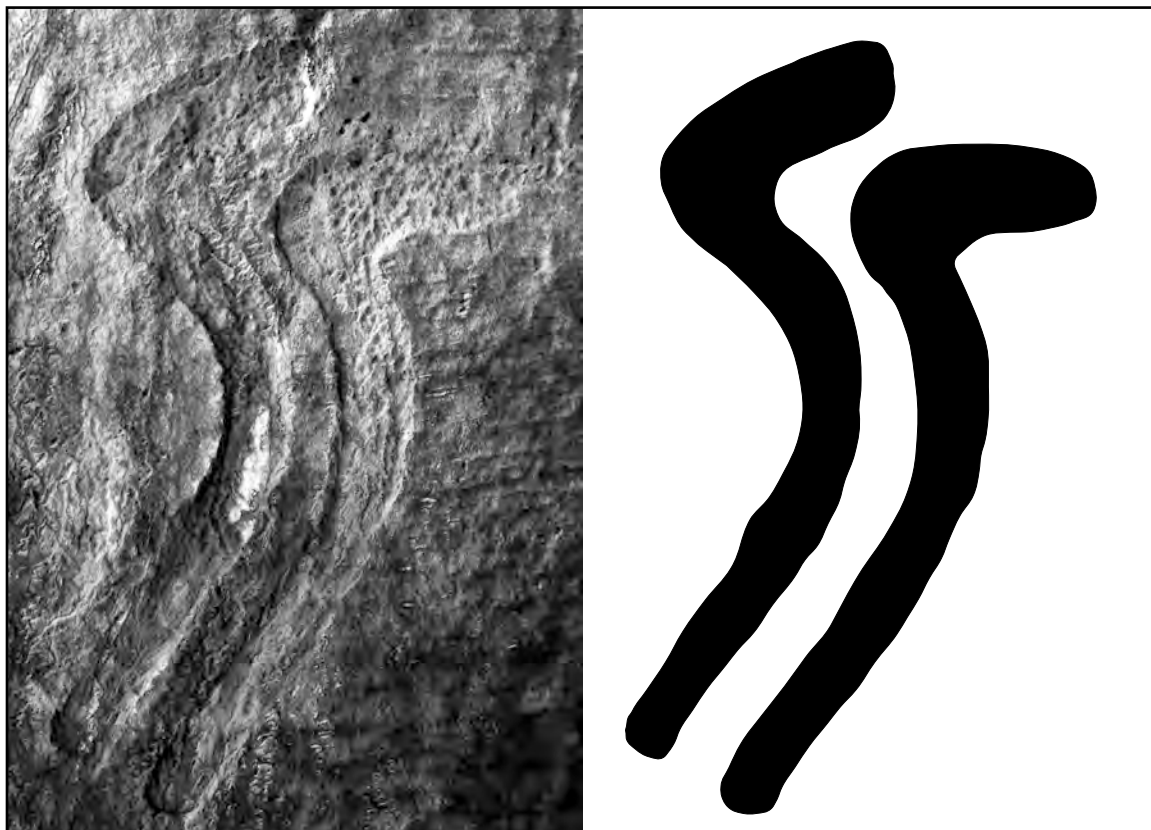


Figure 11.6. Paired S-shaped sticks in McElmo Canyon, at the mouth of Sand Canyon, Colorado (photo by Laurie Webster).

from where western Basketmaker II materials are known to exist, stick morphology might represent a local variant of this artifact type. I know of no actual specimens recovered from this area as of yet.

As discussed in Chapter 6, the pairing of the grooved curved sticks is also seen in Mesoamerican art where the implements are held in the hands of warriors who do not hold other weapons. The pairing seems potentially significant given the Landa account of a lowland Mayan ceremony that he observed in the 1500s in which participants appear to deflect atlatl darts using short sticks. The warriors with paired grooved curved sticks on Chichén Itzá sculptures seem like good candidates for these participants and it is not too great of a stretch to believe that a ceremony observed in the 1500s was extant in the 1200s if not before. It is far more tenuous, but perhaps the pairing of sticks in Basketmaker II rock art indicates that the roots of this ceremony have considerable time depth.

There are also depictions of single S-shaped sticks such as shown previously in Figure 11.5 where they occur near paired sticks. Slightly down canyon from this panel occurs a single vertically oriented S-shaped stick along with an unusual element that may represent a bag (Figure 11.7); these occur below an anthropomorph and bighorn sheep with the human figure perhaps holding S-shaped sticks in each hand (perhaps another case of paired sticks?). Immediately adjacent on a 90 degree facing rock surface are three more small anthropomorphs, one of which is a bird head along with four bighorn sheep. A link between these artifacts and sheep hunting seems problematic and clear differences in patination indicate that the S-shaped stick is older by some degree than the other elements. The direct dating of Basketmaker II S-shaped sticks reported in Chapter 10 indicates that they are all earlier than the Common Era, so by the time the small anthropomorphs and sheep were added around this artifact, it might have been out of circulation.

The White Dog Cave male burial with two S-shaped sticks also possessed atlatl darts and in Basketmaker II rock art there is at least one instance that shows such an association—this at a complex panel in Johns Canyon of SE Utah. Figure 11.8 shows just a small portion of this panel, but it includes the main component on the right side,

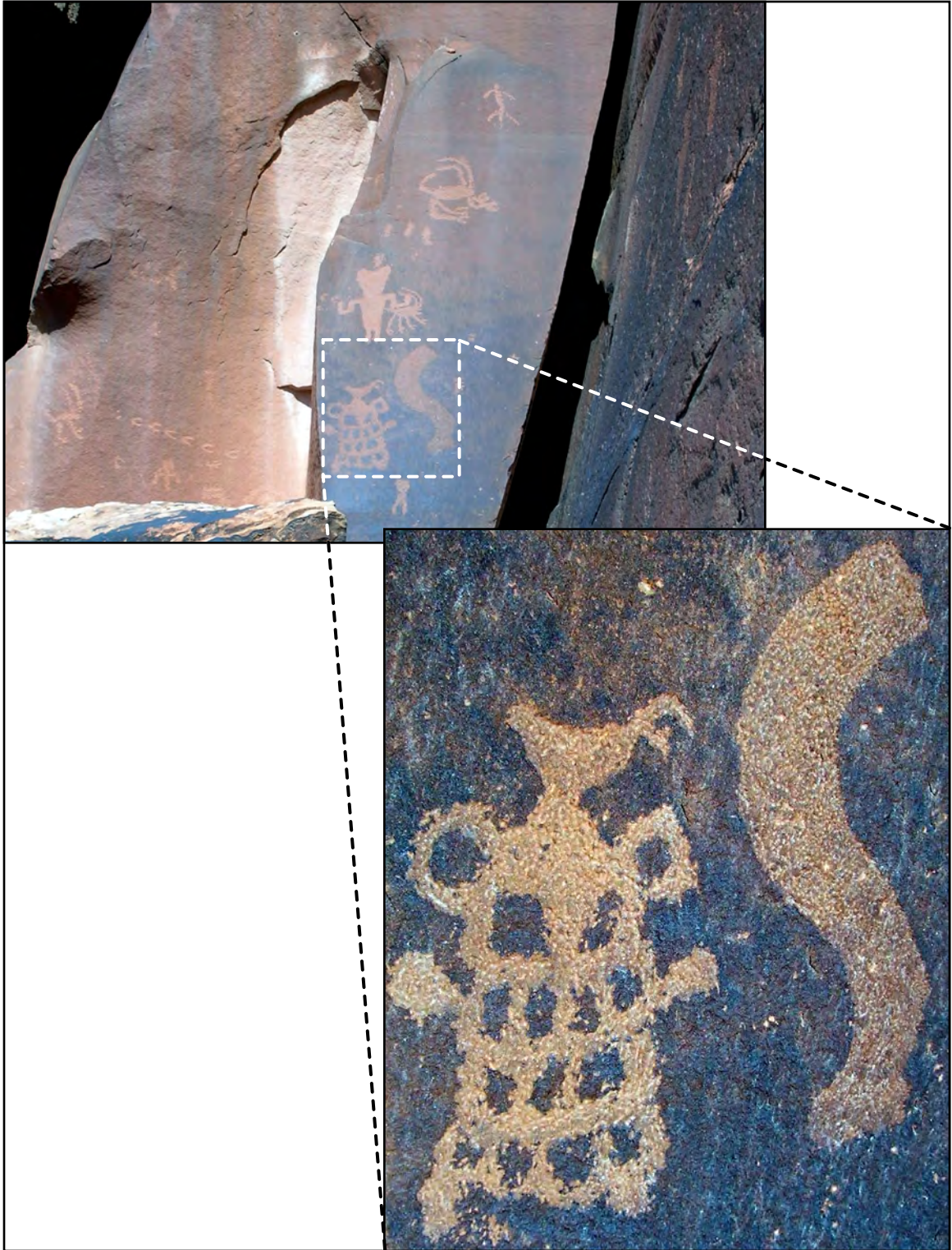


Figure 11.7. Single S-shaped stick at a probable late Basketmaker panel just downstream from the Impaled Neck Panel, lower Chinle Wash, NE Arizona (photos by Phil R. Geib).

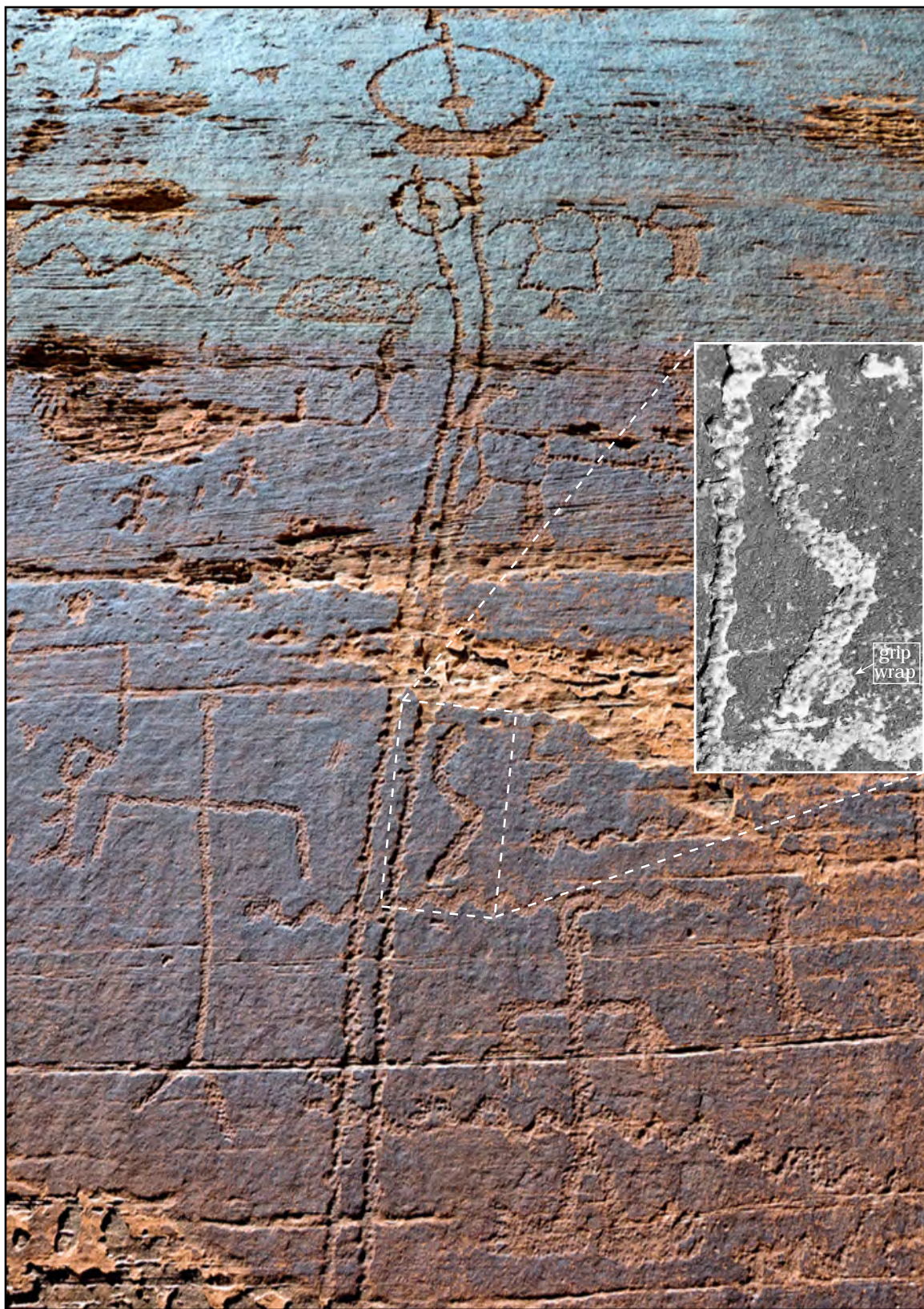


Figure 11.8. S-shaped stick alongside a pair of atlatl darts and other Basketmaker elements at a complex panel in Johns Canyon, SE Utah (photo by Chuck LaRue).

which has an S-shaped stick adjacent to a pair of atlatl darts, the taller one with special feathers (see discussion that follows). Like with the examples in Chinle Wash and Walker Creek, the cordage and pitch grip wrap is clearly shown. Atlatls are also clearly shown elsewhere on this panel—in one case where an anthropomorph has impaled a sheep with a dart and in another case with a lone atlatl shown in plan view. Much of the panel seems to be late Basketmaker II in style including paired lobe-headed figures.

I am aware of no examples in Basketmaker II rock art that show S-shaped sticks being used in a fight involving atlatls and darts. The one possible association like this is at a panel on Cedar Mesa that is described later (the Atlatl Face-Off, see Figure 11.5), but the possible S-shaped stick is not held in the hand and indeed the identification of this element is not certain because of weathering. Indeed, I know of no certain examples of S-shaped sticks held in the hand of a classic style San Juan anthropomorph and just one example where a small figure holds what appears to be such an artifact (Figure 11.9). The content of this panel provides no obvious clue as to the use of the stick.

Outside the Four Corners study area in tributaries of the middle Little Colorado River there are numerous depictions of anthropomorphs holding S-shaped sticks in a style of rock art that seems to both predate and be partially contemporaneous with Basketmaker II. Figure 11.10 shows some examples from Rock Art Ranch on Chevelon Creek but similar examples occur in east Clear Creek and Silver Creek. Malotki (1997, 2001) has designated the particular imagery as the Palavayu Anthropomorphic Style. He recognizes the obvious similarities between many of the human forms of this style and those of the Glen Canyon Linear style which clearly predates Basketmaker II rock art of the Four Corners area. The solidly pecked Palavayu anthropomorphs like those of Figure 11.10b might be more equivalent in age with the Basketmaker San Juan style and they also appear far less patinated than the figures with line or grid bodies. In the general area where these depictions occur no examples of S-shaped sticks have been recovered, although this class of artifacts are known from the surrounding region and there is no reason to suspect that they were not in use by groups that frequented Chevelon Canyon. The common portrayal of these objects in the hands of human figures implies that they held some sort of social significance or status. Nonetheless, there is no obvious



Figure 11.9. Small Basketmaker anthropomorph holding what resembles an oversized S-shaped stick, Slickhorn Canyon, SE Utah (photo by Cedar Mesa Hiker).



Figure 11.10. Examples of Palavayu style anthropomorphs holding what resemble S-shaped sticks, Chevelon Creek (Rock Art Ranch), central Arizona (photos by Phil R. Geib).

indication from the rock art as to function and there is no case that I know of where a Palavayu style anthropomorph holds such an object while engaged in any sort of conflict.

Figure 11.11 shows a small petroglyph on Monitor Mesa in SE Utah that appears to show an anthropomorph throwing an S-shaped stick at a bighorn sheep. In this case the sheep has a distinct grid body that is characteristic of the Archaic Glen Canyon linear style.

Identifying Atlatls and Darts

One significant aspect of the Basketmaker II rock art record of conflict concerns fight scenes involving two opponents using atlatls and darts. As discussed in Chapter 4, the atlatl was the one fire-type weapon in common use throughout Basketmaker II. Its principal function was to dispatch large mammals and the two contexts of this were hunting and warfare. As background for viewing fight scenes it is worth considering how to identify and differentiate between atlatls and darts in rock art (Figure 11.12), since it is not always immediately apparent which is being portrayed, especially with small-scale images. Both atlatls and darts can appear as a straight line that bisects a circle or oval with the latter always appearing toward one end of the line segment. Aside from cultural conventions in representation, Basketmakers used artistic license in some cases evidently to help clarify what was being depicted; this includes improper holding technique for the atlatl so that the diagnostic finger loops are discernible and showing a pronounced “male-like” atlatl spur when such features are absent on Basketmaker II atlatls. Large-game hunting scenes in which atlatls and darts play an obvious prominent role are rather common in Basketmaker rock art and are also informative with regard to the interpretation of fight scenes because they are likewise portrayed at small scale.

Figure 11.12 shows two sets of paired darts each accompanied by an atlatl, precisely the implements needed for a Basketmaker II duel. Even though the size difference between atlatls and darts is not shown exactly in this image, the fact that atlatls are comparatively small in relation to darts is important with regard to identification purposes. Also significant is the shape of the bisected oval in relation to the line segment—is the longest dimension of the oval parallel to the line or perpendicular to it? For atlatls that are depicted somewhat realistically the oval should be perpendicular to the line, something that is readily appreciated by examining the atlatls shown in Figure 4.1.



Figure 11.11. What appears to be an S-shaped stick being thrown at an Archaic style (Glen Canyon Linear) bighorn sheep, Monitor Mesa, SE Utah (photo by Chuck LaRue).

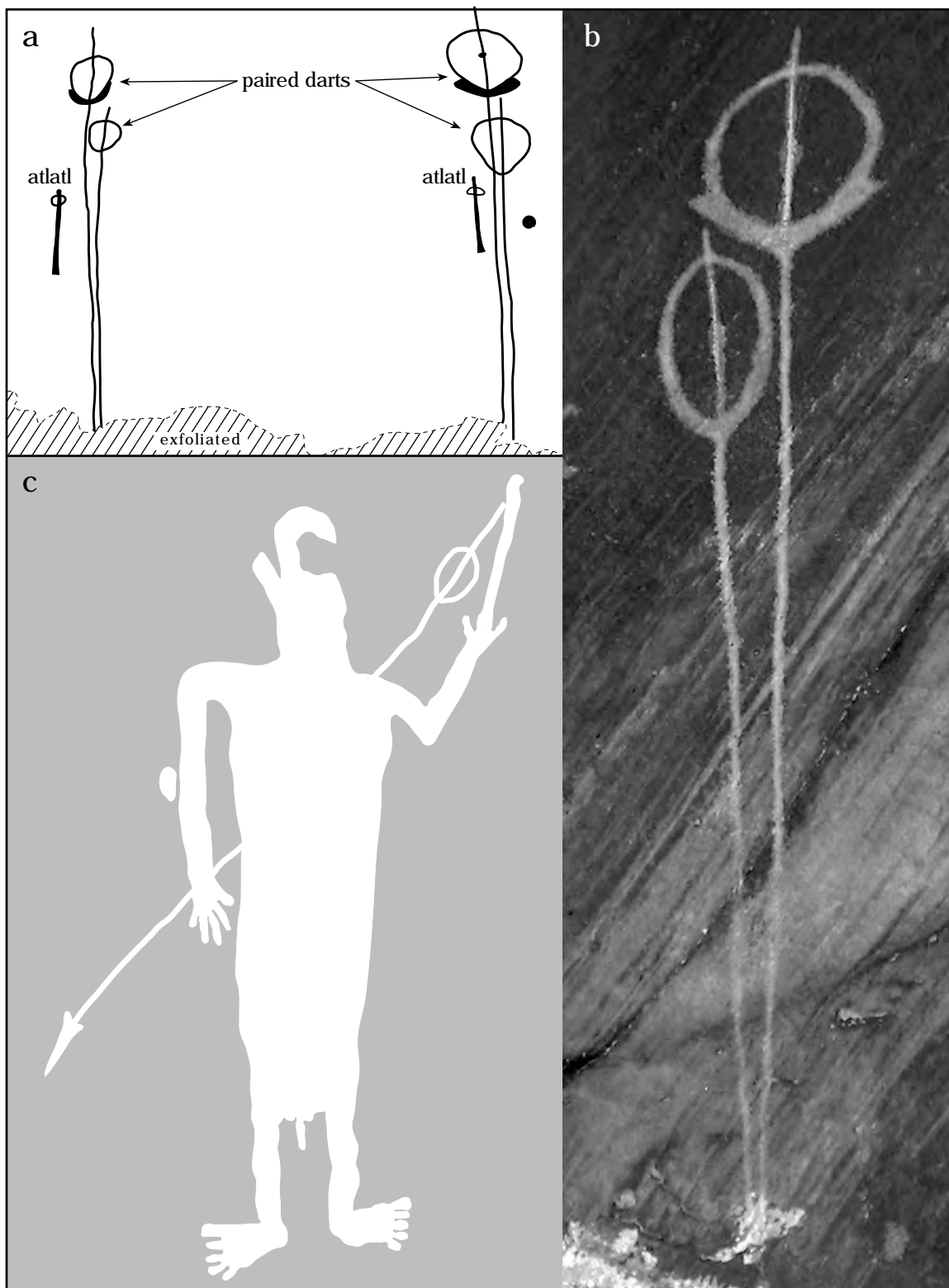


Figure 11.12. Atlatls and darts in Basketmaker II rock art of SE Utah: (a) petroglyph of paired darts and atlatls, Point Lookout Canyon; (b) petroglyph of paired darts on talus boulder, Point Lookout Canyon; (c) pictograph of near life-sized male loading a dart into an atlatl, Slickhorn Canyon (photo by Chuck LaRue; drawings by Phil R. Geib).

The atlatls of Figure 11.12a display this characteristic but not the darts. The atlatls are slightly smaller than life size, since the specimen on the right measures only about 32 cm and that on the left about 36 cm, which is too short given that the length of known Basketmaker II atlatls is greater than 50 cm. Even so, the relatively large size of the atlatls and the fact that they are shown in plan allows portrayal of a slight distal expansion in form away from the finger loops such that there is no doubt that atlatls are being depicted.

The darts of Figure 11.12a might be shown at life-size or slightly larger since the longest specimen on the left measures 172 cm long whereas the known Basketmaker II darts measure less than this (see Chapter 4). Even if dart length is correctly depicted, the fletching is greatly exaggerated, especially for the darts on the right. Based on measurements of darts and atlatls from Basketmaker II sites such as White Dog Cave, darts are about 2.3–2.5 times longer than atlatls whereas in this depiction the darts are about 4.5–5.5 times longer. Seemingly a more true to life scale for a Basketmaker II atlatl dart is shown by the pictograph of Figure 11.12c where a male with plumed head ornament is loading one into an atlatl. The dart is not longer than the individual is tall which probably means it measured around 140 cm. The fletching of this dart is also close to a realistic size. Note that the figure uses both hands to load a dart into his atlatl, which is why a fending stick is an encumbrance.

The bisected oval on atlatls signifies the finger loops and there is very little additional detail that can be added by increasing image scale. For darts, however, the bisected oval signifies the fletching and larger scale images allow for the depiction of greater detail. Hence with large darts, such as those of Figure 11.12a and b, the feathers can be shown as more than just a bisected oval. In both of these cases the longer darts have an additional detail indicated by a lightly pecked band pendant to the oval. This is assumed to signify some aspect of the feathers used for fletching, such as bird species or part (e.g., wing or tail) or how they may have been trimmed. The distinctive pairing of a dart with simple feathers and one with more elaborate feathers and often a cupule in the center is seen repeatedly in Basketmaker II rock art. It is possible that the darts might represent the original form of Puebloan prayer sticks; such an interpretation makes sense

of the hundreds of darts deposited into the Correo shrine of New Mexico and according to cardinal directions (Parsons 1918; Geib and Heitman n.d.).

Scale clearly matters in the details that can be presented and all hunting scenes in Basketmaker II rock art are small scale (Figure 11.13). Even when the overall scene comprises an entire large panel, each individual component such as human figures or the atlatls that they carry are small. Even then, there is often artistic license in the exaggeration of dart or atlatl size or in the display of certain diagnostic features. For example in Figure 11.13a the atlatl is greatly enlarged such that it is essentially the same size as the quadruped. The increased size combined with showing the atlatl in plan view allowed for the distinctive recessed groove with spur to be depicted. The projectile point tip attached to the dart in this image is clearly of a corner-notched variety and is distinct from that of Figure 11.13c, which is side-notched. In the hunt scene of Figure 11.13b the atlatls are very small such that they would not have been identifiable except by exaggeration of the finger loops. The sheep are also exaggerated in size, perhaps to emphasize their significance and because they are the focus of action; as a result, the impaling darts are also enlarged relative to the human figures and atlatls.

The lower right hunter of Figure 11.13b holds an atlatl in one hand with arm cocked back in something of a standard atlatl throwing position (bisected circle indicative of finger loops are in hand) while the other hand holds two darts (bisected circles indicative of fletching are away from the hand). Presumably the dart that he has just thrown is impaling the second sheep in the line. The figure slightly above and to the right holds an atlatl in his right hand (assuming a forward-facing stance) in a position of follow through on a throw, which is also indicated by the dart almost touching the atlatl. This individual holds no darts but has already embedded one in the lead sheep. In Figure 11.13c the atlatl is signified by the arm held back in a cocked holding position, which is the customary stance while preparing to throw with a loaded atlatl. With the dart shown midflight between the hunter and the prey this depiction has caught a moment in the action when the implied outcome seems rather certain. The important point is that with small-scale figures a cocked-back arm and the presence of a dart in flight or stuck in an animal or human form indicates use of an atlatl.

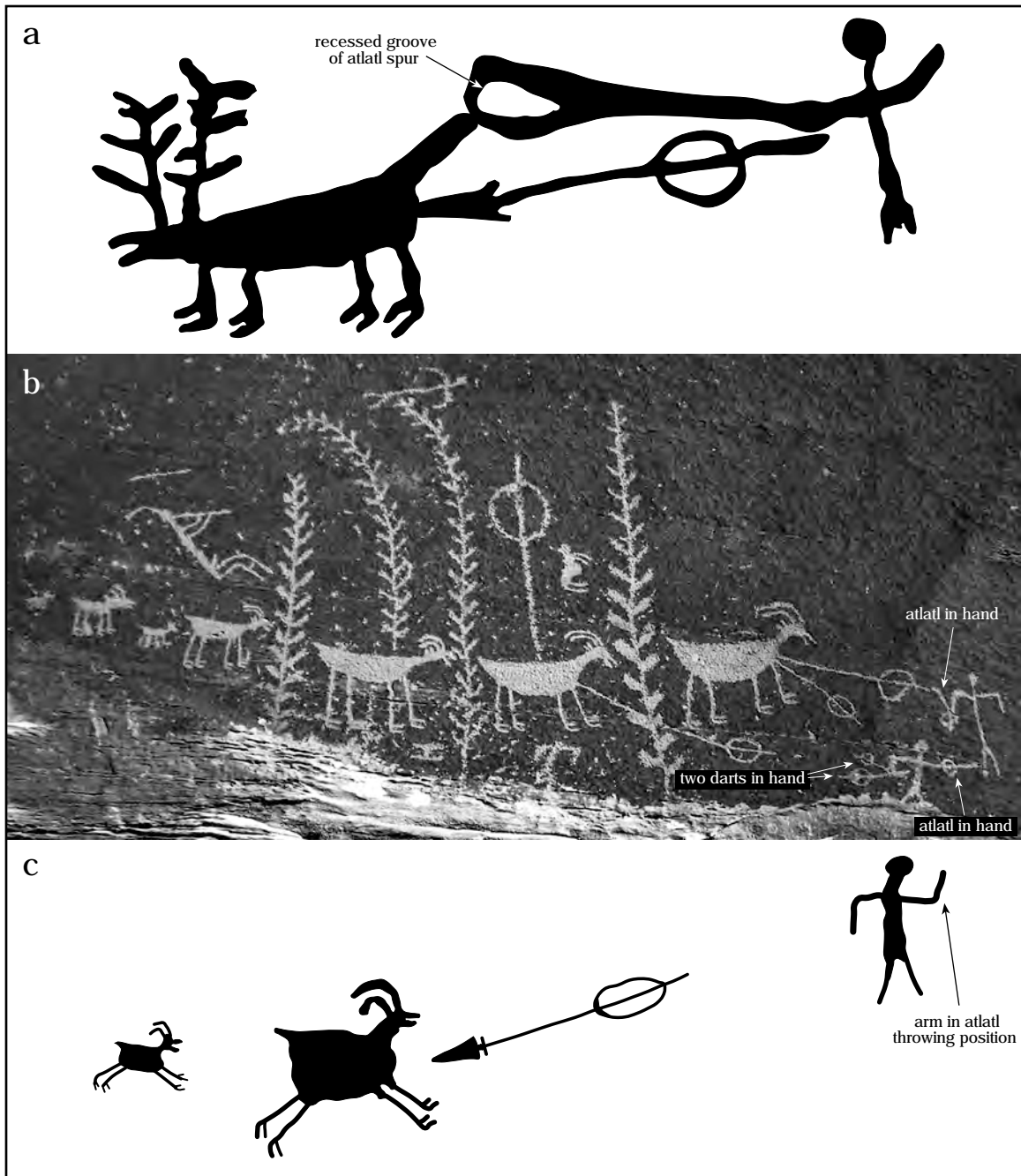


Figure 11.13. Hunt scenes in Basketmaker II rock art: (a) petroglyph of oversized atlatl with dart stuck in deer or elk, Cedar Mesa, SE Utah; (b) petroglyph with hunters tossing darts into lead members of descending bighorn sheep herd, Johns Canyon, SE Utah; (c) petroglyph of atlatl dart in flight toward bighorn sheep with anthropomorph in standard throwing stance, lower Chinle Wash, NE Arizona (photo by Cedar Mesa Hiker; drawings by Phil R. Geib).

Fight Scenes

War per se is not a theme of Basketmaker II rock art in that there are no unmistakable depictions of fights involving multiple individuals from distinct groups. This does occur in historic period rock art of the Southwest, such as the famous Ute Raid panel in Canyon del Muerto (Grant 1978:Figure 4.73, p. 258), but such portrayals are unknown prior to the historic period. Even during the late Puebloan period when direct evidence for conflict is rather abundant and depictions of war-related imagery is rife (e.g., Schaafsma 2000) there are no certain war scenes. The fights shown in Basketmaker II rock art that I describe below occur between two individuals and appear like duels, which is how I will refer to them. I assume a Basketmaker II temporal affiliation for the duels not only because of surrounding imagery that is widely recognized as Basketmaker II in style but also because the duelers use atlatls and darts. This weapon system was replaced soon after the introduction of bow technology and continued atlatl use past about AD 550 is highly unlikely for the Four Corners area or even the Colorado Plateau at large (see discussion of weaponry in Chapter 4; Whittaker 2012). Atlatl dueling scenes occur both as pictographs and petroglyphs but the former are rather rare. Most fight scenes are rather small in scale, especially when compared with adjacent images that often include the large broad-shouldered anthropomorphs that are so typical of Basketmaker II rock art. Nonetheless there are a few larger-scale fight scenes. Moreover, it is abundantly clear that the small images of Basketmaker II panels depict the action of life in contrast to the static qualities of the larger anthropomorphs. Below I illustrate and describe several fight scenes to exemplify how Basketmaker II artists depicted one aspect of violence in their culture—that between two individuals involving atlatls and darts. This is exactly the sort of conflict where defense against darts with an S-shaped stick makes most sense.

Dueling Bird Heads (lower Chinle Wash, SE Utah)

It seems appropriate to start this discussion about Basketmaker depiction of conflict with a panel that shows a pair of opposed bird-headed anthropomorphs, sometimes called duckheads (Figure 11.14). The panel is located at the very lower end of Chinle Wash near the confluence with the San Juan River and is shown by map symbol 1 on Figure 11.1. This pair is part of a somewhat larger panel that includes three other bird-headed figures and other anthropomorphs as well as a small procession of burden

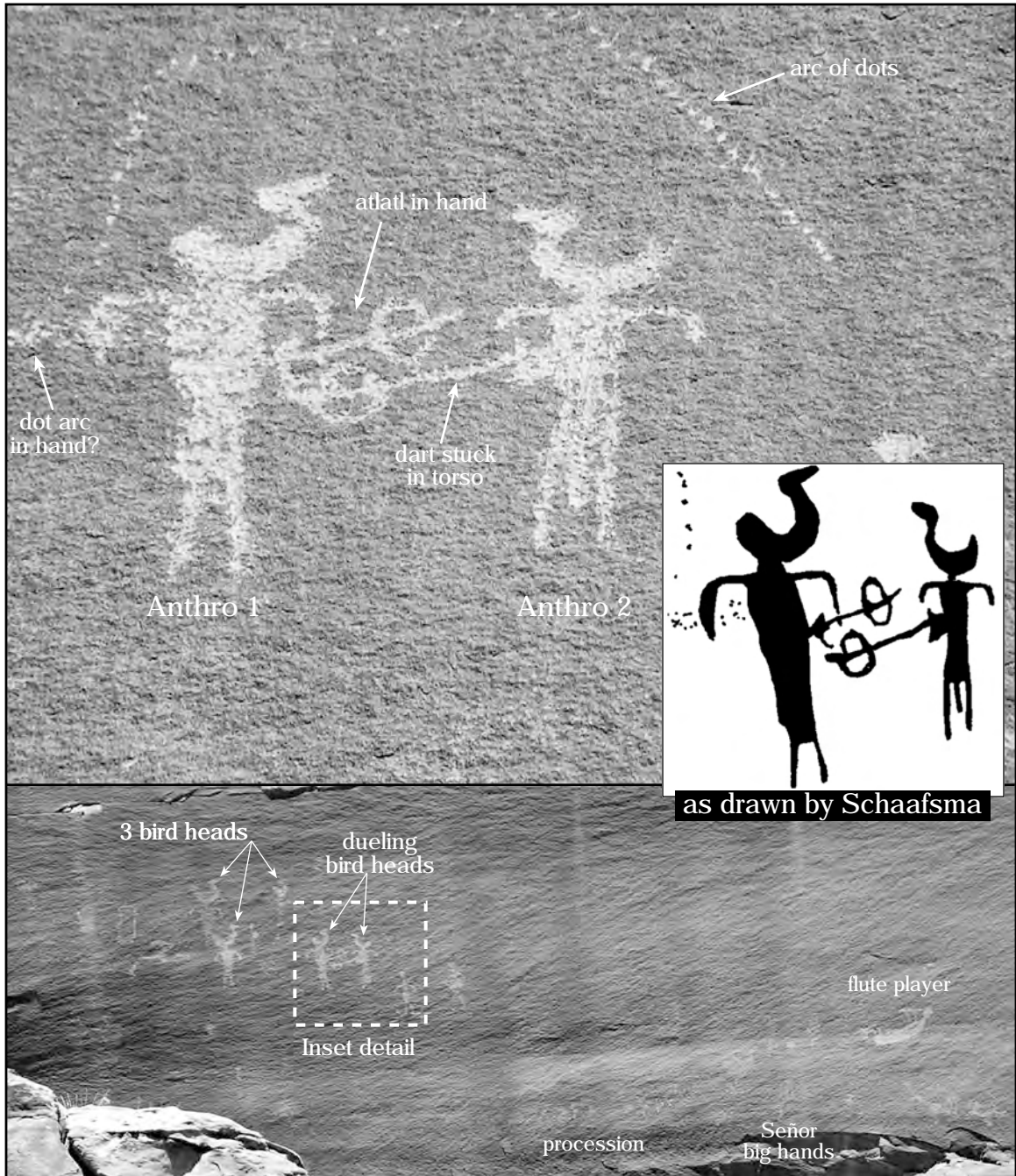


Figure 11.14. Dueling bird-headed anthropomorphs, lower Chinle Wash, SE Utah (photos by Winston Hurst; drawing of dueling pair from Schaafsma 1994). The largest of the birdhead figures measures roughly 30 cm in height.

carriers, a reclining flute player and a San Juan style anthropomorph with enormous upraised hands and one foot that ends in a wavy line that forms a spiral (see Rohn and Ferguson 2006: Figures 3.47 and 3.48). Schaafsma (1994:27, Figure 14) illustrates this pair and argues that both are “pierced by spears” or rather by atlatl darts. Although observing that the meaning of these figures is ambiguous or open to multiple interpretations, Schaafsma (1994:27) concludes that “shamanic combat may be the subject.” She attempts to bolster this argument by recounting an assortment of ethnographic accounts from various cultures of shamans metaphorically piercing or attempting to pierce others or themselves. What makes these particular individuals shamans in this case is the presence of their bird heads, an issue that she discusses at some length (1994:26-27). The opposing bird heads could indeed be shamans but at other rock art panels it is clear that fighting with atlatls and darts has nothing necessarily to do with having a bird head.

Rather than both individuals being pierced with spears I contend that only the anthropomorph on the right (Anthro 2) has an atlatl dart stuck in his side, the point embedded in the rib cage of what is clearly a phallic figure. The object held in the left hand of Anthro 1 that Schaafsma thought to be a spear is, I contend, an atlatl. The odd holding convention is certainly not how an atlatl is actually held when in use but occurs elsewhere in Basketmaker II rock art including the dueling scene on Cedar Mesa that is described next. The convention was perhaps adopted because it helps clarify what is being depicted on the rather small-scale figures (ca. 30 cm high). It is also true that Basketmaker II atlatls lack prominent projecting male spurs, which is what this image seems to show; this feature is also seen on the next panel and appears to qualify as another means of artistic license when trying to render and make clear what is being shown with an otherwise ambiguous object because of scale constraints. The atlatl is not only shorter in length than the dart, true to artistic convention and reality, but the loops are more squashed (wider) compared to the more elongated oval on the dart, which is more realistic of feathers as previously discussed. The right hand of Anthro 1 appears to hold something that is attached to the arc of dots that passes above both figures. The three bird-headed figures to the left of Anthro 1 are all facing the same way as this figure, with birds looking right toward the action. The figures on the right side of the darted

Anthro 2 are not bird heads although one of them has bird-like feet. If wearing a bird head is indicative of being a shaman then this small scene shows a conflict, metaphorical or real, between two of them that is witnessed by three other shamans, plus two additional individuals one of whom also seems shamanic on account of having bird feet. This raises a question about how many shamans there might have been in any small Basketmaker group. If so many had such status then this seems contrary to the very notion of a *specialist* who can access supernatural forces.

Having a bird head might be indicative of some social distinction other than being a shaman and likewise may not serve as a signifier of magic flight. It is difficult to say whether the procession and other elements to the far right of the bird heads are related but they appear similar in execution and weathering. This depiction may be metaphorical but still concern an actual conflict between individuals with the “darts” representative of lethal projectiles in the spirit realm such as might be fabricated from powered human bone. The image might also depict actual physical conflict that occurred between real Basketmaker individuals, perhaps even shamans as Schaafsma suggested. There is no necessary contradiction between these interpretations since the literal and the metaphoric are not necessarily mutually exclusive. When this image is placed in context with other Basketmaker dueling scenes and considered against the physical evidence for conflict, including the evidence that an individual lived for years with a dart point embedded in his body (Burial 128 at Cave 7, Chapter 5 and Geib and Hurst 2013), a literal interpretation of conflict in rock art is not speculative.

Atlatl Face-Off (Cedar Mesa, SE Utah)

The atlatl fight scene of Figure 11.15 occurs at a location west of Johns Canyon on Cedar Mesa (map symbol 2 on Figure 11.1). Heavily patinated and somewhat eroded, the petroglyph is difficult to photograph in the best of circumstances, so a drawing is provided. Various photo enhancements allowed different portions of the image to be seen more clearly but not all at the same time—modifications that allowed the feet to show obscured the throwing arms and heads, etc. This panel shows two combatants wielding atlatls and darts, facing each other in open stance with the foot of the throwing arm extended toward the opponent. The figures are somewhat side-facing, which is

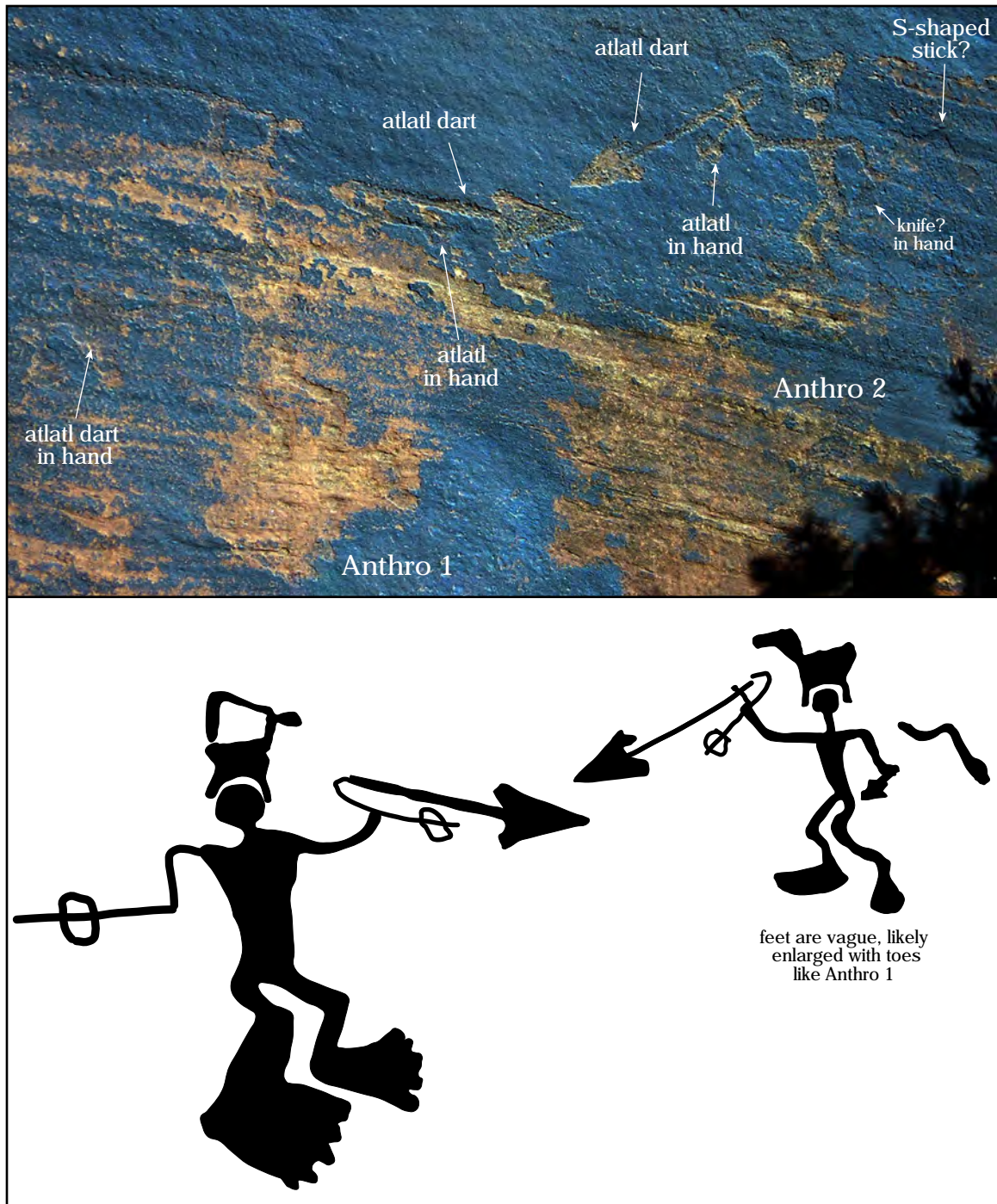


Figure 11.15. A face-off of two figures holding atlatls and darts and wearing quadruped headgear, one of which is clearly a bighorn sheep, Johns Canyon area, SE Utah (photo by Chuck LaRue; drawing by Phil R. Geib).

unusual for San Juan Basketmaker anthropomorphs, but effectively conveys the tense action of men poised to impale each other. Anthro 1 is shown larger in scale and slightly lower on horizontal plane than Anthro 2, which adds a sense of perspective even if the intent was to show individual significance, with Anthro 1 more important than Anthro 2.

Each person holds an atlatl in an unconventional manner by grasping the shaft of the stick about midway rather than using the finger loops of the grip. This allows the diagnostic element to be shown while accentuating the fact that each individual holds atlatls loaded with darts ready to be thrown. The atlatls are shown with pronounced spurs that engage dart proximal ends, another bit of evident artistic license since Basketmaker II atlatls have recessed spurs flush with the shaft or just slightly projecting (a raised nub, see Chapter 4). The atlatl darts are tipped with greatly enlarged projectile points, which certainly helps express the potential lethality of this engagement. Both figures have quadruped head gear, with that of Anthro 1 appearing to be a bighorn mountain sheep. The headdress of Anthro 2 lacks any evidence of horns or antlers so exactly what this animal was intended to represent is hard to say, although head shape seems consistent with bighorn sheep. Anthro 1 holds a reserve atlatl dart in the non-throwing (right) hand, something that is seen in other atlatl duels (good examples occur at the Three Duelers panel discussed next and in the hunt scene of Figure 11.13b) whereas Anthro 2 holds a more enigmatic object in the non-throwing hand (left in this case) that somewhat resembles a large knife or perhaps a projectile tip hafted in a foreshaft. Just to the right of Anthro 2's left shoulder and arm is a faint squiggle that may well be a representation of an S-shaped stick. If so, this would be the single case that I know of that shows such an artifact associated with an atlatl duel, though not playing any obvious role in the action.

If having a bird head is indicative of being a shaman then perhaps this dueling pair is just part of the average populace. As other panels discussed below demonstrate, there are examples of atlatl duels and dart piercings that occur between individuals without bird heads or any head ornamentation at all. Bird headedness could simply represent distinct social groups (families) or social positions/statuses within Basketmaker II society that might not equate with being a religious specialist or having special access

to the supernatural. The outcome of the evident conflict shown at this panel remains unknown but at other rock art sites wounding and death is indicated.

Three Duelers (Bluff Area, SE Utah)

The south-facing cliff face along the San Juan River from just west of Bluff, Utah to the mouth of Butler Wash is a virtual treasure trove of rock art. This includes what are now generally accepted to be authentic Clovis-age depictions of mammoth (Malotki and Wallace 2011), the famous Sand Island Site with flayed human head skins (discussed in Chapter 5; Cole 1985, 1989), and the spectacular and massive panel of near life-sized Basketmaker II anthropomorphs near the mouth of Butler Wash (Robins 1997b; Schaafsma 1980:114-117). The profusion of petroglyphs along the San Juan River at Butler Wash occurs in an almost continuous fashion for a distance of almost 3 km. John Noxon and Deborah Marcus (1992) made an initial attempt to document in detail the numerous and often complexly overlapping elements in this area. Robins (1997b) undertook a very detailed recording of select large panels using digital photography and computer drafting to allow more precise illustration of elements as well as improved capability to isolate portions of different temporal traditions. Most recently, an ongoing thorough archaeological inventory of the entire Butler Wash drainage directed by Winston Hurst has refined the records of Noxon and Marcus and clarified the official site numbers for different panels.

In one place upstream from the mouth of Butler Wash adjacent to the ruins of a Pueblo I site occurs the panel shown in Figure 11.16. This is just one part of an extensive site (Feature 33 of 42SA8019) that includes Archaic-age Glen Canyon Linear elements, most quite faded and generally executed lower on the cliff face (not all are shown) and also a few later additions including a beam socket deeply pecked into the rock that was part of a Puebloan structure. However much of the panel is Basketmaker II and includes a few rather typical broad-shouldered San Juan anthropomorphs as central elements. The latter are mainly solidly pecked and according to Robins's (1997b:3.1) relative chronology this is likely later in the Basketmaker II sequence, perhaps during the first few centuries of the Common Era.

As with some examples of Basketmaker II rock art, the overall scene almost seems to tell a story or several stories. A sequence of meandering dots across the panel

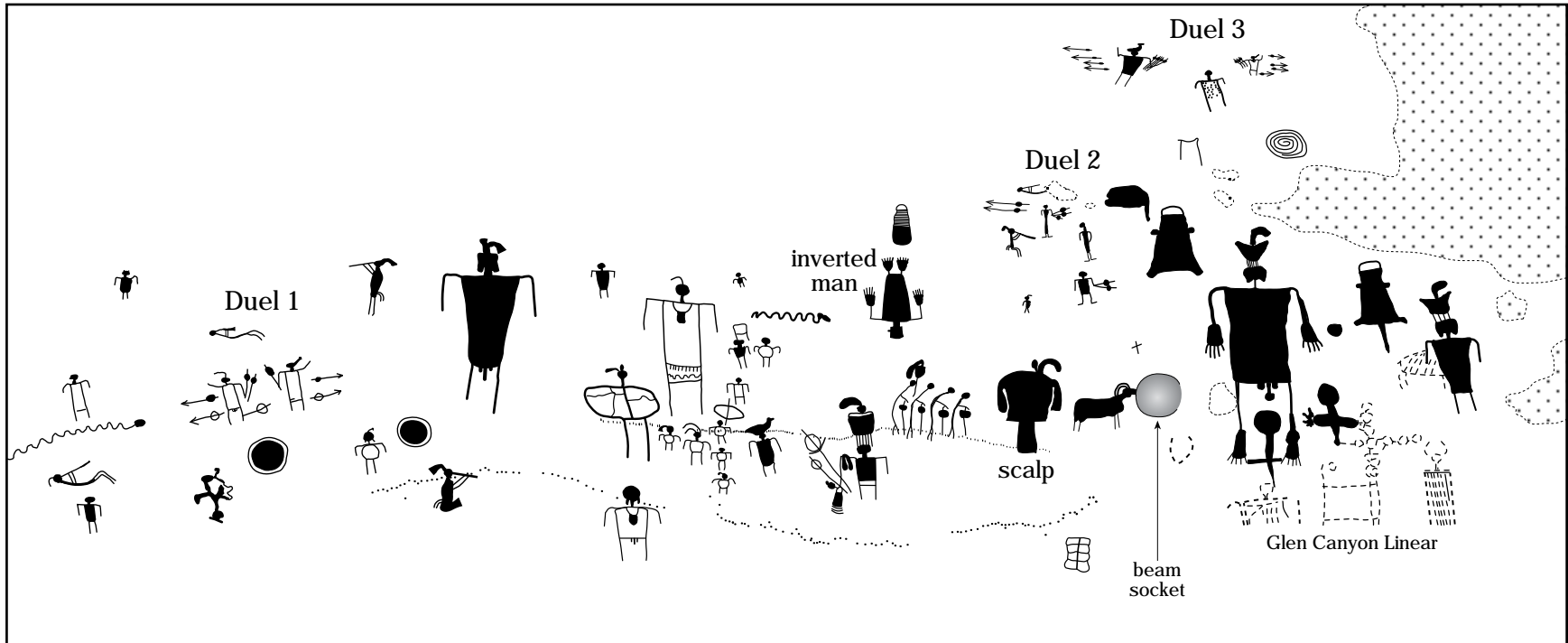


Figure 11.16. Portion of an extensive rock art panel along the San Juan River, upstream from the mouth of Butler Wash, that includes three atlatl duels as well as other evidence of conflict including a flayed head skin and a upside-down anthropomorph, which probably indicates death. Part of Feature 33, 42SA8019, upstream of the mouth of Butler Wash, SE Utah (drawing by Phil R. Geib).

that are only partially shown in Figure 11.16 serve to link various elements and lend to the notion of narration. The small figures around the static larger anthropomorphs portray the action. There are three separate duels of two combatants each, with each duel having witnesses or a third party in attendance. To the extent that the head/hair ornaments worn by individuals signify personal identity or perhaps some social status, then the combatants are distinct both within and among each duel as are most witnesses. With a total of six warriors, these three duels might seem to qualify as group activity but each occupies distinct space and appears to denote separate dyadic fights rather than group conflict. Each of these duels is shown in greater detail in Figures 11.17 through 11.22. Around the duels are other figures, especially flute players and unarmed anthropomorphs that seem to be neutral observers or referees.

Duel 1 (Figures 11.17 and 11.18) has a plume-headed man on the left (Anthro 1) facing off against an individual on the right (Anthro 2) that has something of a spike-like head ornament (by plume I mean an object that projects upwards and then curves over such as soft non-flight feathers can do). Both individuals hold one arm back as though poised for making an atlatl throw while their other hand holds atlatl darts, two in the hand of Anthro 1 and one in the hand of Anthro 2. Two atlatl darts are shown on the backside of each combatant, which I take to indicate missed shots in these instances, ones that passed by each individual harmlessly. Because of their stances or “body language,” neither individual appears compromised in any way. At rock art panels considered later the stance of some individuals suggests severe wounding. Anthro 1, however, also has a dart protruding from the left leg, indicating a nonlethal hit—certainly not a lethal injury in the immediate action of the fight. His opponent who made this shot only has one dart left whereas Anthro 1 has two, so each combatant is shown to have started with four darts with two shots left for the wounded person. There is a recumbent flute player immediately above the duelists and two outlined circles (baskets?), one immediately below them and one slightly to one side.

Duel 2 (Figures 11.19 and 11.20), unlike Duels 1 and 3, does not show combatants on the same horizontal plane in direct opposition and with arms held back in throwing position. Rather, the individuals are offset vertically and their arms are down at their sides as though there is a pause in the action. Two darts are shown to the left of

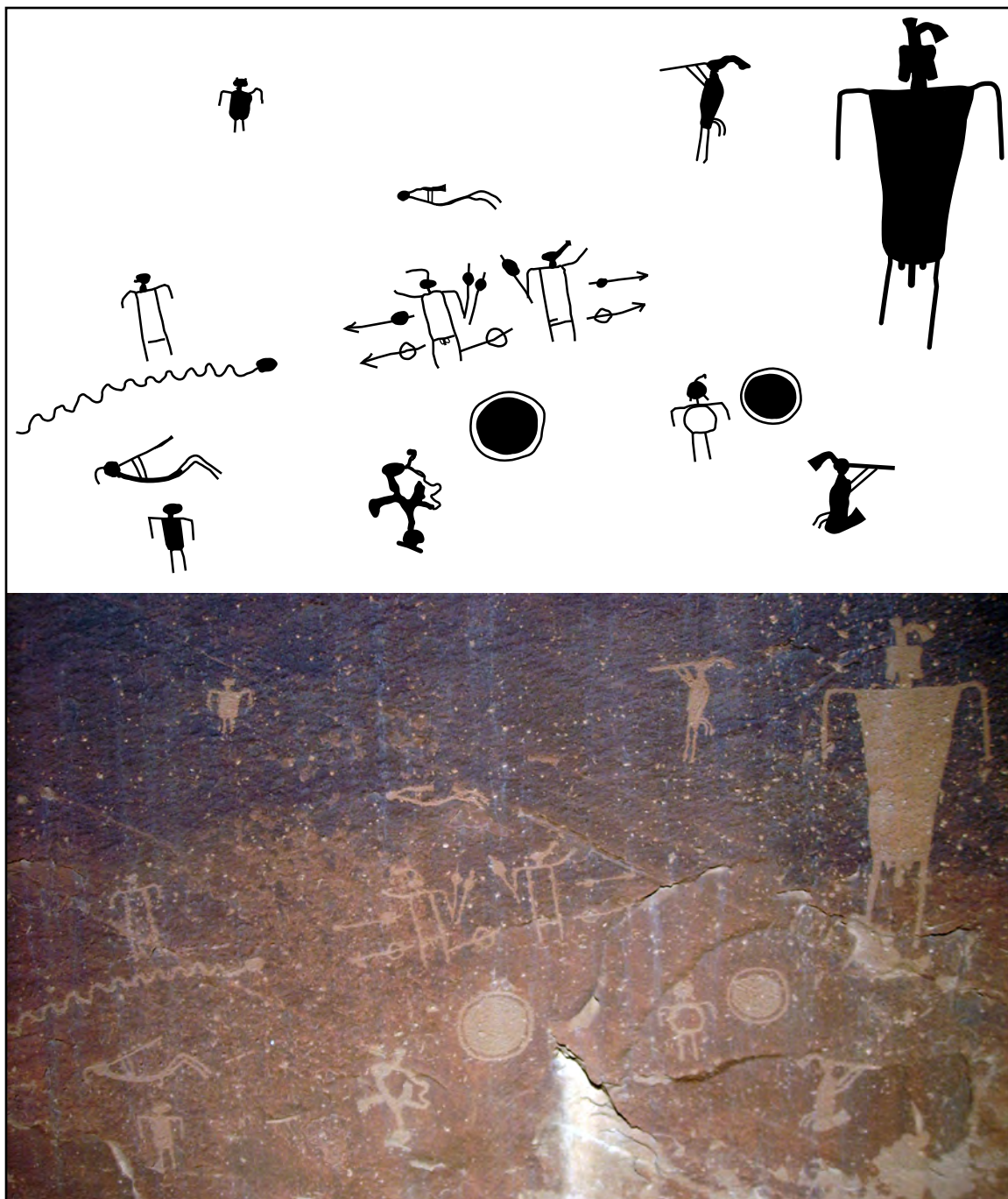


Figure 11.17. Overview of duel 1 at rock art panel along the San Juan River, upstream from the mouth of Butler Wash, part of Feature 33, 42SA8019 (photo and drawing by Phil R. Geib).

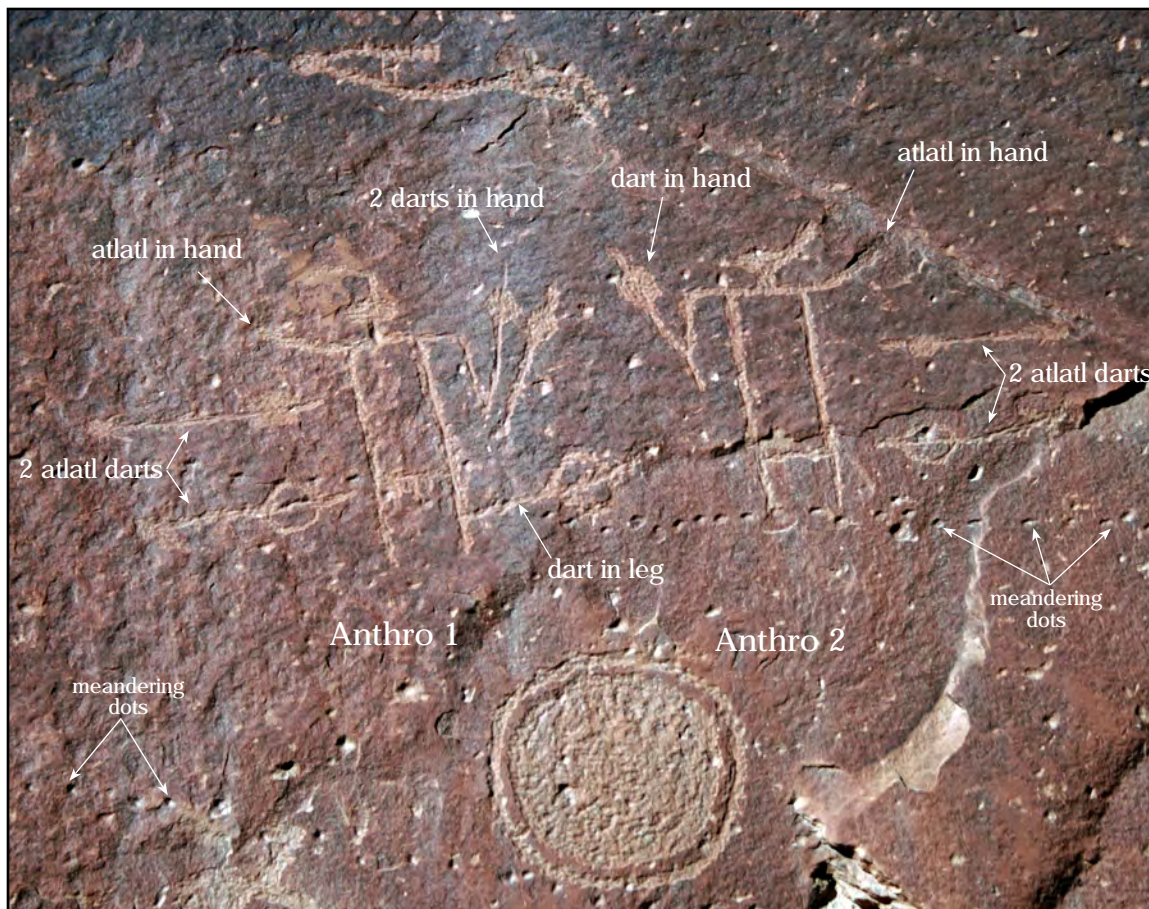


Figure 11.18. Close-up of duel 1 at rock art panel along the San Juan River, upstream from the mouth of Butler Wash, part of Feature 33, 42SA8019 (photo by Phil R. Geib).

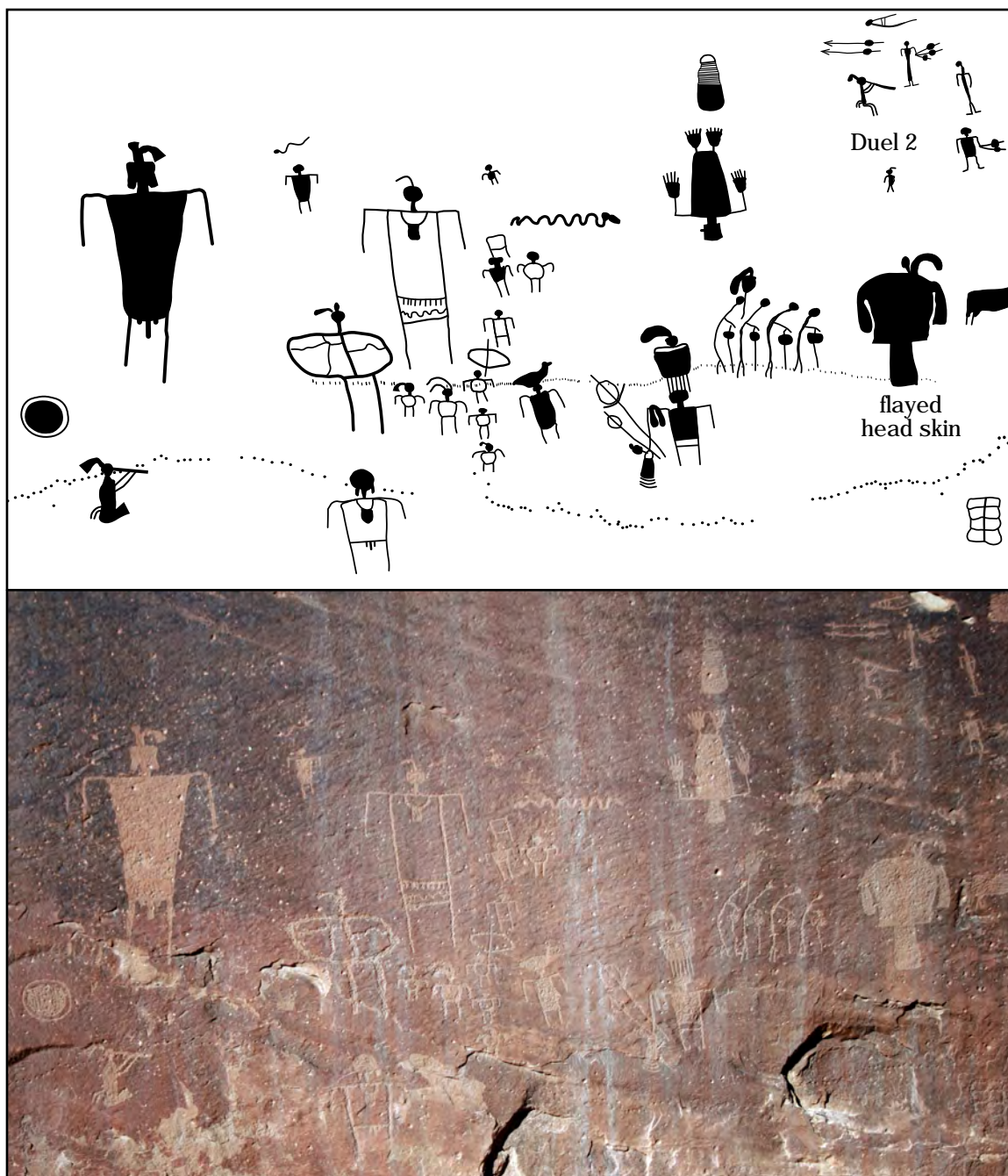


Figure 11.19. Overview of Duel 2 at rock art panel along the San Juan River, upstream from the mouth of Butler Wash, part of Feature 33, 42SA8019 (photo and drawing by Phil R. Geib).



Figure 11.20. Close-up of Duel 2 at rock art panel along the San Juan River, upstream from the mouth of Butler Wash, part of Feature 33, 42SA8019 (photo by Phil R. Geib).

Anthro 1 indicating missed shots and in this individual's left hand are two atlatl darts and a shorter line with loop that may well be the atlatl. As discussed previously, atlatls are often depicted this way with size relative to darts indicative of tool function since at the scale of this drawing (figures less than 20 cm) detail must be sacrificed for a simplified graphic convention. Anthro 1 lacks any sort of head ornamentation but his opponent (Anthro 3) has what appears to be a simplified version (size constraints) of the crescent-shaped headdress that is so common for San Juan anthropomorphs (Robins 1997a, b, 2000). Anthro 3 holds two darts in the left hand but there are no missed darts around this person. Immediately below and slightly right of the feet are some clustered marks that resemble tracks as though from milling around, which might be expected for someone in an atlatl duel. The main bystander of this duel (Anthro 2) also seems to lack head ornamentation although another bystander (Anthro 4) appears to have a bent plume.

Duel 3 (Figures 11.21 and 11.22) occurs to the right and above Duel 2. It is much like Duel 1 in composition, with opponents poised in throwing stance, one arm back and holding atlatl darts in their other hands. On the back side of each individual are four atlatl darts from an equivalent number of attempted shots that evidently missed each opponent. Anthro 1 has a "bird head" ornament, solid pecked body, and five atlatl darts in the left hand. The opponent (Anthro 3) has a spike-like ornament similar to that seen on Anthro 2 of Duel 1; the body is a simple outline as seen in Duel 1, and holds three atlatl darts. Anthro 3 is smaller in scale than Anthro 1 by about half even though they occupy the same horizontal plane; this seems like an attempt to depict perspective, with Anthro 3 in the distance. This same perspective technique is seen at the atlatl face-off scene from Cedar Mesa discussed earlier. The bystander to Duel 3 lacks head ornamentation and has an outlined body that is stipple pecked.

There are several other significant aspects of the overall panel that merit mention and some discussion at this point. There is a large male anthropomorph immediately to the right of Duel 1 that has bobbed hair on either side of the head like many Basketmaker II males (see Guernsey and Kidder 1921:52-53, Plate 19) and sports an elaborate head ornament that projects upright with a plume appended to one side. This same sort of hair ornament is seen on the flayed head skin that occurs immediately below Duel 2. Just to the left of Duel 2 there is a twined bag with loop handle and an upside-down San Juan

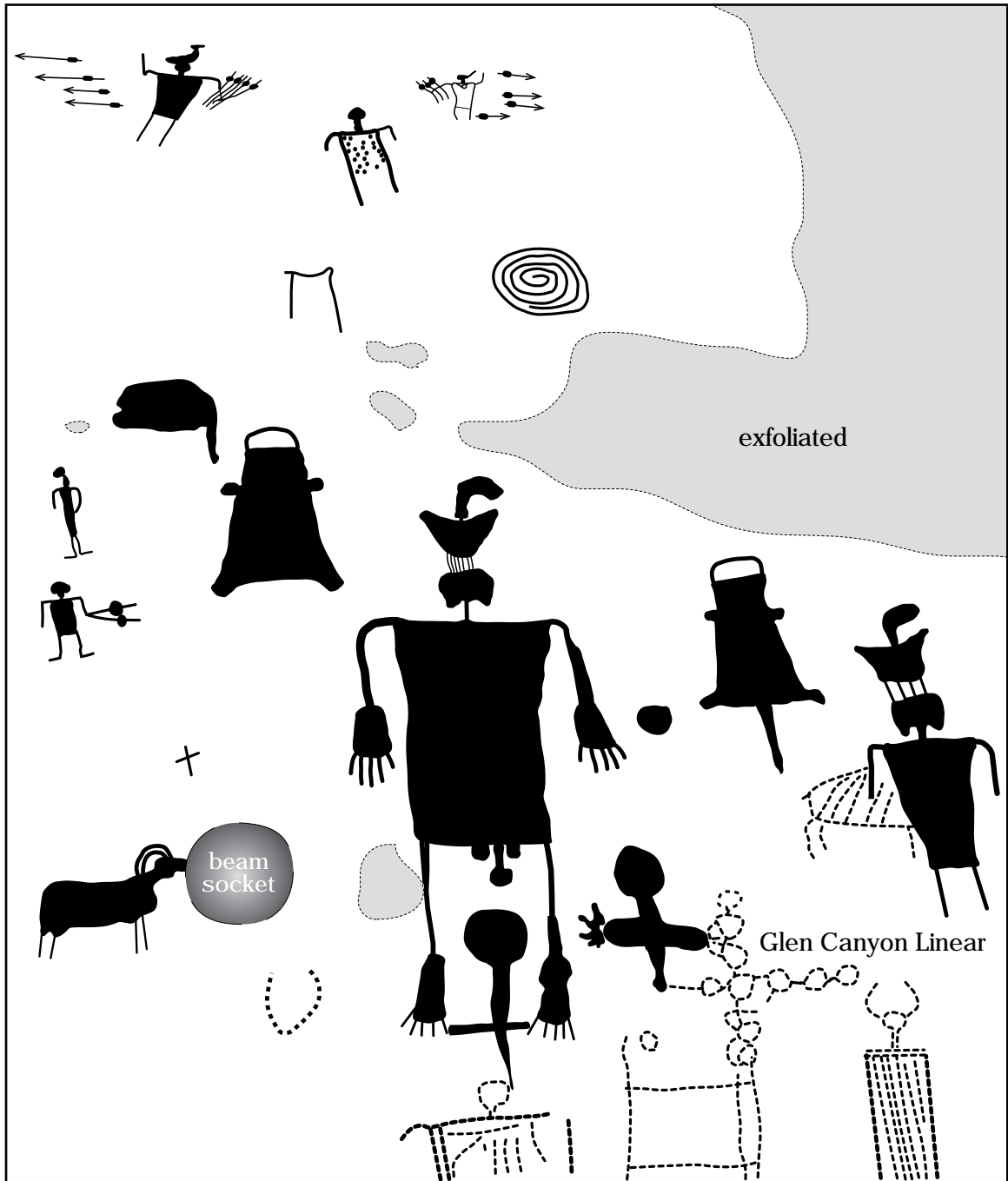


Figure 11.21. Overview of Duel 3, Three Duelers Panel, upstream from Butler Wash along the San Juan River, SE Utah (part of Feature 33, 42SA8019; drawing by Phil R. Geib).

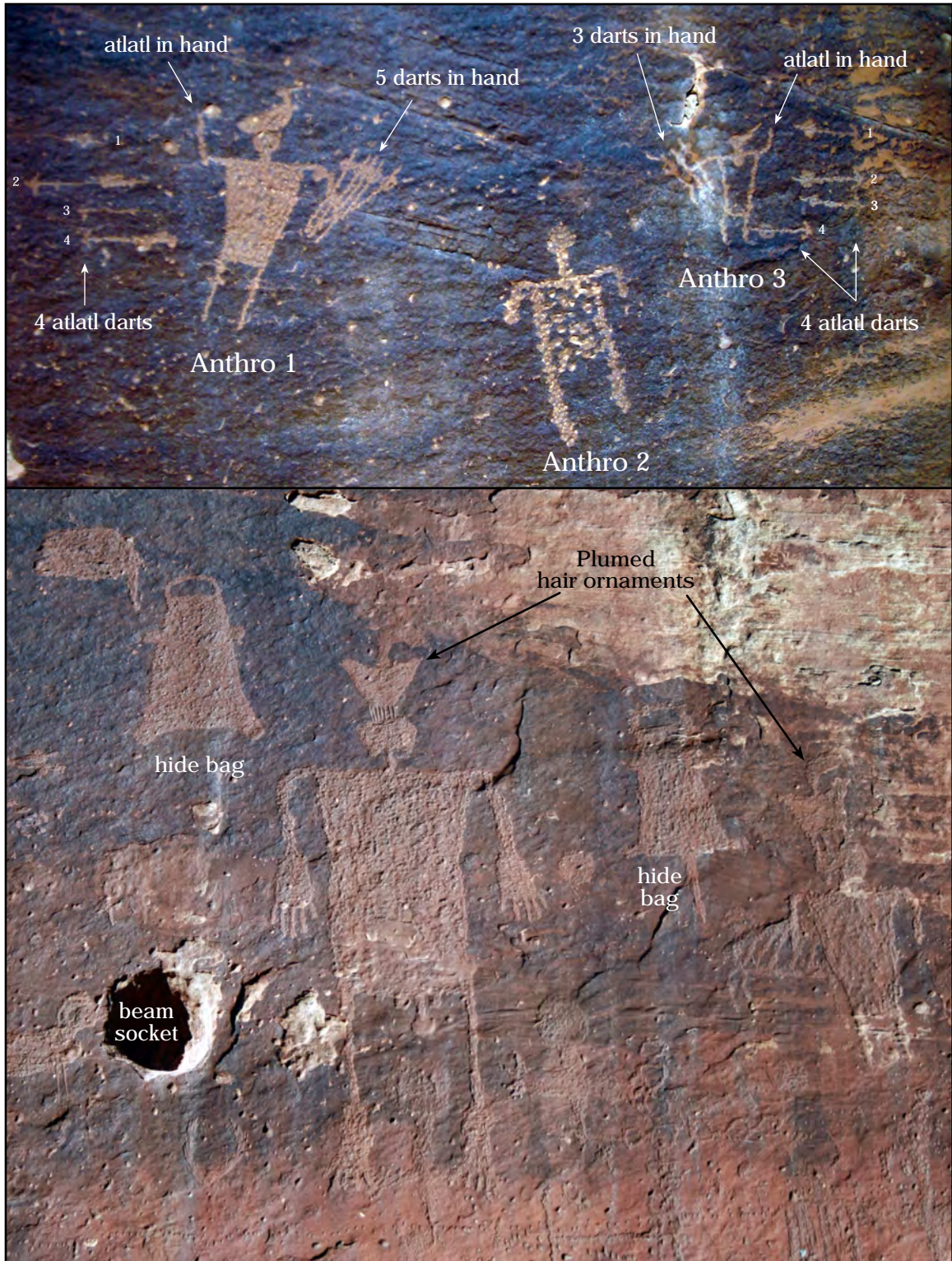


Figure 11.22. Close-up of Duel 3 and adjacent elements, upstream from Butler Wash along the San Juan River, SE Utah (part of Feature 33, 42SA8019; photos by Phil R. Geib).

anthropomorph, which is thought to represent death (discussed below). The co-occurrence of a head skin and dead man is likely not mere coincidence, especially considering the atlatl fights. To the left of the scalp there is a line of four stooped-over walking anthropomorphs leaning on crook-necked staffs that somewhat resemble atlatls (these figures appear to be somewhat more recent than the head skin). Farther left is an anthropomorph with elaborate hair ornament and holding two darts, an atlatl, and a twined bag. This figure was discussed in Chapter 5 under flayed human heads because Schaafsma (2007:Figure 5.2) has been misidentified it as such.

To the right of Duel 2 is a fairly typical large-scale male San Juan anthropomorph with a hair ornament that matches that on the figure just mentioned as well as on another smaller anthropomorph to his right. The latter is superimposed on an Archaic Glen Canyon Linear style quadruped that resembles a bison. This same hair ornament occurs at the previously mentioned Wolfman panel in Butler Wash (see Figure 11.2a) less than 3 km to the NW, where it adorns the one prominent male and what may well be a flayed head skin on a staff (the staff with crescent of Figure 11.2a). The large anthropomorph below Duel 3 has a pair of animal skin bags of slightly different form; to the right is one with a tail and to the left is one without a tail. These same two bag forms are seen in pairs at another important fight scene that is described below (Skewered Man panel). The animal skin bags along with the twined bags that are also present at this panel are quite realistic depictions of items that were commonly used by Basketmakers judging from the numerous examples recovered from dry sites (e.g., White Dog Cave, Broken Roof Cave, and Sand Dune Cave, see Guernsey 1931:Plate 52). The importance of showing these bags is perhaps not the items themselves but rather the implication of what they probably contained. From some archaeological finds it is clear that aside from mundane items, such bags held objects that likely were thought to have great power in the supernatural realm, artifacts such as described and illustrated by Guernsey and Kidder (1921:100-109, Plates 39-44).

Mouth of Butler Fight Scenes (Bluff Area, SE Utah)

There are at least three unmistakable atlatl fight scenes at an extensive rock art panel at the mouth of Butler Wash on the upstream side of the San Juan River. This is just downstream of the Three Duelers panel but is part of a different site. Each of these is

rather poorly preserved when compared with the previous panel and one was impossible to adequately photograph at the time of my visit. There is also a fourth possible duel that is more ambiguous because of intervening figures that are the ones impaled by darts. One of the fight scenes is relatively large in scale, about half life size (Figure 11.23), whereas the other two are small, like those at the Three Duelers panel (Figures 11.24 and 11.25).

The larger scale fight (Figure 11.23) is badly eroded so some details are sketchy but both anthropomorphs seem to have bent plume hair ornaments; this is certain for Anthro 2, who has just thrown the dart that is entering the left side of Anthro 1. Both individuals wear what appear to be the same hair ornaments; this is one of the few rock art panels of a fight scene where this occurs. Anthro 2 does not hold an atlatl in the throwing hand although the arm is cocked back in the proper position and there is an eroded vertical line just outside the frame in the image of Figure 11.23 that might represent an atlatl. It could be that a simple throwing spear is being shown but such items are as yet unknown from Basketmaker II contexts, so perhaps the atlatl was more shallowly pecked or abraded and has since weathered away. Anthro 1 holds something in the right hand, likely a dart or atlatl, but erosion has removed diagnostic details. The impaling dart/spear makes a slight bend on its trajectory toward Anthro 1 as it crosses over a large lobed circle (Manning 1992; Robins and Hays-Gilpin 2000:237-238).

Manning's (1992) speculation that lobed circles represent wombs seems rather farfetched, and a link to pithouse form and emergence as Robins and Hays-Gilpin (2000:237) argue is more persuasive. The meaning of the symbol may well have changed through time but here there is an association with violence and an argument could be made that the circles might signify scalps. In some cases where lobed circles occur with San Juan anthropomorphs they appear to have been superimposed at a slightly later time (Robins 1997b) but here the lobed circle was in place prior to the dart/spear since the deep and large pecking divots of the dart disrupt the arc of pecking dints for the circle. The number and placement of lobed circles with San Juan Basketmaker rock art along this stretch of the river and their integral placement in the composition of several panels suggests that initial use probably occurred relatively early in the Basketmaker II sequence as Manning (1992) claimed. To the right of Anthro 2 and outside the

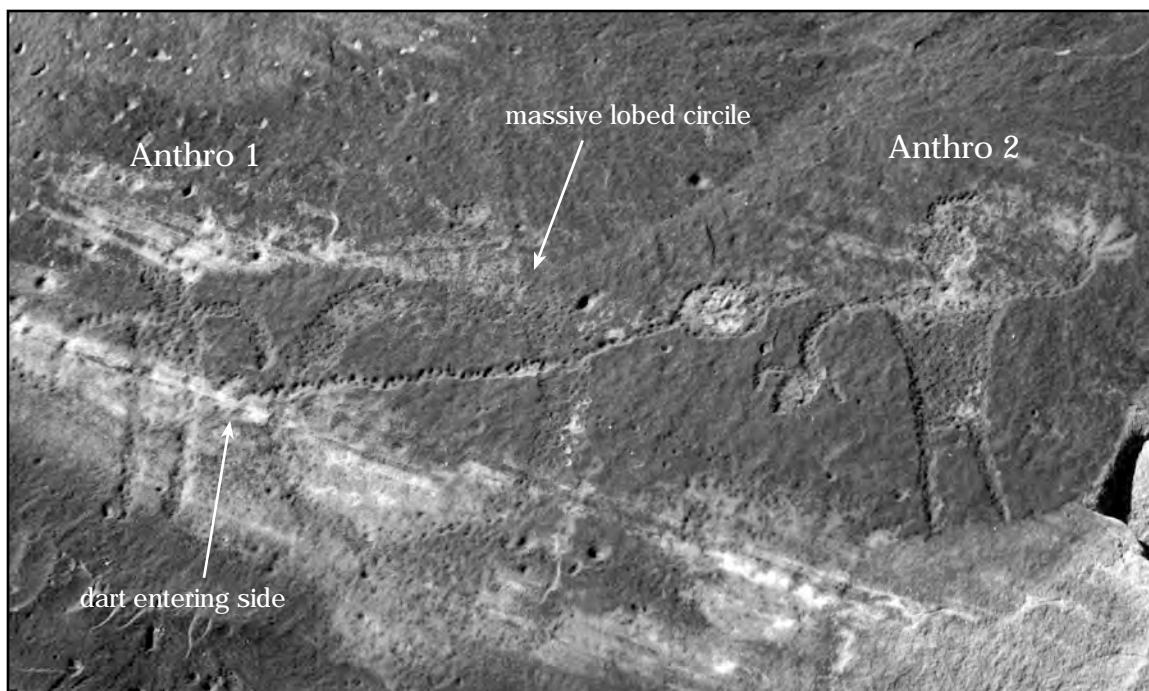


Figure 11.23. Close-up of Lobed Circle Duel, mouth of Butler Wash, upstream side, SE Utah (part of Feature 3.9, 42SA28646; photo by Phil R. Geib).

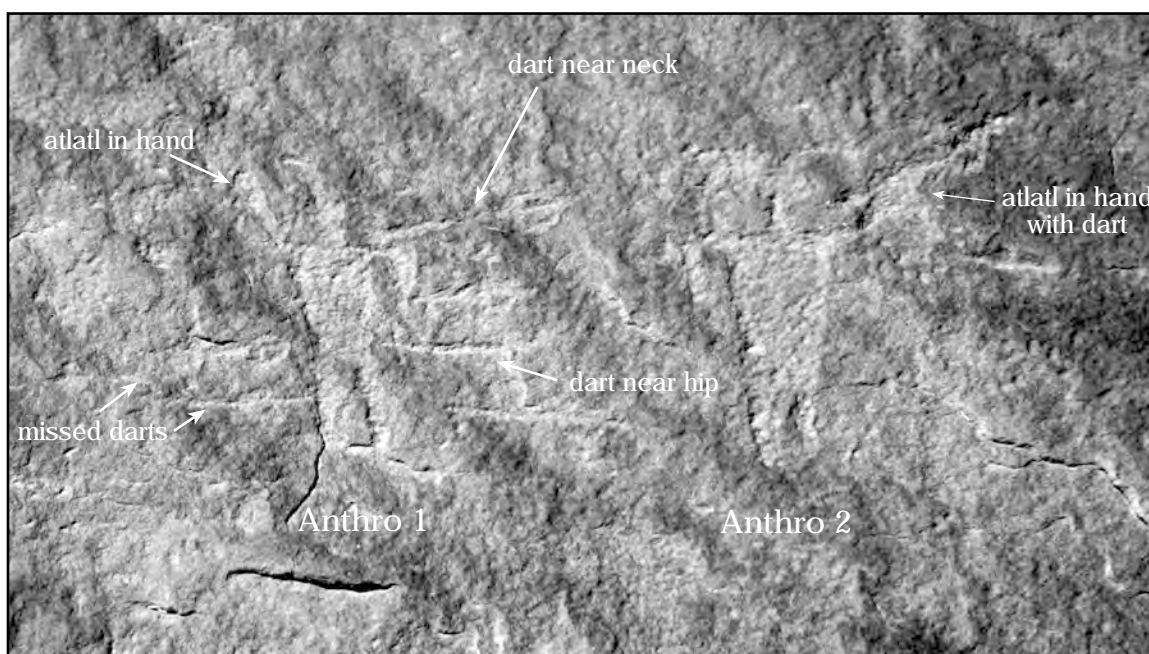


Figure 11.24. Close-up of duel at the mouth of Butler Wash, upstream side, SE Utah (part of Feature 1, 42SA28646; photo by Phil R. Geib).

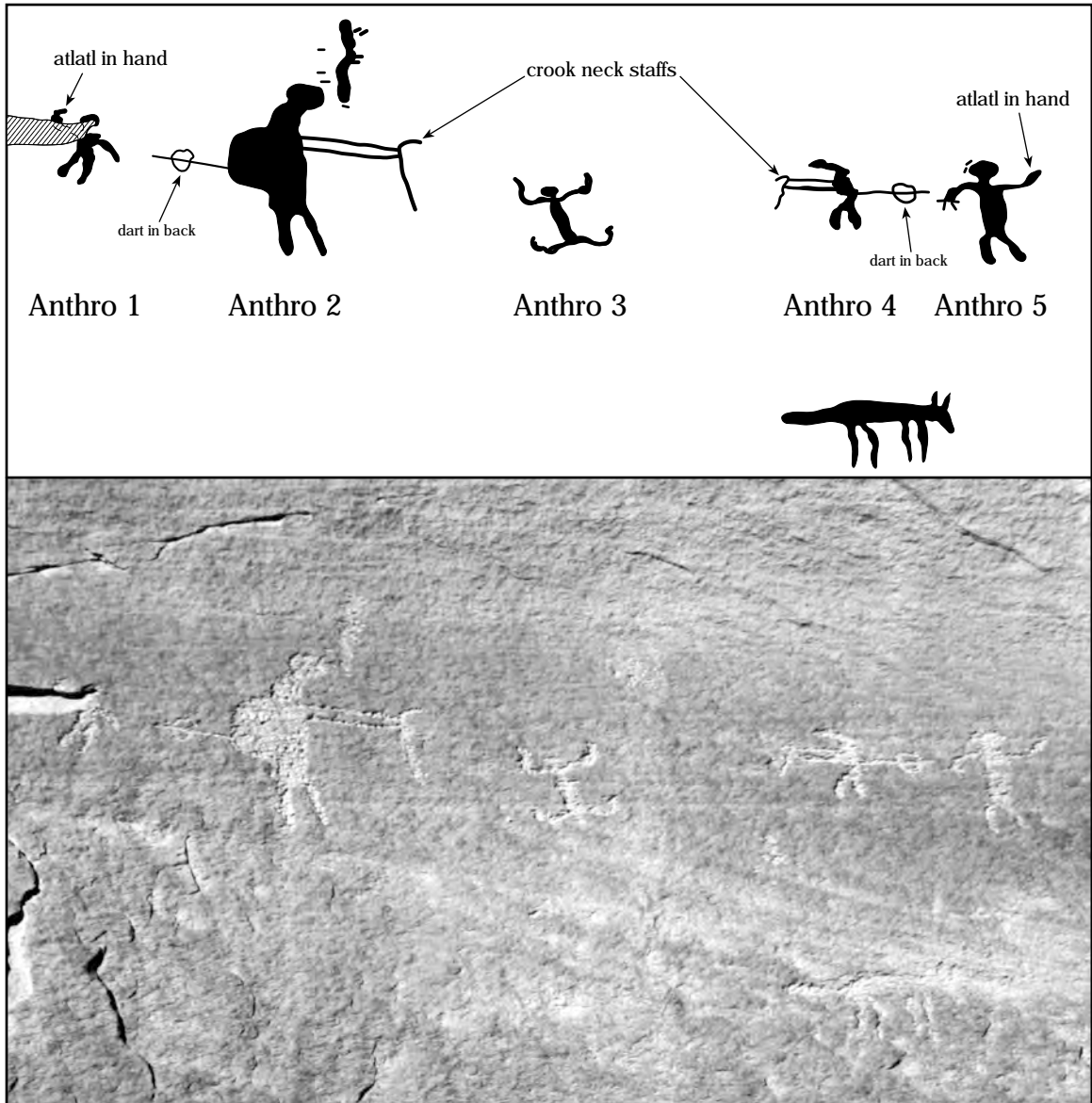


Figure 11.25. Close-up of possible killing at mouth of Butler Wash, upstream side, SE Utah (part of Feature 1, 42SA28646; photo and drawing by Phil R. Geib).

image shown is a bird head that might well be part of the headdress for an adjacent anthropomorph and above this there is another anthropomorph with an arm and neck but with some features obliterated by weathering. These additional figures may well represent third-party witnesses like at the previous panels.

Details of the small-scale fight scene shown in Figure 11.24 are hard to see on the weathered rock surface but understandable given the other duel images in the area. This duel depicts a figure on the right with bent plume head (Anthro 2) that holds an atlatl loaded with a dart in one hand poised ready to throw. The other arm is raised with an undecipherable object held in the hand, but evidently not an atlatl dart. Anthro 2 has already sent at least four darts flying toward his opponent, who has a spike-like head ornament (Anthro 1). Two darts appear to have harmlessly passed by this individual but the two other darts have almost made contact, one near the neck, a probable lethal shot, and one near the hip. Anthro 1 has an empty atlatl held back in throwing position and holds a dart in the left hand. There appears to be a poorly thrown dart between the two opponents that seems to have come from Anthro 1 and a horizontal line on the far side of Anthro 2 that might be a dart that missed. The implication of this duel scene is that Anthro 1 lost and this captures the moment right before this became obvious. Perhaps on account of weathering and later additions to the surrounding cliff face there was no clearly related imagery dealing with death like at the Three Duelers panel or the Skewered Man panel considered below.

As mentioned previously, I was unable to adequately photograph the third evident duel and my notes are not clear about its content. A fourth possible fight scene is shown in Figure 11.25, but in this case the combatants or assailants (Anthros 1 and 5) are separated by three other figures. Anthros 1 and 5 each hold atlatls in cocked throwing position, with that of the first figure indicated by a hook of the spur. Standing immediately in front of these individuals are figures facing each other that hold crooked-neck staffs in outstretched arms. Both have atlatl darts embedded in their backs, which in the case of Anthro 2 consists of a “backpack.” The third party witness to this stands between the figures (Anthro 3). Unlike the duels considered previously and especially the one documented next, this small panel seems more mythic or metaphorical in content, but may document a killing of two individuals.

Skewered Man (Walker Creek, NE Arizona)

An informative panel depicting a Basketmaker II atlatl fight and other elements occurs along Walker Creek (map symbol 4 of Figure 11.1), a tributary of Chinle Wash that has its start on the western flanks of the Carrizo Mountains and joins the Chinle some 28 km upstream from its confluence with the San Juan River. For its final 20 km or so, Walker Creek becomes entrenched within canyon walls of Navajo Sandstone and it is in this stretch that the panel is located, roughly 38 km almost due south of the Three Duelers panel. The bulk of the rock art at this site is Basketmaker II in age, without earlier rock art and lacking superimposed later elements (Figure 11.26). There are later petroglyphs at the site, both Anasazi and Navajo, including a rather extensive Navajo panel that coincidentally includes a fight scene and a man shooting pistols, but these occupy mostly separate portions of the cliff face and do not impinge upon the Basketmaker II elements.

More so than many panels this one seems quite narrative and perhaps biographic. The central part of the scene is tied together and few elements do not seem to relate to the overall theme, which pivots around the depiction of a man being killed by an atlatl dart (Image 1 of Figure 11.26). The dart is shown passing clean through the individual who is falling backwards, legs buckled and arms up—a dramatic pose. Although an atlatl dart at close range is a formidable weapon with considerable impact force (depending on the weight of the dart), actually passing a Basketmaker II willow stem dart through an individual is unlikely, even with the sharpest of projectile tips. Hence, the depiction is probably just artistic license to signify a mortal wounding. The dart was thrown by a male with a “bird head” whose left arm is held back in typical throwing pose, atlatl in hand. At about half life size, the scale of this image was sufficient to allow somewhat realistic depiction of the atlatl cocked back. The opponent that he just skewered with a dart has a spike-like head ornament but no evidence of an atlatl or darts. This may well indicate the killing of a defenseless individual or at least the scene is not a duel like the previously discussed panels. In this regard there is no clear third party in attendance. To the left of this scene stands a small spike-headed anthropomorph that might well represent the impaled individual prior to the violence. Farther left is a pair of animal skin bags like those seen at the Three Duelers panel. The non-tail version of one of these bags

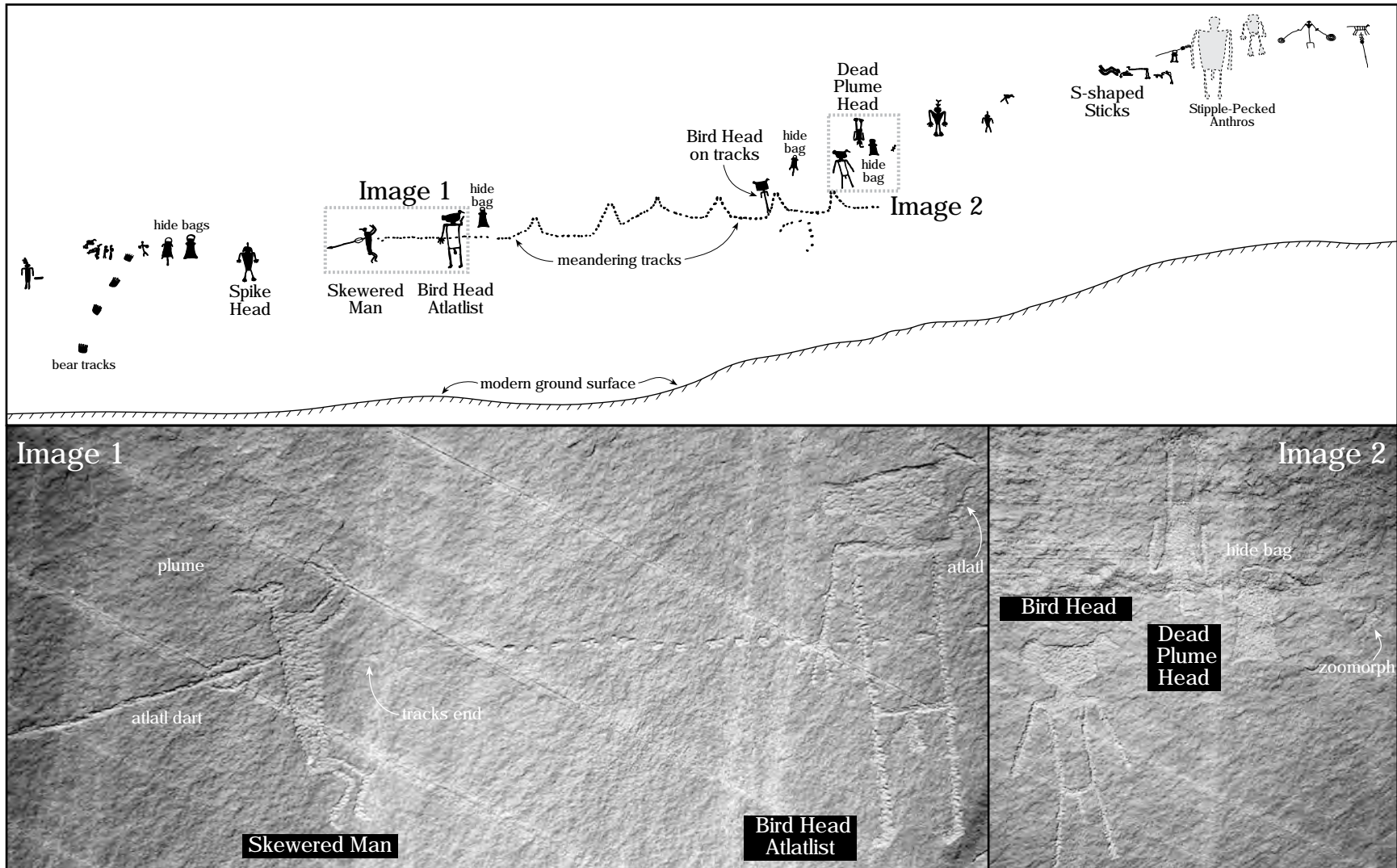


Figure 11.26. Skewered Man Panel, Walker Creek, NE Arizona, with close-up images of two scenes (photos and drawing by Phil R. Geib).

is seen next to the bird-head atlatlist and then the same pair of bags occurs to the far right where a bird-head anthropomorph stands next to an upside-down man, thought to portray death (Image 2). Linking the death scene with the fight scene is an undulating series of pecked dots that may represent tracks; these rise up and then fall six times and end right in front of the skewered anthropomorph. Along these tracks walks a bird-head anthropomorph.

At risk of being a naïve literalist, the panel may recount how the bird-head individual tracked down and killed a rival or individual of a different social group as indicated by their distinct head ornaments. The undulating nature of the tracks seems a good match for the nature of the canyon where this panel occurs because of its many embayments, thereby indicating how the bird head followed or tracked his quarry. Whether or not it was the sole objective, it seems that one consequence of the conflict was the appropriation of hide bags from the victim. Depending on the items in the bags these could provide sufficient motivation for a killing. According to Florence Ellis (1951:180), “Pueblo tradition indicates that the people lived in considerable jealous fear of ‘power’ derived from the supernaturals but controlled by other groups of human beings: a pueblo did not hesitate at forays of punishment against people who appeared to threaten them with this undue ‘power’”

Another significant aspect of this panel is the paired S-shaped sticks that occur in what appears to be a totally separate set of images at the far right side. This panel was discussed and shown in detail previously. If the skewered individual possessed any S-shaped sticks they obviously did not help defensively in this case.

River House Duel (Bluff Area, SE Utah)

Along the San Juan River prior to the Comb Wash confluence (map symbol 5 of Figure 11.1) occurs the small panel shown in Figure 11.27, which occupies an area of cliff face largely devoid of rock art. The rock surface is sloped and exposed such that precipitation falls directly on the face. Once the patina on the rock surface was broken by production of the rock art this allowed for erosion of the sandstone substrate, so fine detail has been lost. The image is somewhat vague by itself yet it is easily understood in the context of the better preserved dueling panels previously considered. Both anthros

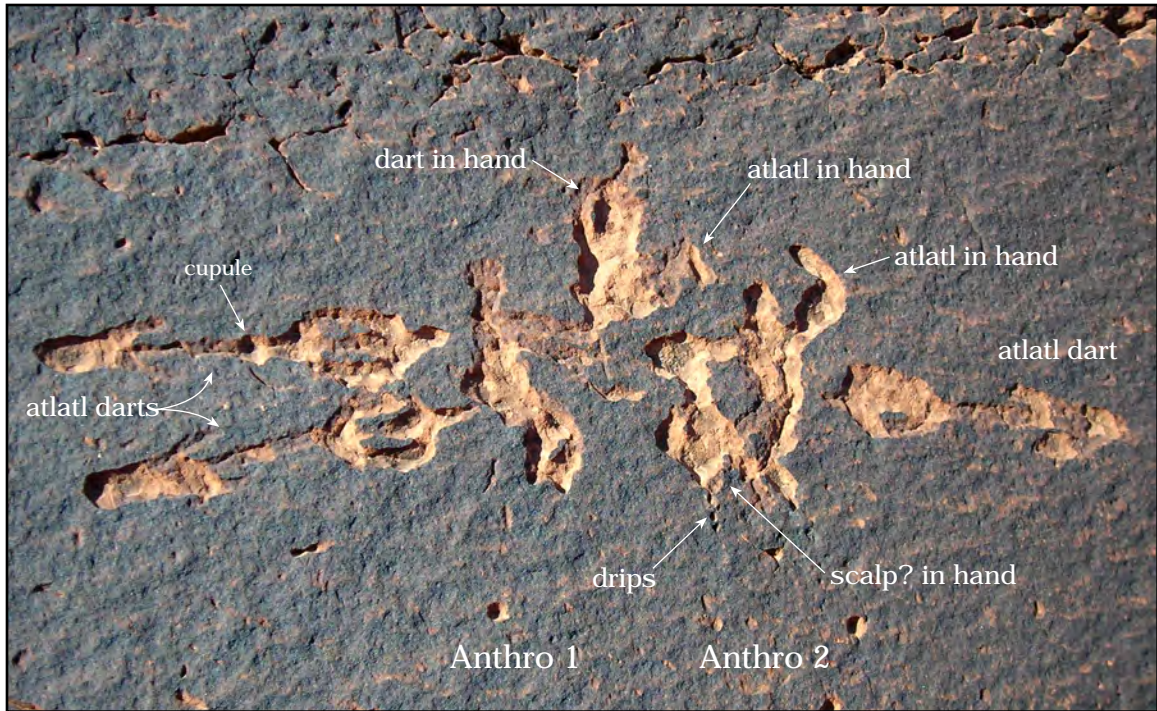


Figure 11.27. Close-up of the River House Duel along the San Juan River, SE Utah (part of 42SA25393; photo by Chuck LaRue).

hold atlatls, which are distinguished by their spurs used to seat against dart proximal ends. As mentioned earlier, Basketmaker atlatls lack prominent male spurs but on small figures such as this the artistic license of including such a feature helps proper identification.

Anthro 1 has a posture of falling backwards, arms outstretched in front of him, holding a dart in one hand and an atlatl in the other. The implication of this body position is one of wounding like that seen at the Skewered Man panel. Two enlarged darts occur on the far side (left) of this individual and according to what was said previously might represent missed shots except that the body position suggests otherwise. Perhaps indicative of which dart caused the wounding is the cupule or small divot pecked on the upper dart and it is perhaps not a coincidence that this is the only dart with such a feature. A few short incised lines project upright from the head of Anthro 1, perhaps denoting a feather headdress such as Guernsey and Kidder (1921:20, Plate 40a) report as part of a male burial (Cist 31 of White Dog Cave).

Anthro 2 has an active stance with his atlatl held backward as though poised to throw. A dart cast by his opponent that evidently did no harm is to his right. In the non-throwing hand hangs an object that resembles a bag or scalp. I favor a scalp interpretation because of what appear to be drops originating from the held object and some depictions of flayed human heads may include droplets (Schaafsma 2007) and ethnographically scalps are associated with rain making (Ellis 1951:189). This could well be a depiction that compresses both the action and the consequence into a single frame: a duel that ended with the death and scalping of the loser by the victor, who is not shown wearing any specific head ornament. Perhaps a contest like this and the resulting flayed head trophy was what allowed the social ascension needed to wear certain head gear or ornaments.

Impaled Neck (lower Chinle Wash, NE Arizona)

There is an informative series of rock art panels clustered together along lower Chinle wash near the Laguna Creek confluence. This area has several good depictions of S-shaped sticks as shown at the start of this chapter, but equally significant is an unmistakable impaling of a San Juan style anthropomorph by an atlatl dart. Figure 11.28a provides an illustration of virtually the entire panel, part of which is exfoliated.

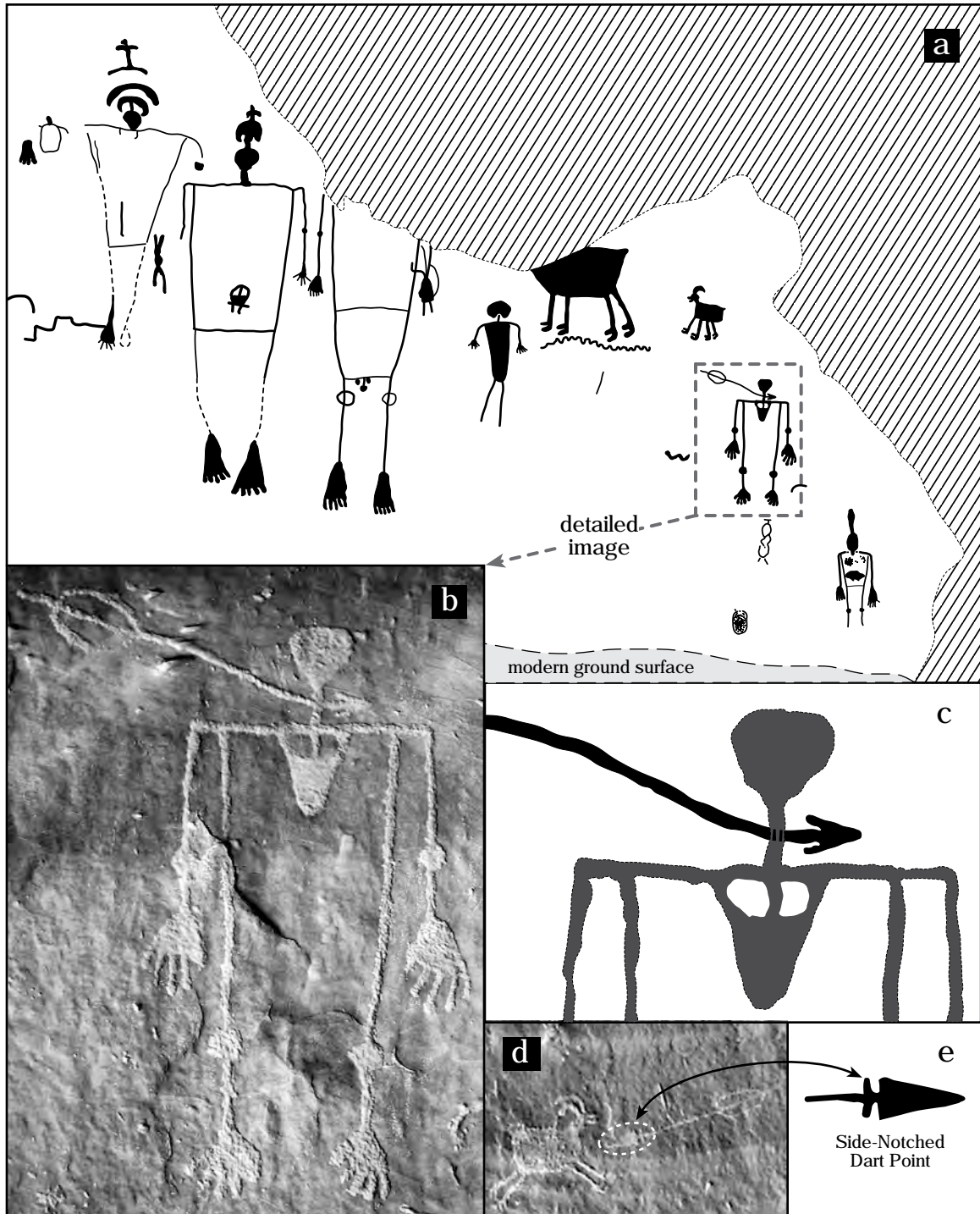


Figure 11.28. Impaled Neck Panel along the lower Chinle Wash, NE Arizona: (a), overview of entire panel; (b) close-up image of the impaled figure; (c) drawing of neck showing the point; (d) close-up image of hunt scene at an adjacent panel that illustrates a different projectile point style; (e) enlarged and rotated drawing of hunt scene dart point for comparison to the one in the man's neck (c); (photos and drawings by Phil R. Geib).

Not drawn are worn areas and scratches from tree branches that once grew on the alluvial terrace next to the rock face after the petroglyphs had been created. The inset photo (b) shows a close-up of the actual neck impalement victim and a detailed drawing of this is also provided (c). This was probably a lethal wounding given the vital carotid arteries, jugular veins and spinal cord crowded into this narrow isthmus of the body. Even if these organs escaped undamaged, the infection that likely would have resulted from such an intrusion could have ended in death. The simple outline body form of the impaled figure and adjacent anthropomorphs seems more similar to the early linear Basketmaker II style identified by Robins (1997b) for Butler Wash, but there is no indication of the tabular-like headdresses. In any event, the figures might well date prior to the Common Era.

The detail drawing of the wounding was made principally to clearly document that the impaling point is corner-notched. The common style of projectile point for Basketmaker II groups of the area has deep side-notches. This is attested to by the Basketmaker points recovered from the nearby Broken Roof Cave, Cist 1 (Guernsey 1931:Plate 48c) and also a clear rock art depiction of a hafted side-notched point at an adjacent panel. This point is shown in the other two inset images of Figure 11.28, with the photo (d) showing the dart in flight toward a bighorn mountain sheep and the drawing (e) providing a detailed rendition that is enlarged and rotated to the same orientation as the point stuck through the anthro's neck. It is perhaps significant that the side-notched "local" point style is shown in a mundane hunting scene thrown by a small atlatlist (see Figure 11.13c). This is not to suggest that conflict between local groups did not occur because it probably did, just that the point style protruding from the neck is more indicative of extra-local conflict. A more corner-notched variety of point was in common use by Basketmakers north of the San Juan River in SE Utah (e.g., the points that occurred with the massacre victims of Cave 7; Hurst and Turner 1993:Figure 8.8). This is also seen in rock art depiction of points from this area, as some of the illustrations in this document demonstrate. As such, it could be that the individual who threw the dart came from this area. The anthropomorph shown to the lower right of the impaled individual is produced in a similar manner and scale, different from the larger anthropomorphs to the left. This individual wears a spike-like head ornament such as

seen at the conflict scene along Walker Creek (Skewered Man panel) and also at the Three Duels panel along the San Juan River.

It is of more than passing interest that Cist 2 of Broken Roof Cave yielded a projectile point hafted to a foreshaft that looks very much like the one depicted in the rock art panel. Indeed, Guernsey commented on its unusual shape for the area: “The point is a red flint or jasper. The notch is chipped at an angle to the long axis, whereas all the foreshaft points we have examined hitherto have been notched at right angles” (Guernsey 1931:73). By “examined hitherto” he refers to all the materials that he and Kidder recovered from the Kayenta region of NE Arizona. This hafted corner-notched point came from the grave of an adult male. This could be mere coincidence but it is an unusual one and certainly it would be worth examining the remains of the individual for neck or other injuries.

It is worth considering what the producer of this image had in mind by omitting any head ornamentation for this individual. The other anthropomorphs of this panel all have them. Clearly it was not the constraints of scale since even figures less than a quarter this large exhibit head gear. The large bare head could be an indication that the speared individual had the skin removed from his cranium.

Painted Duel (Canyon de Chelly, NE Arizona)

The evidence seems to indicate that depictions of fights tend to be concentrated in SE Utah and extending south to somewhat across the state line in NE Arizona. This might be partly due to the comparatively greater level of rock art documentation in SE Utah than elsewhere and there is little doubt that the distribution of fight scenes will expand as research continues. Nonetheless, the concentration evident in SE Utah is likely not just a sampling problem elsewhere. An indication of this comes from Canyon de Chelly which has been rather thoroughly studied for rock art (e.g., Grant 1978) yet I know of only a single fight scene. Like much of the rock art in this canyon system it is painted (Figure 11.29), the only Basketmaker fight scene like this that I know of. Both figures hold atlatls loaded with darts in throwing position and there is a dart midflight between the individuals that is heading toward Anthro 1. The individual that has thrown this dart has three in reserve while the opponent has two items that might be darts, although they look different. There are no stray or missed darts in evidence and no

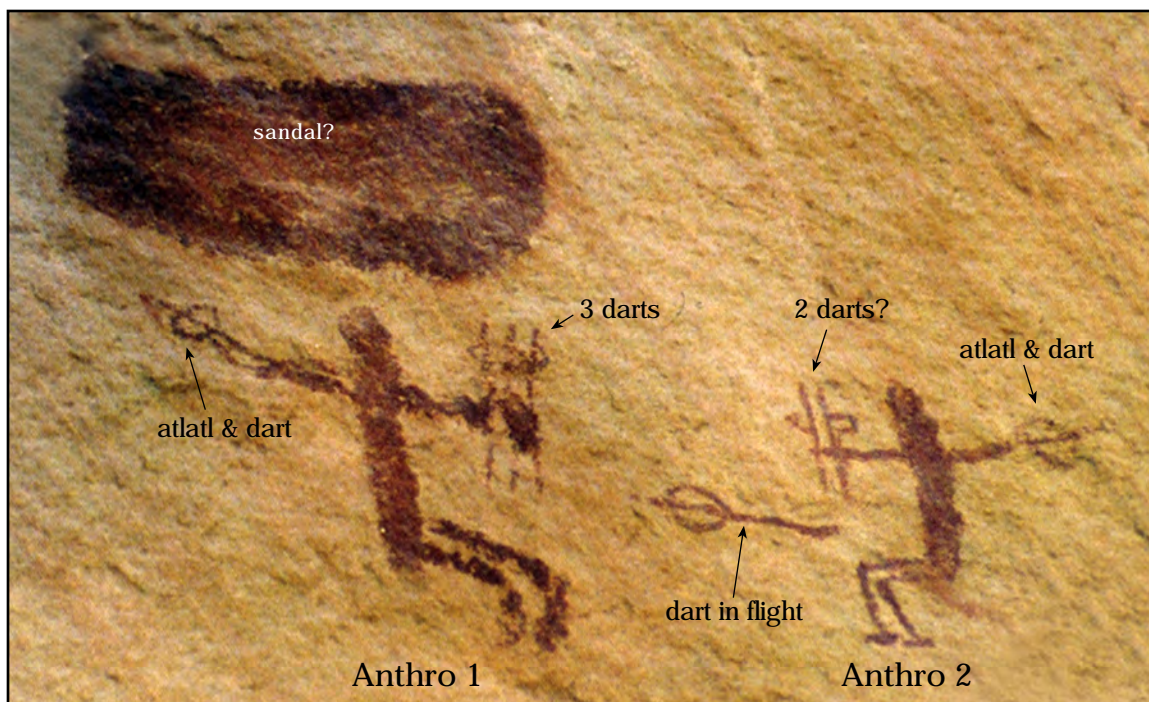


Figure 11.29. Pictograph of two combatants with loaded atlatls in throwing position, Slim Canyon, near Canyon de Chelly, NE Arizona (photo by Scott Thybony).

witnesses or third parties. The outcome of this contest is not clear but with a potentially fatal dart heading for Anthro 2 and the large sandal-like element painted above Anthro 1, the latter might well be the victor. As with other Basketmaker II atlatl duel scenes previously considered, neither contestant holds S-shaped sticks.

Various Impaled Individuals (Cedar Mesa to Canyon de Chelly)

There are various other examples of Basketmaker II anthropomorphs impaled by evident atlatl darts and Figure 11.30 shows a sampling of these from SE Utah and NE Arizona. In only one of these is the individual doing the impaling clearly shown—this for two small figures on Cedar Mesa (Figure 11.30b). In that scene there is a blending together of bodies and weapons that makes clear differentiation impossible but Anthro 1 appears to be the aggressor and Anthro 2 the victim. Anthro 1 also holds what might be an atlatl or club in the right hand; an atlatl seems most likely since Anthro 2 appears to be skewered by a dart. The action of Figure 11.30a seems quite realistic compared to the static portrayals of 11.30c-e. The side-by-side impaled male figures from Grand Gulch (48d) are quite large (the largest is essentially lifesize) and appear to be part of Robins's (1997b) classic San Juan style that probably dates prior to the Common Era. Two distinctly different wounds are indicated, one in the abdomen and one above the clavicle. The pictograph (Figure 11.30e) is from Earl Morris's Pictograph Cave, a site that Larry Loendorf has recorded as TWT001; it is located at the junction of del Muerto and Twin Trails Canyon. The figure has an atlatl dart that penetrates the left ribcage under the armpit, a probable lethal location. There are a series of white painted anthropomorphs to the right of the impaled figure in the direction that the dart came from but none holds an obvious atlatl. One figure holds one arm cocked back perhaps in a throwing-like gesture but this is not obviously what was intended as with the Lobed Circle Duel (see Figure 11.23). The impaled figure at Pictograph Cave and other adjacent Basketmaker II anthropomorphs are superimposed by the mortar from a series of Basketmaker storage cists that had dome-shaped covers. Bits of corn husk in the mortar that covered the figure adjacent to the impaled individual returned a radiocarbon date of 1670 ± 40 BP (Larry Loendorf, personal communication 2012), with a calibrated two-sigma age range of AD 250-530. How much earlier than this the figure was painted remains unknown but the date certainly supports the Basketmaker II temporal assignment. None of the illustrated

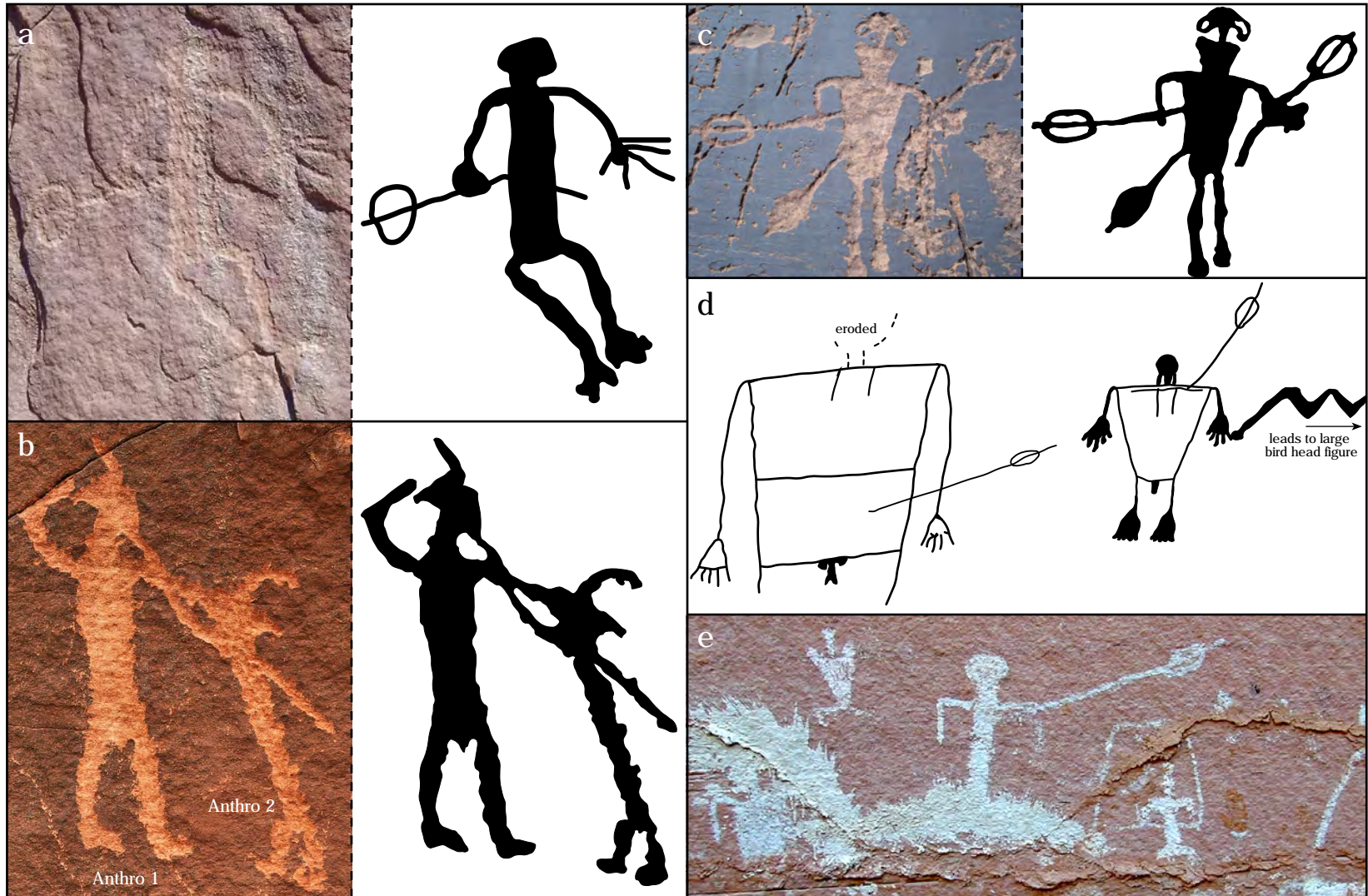


Figure 11.30. Dart-impaled individuals in Basketmaker II rock art of SE Utah and NE Arizona: (a,b) Cedar Mesa; (c) John's Canyon; (d) Grand Gulch; (e) Canyon del Muerto (photos a-c by Chuck LaRue, e by Larry Loendorf; drawings by Phil R. Geib).

examples of impaled individuals show them holding an S-shaped stick and to my knowledge this is also true of the other Basketmaker II depictions like this. Atlatl dart woundings are rather commonly portrayed but defensive implements of any kind, as might be expected if they had any to use, are not obvious.

Dead Individuals

Depictions of anthropomorphs inverted on their heads are not ubiquitous in Basketmaker rock art but are common enough. Since they usually occur grouped with human figures in normal orientation, the body position is all the more notable. Displaying figures as upside-down is taken as an indication of a death, an interpretation that is seen for rock art from various places around the world (e.g., Hudson and Lee 1984). Such depiction might merely signify metaphoric death as has been argued by those who interpret rock art via a shamanic framework. Schaafsma argued that upside-down anthropomorphs which “in themselves provide few clues as to their meaning” were linked to the practice of shamanism and that “these figures could depict the symbolic death of the neophyte or shaman entering a trance.” The occurrence of upside-down figures in association with other evidence of violence such as fights or scalps might also be accounted for metaphorically but as Lakoff and Johnson (1980:19) observe, “metaphors are not distinct from experience but rooted in it.” The display of death by inversion of the body is also seen on occasion in hunting scenes, such as in Figure 11.31. This petroglyph on Cedar Mesa, SE Utah shows a small family of bighorn sheep ($n = 3$) with a dart embedded in the middle adult. The dart originated from the direction of two anthropomorphs (Anthros 1 and 2) and a probable dog. The human figures wear distinctive headgear and the left individual (Anthro 1) is distinctly striding forward. Below them is an anthropomorph with the same striding stance as Anthro 1 and similar headgear. This figure clearly holds the outstretched hind legs of an upside-down bighorn sheep. Unlike the sheep shown to the right, which have solid pecked bodies, this one has an outlined body but with its distinctive rump patch pecked in. This scene appears to capture both the action and consequence of killing a bighorn sheep, with the death signified by inversion.



Figure 11.31. Basketmaker petroglyph on Cedar Mesa, SE Utah that shows three bighorn sheep, one with embedded dart that originated from the direction of two anthropomorphs and a dog; below is an anthropomorph holding the back extended legs of an upside- down bighorn sheep (photo by Peggy Peterson).

Two of the previous described dueling panels depict upside-down individuals, one explicitly in association with an individual being killed by an atlatl dart (Skewered Man panel). The inverted anthropomorph at the Three Duelers panel is not associated with an obvious mortal wounding depicted in the duels, but there is an unmistakable large flayed head skin immediately to the right and below. Another example of an upside-down anthropomorph next to a flayed head skin occurs just a little farther downstream from the Three Duelers panel in an area where the rock surface is unfortunately poorly preserved and exfoliating. As Figure 11.32 shows, the association between the two images could hardly be closer and both are executed in a similar fashion, bring somewhat less than solidly pecked. On account of the poorly preserved rock surface surrounding these two images it is unknown whether there are any fight scenes in close association; the area around this panel would have to be carefully examined under varying light conditions to tease out potentially informative details and even then portions have simply been lost.

Just a little farther down the San Juan River occur four other examples of inverted human forms at the famous panels at the mouth of Butler Wash. On the upstream side there is a single inverted figure that occurs amongst a massed assemblage of other anthropomorphs, with large burden or water baskets and other elements (Feature 3.1 of 42SA28646). This figure appears to balance on the corner of the head of a normally positioned human form that is similarly shaped but larger. Both are solidly pecked and perhaps date late in the Basketmaker II sequence. On the downstream side of the wash there are at least three separate instances (Figure 11.33) that are stretched out along some 30 m distance with hundreds of other elements, the bulk of which appear to be Basketmaker II in age. The style for the inverted anthropomorph in Figure 11.33a along with the adjacent equally large human are what Robins (1997b) classified as part of the classic San Juan style, which likely dates prior to the Common Era. The inverted anthropomorph of Figure 11.33c wears a headdress like that on the normally positioned anthropomorphs of Figure 11.33a, so likely has a similar antiquity. The head of this individual is covered by the bushy tail of a superimposed quadruped. Unlike the scenes where the inverted individuals occur next to flayed human head skins or other signs of violence, in these instances there is no obvious evidence for this.

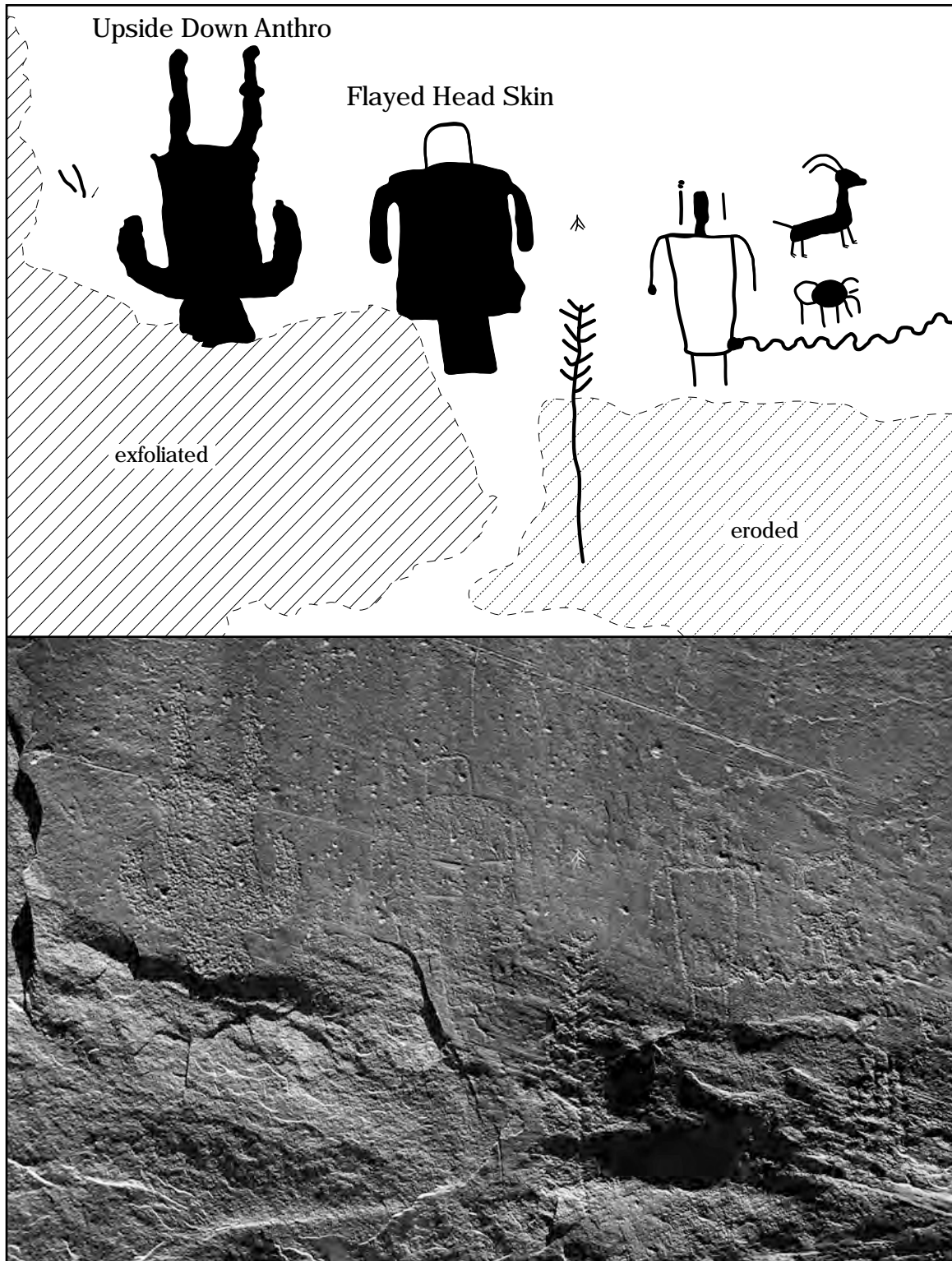


Figure 11.32. Drawing and image of inverted Basketmaker II anthropomorph and flayed human head skin near Three Duelers Panel, upstream from Butler Wash along the San Juan River, SE Utah (part of Feature 33 of 42SA8019; photo by Winston Hurst, Comb Ridge Heritage Initiative Project; drawing by Phil R. Geib).

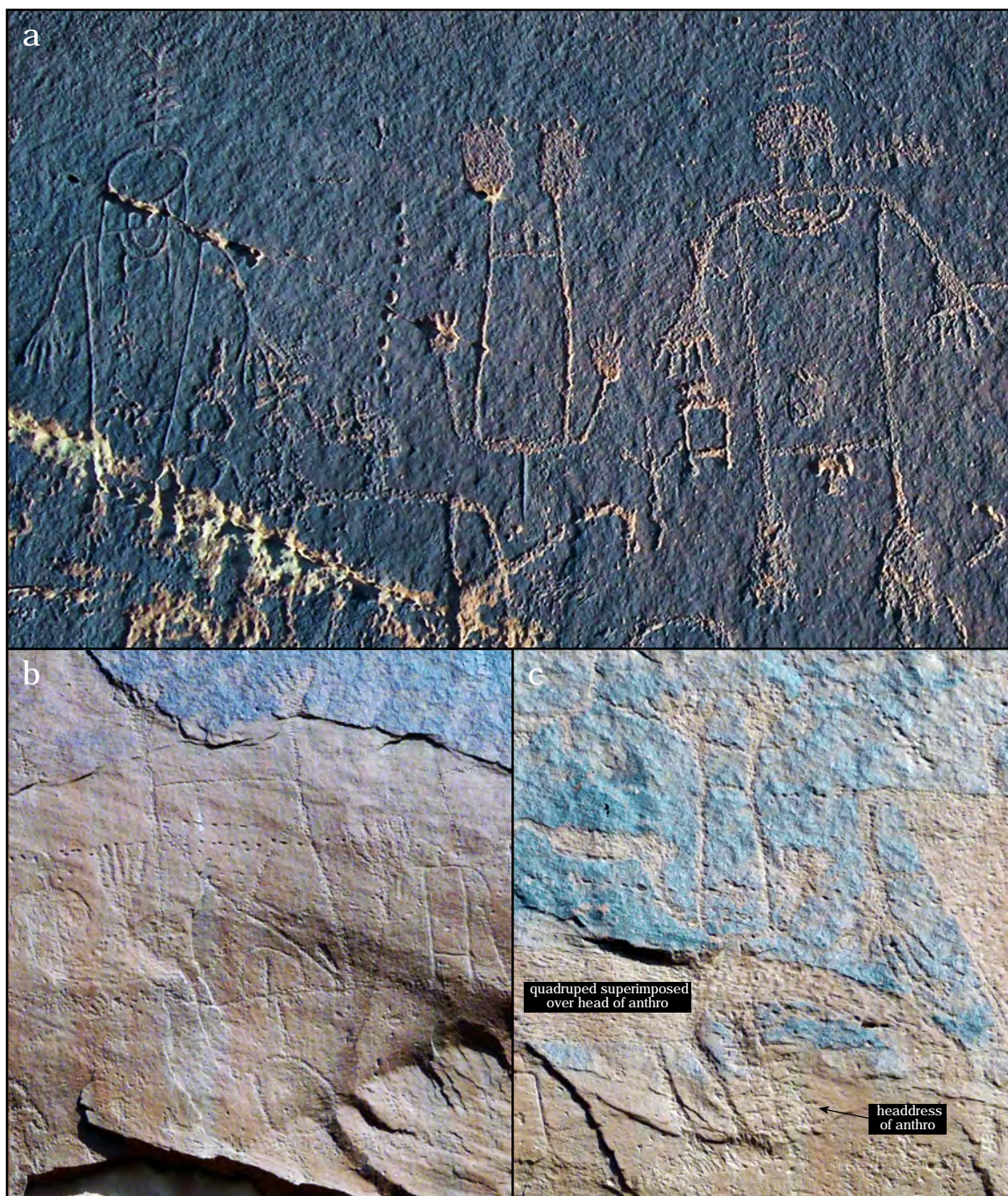


Figure 11.33. Images of inverted Basketmaker II anthropomorphs at the Butler Wash Panel on the downstream side (parts of 42SA28484; photo a by Phil R. Geib; photos b and c by Jay Willian, Comb Ridge Heritage Initiative Project).

Summary

Basketmakers did not portray war per se in their rock art but they did document one clear consequence of warfare by the presence of numerous flayed head skins. Basketmaker II rock art also displays clear evidence of violent conflict using atlatls and darts. These depictions consist of dyadic atlatl duels that are sometimes witnessed by third parties, and sometimes seem more like surprise attacks. Some of these confrontations show obviously lethal wounding of individuals from atlatl darts whereas other scenes depict what appear to be nonlethal dart wounds or no injuries resulting at all. Basketmaker II rock art also shows individuals impaled by darts and these often appear to be lethal wounds. The typical Basketmaker II variety of flat curved stick that Guernsey and Kidder recovered from White Dog Cave are unmistakably depicted in rock art, such that there is no doubt about the item being shown. In almost all cases that I am aware of, these artifacts occur as objects in their own right rather than being held in the hands of individuals. The unmistakable examples of S-shaped flat curved sticks are not depicted in ways that give clear clues as to function. The artifacts seem to have had some special significance, especially in pairs, but what this might have been remains speculative. In no case of where atlatl fights or dart-impaled individuals are shown do the anthropomorphs hold S-shaped sticks or any other form of defense. In situations when it is reasonable to expect that these artifacts would be shown if they indeed functioned to defend against atlatl darts, Basketmaker II artists did not do so. This alone does not disprove the fending hypothesis but a few examples would certainly help to provide strong support.

It is possible that what I assume to be depictions of duels between two individuals are actually how Basketmakers depicted warfare—as a series of separate dyadic engagements rather than a mass of warriors in combat. If this is true, then the absence of S-shaped sticks is perhaps understandable since they would have lacked utility in such an engagement. At present I doubt this because Basketmakers were adept at showing multiple hunters attacking herds of mountain sheep, so depiction of complex multi-actor scenes similar to war was not outside their experience. More detailed documentation of atlatl fights and S-shaped sites in Basketmaker II rock art are certainly required and perhaps this preliminary accounting will instigate such research.

CHAPTER 12

CONCLUSIONS

Basketmaker II Flat Curved Sticks

The grooved S-shaped sticks that Guernsey and Kidder first identified as part of the essential trait list for Basketmaker II culture of the Four Corners region are now known to be a terminal manifestation of an implement with a lengthy history of use in the Chihuahuan and Sonoran deserts of the Southwest. The artifacts that they recovered from sites of NE Arizona are no older than about 400 cal. BC whereas comparable specimens from the southern deserts of the Southwest date back to around 7000 cal. BC. A specific predecessor for the typical western Basketmaker II version of this artifact has yet to be identified, but the grooved S-shaped sticks from the Correo Site in New Mexico near Laguna are closely comparable. The Correo artifacts date as early as 1600 cal. BC, so some 1200 years earlier than the Basketmaker II specimens, sufficient time to account for differences in certain details such as how the cordage was attached to form the grip knob, distal end shape, or preferred number of longitudinal grooves. Given the known temporal and spatial distribution of S-shaped flat curved sticks in the Southwest, this artifact is another piece of evidence for trait-unit or site-unit intrusion onto the Colorado Plateau. Western Basketmaker II material culture as a whole appears to have few local precedents in the Four Corners area. Determining a likely source area for all of the various artifact classes will require a program of detailed analysis and dating of materials across the Southwest and beyond, as I have done for flat curved sticks. At present I still favor a site-unit intrusion from the borderlands to account for western Basketmaker II, but an intrusion that may have transpired through stops and developments in intermediate areas. Moreover, “male technology” like flat curved sticks might well reveal different patterning than “female technology,” so it could be best to parse these to the extent possible.

Guernsey and Kidder (1921:88) assigned no specific use to the sticks that they found, but maintained that they were not rabbit sticks. The fending hypothesis tentatively put forward in their report was inspired by a defensive weapon that Solomon Islanders used to ward off spears. This ethnographic analogue is inapplicable to the Basketmaker

case since the Solomon Island defensive stick is also a formidable offensive weapon, a true death-dealing club that also happened to be well suited to knocking aside oncoming spears. Basketmaker II flat curved sticks are not genuine offensive weapons unless the intent was to anger an opponent, and some of the lightweight examples from the Southwest could do no real harm. Other weaknesses of this analogue include the following three points: 1) the Solomon Islanders used hand-thrown projectiles, which meant that one hand was free to wield the parrying club whereas two hands are required for effective atlatl and dart use; 2) the Solomon Island projectiles had less velocity than the atlatl darts that Basketmakers used, so safe deflection had better odds; and 3) compared to Basketmaker II S-shaped sticks, the parrying club had far more surface area, which provided for better shielding capability.

Lest any reader think that the notion of trying to bat away atlatl darts is absurd, there are tribes in South America who still do this activity: the Kamayurá and adjacent groups of the Upper Xingu region. This impressive feat is performed in a ritual where opponents from different villages, even different ethnic groups, take turns throwing atlatl darts at close range in an attempt to strike their foe who defends against the projectiles with a bundle of poles. This duel-like contest has explicitly violent overtones of intergroup conflict but with cultural restraints in place to ensure a non-lethal outcome, including proscriptions on which portions of the body are legitimate targets and tipping the darts with bunts. Since dart deflection is achieved with a more substantial obstacle than a flat curved stick, the analogue might seem to end here. Yet it is in just this sort of rule-bound, duel-like setting where use of a stick for defense against atlatl darts is most logical. Moreover, my experiments described in Chapter 6 show that atlatl darts can be deflected with Basketmaker II S-shaped grooved sticks at a range of almost 10 m. I fended away darts with bunts rather than lethal tips, but substituting stone tips would not diminish the utility of a fending stick for dart deflection, although it would make duels far more potentially lethal. Such bunts were in common use by western Basketmakers and other early groups of the Southwest and may well have been used for practice fights when there was no lethal intent. The South American atlatl duels reinforce men's esteem as great warriors, a measure of their worth to fellow men and in the eyes of women, while also simultaneously reinforcing peaceful relationships between neighboring groups. The

feat of deflecting atlatl darts would seem all the more impressive using just a single small stick.

Despite the demonstrated feasibility of atlatl dart deflection with flat curved sticks, use of these artifacts in warfare seems highly dubious. Aside from being an encumbrance to effective atlatl dart loading, they offer no defensive advantage that could not be obtained by spare darts in the non-throwing hand or the atlatl itself. Australian aborigines used their atlatls (*woomera*) to deflect spears/darts in warfare (Best 2003), so there is no reason that Basketmakers could not have done the same. Unlike the Solomon Island parrying club, Basketmaker II sticks offer no offensive advantage, contrary to arguments like this for similar artifacts from Mesoamerica (e.g., Hassig 1988:294-295). As such, if the sticks truly functioned as a specialized defensive tool, this was probably not in the context of warfare. The sticks are not weapons of any advantage to take on a lethal raid of another village and are of little or no value for defense against such an attack. Nonetheless, since development of a duel-like contest involving atlatl darts probably occurred within a social environment where intergroup relations were permeated by fear of attack and reprisal—an environment of endemic warfare—such artifacts could constitute a general indicator of intergroup conflict.

Atlatl duels are documented in Basketmaker II rock art, dyadic contests witnessed by third-party observers and those that appear to have had no witnesses. The consequences of these duels are also portrayed by individuals run through by darts such that there is no doubt that lethal-tipped projectiles were used. In at least one instance the stone tip that impaled a warrior in the neck is clearly shown and the point form is not local to the immediate area, indicating that the assailant was from an outside group, likely 50 km or more to the north of where the panel occurs. The consequences of such duels perhaps account for some of the physical evidence from the area such as skulls and vertebrae impaled with dart points. One of the individuals massacred at Cave 7 lived for years with a dart point embedded in a vertebra, a wound possibly obtained in a duel. Dueling may have been one way that Basketmaker men competed for status. Another way, directly linked to war, was the procurement of flayed head skins or other trophies of vanquished enemies.

Although Basketmakers depicted atlatl fights between two individuals, they evidently did not show S-shaped sticks being used in such encounters. This does not necessarily mean that it did not occur and such a depiction might exist on some rock surface in the Four Corners that has yet to be documented or brought to my attention. There seems little doubt that the S-shaped sticks held special significance for western Basketmakers since they were rarely disposed of or recycled and occur mainly as male funerary offerings or in caches. They are also clearly depicted in rock art, sometimes in pairs, but not in ways that provide unambiguous clues as to their use. In central Arizona along some tributaries of the Little Colorado River, S-shaped sticks are shown prominently in the hands of anthropomorphs, strongly suggesting that they served as a symbol of some sort of status.

Use of flat curved sticks for defense against atlatl darts, whether in duel-like contests or true war, should result in identifiable use-wear or use-inclusions (it could also result serious wounds to the holding hand or forearm). My experimental research indicates that this is true even when non-lethal darts were used and defense against those tipped with stone projectile points would only increase the visibility of such use evidence. A prehistoric stick from the Chihuahuan Desert provides rather conclusive support for atlatl dart defense, and sticks from other places of the Southwest also exhibit traces indicative of fending use. Moreover, the earliest examples of this artifact class are the least like ethnographic rabbit sticks. The artifacts morph through time, becoming more like rabbit sticks and eventually looking little different; this is exemplified by a charred specimen from a burned pithouse on Mesa Verde dated to shortly after AD 600 (see Figure 10.9). The morphological evolution of this artifact, or functional refinement toward a rabbit stick, is seen by the change from S-shaped to single curve, by the increase in stick width and weight, by the discontinuation of grip wraps, and by the discontinuation of fine wood finishing and longitudinal grooves. There is also a corresponding increase in physical traces from throwing use such as embedded rocks and spines and heavy attrition to stick edges and ends. This change is seen for the Southwest as a whole but it is also documented by the single large assemblage of flat curved sticks that came from the Correo Site in New Mexico (see Figure 10.7).

Elsie Clews Parsons first brought this site to the attention of anthropologists in a 1918 paper on war god shrines of the Laguna and Zuni. She recovered several flat curved sticks from the site along with other materials. It is notable that when she showed one of the Correo Site grooved sticks to a Zuni informant, that person identified it as a “bow priest club,” stating that “in Zuni such a club is not used in rabbit hunting” (Parsons 1918:384, footnote 2). She went on to speculate that, “I have little doubt that the clubs in the pit shrine [Correo] were war clubs although clubs like them are applied today, not to Navajo, but to rabbits” (Parsons 1918:384, footnote 2). She also mentions how these bow priest clubs are similar to those recovered by Guernsey and Kidder from NE Arizona, meaning the Basketmaker II artifacts from White Dog Cave. What Parsons could not have known in 1918 is that the comparable Correo specimens were some 1200 years older than the Basketmaker II specimens recovered by Guernsey and Kidder. Also, that the Correo sticks in turn represent a spread of this artifact type to the Colorado Plateau from the southern deserts of the Southwest after the introduction of maize farming and perhaps as a result of farmer expansion. Parsons (1918:385, footnote 1) reports that “in Zuni and Keresan myths the rabbit stick is associated with the war gods.” The rabbit stick alone has documented defensive and offensive utility among the Hopi, but a link to fighting might have even greater time depth and associations if the rabbit stick represents a modified fending stick, as seems probable.

Use-wear and use-inclusions demonstrate that prehistoric flat curved sticks were used as rabbit sticks, at least those that date after about 4000 rcybp. Such use does not preclude knocking aside atlatl darts and some sticks have evidence consistent with having functioned in both roles, including the one stick with the most conclusive damage relatable to fending use. A shift in function, from a stick used in atlatl fights to one used for hunting small game, makes logical sense of the subsequent conflation of a mundane artifact with warfare and as a war god symbol. “Bow priest” likely would have been translated as *atlatl priest* prior to the introduction of bow and arrow technology. As such, the *bow priest club* that the Zuni informant mentioned to Parsons was probably designated as an *atlatl priest club* originally, but with the qualification that *club* referenced use against atlatl darts not people’s heads. A club for close quarters combat does not match the nature of the flat curved sticks at Correo. A stick used for defense

against darts, even in a ritual fight, could well qualify as a symbol of office, especially if the fights were conducted with potentially lethal darts. Success in warfare as evidenced by trophies such as scalps was a key part for admittance to Puebloan war societies, especially for leadership roles (e.g., Curtis 1922:65, 69, 131, 221; Stevenson 1904:577). I can envision that this was true during Basketmaker II times and even further back in time, with atlatl duels perhaps also used as a membership criterion.

Also deposited in the Correo shrine along with a few hundred flat curved sticks were hundreds and perhaps thousands of atlatl darts. This further strengthens the relationship noted by Guernsey and Kidder for an association between atlatl darts and flat curved sticks. It seems more than just coincidence that weapons were deposited in a site ethnographically documented as a war god shrine used by war captains. Rather, the ethnographic use of this inaccessible opening in the earth as a war shrine probably stems from having served as an ancient ritual depository of war implements, including flat curved sticks, especially if these had been used for fending atlatl darts in some sort of ritual fight. Among the South American tribes that conduct the duel-like ritual fights with atlatls and darts, the weapons are destroyed at the end of the event. Perhaps in a somewhat analogous manner the atlatl darts and fending sticks were deposited into the Correo shrine. The flat open grasslands that surround the Correo site would be well suited to a meeting of competing groups in order to conduct a ritual fight as there is little possibility of being able to stage a surprise attack—you can see people coming from a long distance away and the terrain does not lend itself to any military advantage.

Ethnohistorically Puebloans deposited special prayer sticks into the Correo shrine, small sticks that are commonly pointed on one end and with feathers attached to the opposite end. These sticks are offered along with prayers for supernatural assistance. It is not too great of a stretch to argue that atlatl darts functioned like the ethnohistoric prayer sticks and that the recent artifacts are greatly modified versions of the original prayer stick—an atlatl dart. Atlatl darts appear to play an important symbolic role in Basketmaker II rock art of the Four Corners region, and a link to prayer offerings is perhaps understandable since darts are directly associated with the procurement of large game and in defense of the group, including revenge attacks, aspects of life where appeals for supernatural assistance are likely.

Curved sticks with longitudinal facial grooves comparable to those from the Southwest occur in Mesoamerica, especially at Chichén Itzá on the Yucatan Peninsula but also in the central highlands at Tula. In Mesoamerican art these artifacts are commonly depicted in the hands of warriors that also hold atlatls and darts. Archaeologists have designated these artifacts as fending sticks by accepting the speculative account initially put forward in Guernsey and Kidder, who pointed to the Mesoamerican art and artifacts as potentially corroborating the fending role. Despite the circularity of this argument it was not until the late 1980s that some researchers began to doubt the fending interpretation, with Hassig (1988:294-295) arguing that the grooved curved sticks were specialized short swords for close fighting. My analysis of the Chichén Itzá sticks along with a consideration of the mural evidence disproves the short sword argument, but does not corroborate the fending role. However, there is a tantalizing bit of ethnographic evidence from Diego de Landa that hints at the possibility of the Yucatec Maya deflecting atlatl darts using short sticks in a ritual designated as a dance. Fending atlatl darts in ritual fights remains a probable interpretation of these sticks and this would also accord with the thought that these artifacts represent some sort of military insignia for officers. The rituals of military investiture that Ringle (2009) discuss for the Sacred Cenote, where the only extant examples of these artifacts were found, could have included a duel-like rite of passage that involved fending sticks, one with very ancient roots in the Southwest. The Kamayurá and adjacent tribes of South America may be enacting the last vestige of this atlatl dueling ritual and Diego de Landa seems to have witnessed a version in the Yucatan during the 1500s. As such, the Southwest, because of its sheltered sites and arid environment, might merely preserve an artifactual trace of a once widespread warrior rite.

Basketmaker II Violence and War

The Basketmaker II archaeological record from NE Arizona and SE Utah contains abundant evidence for violent conflict, evidence that meets a behavioral definition of war. Indeed, much of the violence that was present in Basketmaker II society probably stemmed directly from a heightened state of lethal intergroup conflict. Violence between individuals no doubt occurred, but the larger context for most of this appears to have been warfare. The massacre assemblages of Cave 7 and Battle Cave allow a strong inference

that war was a facet of Basketmaker II existence. The Cave 7 evidence was briefly in doubt based on radiocarbon results reported by Coltrain (et al. 2012), but as I demonstrate in Chapter 5 and Geib and Hurst (2013), their dates cannot be used to overturn Richard Wetherill's field-based interpretation that numerous Basketmaker II individuals had been massacred. The two massacre assemblages confirm that Basketmaker II violence was not just from dyadic interactions, capital punishment, or small-scale disputes.

A single-event mass killing continues to be the most likely interpretation for around 58 of the individuals interred at Cave 7. At least 35 of the 58 were adult males, but adult females and children were also included. This incident occurred around cal. AD 20–80 and doubtless had a significant social impact at the time because of its scale, reverberating throughout the early farming communities of the Southwest. The sex and age bias seen in the Cave 7 skeletal sample is consistent with an attack where some women and children were taken captive. Survivors of the attack are the ones that likely buried those that had been slain; survivors also likely comprised the individuals that were subsequently interred at the site thereby increasing the size of the Cave 7 burial assemblage. Later burials mostly occurred within a part of the shelter separate from the massacre victims and consisted of more women and children than men.

The Cave 7 massacre implies a form of social organization and cooperation, even if fleeting, that far exceeds in scale the social units of Basketmaker residential sites or even clusters of such sites. Given the fighting implements available during Basketmaker II, with the atlatl and dart the one fire-type weapon and no certain shock weapon besides those of expedience, the size of the group required to overpower 35+ healthy males, even with the advantage of surprise, was likely double or more the number killed. As Gat (1999:563) phrased it, “the principle of deadly violence in nature is fighting against weakness and fighting only at highly favorable odds—asymmetrical fighting.” An attack with overwhelming superior numbers could easily have involved a coalition of at least twice the number of warriors killed, thus more than 60 and perhaps more than 80. Yet Basketmaker II farmers lived in scattered single family or small extended family homesteads (Dohm 1994; Geib 2011; Geib and Spurr 2000; Matson 1991; Matson et al. 1988, 1990; Smiley 2002). Even the largest Basketmaker II sites with multiple living structures housed well below the number of males killed at Cave 7, to say nothing of the

attacking force. Plus the presence of multiple structures at Basketmaker II sites does not necessarily equate with multiple families in residence at the same time: Kin Kahuna on the Rainbow Plateau contains more than six structures but extensive radiocarbon dating demonstrated that few if any of them were contemporaneous, thus, no more than two or three families probably occupied the site at any one interval (Geib 2011). The Basketmaker II “neighborhoods” that Dohm (1994:272) recognized on Cedar Mesa consisted of just several dispersed households (ca. 4-5 in number), such that even if all residences were truly contemporaneous, they were unlikely to muster more than 10 adult males.

The Cave 7 massacre was not an isolated incident nor the first massacre site, since the Battle Cave assemblage is also indicative of a mass killing. The social scale is smaller in this case, consisting of just 10 individuals: six adults, a subadult and three children (Turner and Turner [1999] mistakenly upped the count by including one adult from the Basketmaker III or Pueblo I period). An age and sex bias is again evident suggesting that some women and children were captured rather than killed. Radiocarbon dating indicates that the Battle Cave massacre happened a century or two before the Cave 7 massacre. The potential timeframe for this event cannot be specified as narrowly as for Cave 7, but the interval of 210 and 85 cal. BC has the highest probability with some chance that it occurred in the earlier range of 355–300 cal. BC. The remains were not immediately buried as at Cave 7, but remained exposed on the surface for some time with the loose bones eventually deposited in a storage pit as a secondary burial. This implies that any surviving family members who were taken captive no longer lived close by.

The confirmatory evidence for war actually makes explicable the occurrence of flayed head skin trophies, items displayed on highly visible rock art panels and deployed in at least one burial ceremony at Kinboko Cave 1. These mementos of violence along with other examples are unlikely to exist outside of a context of hostile intergroup relations where defense of the social group was highly valued. “Defense” is, as often as not, an offensive attack for the purposes of revenge whence trophies could be obtained. I maintain that trophies such as the Basketmaker II flayed head skins are nearly on par with massacre assemblages as direct evidence for war. One (war) begets the other (trophies) like fire produces smoke and by seeing smoke one knows a fire exists whether or not the

flames are actually visible. Although a direct connection between the flayed head skins and war hardly seems tenuous, the evidence for “scalping” (cut marks) on some of the male skulls within the two Basketmaker II massacre assemblages provides a rather clear link. Rather than an efficient severing of the scalp, these Basketmaker II trophies are more akin to animal skinning and require precession cuts such that physical traces on the skull might not be present or might consist of several rather minor small cuts, as is evident on some of the Cave 7 skulls and one from Battle Cave.

Why Basketmaker II Warfare?

Basketmakers evidently shared the apparent human penchant for killing our own kind, but why? The oft-cited need for land or food may seem an intuitively satisfying explanation for warfare, but intergroup conflict can remain omnipresent even when resources are abundant. Moreover, population levels during the Early Agricultural Period were doubtless far less than later when carrying capacity problems seem to have become profound (e.g., Kohler et al. 2014), thus other factors may have played a more significant role in intergroup conflict. Yet a model of resource competition provides some clear expectations that are potentially subject to examination using archaeological data, especially for regions with a relatively fine-grained and detailed paleoenvironmental record. This is especially true in situations where environmental changes of one sort or another create a potential for subsistence stress.

Subsistence resources on the Colorado Plateau prior to the spread of Mesoamerican domesticates were generally either scarce, or unpredictable, or both, and the environment was never productive enough to support even moderately dense populations or any degree of residential permanence. Ecology kept humans thinly scattered on the landscape and in nearly constant seasonal movement in order to secure enough food. Given these circumstances, evidence for intergroup fighting might be minimal prior to the spread of domesticates. First, the costs of fighting could have outweighed benefits; indeed, mutual cooperation and forms of reciprocity often profit foragers far more than aggressive behavior. Second, even if there was significant intergroup conflict among foragers, minimal group sizes probable kept lethal engagements very small. This coupled with the dispersed nature of the forager

archaeological record on account of residential mobility greatly limits chances of detection.

Maize and squash had diffused into portions of the Colorado Plateau from Mesoamerica by around 2200 cal. BC and a Formative pattern characterized by a heavy reliance on food production was well established by 800 BC or shortly thereafter in the Four Corners area. This is when a distinct Basketmaker II culture is clearly recognizable. The advent of food production would have altered the cost/benefit calculus of lethal conflict in the Southwest by transforming the ecological context to one with patches of predictable and dense resources represented by farm plots (e.g., Ford 1984). There are important theoretical grounds for expecting that the benefits from lethal intergroup conflict could have outweighed the costs after the advent of food production and researchers have documented a strong cross-cultural correlation between this sort of economy (either farming, herding, or a combination of both) and war (e.g., Ember and Ember 1992; Wright 1965).

The altered cost/benefit ratio was not just in evolutionary terms that were opaque to people, but also likely in very human terms—how people perceived and weighed the risks and rewards of lethal conflict. That the ecological transformation occurred only by dint of labor investment would have increased the probabilities for territorial conflicts and war. Besides the spatial concentration of resources, desirable farm plots are not ubiquitous on the Colorado Plateau or the Southwest at large, being especially limited during the initial interval of farming when the focus of settlement was on those settings with potential for runoff concentration, irrigation or subirrigation—basically along drainage floodplains with fine-grained alluvium and high water tables (Gregory et al. 2011; Matson 1991). With such an ecological constraint some degree of competition over productive land is easy to envision.

Warfare by Whom Against Whom?

Determining who the victims were and who the victors were is one facet of coming to an understanding about *why* there was Basketmaker II warfare. Ethnographic data clearly indicate that social identity and the extent and nature of relationships between individuals and social groups have an important bearing on the nature and conduct of conflict. Solometo refers to this as *social distance* and sees it as central to

understanding the social scale, tactics, goals, frequency, and predictability of war in non-centralized societies (Solometo 2004:19-37, 2006). At the simplest level, social distance can be dichotomized as internal and external (Otterbein 1968, 1970). External warfare involves conflict between groups from distinct cultural/linguistic/ethnic traditions, such that members of the opposing forces might not even recognize each other as fully human. Victors may be unbound by social rules governing treatment of the vanquished dead and wounded. In contrast, warfare between groups from the same cultural/linguistic/ethnic traditions, might (but not necessarily) involve cultural prescriptions that constrain the violence meted out to the dead and dying of certain sex, age or other social categories. The scale of conflict (number of dead and the demographics) might also vary depending on whether and to what extent groups have social relations, with the possibility for genocide-like conflict between groups from completely different ethnic communities. Solometo thinks that the internal/external distinction may obscure subtle details such as the number and strength of ties that crosscut groups, yet such aspects are not normally accessible to archaeologists. Even the internal/external distinction is difficult to infer, though possible based largely on the geographic scale of distinctions that can be drawn in artifact styles, raw materials, or architecture. In the final analysis, archaeologists often talk about social groups as geographic entities and social distance gets expressed according to this proxy.

The agricultural transition in the Southwest generally and the Colorado Plateau specifically probably transpired by the diffusion of crops and farming knowledge to in situ foragers and by the northward migration of farmers (e.g., Berry and Berry 1986; Hill 2001; Huckell 1995; Matson 1991, 2002; Merrill et al. 2006; Wills 1988). Both processes may have operated at different times and different spatial scales and with somewhat differing consequences. Given the spread of crops if not people from south to north there may be a temporal and spatial pattern in the evidence for war, with the earliest indications occurring in northern Mexico then spreading northward rapidly. Moreover, if migration was involved in the process, no matter the scale (interregional: Mesoamerica to Southwest or intraregional: southern Southwest to northern Southwest), it likely would have juxtaposed culturally if not linguistically differentiated populations creating the potential for a shoot-on-sight policy and external warfare. The same might also be true of

sub-regional migration such as from the Marsh Pass area of NE Arizona to Navajo Mountain, Utah.

Matson (1991, 2002) made a case for both migration and diffusion on the Colorado Plateau, which resulted in “ethnic” diversity among Basketmaker II populations in the Four Corners. The principal split, initially recognized by Morris and Burgh (1954), occurs between *eastern* and *western* groups. Western Basketmaker II groups occupy areas of SE Utah and NE Arizona, including the locations of both Cave 7 and Battle Cave. Eastern Basketmaker II groups occur in SW Colorado, best known from the Durango area and NW New Mexico. As Matson sees it, the ethnic and presumably linguistic differences between these divisions, which are reflected in material culture and architecture, stem from distinct origins—western Basketmakers were farmer migrants to the Colorado Plateau from southern source areas (Sonoran Desert and beyond) whereas eastern Basketmakers were indigenous local foragers who adopted farming.

If this reconstruction is true, an influx of ethnically distinct farmers to the Colorado Plateau could have resulted in violent conflict at two different scales: (1) between the migrant farming groups and indigenous foragers (those that maintained an essentially hunter-gatherer lifestyle), and (2) between the migrants and indigenous farmers—basically between eastern and western Basketmaker II groups. In either case, the conflict could be considered as an external variety of war between groups that did not share a common language and culture, and thus might have had an inherent mistrust and intrinsically considered the other as inferior or subhuman. Even if small groups of intrusive farmers occupied only a tiny fraction of forager territory and thus presented no conflict over foraged plant resources and small game, there is likely to have been depression of large game and thus conflict over this resource.

Conflict between farmers and foragers should have been rather small-scale affairs given the probable limited demographic size of forager groups. In essence, foragers were likely so dispersed and highly mobile that conflict would have consisted of a shoot-on-sight policy like Kelly (2000) describes for the Jarwa and Bea on the Andaman Islands. The evident scale of the suspected Basketmaker II massacres far exceeds what would be expected for foragers to have inflicted upon farmers or the reverse. My estimate of 35+ males in the Cave 7 massacre assemblage is an improbably high number for any forager

group on the Colorado Plateau. Given that overwhelming superior numbers would have been needed to kill this many males plus adult females and adolescents of potential effective fighting age, it is even more unlikely that any foragers could have mounted a force of sufficient size. Indeed, this is an impressive feat even for Basketmaker II farmers and provides the best evidence of social action above the level of a local community.

The individuals killed at both massacres were likely local to the immediate area of interment in that they consisted of females and children along with males—families—rather than just a portion of the social group that could be considered as warriors alone. Aside from being local, the isotope measurements on bone that Joan Coltrain obtained indicate that all individuals had diets that were typical for Basketmaker II groups of the Four Corners area, typical both in the high proportion of C4 plants consumed, presumably maize, and in the relatively low dietary contribution of animal protein (e.g., Coltrain and Janetski 2013; Coltrain et al. 2006, 2007, 2012). The victims were not foragers in conflict with farmers but farmers no different from other Basketmakers on the Colorado Plateau.

The responsible party for the attack at Battle Cave is unlikely to ever be known since no weapons were left at the scene or at least none were included in the subsequent interment of the skeletal remains. Cave 7 is another matter since killing weapons were left at the scene and embedded in bodies, including stone projectile points and knife blades that contain stylistic, technological, and raw material details that can be used as evidence to make inferences about social groups as geographic entities, which is generally how archaeologists must try to measure social distance in warfare. Based on the geographic scale of distinctions that are evident in lithic sources and projectile point style and production technology (Geib and Hurst n.d.), the attacking force of the Cave 7 massacre had a fairly local origin. An eastern Basketmaker II force is not indicated nor is one coming from NE Arizona such as the lower Chinle Wash, Marsh Pass area, or Black Mesa. Likewise, a force from the greater Cedar Mesa/Grand Gulch/White Canyon area is not supported, in this case because of the raw materials. The evidence is strongly indicative of internal war at a very local level, with attackers probably originating at a distance of just 20-40 km from Cave 7; originating from the south and SE is in best

agreement with what is currently known of lithic resource availability. Conflict between neighboring groups with frequent raiding and occasional brutal massacres is a common feature of ethnographically documented subsistence agriculturalists comparable to the Basketmaker II populations of the Four Corners (e.g., the Dani or Mae Enga of the New Guinea Highlands; Heider 1970, 1979; Meggitt 1977).

This does not mean that there was not conflict at greater physical distances and likely social distances. A hint of this comes from a Basketmaker II rock art panel along Chinle Wash in NE Arizona that shows an individual with an atlatl dart driven through the neck (see Figure 11.28). The projectile point on the dart is clearly depicted as corner-notched and thus different from the commonly side-notched points used in the local area of the rock art panel. The style of the protruding point is more indicative of extralocal conflict since this more corner-notched variety was in common use by Basketmakers north of the San Juan River in SE Utah. If part of a group-level conflict (the outcome of a raid) it would probably still be classified as internal war, since the Basketmaker II groups of NE Arizona and SE Utah were doubtless part of the same ethno-linguistic group, just somewhat farther apart geographically.

Besides any conflict that might have existed between western Basketmaker II groups and social outsiders, western Basketmakers were not internally peaceful. They fought each other, perhaps commonly, much like tribes in the New Guinea Highlands, and on occasion this conflict escalated into modest-size massacres such as Battle Cave or large-scale examples like Cave 7. Groups in immediate contact with one another as often as not have many conflicts over land, resources and mates and there are always shifting alliances as groups try to win and maintain support from certain neighbors in disputes with other neighbors.

Resource Problems

Since war risks life and reproductive success, materialists such as Brian Ferguson (1984, 1989, 1990) argue that the direct acquisition of resources is both a necessary and sufficient condition for war: only a large and immediate payoff could justify risk to a participant, and the link to enhanced fitness from somatic resources is quite direct and seems easily justified. Warring for material need emphasizes between-group competition for resources key to survival. As part of this, war is commonly viewed as a stress-related

response that causes one group to use instrumental force to try to secure resources from a different group or groups (LeBlanc 2003). Political and religious stresses might be important complements, but these are seen as arising from the former (e.g., Ferguson 1990). Population is also a critical factor but the intensity of competition is dependent not just on overall population size but also on the number of near neighbors (Read and LeBlanc 2003).

An important part of evaluating what might have motivated Basketmaker II warfare is the temporal placement of the massacres so that they can be juxtaposed against various environmental and social factors. Unlike the usual case in archaeology, dating of the Basketmaker evidence is quite precise and yet it still appears rather gross when it comes to making inferences about causes of war. Even in the best case, that of Cave 7, there is an 80-year interval for when this massacre could have taken place. With such resolution it is impossible to make specific correlations that might actually scale with those of the individuals involved: for example, group X was attacked because of the extreme drought at AD 70. Nonetheless, if the frequency and intensity of intergroup conflict tracks with overall environmental conditions, then general trends in past conditions might be seen as setting the stage for warfare or a lack thereof, making it more or less likely. Also, Ember and Ember's (1992) cross-cultural analysis found a strong relationship between resource unpredictability and warfare frequency in small-scale societies, with food scarcity caused by natural disasters such as drought as a key predictor variable. Rather than actual resource loss, it was the *fear* of such loss and its unpredictability that Ember and Ember (1992:256) concluded was an impetus for war.

The two massacre assemblages are a hundred or more years apart in time, with Battle Cave potentially as early as the fourth century BC, but more likely occurring sometime during the third or second centuries BC. Fully supportive of war as early as the third century BC if not the fourth is the flayed head skin trophy that Kidder and Guernsey recovered from Kinbiko Cave 1, which has a two-sigma age range of 385–200 cal. BC. Also potentially indicative of war during the first or second centuries BC is the Red Canyon skull with a killing blow to the left side. Warfare at a far more substantial scale is indicated by the Cave 7 massacre during the first century AD, sometime between AD 20 and 80.

Relatively fine-grained paleoclimatic reconstructions based on the analysis of tree-rings are available for part of the Basketmaker II period: there is a 2129-year record, back to 136 BC for El Malpais National Monument in west-central New Mexico (Grissino-Mayer 1996), a slightly longer record back to 268 BC from the southern San Juan Mountains of Colorado (the Summitville record), which provide snowpack water to the Rio Grande and San Juan River (Routson et al. 2011), an even longer 2300-year tree-ring record extending to 323 BC for the Tavaputs Plateau of NE Utah (Knight et al. 2010), and the reconstructed Palmer Drought Severity Index (PDSI) values (Cook et al. 2008) for the Four Corners area (average of data from map points 103, 104, 118, 119, 132, 133). The latter is limited to a time depth of the Common Era and includes the El Malpais data, so it is not a strictly independent record.

All of the records show a strong degree of correspondence and reveal some significant droughts (Table 12.1, Figure 12.1) when precipitation fell well below the normal average. Dean (1988:138) argued that precipitation 1.1 standard deviations below normal comprised “climatic conditions that were sufficiently rare and severe to have had processual consequences for physical, biotic, and human behavioral systems on the Colorado Plateau.” According to Routson et al. (2011:1) there was “a multi-century period of unusual dryness between 1 and 400 AD, including an extreme drought during the 2nd century.” The latter they refer to as a megadrought that equaled if not exceeded the severe megadroughts that Southwestern archaeologists are familiar with—those of the mid AD 1100s and late 1200s that so disrupted the social fabric of Puebloan groups. The El Malpais record (Figure 12.1a) clearly registers the second-century drought (cf. Grissino-Mayer 1996:Table 4), but reveals an even more significant downturn during the fourth and fifth centuries AD (Figure 12.1a) and also more than 80 years of below normal precipitation during the first century of the Common Era. Grissino-Mayer (1996:200) refers to the conditions of the fourth and fifth centuries AD as “the most severe of any long-term drought period in the last 2129 years. Tree growth during this period was noticeably reduced, especially beginning ca. AD 350.” The poor conditions of the third through fifth centuries AD are clearly reflected in the PDSI record since three of the ten intervals of persistent drought conditions in the Southwest occur between AD 222 and 481. Some might question, how well does the El Malpais record, which accounts for a

large proportion of the PDSI values prior to around AD 500, reflect past conditions in the Four Corners area? Since similar trends occur in both of the independent Tavaputs and Summitville records, which bracket the Four Corners to the north and east, the patterning is likely to be robust.

If drought was a causal factor in conflict, then the fourth and fifth centuries AD seem more conducive to war in this regard since precipitation was evidently so poor over such an extended interval, perhaps accompanied by water table lowering and alluvial degradation (e.g., Karlstrom 1988). Yet all evidence for Basketmaker II conflict predates

Table 12.1. Intervals of persistent drought during the Basketmaker II period as identified by Routson et al. (2011) in four Colorado Plateau proxy moisture records. The authors used a 25-year running mean to document the 10 periods of most persistent drought in each record; those intervals earlier than AD 600 are included here in age sequence. Their second-century AD megadrought is highlighted.

Tavaputs	El Malpais	Summitville	PDSI
243–202 BC	99–60 BC	AD 77–282	AD 97–181
23 BC – AD 27	8 BC – AD 46	AD 301–400	AD 222–257
AD 132–184	AD 138–174		AD 347–399
AD 507–545	AD 349–395		AD 426–481
	AD 443–483		AD 505–537

this interval as well as Routson et al.'s (2011) second-century AD megadrought. The large-scale Basketmaker II massacre at Cave 7 occurred partially during an interval of lower than average precipitation in the El Malpais record, and this might have been significant enough. Indeed, it seems reasonable to suggest that drought closely following on the heels of a favorable moisture regime is potentially more significant than extended drought episodes. The intervals of closely fluctuating good and bad years such as during the last half of the first century BC (~60-1 BC) or the latter half of the third century AD (~AD 360-400) are perhaps more significant than broad spans of generally poor years. In this regard, the span of the Cave 7 massacre can be characterized as one where precipitation had already been below normal for decades, with some signs of improvement toward the end of this interval.

Intervals of drought also characterized the early centuries BC when the Battle Cave massacre occurred. One is clearly evident in the El Malpais record but likely after the massacre (99-60 BC) yet this record starts out well below normal and this is also seen

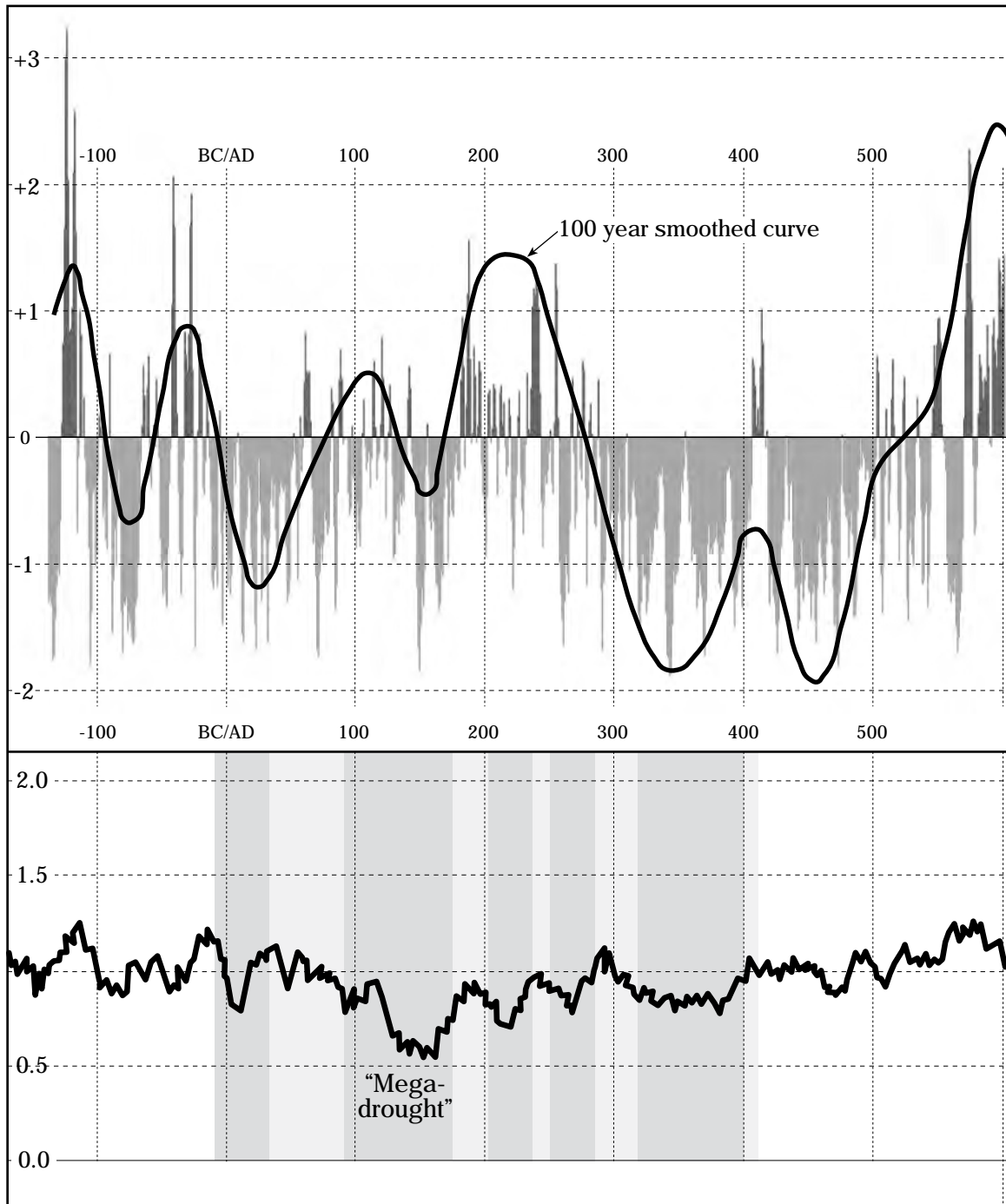


Figure 12.1. Two tree-ring based reconstructions of annual rainfall for the Colorado Plateau: (a) El Malpais, NM (Grissino-Mayer 1996), plotted in standard deviation units with a 10-year smoothing spline to accentuate short-term (<50 yr) climate episodes and a 100-year smoothed curve to accentuate long-term (>100 yr) trends; (b) Summitville, CO (Routson et al. 2011), standard index smoothed with a 25-year moving average. Light shaded bars represent five of the ten driest 25-year periods defined by the Summitville chronology. Dark shaded bars highlight multicentury periods of increased aridity and drought frequency.

in the Tavaputs and Summitville records. Perhaps once the El Malpais record is extended further back in time a significant drought during the second century BC will become evident. The Tavaputs record also reveals a persistent drought interval during the latter part of the third century BC. Only future research will determine whether this downturn was also seen farther south in the Four Corners regions, but this seems likely, so it is possible to point to a potentially correlative time of environmental stress for the Battle Cave massacre.

Whether or not Basketmaker II groups would have been impacted by below-average moisture depends on the nature of their farming strategies. Matson (1991) and other authors (e.g., Robins 1997a, b) have argued that, prior to the Common Era, Basketmakers farmed in settings such as alluviated canyons with high water tables, springs for irrigation, or other settings where plants did not have to depend on precipitation alone or where rainfall could be concentrated for maximum effect. True dry farming is usually considered a development that occurred after the start of the Common Era, perhaps as a result of newly developed maize varieties, and is seen to be a reason behind the evident proliferation of open Basketmaker II habitations on upland settings like Black Mesa (Smiley 2002) and Cedar Mesa (Matson 1991). Drought intervals might not have been overly significant to Basketmaker II farmers not dependent on summer rainfall for crop production, unless of course significant drought led to dissection of floodplains and lowering of water tables. After dry farming became a common practice, drought would have had a significant impact, which is another reason to expect greater conflict after the Cave 7 massacre.

Nonetheless, there remains an evolutionary linkage problem in arguments about war and environmental stressors such as drought. What would be the fitness motivation or payoff for attacking a group that was equally impacted and suffering from a climatic downturn? Indeed, Durham (1976:391) argued that fitness benefits from fighting over scarce resources should occur only when they are dependable and of high quality and only if at least some of the aggressors obtain them—that there is some payoff for the risky behavior. It is perhaps notable that both of the Basketmaker massacres occur in canyon settings far less likely to have been affected by drought, persistent or not. This might indicate that the attacking groups were motivated to obtain more productive land

than they currently had, well-watered settings perhaps less affected by drought conditions. To support such an argument it would be important to show that victorious groups occupied vacated land, something that seems an improbably difficult thing to do archaeologically. What seems certain from the massacre assemblages is that women and children were spared and perhaps incorporated by the victors; such personnel can be seen as an alienable resource, but one that has nothing to do with land or food.

Natural environmental downturns or disasters are only one side of the coin to resource competition; such events need to be juxtaposed against the population size or density for different areas since this is critical to potential consequences, to knowing how significant resource scarcity will be felt. Indeed, population pressure alone, even without environmental problems, could be seen as leading to sociopolitical instability and warfare among pre-state societies (e.g., Turchin and Korotayev 2006; cf. Keeley 1996:117–121, 202). At low population density there are more options available for survival within a region during a period of drought or when an early killing frost ruins a maize harvest. This relationship was examined in terms of per capita maize production for two different Puebloan groups of the Southwest by Kohler et al. (2014). For the Mesa Verde region, they found “a weak tendency for decreases in per capita production to lead to increased violence, tenuously supporting much recent thinking by archaeologists about the causes of warfare [as well as] a propensity for periods with high variance in production to have increased violence” (Kohler et al. 2014:457). Kohler et al. could reach such conclusions because of estimates for mean momentary population for various Puebloan periods. Such estimates are unfortunately not available for the Basketmaker II period.

Although a key variable, population is exceedingly difficult to estimate for the Basketmaker II interval. Residential architecture is buried or otherwise difficult to identify thereby limiting the utility of estimates based on the number of individuals per household. Even with adequate counts of Basketmaker II households, temporal resolution is on the order of a few hundred years in the best cases and this requires laboratory dating. Lacking a means to accurately place Basketmaker II sites into relative chronological sequence, even rather gross intervals of several hundred years, there are no estimates of momentary population for this interval. Generating useful estimates of demographic trends during the lengthy Basketmaker II period requires precise

radiocarbon dates on high-quality samples from numerous sites across many local areas, something that is presently available for only a few places like the Rainbow Plateau (Geib 2011). Dates alone can be used as a proxy for population trends based on the simple assumption that the frequency of radiocarbon dates reflects the magnitude of occupation, but the patterning that is evident in such data shows no simple correspondence with the timing of the massacre assemblages. More important, the number of dates currently available for the areas local to the massacre assemblages is so few as to be meaningless for assessing relative population levels.

What seems certain and what few Southwest archaeologists would dispute is that population density during Basketmaker II was likely many orders less than it ultimately was several hundred years later during the Puebloan periods. All estimates of population that have been generated for the Colorado Plateau start off at a low point during the Basketmaker III period and generally climb, sometimes radically so, into the Pueblo II period and often beyond depending on location. Kohler and Reese's (2014) analysis of estimates for birth rate and life expectancy for the prehistoric Southwest (also Kohler et al. 2008) showed that there was a delayed onset to the Neolithic Demographic Transition and that no critical population threshold was crossed until sometime after around AD 500. Kohler and Reese did not try to generate an estimate of population sizes or growth rates, but they sided with previous researchers in concluding that population increased most rapidly between AD 500 and 1000 (2014:10105). They concluded that "the carrying capacity of the agricultural niche in the Southwest" was not reached until around AD 1000 (Kohler and Reese 2014:10101).

Non-Resource Issues

Under many circumstances, it is likely that mates were commonly perceived as being in short supply, at least for some individuals or groups, such as young age cohorts. Therefore, females were probably a persistent source of potential conflict that could initiate competition both within and between groups; this is certainly what the ethnographic record indicates (cf. Kelly 2000:35). Even with a female-biased sex ratio, there is always the potential for some males to monopolize more females through polygyny, or for younger males to be excluded either directly by older males or by female choice because young men lack the status and resources that are useful to female

reproductive success. Since relative comparison often matters most, even if all males have mates, the possibility for more can generate competition.

There is also a critical problem with benefits gained in war that are both divisible and excludable, which pertains to mates, food, and wealth (Table 12.2). Excludability refers to whether benefits can be appropriated by an individual or subgroup such that they cannot be used by others and divisibility refers to whether benefits can be divided among consumers without a reduction in total utility (Boone 1992:328-331). Competition for divisible and excludable benefits can undermine the group cohesion that is necessary to form an effective fighting force. Direct-contest competition for reproductive advantage is not only potentially damaging to the maintenance of a coalition but it is also perhaps less beneficial than it might appear at first glance—problems inherent to having a captive mate with a will of her own.

Table 12.2. Conceivable benefits from an offensive war according to Boone's (1992:Table 10.3) classification of goods based on the combinations of excludability and divisibility.

	Excludable	Nonexcludable
Divisible	Private Benefits: food, wealth, mates, slaves (<i>contest competition</i>)	Partially Public Benefits: prestige, revenge (<i>scramble competition</i>)
Indivisible	Partially Public Benefits: public works	Public Benefits: territory, defense/deterrence

Conflict over external resources might be sufficient cause for war and has an intuitive appeal, but such competition may not be necessary (Robarchek 1990). Regardless of resource abundance, external conflict might be driven by within-group status competition among individuals. War can increase the status of competitors and even killing for revenge fits this since revenge is status regained (McCauley 1990:20). According to Wiessner (2006:168), revenge “is the most commonly given reason for warfare in noncentralized societies.” Since status can directly impact fitness by providing access to mates or resources or conferring advantages to offspring (Chagnon 1988, 1990), competition in this realm is expectable—part and parcel of living socially. Such striving confers benefits both within a group and among groups, especially those that are part of the same general cultural tradition. Status competition may be as basic as

competition for physical resources and mates and can become a significant motivation for war. Moreover, status earned in fighting and war conveys useful information about an individual's abilities. Status competition is a means to compete indirectly for reproductive access or rights. Basically it turns what might have been a contest competition over mates or resources into a scramble competition for prestige.

Status competition is linked to reproductive success in several rather direct as well as indirect ways. First is female choice, which plays a huge part in whether human males have any potential for reproduction. The evolution of cryptic ovulation (Shlain 2003) is probably closely linked since it facilitated the direction of sexual favors toward cooperative and affiliative males while also serving to dampen down within-group competition. Second is that intra- and intergroup relations are key to obtaining mates rather than bullying, intimidation and harassment. Although forceful acquisition of mates is a possibility, there are inherent risks to having a captive "mate"—they can easily return home and enlist the help of kin. According to Wiessner (2006:167), "in most human societies, people reject marriage by abduction so as not to forgo valuable social ties generated by marriage." Related to mating are patterns of female and male dispersal and the nature of social groups. Unlike the male philopatry and female dispersal of chimpanzees (Ghiglieri 1984, 1987; Goodall 1986; Wrangham 1980), and its implications for the relative status of the sexes and other aspects of social organization, humans are far more flexible in how they disperse, with no hard and fast rule. Residence with a male's parents (virilocal) is often seen as the basic forager pattern (e.g. Ember 1975; Service 1967), but Marlowe (2004) has shown this not to be the case. "Murdock's bilocal view is supported by the cross-cultural data and for just the reasons he cited: small, mobile, flexible groups that maintain ties with kin of both husband and wife are well suited to foraging for dispersed and seasonal foods" (Marlowe 2004:283). Long-term pair bonds and links with affinal kin in relations of reciprocity (Fox 1967, 1975; Lévi-Strauss 1969) is a central aspect of human reproductive success.

Status competition in the milieu of group living is variable among recent societies (Benedict 1934) but it can be pervasive. Venues for such competition take many forms including the relatively benign, but many consist of physical contests of strength and bravery that can involve between-group fighting and taking trophies—e.g., various tribes

on the Great Plains (Wright 1965) and the Yanomamö (Chagnon 1983). Because war is risky behavior, it serves as an ideal arena for displays of daring, athletic ability, skill, and leadership. Chagnon (1990:94-95) maintains that attaining high esteem and prestige can have important reproductive benefits and that killing in war can be one of them, since among the Yanomamö it is correlated with twice as many wives and more than three times as many children (Chagnon 1988; cf. Ferguson 2001; Fry 2006:184-199).

War as an arena for acquiring social prestige can entail at least two significant aspects: ritualized action where risk is attenuated by convention and rules (“staged” fights such as jousting or even larger events) and a symbolic component where objects used or acquired in fighting are displayed (status symbols). The assessment of costs and benefits in fighting as an arena for earning status is made chiefly on internal factors rather than externally induced needs. Internal perceptions and motives are salient and count in the long run if they dovetail with the ultimate basis for war (fitness enhancement).

The violence depicted in Basketmaker II rock art allows inferences as to potential personal reasons or emic motives behind conflict. Rock art provides one of the best means for accessing or inferring the worldviews and paradigms of past cultures, even if the specific meanings that images had for their creators are opaque. Basketmaker II rock art does not appear to directly document war per se. It does, however, document one clear consequence of warfare by the presence of numerous flayed head skins. Basketmakers also appear to have documented other potential war trophies in the form of severed arms and legs, actual finds of which have also been recovered from sites of the Four Corners, just as with flayed head skins. At least one rock art panel displays objects of potential power or sorcery that were confiscated from an individual killed by an atlatl dart.

Tangible symbols of valor and victory over opponents can strongly encourage participation in violent intergroup conflict. The societal recognition or prestige that comes from trophies like flayed human head skins forms a tangible reward that helps to sustain the risky behavior of acting like a warrior: McCauley’s (1990:20) “getting a head to get ahead.” Prestige is a divisible but nonexcludable benefit from acting like a warrior, a benefit that will not undermine group cohesion. Warriors are motivated to excel for the social recognition they will receive from being a successful protector of the group and

little serves this better than a body portion of a vanquished enemy. This sort of competition encourages participation in fighting for the group (the scramble competition for prestige) while limiting costly infighting that would corrode the collective action needed for success in warfare.

The cultural value of warrior status symbols does not arise *ex nihilo* but from the prior existence of a social environment characterized by lethal intergroup conflict. One may go to war to literally get a head, but such an account leaves a deeper understanding of causality unexamined—why would a society value such risky behavior and what is the evolutionary payoff to the individual? It is understandable that abstract cultural goals that motivate fighters to attain objectives beneficial to the group serve to facilitate reproductive success. But a state of persistent intergroup hostility would seem to be a necessary precondition for such valuation. This is true of chimpanzee society (e.g., Manson and Wrangham 1991; Wrangham 1999), but it seems an unlikely scenario for human groups in deep time (contra Kelly 2005) when open social networks and fluid associations that facilitated access to the resources of extensive territories (e.g., Whallon 1989) are what furthered reproductive success and the global expansion of humans. The significant factor for the western Basketmaker II case was the presence of predictable and dense subsistence resources (Dyson-Hudson and Smith 1978) in the farm fields that Basketmakers created in settings that were not ubiquitous on the Colorado Plateau. Groups linked their identity and survival to particular places from which developed a consensus that defense of these locations was of mutual benefit—the interests of various individuals become welded together and focused to form a group interest.

Final Thoughts

I remain uncertain whether western Basketmaker II groups used their S-shaped flat curved sticks to deflect atlatl darts. I am certain, however, that Guernsey and Kidder were correct in stating that these artifacts were not rabbit sticks, at least that was not their intended primary role. Basketmakers understood the principal of rabbit sticks and even recycled some of their S-shaped sticks for this purpose, but they did not fabricate these items for throwing at small game. I am also convinced that Native Americans deflected atlatl darts with flat curved sticks in other portions of the Southwest well prior to the Basketmaker II period. The early Archaic examples of these artifacts from the

Chihuahuan and Sonoran deserts do not appear to have been designed like rabbit sticks and they also lack obvious traces of such use. Defensive weapons in the early Archaic suggest that warfare had ancient roots in parts of the Southwest. Many of the late Archaic/Early Agricultural period examples from the Correo site and elsewhere also are poorly suited for throwing at small game and likewise lack evidence of such use. The smoking gun in support of the fending stick hypothesis might exist but I did not document it in my sample of almost 500 artifacts. Nonetheless, there is use-wear that is strongly supportive of atlatl dart deflection including one example where a probable stone tipped dart embedded itself into the wood. Unfortunately, the stick's owner pulled out this intruding object leaving its identification open to interpretation. Flat curved sticks ultimately became specialized implements for hunting small game (rabbit sticks) and as a result became simplified in form and expedient in fabrication, changes that reflect a fine tuning of morphology for this role. As agricultural fields expanded across the Southwest after the introduction of Mesoamerican crops, the disturbed habitats increased the abundance of rabbits, hares and other small game and garden hunting became a common strategy (Linares 1976; Neusius 2008). As a consequence, the utility of rabbit sticks greatly increased.

Knocking aside atlatl darts with a small stick is doable, even at relatively close range, and Native Americans of central Brazil still perform a feat like this in a duel-like ritual. The fending hypothesis is most logical in a duel-like contest like the atlatl jousts of South America or in a rule-bound non-lethal battle like those that still occur on Makira Island of the Solomon Islands. Formal fights with serious intent to kill, but where such intent cannot be effectively acted on, might also qualify; the theater-like battles of the Dugam Dani are like this (Roscoe 2011) and the open grasslands around the Correo shrine in New Mexico might have provided a similar setting since the terrain is not suitable for a surprise attack. Yucatec Maya appear to have performed a ceremony in the 1500s that involved a dart throwing contest between two warriors (dancers) somewhat analogous to the one in South America, but where a short stick was used for defense against atlatl darts. Given the presence of flat curved sticks at Chichén Itzá in close association with atlatls and darts and deposited in the Sacred Cenote as part of a military rite (Ringle 2009), the defensive sticks used by the Maya at contact were probably the

surviving forms of the prehistoric flat curved sticks. The Cenote can be seen as analogous to the Correo shrine, portals to the underworld/previous world, and Native Americans placed weapons of war—atlatl darts and fending sticks—into both these subterranean chambers. The implication is that the Cenote ritual represents the continuation or modification of one that was practiced in the Southwest at around 2000 cal. BC. Because the earliest examples of flat curved sticks are almost 9000 years old and seem designed for a purpose other than hunting, ritual fighting involving atlatls, darts, and fending sticks may have a similar temporal depth. The South American atlatl duel ritual might well represent the surviving remnant of a once widespread practice in the Americas.

Western Basketmakers may have participated in this custom or at least appear to have had some knowledge of it from oral tradition since the flat curved stick appears to have held special meaning for them. A Zuni man identified a prehistoric flat curved stick from the Correo site as a *bow priest club*, a symbol of membership in the warrior society (bow priesthood). Bow can be read as *atlatl* for the time period when the stick was deposited in the shrine. This may well have been what the S-shaped stick signified in Basketmaker II society—a badge of specific warrior status, perhaps for someone who participated in an atlatl duel like those shown in Basketmaker rock art. Flayed human head skins appear to have been another symbol of warrior status and the count of these might also be depicted in their rock art by the crescent headdresses that adorn male figures (Robins 2002). Basketmakers might never have used S-shaped sticks for defensive purposes but they still could have considered them as symbols of warrior status much like the sabers that military officers of today still have for ceremonial occasions but not active duty.

ENDNOTES

ⁱ Replicated examples take a minimum of 3 hours to make with the help of modern tools and without incising the grooves into both faces; with stone tools the effort takes about 2-3 times longer and then there is the engraving of the longitudinal grooves.

ⁱⁱ Claims that grooved flat curved sticks are temporally associated with the bow and arrow resulted from work in Texas (e.g., Coffin 1932; Jackson 1937); Heizer (1942:44) accepted this claim. Given the rather crude recovery methods including a lack of excavation by strata, such association could be spurious, requiring confirmation by direct dating. As reported in Chapter 10, some of the flat curved sticks from west Texas are contemporary with bow technology and extend in time up to the late prehistoric period.

ⁱⁱⁱ That the grooved curved objects in the hands of warriors at Chichén Itzá are indeed grooved curved sticks like those found in the Southwest has been disputed by several authors (e.g., Hassig 1988, 1992), a topic that I cover in Chapter 6.

^{iv} Earl Morris did not always believe in the fending interpretation since the two examples of S-shaped grooved curved sticks that he excavated in 1929 from Cave 2 in Moqui Canyon, UT and Battle Cave in Canyon del Muerto, AZ were identified as rabbit or throwing sticks and presented as such to the museums that received the collections: Chapin Mesa Museum, Mesa Verde, CO and AMNH, New York City respectively.

^v Charles and Cole (2006) include Basketmaker remains from what they term the Chuska/Lukachukai site group as part of the eastern Basketmaker II variant; this includes sites from Chinle Valley (Gilpin 1994) along with Painted Cave (Haury 1945). To the contrary, rock art and material remains from the entire Chinle drainage, including Canyon de Chelly, place this region within the western Basketmaker II variant; this also includes the Prayer Rock area. Sites on the floor of the Chuska Valley (Baugh et al. 1998; Kearns 2011) on the eastern side of the Chuska/Lukachukai mountain chain might be considered part of the eastern Basketmaker II variant, but based on the projectile points that Kerns (2011:59-61, Figure 4) describes and illustrates, assignment to the western variant seems a better match.

^{vi} Some authors claim that Raymond Kelly (2000) “offers a good working definition for examining prehistoric warfare” (Roksandic 2006:167, also Roksandic 2004). Kelly (2000:5, 21, 41) invokes the principal of social substitutability or social substitution to specify how war differs from other forms of human conflict such as disputes, altercations and collective execution. At play are the interrelated concepts of group injury, group responsibility and group liability (Kelly 2000:5). He is very clear that feuds are included in his category of war, which parallels other authors with broad definitions (e.g., Divale and Harris 1976:521). The notion of social substitutability goes right to the heart of Kelly's definition of war and his ethnographic approach to the topic: "it is critical that war be analyzed as meaningful entailed social action (intelligible from the actor's point of view) rather than simply in behavioral terms" (Kelly 2000:5). But can archaeologists actually know the actor's point of view when we only study the consequences of actions? How can we know if the calculus of social substitutability was applied with say Ötzi the Iceman who evidently died after being shot in the back with an arrow (<http://www.iceman.it/en/how-oetzi-died>). Was this capital punishment or homicide and thus not war according to Kelly, or was he shot in the back as a representative of a targeted group? In this instance there is other evidence suggestive of hand-to-hand combat and perhaps the blood of other individuals, but again inferring social substitution is problematic. For the archaeological study of war a simple behavioral definition not only seems appropriate but necessary given that we lack ready access to past people's points of view—the meanings behind their social actions.

^{vii} Charles McLoyd was actually the first to clearly distinguish long-headed “Cave Dwellers” (Basketmaker II people) from short-skulled “Cliff Dwellers” (Puebloans). McLoyd was a former digging partner of Richard Wetherill and he along with C.C. Graham and others were the first to make collecting expeditions into SE Utah during the 2 years prior to Wetherill's Cave 7 discovery. McLoyd lacked clear stratigraphic evidence to show that the Cave Dwellers significantly predated the Cliff Dwellers, which is what Wetherill conclusively demonstrated at Cave 7. With the aceramic long-headed Cave Dwellers buried below and separated from the remains of Cliff Dwellers by 3 feet

or so of clean sediment, the relatively greater antiquity of the culture we now call “Basketmaker” was obvious.

^{viii} The foreshaft had been wired in place by either Morris or AMNH to prevent inadvertent loss but since the curatorial staff needed to remove this wire, which was oxidizing and staining the wood, the foreshaft was pulled from the body thereby allowing photography and study.

^{ix} In a February 4, 1894 letter to Talbot Hyde, Richard Wetherill writes the following: “I saved all the skeletons from the first cave as I thought you would want them for study, but I will not save any more; the distance is too great, but will save all skulls.” This aptly summarizes the general approach of that time, which is why Wetherill (and others) noted so many headless bodies at previously excavated sites that he also worked at.

^x The Lovelock specimens are undated but based on their poor condition compared with the beautiful preservation of many old artifacts at this site they must have come from deep within the deposits and likely have an antiquity equal to those at Fish Cave. My 2009 detailed study of the Fish Cave specimens, which are all fragmentary, strongly suggests that they were unlikely to have been used for rabbit hunting. The use-wear on the fragments is inconsistent with such an interpretation, especially the lack of obvious battering or crushing of the wood, which is quite soft (probably willow or cottonwood). Given the location of these artifacts in an area where foragers depended on waterfowl, it is far more likely that these sticks were used to procure ducks and perhaps larger waterfowl. Sticks thrown to spin in the air above a flock of ducks have the effect of suppressing flight because the thrown object is mistaken for a hawk or other hunting bird (Chuck LaRue, personal communication 2011). This could have been an effective strategy for forcing a flock not to fly or for driving them to where they could be easily netted. Foragers also likely used such sticks as killing weapons to strike waterfowl as they lifted off in flight.

APPENDIX A:

FLAT CURVED STICK ANALYSIS FORM

Grooved Curved Stick Analysis Form

Stick # _____ page 1 of 2

Site Name / #: _____ Provenience #: _____ Item #: _____
Repository: _____ Accession #: _____
Provenience Information: _____

Analyst: _____ Date: _____

Description: _____

Condition: complete nearly complete fragmentary unfinished
Portion: handle to mid handle only distal to mid distal tip
 mid section no proximal or distal other (specify) _____

Breakage: transverse medial crack longitudinal split distal longitudinal split proximal
 other _____

Preservation: poor (could not turn over) fragile (turned with care) good (solid, weathered) well preserved

Decoration: none grooves groove count: _____ gaps gap count: _____ painted color: _____
Description: _____

Overall Use Wear: sheen/polish abrasion scratches dents nicks gouges
 other: _____

Use Wear Preservation: excellent good variable (good to poor) modest poor
Description: _____

Dimensions

Length overall _____ cm with bend _____ cm
Width proximal: _____ cm medial: _____ cm distal: _____ cm
Thickness proximal: _____ cm medial: _____ cm distal: _____ cm
Weight _____ grams

HANDLE END

Grip present absent can't tell (mid or distal fragment) Type plain wrapped knob
Preparation: scored lines crisscross lines pitch veneer pitched cord wrap notch to seat cord
Cordage type: _____ Knot Type: _____ sinew other: _____
Description: _____

Measurements: length _____ cm width _____ cm thickness _____ cm other _____

Wraps present absent Wrap Type sinew cordage (type: _____) other: _____
Description: _____

Wear Patterns/Stains carbonization packrat urine stains (not urine, specify: _____)
 sheen/polish abrasion scratches dents nicks gouges other: _____
Description: _____

Other observations:

DISTAL END

Wraps present absent **Wrap Type** sinew cordage (type: _____) other: _____
Description: _____

Wear Patterns/Stains carbonization packrat urine stains (not urine, specify: _____)
 sheen/polish abrasion scratches dents nicks gouges other: _____
Description: _____

Other observations: _____

MEDIAL PORTION

Wraps present absent **Wrap Type** sinew cordage (type: _____) other: _____
Description: _____

Wear Patterns/Stains carbonization packrat urine stains (not urine, specify: _____)
 sheen/polish abrasion scratches dents nicks gouges other: _____
Description: _____

Other observations: _____

WOOD IDENTIFICATION

oak
 other: _____

¹⁴C AGE

RCYBP: _____ Lab #: _____ $\delta^{13}\text{C}$: _____

ARTIFACT SKETCHES (also see attached sheet)

Cross-section (life size)

REFERENCES

- Aguadé, Carmen Ma. Pijoan and Josefina Mansilla Lory
 2000 La Cueva de La Candelaria: Bultos Mortuorios y Materiales. *Chungará. Revista de Antropología Chilena*, 32(2):211-215.
- Alexander, Hubert G. and Paul Reiter
 1935 *Report on the Excavation of Jemez Cave, New Mexico*. Monographs of the School of American Research, No. 4. University of New Mexico Press, Albuquerque.
- Ames, Kenneth M., Kristen A. Fuld, and Sara Davis
 2010 Dart and Arrow Points on the Columbia Plateau of Western North America. *American Antiquity* 75:287-325.
- Amsden, Charles A.
 1949 *Prehistoric Southwesterners from Basketmaker to Pueblo*. Southwest Museum, Los Angeles.
- Arkush, Elizabeth N.
 2008 Warfare and Violence in the Americas. Book review essay. *American Antiquity* 73:560-565.
- Arnold, Philip J.
 2003 Back to Basics: The Middle Range Program as Pragmatic Archaeology. In *Essential Tensions in Archaeological Method and Theory*, edited by Todd L. VanPool and Christine S. VanPool, pp. 55-66. University of Utah Press, Salt Lake City.
- Andrushko, Valerie A., Kate A. Latham, Diane L. Grady, Allen G. Pastron, and Phillip L. Walker
 2005 Bioarchaeological Evidence for Trophy Taking in Prehistoric Central California. *American Journal of Physical Anthropology* 127: 375-384.
- Aschmann, Homer
 1959 *The Central Desert of Baja California: Demography and Ecology*. University of California Press, Berkeley.
- Aveleyra Arroyo de Anda, Luis; Manuel Maldonado-Koerdell y Pablo Martínez del Río
 1956 *Cueva de La Candelaria*. Vol. I; Memorias del -Instituto Nacional de Antropología e Historia, 5, México, D. F.
- Bahn, Paul G.
 1998 *The Cambridge Illustrated History of Prehistoric Art*. Cambridge University Press, Cambridge.
 2010 *Prehistoric Rock Art: Polemics and Progress*. Cambridge University Press, New York.
- Bandelier, Adolph F.
 1890 *Final Report of Investigations among the Indians of the Southwestern United States, Part I*. Papers of the Archaeological Institute of America, American Series No. 3. Cambridge, Mass.
- Basso Ellen B.
 1973 *The Kalapalo Indians of Central Brazil*. Holt, Rinehart and Winston, New York.
- Baugh, Timothy G., Timothy M. Kearns, and Charles W. Wheeler (editors)
 1998 Pipeline Archaeology 1990-1993: the El Paso Natural Gas North System Expansion Project, New Mexico and Arizona. Volume II Book 1 of 2: Archaic, Basketmaker II, Protohistoric, and Aceramic Sites in Northwestern New Mexico. Western Cultural Resource Management, Farmington, NM.
- Beaglehole, Ernest and Pearl Beaglehole
 1976 *Hopi of the Second Mesa*. Memories of the American Anthropological Association 44. Kraus Reprint Co., Millwood, New York.
- Bell, Willis H.; Castetter, Edward F.
 1937 *The Utilization of Mesquite and Screwbean by the Aborigines in the American Southwest*. Ethnobiology Studies in the American Southwest Bulletin Vol. 5, No. 2. University of New Mexico, Albuquerque.

- Benedict, Ruth.
1934 *Patterns of Culture*. Houghton, Mifflin Company, Boston.
- Berlo, Janet Catherine
1989 Early Writing in Central Mexico: In Tlilli, In Tlapalli before A.D. 1000. In *Mesoamerica after the Decline of Teotihuacan, A.D. 700-900*, edited by Richard A. Diehl and Janet Catherine Berlo, pp. 19-47. Dumbarton Oaks, Washington, D.C.
- Bernatzik, Hugo Adolf
1936 *Owa Raha*. Bernina-Verlag, Vienna.
- Berry, Claudia F.
1984 *Coronado Project Archaeological Investigations. A Description of Lithic Collections from the Railroad and Transmission Line Corridors*. Coronado Series 6, MNA Research Paper 29. Museum of Northern Arizona Press, Flagstaff.
1987 *A Reassessment of the Southwestern Archaic*. Ph.D. dissertation, Department of Anthropology, University of Utah. University Microfilms, Ann Arbor,
- Berry, Claudia F. and Michael S. Berry
1986 Chronological and Conceptual Models of the Southwestern Archaic. In *Anthropology of the Desert West. Essays in Honor of Jesse D. Jennings*, edited by Carol J. Condie and Don D. Fowler, pp. 253-327. Anthropological Paper 110, University of Utah Press, Salt Lake City.
- Berry, Michael S. and Claudia F. Berry
1976 *An Archaeological Reconnaissance of the White River Area, Northeastern Utah*. Antiquity Section Selected Papers No. 4. Utah State Historical Society, Salt Lake City.
- Best, Anne
2003 *Regional Variation in the Material Culture of Hunter Gatherers: Social and Ecological Approaches to Ethnographic Objects from Queensland, Australia*. BAR International Series 1149. Archaeopress, Oxford.
- Billman, Brian R., Patricia M. Lambert, and Banks L. Leonard
2000 Cannibalism, Warfare, and Drought in the Mesa Verde Region during the Twelfth Century AD. *American Antiquity* 65:145-178.
- Binford, Lewis R.
1977 Introduction. In *For Theory Building in Archaeology*, edited by Lewis R. Binford, pp. 1-10. Academic Press, New York.
- Blackburn Fred M. and Victoria M. Atkins
1993 Handwriting on the Wall: Applying Inscriptions to Reconstruct Historic Archaeological Expeditions. In *Anasazi Basketmaker: Papers from the 1990 Wetherill-Grand Gulch Symposium*, edited by Victoria M. Atkins, pp. 41-100. Cultural Resource Series No. 24. Bureau of Land Management, Salt Lake City.
- Blackburn, Fred M., and Winston B. Hurst
1994, Charley Lang: Pioneer Photographer, Musician and Archaeologist. *Blue Mountain Shadows* 14:5-13. San Juan County Historical Commission, Monticello, Utah.
- Blackburn, Fred M. and Ray A. Williamson
1997 *Cowboys and Cave Dwellers: Basketmaker Archaeology in Utah's Grand Gulch*. School of American Research Press, Santa Fe.
- Bolton, Eugene Herbert
1931 *Font's Complete Diary: A Chronicle of the Founding of San Francisco*. University of California Press, Berkeley.
- Boone, James L.
1992 Competition, Conflict and the Development of Social Hierarchies. In *Evolutionary Ecology and Human Behavior* edited by Eric A. Smith and Bruce Winterhalder, pp. 301-337. Aldine de Gruyter, Hawthorne, NY.

- Bronk Ramsey, Christopher
2009 Bayesian Analysis of Radiocarbon Dates. *Radiocarbon* 51:337-360.
- Brown, David E. (editor)
1982 *Desert Plants. Biotic communities of the American southwest United States and Mexico.* University of Arizona, Tucson
- Bruhn, Frank, Alexander Duhr, Pieter M Grootes, Annette Mintrop, and Marie-Josée Nadeau
2001 Chemical Removal of Conservation Substances by 'Soxhlet'-type Extraction. *Radiocarbon* 43:229-237.
- Butler, Charles T.
1948 *A West Texas Rock Shelter.* Master's thesis, University of Texas at Austin.
- Callahan, Errett
1999 How to Make a Throwing Stick. The Non-Returning Boomerang. In *Primitive Technology: A Book of Earth Skills*, edited by David Wescott, pp. 214-218.
- Campbell, Paul D.
1999 *Survival Skills of Native California.* Gibbs Smith, Layton, UT.
- Castetter, Edward F., and Willis H. Bell
1942 *Pima and Papago Indian Agriculture.* University of New Mexico Press, Albuquerque.
- Castiglia, Peter J. and Peter J. Fawcett
2006 Large Holocene Lakes and Climate Change in the Chihuahuan Desert. *Geology* 34:113-116.
- Cervera Obregón, Marco A.
2007 *El Armamento Entre Los Mexicanos.* Anejos de Gladius 11, Consejo Superior de Investigaciones Científicas, Polifemo Ediciones, Madrid.
- Chacon, Richard J. and David H. Dye (editors)
2007 *The Taking and Displaying of Human Body Parts as Trophies by Amerindians.* Springer Press, New York City.
- Chacon, Richard J. and David H. Dye
2007 Conclusions. In *The Taking and Displaying of Human Body Parts as Trophies by Amerindians*, edited by Richard J. Chacon and David H. Dye, pp. 630-653. Springer Press, New York City.
- Chagnon, Napoleon A.
1983 *Yanomamö: The Fierce People* 3ed. Holt, Rinehart and Winston, New York.
1988 Life histories, blood revenge, and warfare in a tribal population. *Science* 239:985-992.
1990 Reproductive and Somatic Conflicts on Interest in the Genesis of Violence and Warfare among Tribesmen. In *The Anthropology of War*, edited by Jonathan Haas. Cambridge University Press, Cambridge.
- Charles, Mona C. and Sally J. Cole
2006 Chronology and Cultural Variation in Basketmaker II. *Kiva* 72:167-216.
- Charlot, Jean
1931 Bas-reliefs from the Temple of the Warriors Cluster. In *The Temple of the Warriors at Chichen Itzá* by Earl H. Morris, Jean Charlot, and Ann Axtell Morris. Carnegie Institute of Washington No. 406. Vol. 1, pp. 229-346; Vol. 2, plates 28-129. Carnegie Institute, Washington D.C.
- Chelf, Carl
1946 Grooved Clubs from a Peat Bog in Milam County, Texas. *Bulletin of the Texas Archeological and Paleontological Society* 17: 42-47.
- Chisholm, B., and R. G. Matson
1994 Carbon and Nitrogen Isotopic Evidence on Basketmaker II Diet at Cedar Mesa, Utah. *Kiva* 60:239-256.

- Clark, Jeffery J.
 2007 Archaeological Concepts for Assessing Zuni-Mogollon Connections. In *Zuni Origins: Toward a New Synthesis of Southwestern Archaeology*, edited by David A. Gregory and David R. Wilcox, pp. 39-48. University of Arizona Press, Tucson.
- Coffin, Edwin F.
 1932 *Archaeological Exploration of a Rock Shelter in Brewster County, Texas*. Monograph No. 48, Museum of the American Indian, Heye Foundation, New York.
- Coggins, Clemency C.
 1984a The Cenote of Sacrifice Catalogue. In *Cenote of Sacrifice: Maya Treasures from the Sacred Well at Chichén Itzá*, edited by Clemency C. Coggins and Orrin C. Shane III eds. Pp.23-155. University of Texas Press, Austin.
 1984b Murals in the Upper Temple of the Jaguars, Chichén Itzá. In *Cenote of Sacrifice: Maya Treasures from the Sacred Well at Chichén Itzá*, edited by Clemency Chase Coggins and Orrin C. Shane III, 157-165. University of Texas Press, Austin.
- Coggins, Clemency C. and Orrin C. Shane, III (editors)
 1984 *Cenote of Sacrifice: Maya Treasures from the Sacred Well of Chichen Itza*. University Of Texas Press, Austin.
- Cole, Sally J.
 1984 Analysis of a San Juan (Basketmaker) Style Painted Mask in Grand Gulch, Utah. *Southwestern Lore* 50(1):1-6.
 1985 Additional Information on Basketmaker Masks or Faces in Southeastern Utah. *Southwestern Lore* 51(1):14-18.
 1989 Iconography and Symbolism in Basketmaker Rock Art. In *Rock Art of the Western Canyons*, edited by Jane S. Day, Paul D. Friedman, and Marcia J. Tate, pp. 59-85. Colorado Archaeological Society Memoir 3. Denver Museum of Natural History and Colorado Archaeological Society, Boulder.
 1990 *Legacy on Stone: Rock Art of the Colorado Plateau and Four Corners Region*. Johnson Books, Boulder.
 1993 Basketmaker Rock Art at the Green Mask Site, Southeastern Utah. In *Anasazi Basketmaker, Papers from the 1990 Wetherill-Grand Gulch Symposium*, edited by Victoria Atkins, pp. 192-220. Cultural Resource Series 24, Bureau of Land Management, Salt Lake City.
 2009 *Legacy on Stone: Rock Art of the Colorado Plateau and Four Corners Region*. Revised and updated. Johnson Books, Boulder.
- Coltrain, Joan, and Joel C. Janetski
 2013 The Stable and Radio-Isotope Chemistry of Southeastern Utah Basketmaker II Burials: Dietary Analysis using the Linear Mixing Model SISUS, Age and Sex Patterning, Geolocation and Temporal Patterning. *Journal of Archaeological Science* 40:4711-4730.
- Coltrain, Joan B., Joel C. Janetski and Shawn W. Carlyle
 2006 The Stable and Radio-Isotope Chemistry of Eastern Basketmaker and Pueblo Groups in the Four Corners Region of the American Southwest: Implications for Anasazi Diets, Origins and Abandonments. In *Stories of Maize: Multidisciplinary Approaches to the Prehistory, Biogeography, Domestication, and Evolution of Maize (Zea mays L.)*, edited by John E. Staller, Robert H. Tykot and Bruce F. Benz, pp. 275-287. Elsevier, San Diego.
 2007 The Stable- and Radio-Isotope Chemistry of Western Basketmaker Burials: Implications for Early Puebloan Diets and Origins. *American Antiquity* 72:301-321.
- Coltrain, Joan B., Joel C. Janetski and Michael D. Lewis
 2012 A Re-assessment of Basketmaker II Cave 7: Massacre Site or Cemetery Context. *Journal of Archaeological Science* 39:2220–2230.
- Cook, E. R., C.A. Woodhouse, C.M. Eakin, D.M. Meko and D.W. Stahle
 2008 *North American summer PDSI reconstructions, version 2a, IGBP PAGES World Data Cent*. Paleoclimatological Data Contribution Series 2008-046, Paleoclimatological Program, NGDC, NOAA, Boulder.

- Cordell, Linda
1984 *Prehistory of the Southwest*. Academic Press, New York.
- Corliss, David W.
1972 *Neck Width of Projectile Points: An Index of Cultural Continuity and Change*. Occasional Papers No. 29. Idaho State University Museum, Pocatello.
- Cosgrove, C. B.
1947 *Caves of the Upper Gila and Hueco Areas in New Mexico and Texas*. Papers of the Peabody Museum of American Archaeology and Ethnology 24(2). Harvard University, Cambridge, MA.
- Creel, Darrell G.
1997 Ceremonial Cave: An Overview of Investigations and Contents. Appendix A. In: *The Hueco Mountain Cave and Shelter Survey: A Phase I Baseline Inventory in Maneuver Area 2D on Fort Bliss, Texas* by Federico A. Almaraz and Jeff D. Leach, pp 75-88. Archaeological Technical Reports 10. Anthropology Research Center, University of Texas, El Paso.
- Curtis, Edward S.,
1922 The Hopi. Vol. 12 of *The North American Indian* edited by Frederick W. Hodge. Plimpton Press, Norwood, MA. <http://curtis.library.northwestern.edu/curtis/catalogrecord.html#catalog>
1926a Southern California Shoshoneans. The Diegueños. Plateau Shoshoneans. The Washo. Vol 15 of *The North American Indian*, edited by Frederick W. Hodge. Plimpton Press, Norwood, MA. <http://curtis.library.northwestern.edu/curtis/catalogrecord.html#catalog>
1926b The Tiwa. The Keres. Vol. 16 of *The North American Indian* edited by Frederick W. Hodge. Plimpton Press, Norwood, MA. <http://curtis.library.northwestern.edu/curtis/catalogrecord.html#catalog>
- Darlington, Herbert S.
1939 The Meaning of Head Hunting: An Analysis of a Savage Practice and Its Relationship to Paranoia. *Psychoanalytic Review* 26(1):55-68.
- Davenport, W. H.
1996 Wogasia. An Annual Renewal Rite in the Eastern Solomon Islands. *Expedition* 38(3): 24-40.
- Davidson, George
1873 Notes on Professor Davidson's Communication at the June 17, 1872, Regular Meeting of the California Academy of Sciences Regarding a Nonreturn Boomerang from Santiago Canyon, Orange County. *Proceedings of the California Academy of Sciences* 4:233, San Francisco.
- d'Azevedo, Warren L. (editor)
1986 *Handbook of North American Indians, Volume 11: Great Basin*. Smithsonian Institution Press, Washington, D.C.
- Dean, Jeffrey S.
1975 *Tree ring dates from Colorado W: Durango area*. Laboratory of Tree-Ring Research, Tucson.
1988 Dendrochronology and Paleoenvironmental Reconstruction on the Colorado Plateaus. In *The Anasazi in a Changing Environment*, edited by George J. Gumerman, pp. 119-167. Cambridge University Press, Cambridge.
- Densmore, Frances
1918 *Teton Sioux Music*. Bureau of American Ethnology, Bulletin No. 61, U.S. Government Printing Office, Smithsonian Institution, Washington, D.C.
- Divale, William T. and Marvin Harris
1976 Population, Warfare, and the Male Supremacist Complex. *American Anthropologist* 78: 521-538.
- Dohm, Karen
1994 The Search for Anasazi Village Origins: Basketmaker II Dwelling Aggregation on Cedar Mesa. *Kiva* 90:257-276.
1995 Survey Evidence for Basketmaker II Villages. In *Exploring Anasazi Origins: The Cedar Mesa Basketmaker II*. Report to Bureau of Land Management Monticello, Utah, edited by R.G. Matson

and Michael Brand, pp.33-54. Available on line at: http://www.anth.ubc.ca/fileadmin/user_upload/anso/LOA_PDFs/Matson_and_Brand_1995/Matson_and_Brand_1995.pdf

- Dominguez Virginia R.
1986 The Marketing of Heritage. *American Ethnologist* 13:546-555.
- Drucker, Philip
1937 Culture Element Distributions: V, Southern California. *University of California Anthropological Records* 1(1).
1941 Culture Element Distributions: XVII, Yuman-Piman. *University of California Anthropological Records* 6(3).
- Duhaut-Cilly, A.
1929 Duhaut-Cilly's Account of California in the Years 1827-28. *California Historical Society Quarterly* 8(3):214-250. (Translated by C. F. Carter.)
- Dunnell, Robert C.
1978 Style and Function: A Fundamental Dichotomy. *American Antiquity* 43:192-202.
- Durham, William H.
1976 Resource Competition and Human Aggression. Part 1: A Review of Primitive War. *Quarterly Review Biology* 51:385-415.
- Dyson-Hudson, R. & Eric A. Smith
1978 Human territoriality: An ecological assessment. *American Anthropologist* 80:21-42.
- Ellis, Christopher J.
1997 Factors Influencing the Use of Stone Projectile Tips: An Ethnographic Perspective. In *Projectile Technology*, edited by Heidi Knecht, pp. 37-74. Plenum Press, New York.
- Ellis, Florence H.
1951 Patterns of Aggression and the War Cult in Southwestern Pueblos. *Southwestern Journal of Anthropology*, 7:177-201.
- Ember, Carol R.
1975 Residential Variation among Hunter-Gatherers. *Behavior Science Research* 10:199-227.
- Ember, Carol R. and Melvin Ember
1992 Resource Unpredictability, Mistrust, and War: A Cross-Cultural Study. *The Journal of Conflict Resolution* 36:242-262.
- Evans, Bill
2005 Solomon Islands. In *Shields of Melanesia*, edited by Harry Beran and Barry Craig, pp. 237-253. Crawford House Publishing, Belair, Australia.
- Farmer, James D.
1993 *Style and Variation in Early Anasazi Art: The Green Mask Site in Grand Gulch, Utah*. Ph.D. dissertation, Department of Art History, University of Texas, Austin. University Microfilms, Ann Arbor.
1997 Iconographic Evidence of Basketmaker Warfare and Human Sacrifice: A Contextual Approach to Early Anasazi Art. *Kiva* 62:391-420.
- Fawcett, W. B., Jr., and M. Kornfeld
1980 Projectile Point Neck-Width Variability and Chronology on the Plains. *Wyoming Contributions to Anthropology* 2:66-79.
- Ferdon, Edwin N., Jr.
1946 *An Excavation of Hermit's Cave, New Mexico*. Monograph No. 10, School of American Research, Santa Fe.
- Ferg, Alan and William D. Peachey
1998 An Atlatl from the Sierra Pinacate. *Kiva* 64:175-200.

- Ferguson, R. Brian
 1984 Introduction: Studying War. In *Warfare, Culture, and Environment*, edited by R. Brian Ferguson, pp. 1-81. Academic Press, Orlando.
 1989 Do Yanomamo Killers Have more Kids? *American Ethnologist* 16:564-565.
 1990 Explaining War. In *The Anthropology of War*, edited by Jonathan Haas, pp. 26-55. Cambridge University Press, Cambridge
 2001 Materialist, Cultural and Biological Theories on Why Yanomami Make War. *Anthropological Theory* 1:99-116.
- Fewkes, Jesse W.
 1911 *Preliminary Report on a Visit to the Navaho National Monument, Arizona*. Bureau of American Ethnology Bulletin 50. Smithsonian Institution, Washington, D.C.
- Fields, Ronald C. D.
 2013 *Do Arrow Foreshafts Differ from Atlatl Dart Foreshafts?* MA Thesis, Department of Anthropology, University of New Mexico, Albuquerque.
- Finegold, Andrew
 2012 Dramatic Renditions: Battle Murals and the Struggle for Elite Legitimacy in Epiclassic Mesoamerica. Ph.D. dissertation, Columbia University.
<http://academiccommons.columbia.edu/catalog/ac%3A174576>
- Fletcher, Alice C. and Joseph Laflesche.
 1911 *The Omaha Tribe*. Bureau of American Ethnology, 27th Annual Report 1905-06, U.S. Government Printing Office, Smithsonian Institution, Washington D.C.
- Ford, Richard I.
 1984 Ecological Consequences of Early Agriculture in the Southwest. In *Papers on the Archaeology of Black Mesa, Arizona, Volume II*, edited by Stephen Plog and Shirley Powell, pp. 127-138. Southern Illinois University Press, Carbondale.
- Fox, Charles E.
 1924 *The Threshold of the Pacific. An Account of the Social Organization, Magic, and Religion of the People of San Cristoval in the Solomon Islands*. A.A. Knopf, New York.
- Fox, Robin
 1967 *Kinship and Marriage: An Anthropological Perspective*. Penguin Books; Baltimore.
 1975 Primate and human kinship. In *Biosocial Anthropology*, edited by Robin Fox, pp. 9-35. Malaby Press, London.
- Friederici, Georg
 1907 *Scalping in America*. Smithsonian Institution Annual Report 1906, pp. 423-438. Smithsonian Institution Press, Washington D.C.
- Fry, Douglas P.
 2006 *The Human Potential for Peace: An Anthropological Challenge to Assumptions about War and Violence*. New York: Oxford University Press.
- Galvin, John (editor)
 1967 *A Record of Travels in Arizona and California, 1775-1776*, by Fr. Francisco Garces. John Howell Books, San Francisco.
- Garfinkel, Alan P. and Donald R. Austin
 2011 Reproductive Symbolism in Great Basin Rock Art: Bighorn Sheep Hunting, Fertility and Forager Ideology. *Cambridge Archaeological Journal* 21:453-471.
- Garfinkel, Alan P., David A. Young, and Robert M. Yohe II
 2010 Bighorn Hunting, Resource Depression, and Rock Art in the Coso Range, Eastern California: A Computer Simulation Model. *Journal of Archaeological Science* 37:42-51.

- Garnett, Justin
 2015 Experiments in Fending Atlatl Darts with Basketmaker S-Shaped Sticks. Poster presented at the 73 Plains Anthropological Conference, Iowa City.
- Gat, Azar
 1999 The Pattern of Fighting in Simple, Small-Scale Prestate Societies. *Journal of Anthropological Research* 55:563-583.
- Gates, William (translator)
 1937 *Yucatan Before and After the Conquest by Diego de Landa*. reprint 1978. Dover, New York.
- Geib, Phil R.
 1990 A Basketmaker II Wooden Tool Cache from Lower Glen Canyon. *Kiva* 55:265-277.
 1996 *Glen Canyon Revisited*. Anthropological Paper No. 119, University of Utah Press, Salt Lake City.
 2002 Basketmaker II Horn Flakers and Dart Point Production: Technological Change at the Agricultural Transition. In *Traditions, Transitions and Technologies: Themes in Southwest Archaeology*, edited by Sarah H. Schlanger, pp. 272-306. University Press of Colorado, Boulder.
 2004 AMS Dating of a Basketmaker II Hunter's Bag (Cache 1) from Sand Dune Cave, Utah. *Kiva* 69:271-282.
 2011 *Foragers and Farmers of the Northern Kayenta Region. Excavations along the Navajo Mountain Road*. University of Utah Press, Salt Lake City.
- Geib, Phil R. Nancy Coulam, Victoria H. Clark, and Kelley A. Hays-Gilpin
 2007 AZ-J-14-41 (Atlatl Rock Cave). In *Prehistory of the Northern Kayenta Anasazi Region: Archaeological Excavations along the Navajo Mountain Road, Vol. 2, Archaic Site Descriptions*, edited and assembled by Phil R. Geib, Kimberly Spurr and Jim Collette, pp. II-2-1–II-2-63. Navajo Nation Archaeology Department Report No. 02-48, Window Rock, AZ.
<http://content.lib.utah.edu/cdm/compoundobject/collection/upoa/id/124/rec/7>
- Geib, Phil R. and Dale Davidson
 1994 Anasazi Origins: A Perspective from Preliminary Work at Old Man Cave. *Kiva* 60:191–202.
- Geib, Phil R. and Carrie C. Heitman
 n.d. The Longue Durée of Puebloan Ritual Practice in the North American Southwest. Manuscript in review.
- Geib, Phil R. and Winston B. Hurst
 2013 Should Dates Trump Context? Evaluation of the Cave 7 Skeletal Assemblage Radiocarbon Dates. *Journal of Archaeological Science* 40:2754–2770.
 n.d. Social Distance and Basketmaker II Massacres. Manuscript in review.
- Geib, Phil R. and Edward A. Jolie
 2010 Direct Evidence of Early Holocene Dietary Expansion on the Colorado Plateau: Interpreting the Constituents of Dated Human Feces. Paper presented at the 75th Annual Meeting of the Society for American Archaeology, St. Louis.
 2015 Rise of Broad Spectrum Foraging on the Colorado Plateau during the Early Holocene. In *The Archaic Southwest: Foragers in an Arid Land*, edited by Bradley J. Vierra. Manuscript in press, University of Utah Press.
- Geib, Phil R. and Kimberly Spurr
 2000 The Basketmaker II-III transition on the Rainbow Plateau. In *Foundations of Anasazi Culture: The Basketmaker–Pueblo transition*, edited by Paul Reed, pp. 175-200. University of Utah Press, Salt Lake City.
- Geib, Phil R. and Kimberly Spurr
 2007 Kin Kahuna. In *Prehistory of the Northern Kayenta Anasazi Region: Archaeological Excavations along the Navajo Mountain Road, Vol. 3, Basketmaker II Site Descriptions*, edited and assembled by Phil R. Geib, Kimberly Spurr and Jim Collette, pp. III-2-1–III-2-80. Navajo Nation Archaeology Department Report No. 02-48, Window Rock, AZ.
<http://content.lib.utah.edu/cdm/compoundobject/collection/upoa/id/63/rec/8>

- Gendar, Jeannine
 1995 *Grass Games and Moon Races: California Indian Games and Toys*. Heyday Books, Berkeley.
- George, Kenneth
 1996 *Showing Signs of Violence: The Cultural Politics of a Twentieth-century Headhunting Ritual*. University of California Press, Berkeley.
- Ghiglieri, Michael P.
 1984 *The Chimpanzees of Kibale Forest: A Field Study of Ecology and Social Structure*. Columbia University Press, Columbia.
 1987 Sociobiology of the Great Apes and the Hominid Ancestor. *Journal of Human Evolution* 16:319–58.
- Gifford, Edward W.
 1936 Northeastern and Western Yavapai. University of California Publications in American Archaeology and Ethnology 34(4).
 1940 Culture Element Distributions: XII, Apache-Pueblo. *University of California Anthropological Records* 4(1).
- Gilpin, Dennis
 1994 Lukachukai and Salina Springs: Late Archaic/Early Basketmaker Habitation Sites in the Chinle Valley, Northeastern Arizona. *Kiva* 60:203-218.
- Gilreath, Amy J. and William R. Hildebrandt
 2008 Coso Rock Art within its Archaeological Context. *Journal of California and Great Basin Anthropology* 28:1–22.
- Goodall, Jane
 1986 *The Chimpanzees of Gombe: Patterns of Behavior*. Belknap Press, Cambridge, MA.
- Grant, Campbell
 1978 *Canyon de Chelly: Its People and Rock Art*. University of Arizona Press, Tucson.
- Green, Rev. Charles H.
 1894 Catalogue of a Unique Collection of Cliff Dweller Relics taken from the lately discovered ruins of southwestern Colorado and adjacent parts of Utah, New Mexico and Arizona. Art Institute of Chicago. Digitized version available at <http://books.google.com/books?id=gENOAAAAYAAJ&printsec=frontcover&dq=inauthor:%22Rev.+Charles+H.+Green%22&hl=en&sa=X&ei=uNh6UY-ufelo2AW03YD4DA&ved=0CDIQ6AEwAA>.
- Gregor, Thomas.
 1985 *Anxious Pleasures: The Sexual Lives of an Amazonian People*. University of Chicago Press, Chicago.
- Gregory, David A., Fred L. Nials, and J. Brett Hill
 2011 Early Agricultural Period Settlement Strategies in the Southern Southwest. In *The Latest Research on the Earliest Farmers*, edited by Sarah A. Herr, Online publication: www.archaeologysouthwest.org/what-we-do/investigations/earliest-farmers.
- Griffith, Glenn (compiled by)
 2010 Level III North American Terrestrial Ecoregions: United States Descriptions. Manuscript available at http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm.
- Grissino-Mayer, Henri
 1996 A 2129-Year Reconstruction of Precipitation for Northwestern New Mexico, U.S.A. In *Tree Rings, Environment and Humanity*, edited by J.S. Dean, D.M. Meko, and T.W. Swetnam, pp 191–204. Radiocarbon, Tucson, AZ.
- Guernsey, Samuel J.
 1931 *Explorations in Northeastern Arizona*. Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University, Vol. 12, No. 1. Cambridge, MA.

- Guernsey, Samuel J., and Alfred V. Kidder
 1921 *Basket Maker Caves of Northeastern Arizona*. Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University, Vol. 8, No. 2. Cambridge, MA.
- Guppy, Henry B.
 1887 *The Solomon Islands and Their Natives*. Lowrey & Co, Swan Sonnenschein, London.
- H.
 1894 Recent Finds in Utah. *The Archaeologist* 2, 154-155. Waterloo.
- Hare, P. Gregory, Sheila Greer, Ruth Gotthardt, Richard Farnell, Vandy Bowyer, Charles Schweger and Diane Strand
 2004 Ethnographic and Archaeological Investigations of Alpine Ice Patches in Southwest Yukon, Canada. *Arctic* 57:260–272.
- Harrington Mark. R.
 1933 *Gypsum Cave, Nevada*. Paper No. 8. Southwest Museum, Los Angeles.
 1942 Black Dog Cave. *Masterkey* 16(5). Southwest Museum, Los Angeles.
- Hartman, Dana
 1983 NA15,723 cited in *American Antiquity* 48:853.
 nd Navajo Housing Authority, Mass Burial, Progress Report. NA15,723 site file, Museum of Northern Arizona, Flagstaff.
- Hassig, Ross
 1988 *Aztec Warfare: Imperial Expansion and Political Control*. University of Oklahoma Press, Norman.
 1992 *War and Society in Ancient Mesoamerica*. University of California Press, Berkeley.
 2001 *Time, History, and Belief in Aztec and Colonial Mexico*. University of Texas Press, Austin.
- Haury, Emil W.
 1945 *Painted Cave, Northeastern Arizona*. The Amerind Foundation 3. Dragoon, AZ.
 1975 *The Stratigraphy and Archaeology of Ventana Cave*. (2nd Printing) University of Arizona Press, Tucson.
- Hays-Gilpin, Kelley A.
 1996 Anasazi Iconography: Medium and Motif. In *Interpreting Southwestern Diversity: Underlying Principles and Overarching Patterns*, edited by Paul R. Fish and J. Jefferson Reid, pp. 55-67, Arizona State University Anthropological Research Papers No. 48, Tempe.
 2000 Beyond Mother Earth and Father Sky: Sex and Gender in Ancient Southwestern Visual Arts. In *Reading the Body: Representations and Remains in the Archaeological Record*, edited by Alison Rautman, pp. 165-186. University of Pennsylvania Press, Philadelphia.
 2004 *Ambiguous Images: Gender and Rock Art*. Altamira Press, Walnut Creek, CA.
- Hays-Gilpin, Kelley. A., Ann. C. Deegan, and Elizabeth A. Morris
 1998 *Prehistoric Sandals for Northeastern Arizona: The Earl H. Morris and Ann Axtell Morris Research*. Anthropological Papers of the University of Arizona No. 62. University of Arizona Press, Tucson.
- Heider, Karl G.
 1970 *The Dugum Dani: A Papuan Culture in the Highlands of West New Guinea*. Aldine, Chicago.
 1979 *Grand Valley Dani, Peaceful Warriors*. Holt, Rinehart and Winston, New York.
- Heizer, Robert F.
 1942 Ancient Grooved Clubs and Modern Rabbit Sticks. *American Antiquity* 8:41-56.
 1968 *The Indians of Los Angeles County: Hugo Reid's Letters of 1852*. Southwest Museum Papers No. 21, Los Angeles.
- Hemmings, C. Andrew
 2004 *The Organic Clovis: A Single Continent-Wide Cultural Adaptation*. PhD dissertation, Department of Anthropology, University of Florida, Gainesville.

- Hildebrandt, William R. and Jerome H. King
 2012 Distinguishing between Darts and Arrows in the Archaeological Record: Implications for Technological Change in the American West. *American Antiquity* 77:789-799.
- Hill, Jane
 1984 Prestige and Reproductive Success in Man. *Ethology and Sociobiology* 5(2):77-95.
- Hill, Jane H.
 2001 Proto-Uto-Aztecan: A Community of Cultivators in Central Mexico? *American Anthropologist* 103:913-934.
- Hoadley, R. Bruce
 1990 *Identifying Wood: Accurate Results with Simple Tools*. The Taunton Press, Newtown, CT.
- Holmer, Richard N.
 1978 *A Mathematical Typology for Archaic Projectile Points of the Eastern Great Basin*. Ph.D. dissertation, Department of Anthropology, University of Utah, Salt Lake City. University Microfilms, Ann Arbor.
- Hopcroft, Rosemary L.
 2006 Sex, status, and Reproductive Success in the Contemporary United States. *Evolution and Human Behavior* 27:104-120.
- Hopkins, Arthur I.
 1928 *In the Isles of King Solomon: An Account of Twenty-Five Years Spent amongst the Primitive Solomon Islanders*. Seeley, Service & Co., London.
- Hoskins, Janet (editor)
 1996 *Headhunting and the Social Imagination in Southeast Asia*. Stanford University Press, Stanford.
- Howard, Julie and Joel C. Janetski
 1992 Human Scalps from Eastern Utah. *Utah Archaeology* 5:125-132.
- Huber, Edgar K.
 2005 Chapter 36: Early maize at the Old Corn Site (LA 137258). In *Fence Lake Project. Volume 1: Introduction and Site Descriptions*, edited by Edgar K. Huber and Carla R. Van West, pp. 36.1-36. Technical Series No. 84, Statistical Research, Tempe.
- Huckell, Bruce B.
 1995 *Of Marshes and Maize: Preceramic Agricultural Settlements in the Cienega Valley, Southeastern Arizona*. Anthropological Papers of the University of Arizona No. 59. University of Arizona Press, Tucson.
 1996 The Archaic Prehistory of the North American Southwest. *Journal of World Prehistory* 10:305-372.
- Huckell, Bruce B., Lisa W. Huckell, and M. Steven Shackley
 1999 McEuen Cave. *Archaeology Southwest* 13:12.
- Huckell, Lisa W.
 2006 Ancient Maize in the Southwest: What Does it Look Like and What Can It Tell Us? In *Histories of Maize: Multidisciplinary Approaches to the Prehistory, Linguistics, Biogeography and Evolution of Maize*, edited by John Staller, Robert Tykot, and Bruce Benz, pp. 97-107. Elsevier Academic Press, Boston.
- Hudson, Travis and Georgia Lee
 1984 Function and Symbolism in Chumash Rock Art. *Journal of New World Archaeology* 6(3):26-47, Institute of Archaeology, University of California, Los Angeles.
- Hurst, Winston B.
 1996 Colonizing the Dead: Early Archaeology in Western San Juan County. *Blue Mountain Shadows* Volume 17:2-13. San Juan County Historical Commission, Monticello, Utah.

- Hurst, Winston B. and Christy G. Turner, II
 1993 Rediscovering the "Great Discovery": Wetherill's First Cave 7 and Its Record of Basketmaker Violence. In *Anasazi Basketmaker: Papers from the 1990 Wetherill-Grand Gulch Symposium*, edited by Victoria M. Atkins, pp. 143-191. Cultural Resource Series No. 24. Bureau of Land Management, Salt Lake City.
- Hyder, William D.
 1994 Basketmaker Spatial Identity: Rock Art as Culture and Praxis. In *Rock Art as Visual Ecology*, edited by Paul Faulstich, pp. 31-42. American Rock Art Research Association, Tucson.
- Irons, William
 1979 Cultural and Biological Success. In *Evolutionary Biology and Human Social Behavior: An Anthropological Perspective*, edited by Napoleon A. Chagnon, & William Irons, pp. 257-272. Duxbury Press, North Scituate, MA.
- Jackson, Alvin T.
 1937 Exploration of Certain Sites in Culberson County, Texas. *Bulletin of the Texas Archaeological and Paleontological Society* 9: 146-192.
- James, Harry
 1960 *The Cahuilla Indians: The Men Called Master*. Westemlore Press, Los Angeles.
- Janetski, Joel C.
 1980 Wood and Reed Artifacts. In *Cowboy Cave*, by Jesse D. Jennings, pp. 75-95. Anthropological Papers No. 104. University of Utah Press, Salt Lake City.
- Janetski, Joel C., Mark L. Bodily, Bradley A. Newbold, and David T. Yoder
 2012 The Paleoarchaic to Early Archaic Transition on the Colorado Plateau: The Archaeology of North Creek Shelter. *American Antiquity* 77:125-159.
- Janetski, Joel C., and Michael J. Hall
 1983 *An Archaeological and Geological Assessment of Antelope Cave (NA5507), Mohave County, Northeastern Arizona*. Brigham Young University Department of Anthropology Technical Series No. 83-73. Provo.
- Jolie, Edward A. and Phil R. Geib
 2010 Small seeds, Basketry, and the Broad Spectrum Revolution on the Colorado Plateau. Paper presented at the 75th Annual Meeting of the Society for American Archaeology, St. Louis.
- Judd, Neil M.
 1926 *Archaeological Observations North of the Rio Colorado*. Bureau of American Ethnology Bulletin No. 82. Washington, D.C.
 1952 A Pueblo III War Club from Southeastern Utah. *The Masterkey* 26(2):60-62).
- Karlstrom, Eric T.
 1988 Rates of Soil Formation on Black Mesa, Northeastern Arizona: A Chronosequence in Late Quaternary Alluvium. *Physical Geography* 9:301-327.
- Kearns, Timothy M.
 2011 Basketmaker II in the Southern Chuska Valley, New Mexico. *Southwestern Lore* 77(2-3):49-72.
- Keeley, Lawrence H.
 1980 *Experimental Determination of Stone Tool Uses: A Microwear Analysis*. University of Chicago Press.
 1996 *War Before Civilization: The Myth of the Peaceful Savage*. Oxford University Press, New York and Oxford.
- Kehoe, Alice B.
 2000 *Shamans and Religion: An Anthropological Exploration in Critical Thinking*. Waveland Press, Prospect Heights.
- Kelly, Raymond C.
 2000 *Warless Societies and the Origin of War*. The University of Michigan Press, Ann Arbor.

- 2005 The Evolution of Lethal Intergroup Violence. *Proceedings of the National Academy of Sciences* 102:15294-15298.
- Kennard, Edward A.
1979 Hopi Economy and Subsistence. In *Handbook of North American Indians, Vol. 9, Southwest*, edited by Alfonso Ortiz, pp. 554-563. Smithsonian Institution, Washington, D.C.
- Keyser, James D., and Michael A. Klassen
2001 *Plains Indian Rock Art*. University of Washington Press, Seattle.
- Khera, Sigrid, and Patricia S. Mariella
1983 Yavapai. In *Handbook of North American Indians, Vol. 10, Southwest*, Alfonso Ortiz, ed., pp. 38-54. Smithsonian Institution, Washington, D.C.
- Kidder, Alfred V.
1927 Southwestern Archaeological Conference. *Science* 66:489-91.
1962 An Introduction to the Study of Southwestern Archaeology, with a preliminary account of the excavations at Pecos. Papers Phillips Academy Southwestern Expedition No. 1. (Revised ed. 1924).
- Kidder, Alfred V. and Samuel J. Guernsey
1919 *Archaeological Explorations in Northeastern Arizona*. Bulletin 65. Bureau of American Ethnology, Washington, D.C.
- Kluckhohn, Clyde
1944 *Navaho Witchcraft*. Papers of the Peabody Museum of Archeology and Ethnology, Harvard University. Vol. 22, No. 2. Cambridge, MA.
- Knauff, Bruce M.
1990 Melanesian Warfare: a Theoretical History. *Oceania* 60:250-311.
- Knight, Troy A., David M. Meko, and Christopher H. Baisan
2010 A Bimillennial-length Tree-ring Reconstruction of Precipitation for the Tavaputs Plateau, Northeastern Utah. *Quaternary Research* 73:107-117.
- Koerper, Henry C.
1998 A Game String and Rabbit Stick Cache from Borrego Valley, San Diego County. *Journal of California and Great Basin Anthropology*, 20:252-270.
- Koerper, Henry C., Bruce Pinkston, and Michael Wilken
1998 Nonreturn Boomerangs in Baja California Norte. *Pacific Coast Archaeological Society Quarterly* 34(3):65-82.
- Kohler, Timothy A., Matt Pier Glaude, Jean-Pierre Bocquet-Appel, and Brian M. Kemp
2008 The Neolithic Demographic Transition in the U.S. Southwest. *American Antiquity* 73:645-669.
- Kohler, Timothy A., Scott G. Ortman, Katie E. Grundtisch, Carly M. Fitzpatrick, and Sarah M. Cole
2014 The Better Angels of Their Nature: Declining Violence through Time among Prehispanic Farmers of the Pueblo Southwest. *American Antiquity* 79:444-464.
- Kohler, Timothy A., and Kelsey M. Reese
2014 Long and spatially variable Neolithic Demographic Transition in the North American Southwest. *Proceedings of the National Academy of Sciences* 111:10101-10106.
- Kowalski, Jeff K., Cynthia Kristan-Graham (editors)
2007 *Twin Tollans: Chichén Itzá, Tula, and the Epiclassic to Early Postclassic*. Dumbarton Oaks, Washington D.C.
- Kroeber, Alfred L.
1925 *Handbook of the Indians of California*. Bureau of American Ethnology Bulletin 78, Washington D.C.

- Kuckelman, Kristin A., Ricky R. Lightfoot, and Debra L. Martin
2000 Changing patterns of Violence in the Northern San Juan Region. *Kiva* 66:147–65.
- Lakoff, George and Mark Johnson
1980 *Metaphors We Live By*. University of Chicago Press, Chicago.
- LeBlanc, Steven A.
1999 *Prehistoric Warfare in the American Southwest*. University of Utah Press, Salt Lake City.
- LeBlanc, Steven A. (with Katherine E. Register)
2003 *Constant Battles. The Myth of the Peaceful Noble Savage*. St. Martin's Press, New York.
- LeMoine, Genevieve M.
1994 Use Wear on Bone and Antler Tools from the Mackenzie Delta, Northwest Territories. *American Antiquity*, 59:316-334.
- Lévi-Strauss, Claude
1969 *The Elementary Structures of Kinship*. Beacon Press, Boston.
- Lindsay, Alexander J., Jr., J. Richard Ambler, Mary Anne Stein, and Philip M. Hobler
1968 *Survey and Excavation North and East of Navajo Mountain, Utah 1959–1962*. Museum of Northern Arizona Bulletin No. 45. Northern Arizona Society of Science and Art, Flagstaff.
- Lipe, William D.
1960 *1959 Excavations, Glen Canyon Area*. University of Utah Anthropological Paper 49, Salt Lake City
1994 Comments. *Kiva* 60:337–344.
- Linares, Olga F.
1976 “Garden Hunting” in the American Tropics. *Human Ecology* 4:331-349.
- Lintz, Christopher and Leon George Zabawa
1984 The Kenton Caves of Western Oklahoma. In *Prehistory of Oklahoma*, edited by Robert E. Bell, pp. 161-174. Academic Press, New York.
- Lister, Florence C. and Robert H. Lister
1968 *Earl Morris & Southwestern Archaeology*. The University of New Mexico Press, Albuquerque.
- Lockett, H. Claiborne and Lyndon L Hargrave
1953 *Woodchuck Cave, a Basketmaker II Site in Tsegi Canyon, Arizona*. Museum of Northern Arizona Bulletin No. 26. Northern Arizona Society of Science and Art, Flagstaff.
- Loendorf, Chris R.
2010 *Hohokam Core Area Sociocultural Dynamics: Cooperation and Conflict along the Middle Gila River in Southern Arizona during the Classic and Historic Periods*. Ph.D. Dissertation, Arizona State University, Tempe.
- López Varela, Sandra L., Annelou van Gijn, and Loe Jacobs
2002 De-mystifying Pottery Production in the Maya Lowlands: Detection of Traces of Use-Wear on Pottery Sherds through Microscopic Analysis and Experimental Replication. *Journal of Archaeological Science* 29:1133-1147.
- Lorentzen, Leon H.
1993 *From Atlatl to Bow: The Impact of Improved Weapons on Wildlife in the Grasshopper Region*. MA Thesis, Department of Anthropology, University of Arizona, Tucson.
- Loud, Llewellyn, and Mark R. Harrington
1929 *Lovelock Cave*. University of California Publications in American Archaeology and Ethnology 25(1).
- Lyell, Charles
1830 *The Principles of Geology*. Murray, London.

- MacMinn, Margaret, Helen O'Brien, and Elizabeth S. Word
 1984 Arizona D:7:3141. In *Excavations on Black Mesa, 1982: A Descriptive Report*, edited by Deborah L. Nichols and F. E. Smiley, pp. 167-178. Center for Archaeological Investigations Research Paper No. 39, Carbondale.
- Magennis, Ann L. and Debra L. Martin
 1984 Osteological Remains from Excavated Sites, 1982. In *Excavations on Black Mesa, 1982: A Descriptive Report*, edited by Deborah L. Nichols and F. E. Smiley, pp. 805-811. Center for Archaeological Investigations Research Paper No. 39, Carbondale.
- Malotki, Ekkehart
 1997 The Dragonfly: A Shamanistic Motif in the Archaic Rock Art of the Palavayu Region in Northeastern Arizona. In *American Indian Rock Art*, vol. 23, edited by Steven M. Freers, pp. 57-72. American Rock Art Research Association, San Miguel, CA.
 2001 The Serpent: A Shamanistic Motif in Archaic/Basketmaker Rock Art Imagery of the Palavayu Anthropomorphic Style (PASTYLE), Arizona. In *American Indian Rock Art*, Vol. 27, edited by Steven M. Freers and Alannah Woody, pp. 237-252. American Rock Art Research Association, San Miguel, CA.
- Malotki, Ekkehart and Henry D. Wallace
 2011 Columbian Mammoth Petroglyphs from the San Juan River near Bluff, Utah, United States. *Rock Art Research* 28(2):143-152.
- Manning, Steven J.
 1992 The Lobed-Circle Image in the Basketmaker Petroglyphs of Southeastern Utah. *Utah Archaeology* 5:1-37.
- Marcus, Deborah and John Noxon
 1992 The Complete Guide to Rock Art Panels at the Mouth of Butler Wash Site on the San Juan River, Utah. Unpublished manuscript on file, Utah State Historical Society.
- Marlowe, Frank W.
 2004 Marital Residence among Foragers. *Current Anthropology* 45:277-284.
- Mason, Otis T.
 1899 Aboriginal American Zoötechny. *American Anthropologist* 1:45-81.
- Manson, Joseph H., and Richard W. Wrangham
 1991 Intergroup Aggression in Chimpanzees and Humans. *Current Anthropology* 32:369-90.
- Mastache, Alba Guadalupe, Dan M. Healan and Robert H. Cobean
 2009 Four Hundred Years of Settlement and Cultural Continuity in Epiclassic and Early Postclassic Tula. In *The Art of Urbanism: How Mesoamerican Kingdoms Represented Themselves*, edited by William Leonard Fash and Leonardo López Luján, pp. 290-328. Dumbarton Oaks, Washington, D.C.
- Matson, R.G.
 1991 *The Origins of Southwestern Agriculture*. University of Arizona Press, Tucson.
 1994 Anomalous Basketmaker II sites on Cedar Mesa: Not so Anomalous After all. *Kiva* 60: 219-237.
 2002 The Spread of Maize Agriculture into the U.S. Southwest. In *Examining the Farming/Language Dispersal Hypothesis*, edited by Peter Bellwood and Colin Renfrew, pp. 341-356.
 2006a What is Basketmaker II? *Kiva* 72:149-166.
 2006b Basketmaker II and Cedar Mesa. In *Tracking Ancient Footsteps: William P. Lipe's Contributions to Southwestern Prehistory and Public Archaeology*, edited by R. G. Matson and T. Kohler, pp. 46-62. Washington State University Press, Pullman.
- Matson, R.G. and Michael Brand (editors)
 1995 Exploring Anasazi Origins; The Cedar Mesa Basketmaker II. Report to Bureau of Land Management Monticello, Utah. University of British Columbia electronic document, <https://circle.ubc.ca/handle/2429/39208>.

- Matson, R. G., and B. Chisholm
 1991 Basketmaker II Subsistence: Carbon Isotopes and Other Dietary Indicators from Cedar Mesa, Utah. *American Antiquity* 56:444–459.
- Matson, R.G. and Sally J. Cole
 2002 Ethnicity and Conflict among the Basketmaker II of the U.S. Southwest. In *The Archaeology of Conflict: Processes and Consequences*, edited by Kurtis Lesick, Barbara Kulle, Christine Cluney and Meaghan Peuramaki-Brown, pp. 206-217. 25th Annual Chacmool Conference Proceedings, Archaeological Association of the University of Calgary, Calgary.
- Matson, R.G., William D. Lipe, and William R. Haase IV
 1988 Adaptational Continuities and Occupational Discontinuities: The Cedar Mesa Anasazi. *Journal of Field Archaeology* 15:245-264.
 1990 Human Adaptations on Cedar Mesa, Southeastern Utah. University of British Columbia electronic document, <https://circle.ubc.ca/handle/2429/19586>.
- McCauley, Clark
 1990 Conference Overview. In *The Anthropology of War*, edited by Jonathan Haas, pp. 1-25. Cambridge University Press, Cambridge
- McFadden, Douglas A.
 2011 The Basketmaker II Horizon: A View from the Grand Staircase. *Southwestern Lore* 77(2/3):119-128.
- McGregor, John C.
 1965 *Southwestern Archaeology*. University of Illinois Press, Urbana.
- McNitt, Frank
 1966 *Richard Wetherill: Anasazi*. Revised edition. University of New Mexico Press, Albuquerque.
- Mead, Sidney M.
 1973 *Material Culture and Art in the Star Harbour Region, Eastern Solomon Islands*. Ethnography Monograph 1, Royal Ontario Museum, Publications in Ethnography.
- Meggitt, Mervyn J.
 1977 *Blood Is Their Argument: Warfare among the Mae Enga Tribesmen of the New Guinea Highlands*. Mayfield, Palo Alto, CA.
- Meigs, Peveril
 1939 *The Kiliwa Indians of Lower California*. Ibero-Americana 15. University of California Press, Berkeley.
 1972 Notes on the La Huerta Jat'am, Baja California: Place Names, Hunting and Shamans. *Pacific Coast Archaeological Society Quarterly* 8(1):35-40.
- Meltzer, David J.
 1999 Human Response to Middle Holocene (Altithermal) Climates on the North American Great Plains. *Quaternary Research* 52:404–416.
- Merriam, C. Hart
 1890 *Results of a Biological Survey of the San Francisco Mountain Region and the Desert of the Little Colorado, Arizona*. North American Fauna Report 3. U.S. Department of Agriculture, Division of Ornithology and Mammalia, Washington, D.C.
- Merrill, William L., Robert J. Hard, Jonathan B. Mabry, Gayle J. Fritz, Karen R. Adams, John R. Roney, and A. C. MacWilliamsg
 2009 The Diffusion of Maize to the Southwestern United States and Its Impact. *Proceedings of the National Academy of Sciences* 106:21019–21026
- Miller, Myles R. and Nancy A. Kenmotsu
 2004 Prehistory of the Jornada Mogollon and Eastern Trans-Pecos Regions of West Texas. In *The Prehistory of Texas*, edited by Timothy K. Pertulla, pp. 205-265. Texas A&M University Press, College Station.

- Miller, Virginia E.
 1989 Adela Breton in Yucatán. In *The Art of Ruins: Adela Breton and the Temples of Mexico*, edited by Sue Giles and Jennifer Stewart, 33-41. City of Bristol Museum and Art Gallery, Bristol, UK.
- Moreno, Teresa K.
 2000 Accelerator Mass Spectrometry Dates from McEuen Cave. *Kiva* 65:341-360.
- Morris, Ann A.
 1933 *Digging in the Southwest*. 1978 reprint. Peregrine Smith, Santa Barbara and Salt Lake City.
- Morris, Don P.
 1986 *Archaeological Investigations at Antelope House*. National Park Service, Washington, D.C.
- Morris, Earl H.
 1925 Exploring in the Canyon of Death. *National Geographic Magazine* 48(3):263-300.
 1929 Excavation notes and artifact catalog from Canyon del Muerto, Arizona, 7th Bernheimer expedition. American Museum of Natural History, Anthropology Archives and Collections, New York City.
 1938 Mummy Cave. *Natural History Magazine* XLII(2): 127-138.
 1939 *Archaeological Studies in the La Plata District*. Carnegie Institution of Washington Publication 519. Washington, D.C.
 1948 Tomb of the Weaver. *Natural History* 57:66-71.
- Morris, Earl H., and Robert F. Burgh
 1941 *Anasazi Basketry, Basket Maker II through Pueblo III: A Study Based on Specimens from the San Juan River Country*. Carnegie Institution of Washington Publication 533. Washington, D.C.
 1954 *Basket Maker II Sites near Durango, Colorado*. Carnegie Institution of Washington Publication 604. Washington, D.C.
- Morris, Earl H., Jean Charlot, and Ann Axtell Morris
 1931 *The Temple of the Warriors at Chichen Itzá, Yucatan*. 2 vols. Publication 406, Carnegie Institution, Washington, D.C.
- Morris, Elizabeth Ann
 1980 *Basketmaker Caves in the Prayer Rock District, Northeastern Arizona*. Anthropology Papers of the University of Arizona No. 35. University of Arizona Press, Tucson.
- Mowrer, Kathy
 2003 *Basketmaker II Mortuary Practices: Social Differentiation and Regional Variability*. Unpublished M.A. Thesis, Department of Anthropology, Northern Arizona University, Flagstaff.
- Navi, Parviz and Dick Sandberg
 2012 *Thermo-Hydro-Mechanical Wood Processing*. EPFL Press, Lausanne, Switzerland.
- Neusius, Sarah W.
 2008 Game Procurement among Temperate Horticulturists: The Case for Garden Hunting by the Dolores Anasazi. In *Case Studies in Environmental Archaeology*, 2nd edition, edited by Elizabeth J. Reitz, C. Margaret Scarry and Sylvia J. Scudder, pp. 297-314. Springer, New York.
- Nichols, Robert F.
 1981 Wood and Reed Artifacts. In Chapter 8, Worked Vegetal Materials, galleys for unpublished Step House report, compiled by Robert Nichols. Mesa Verde National Park Archives, WMAP, RC-4-K.2, Box 9, Series 6. Mesa Verde National Park, Colorado.
- Nichols, Robert F. and Thomas P. Harlan
 1967 Archaeological Tree-Ring Dates from Wetherill Mesa. *Tree-Ring Bulletin* 28(1-4):13-28.
- Oberg, Kalervo
 1953 *Indian Tribes of Northern Mato Grosso, Brazil*. Smithsonian Institution, Institute of Social Anthropology Washington, D. C.

- Odell, George H.
 1977 *The Application of Micro-wear Analysis to the Lithic Component of an Entire Prehistoric Settlement: Methods, Problems, and Functional Reconstructions*. PhD dissertation, Harvard University, Cambridge, MA.
- Ortiz, Alfonso (editor)
 1979 *Handbook of North American Indians, Vol. 9, Southwest*. Smithsonian Institution, Washington, D.C.
 1983 *Handbook of North American Indians, Vol. 10, Southwest*. Smithsonian Institution, Washington, D.C.
- Otterbein, Keith F.
 1968 Internal war: A cross-cultural study. *American Anthropologist* 70:277-89.
 1970 *The Evolution of War: A Cross-Cultural Study*. HRAF Press, New Haven.
- Parry, William J.
 1987a Technological Change: Temporal and Functional Variability in Chipped Stone Debitage. In *Prehistoric Stone Technology on Northern Black Mesa*, by William J. Parry and Andrew L. Christenson, pp. 199–256. Center for Archaeological Investigations Occasional Paper No. 12. Southern Illinois University Press, Carbondale.
 1987b Sources of Chipped Stone Material. In *Prehistoric Stone Technology on Northern Black Mesa*, by William J. Parry and Andrew L. Christenson, pp. 21–43. Center for Archaeological Investigations Occasional Paper No. 12. Southern Illinois University Press, Carbondale.
- Parry, William J. and Andrew L. Christenson
 1987 *Prehistoric Stone Technology on Northern Black Mesa*. Center for Archaeological Investigations Occasional Paper No. 12. Southern Illinois University Press, Carbondale.
- Parsons, Elsie, C.
 1918 War God Shrines of Laguna and Zuni. *American Anthropologist* 20:381-405.
 1924 *The Scalp Ceremonial of Zuni*. Memoirs of the American Anthropological Association 31, Lancaster, Pennsylvania.
 1939 *Pueblo Indian Religion*. University of Chicago Press, Chicago.
- Pepper, George H.
 1902 The Ancient Basket Makers of Southeastern Utah. *American Museum of Natural History Journal* 2(4), Supplement.
 1905 The Throwing-Stick of a Prehistoric People of the Southwest. In *The International Congress of Americanists*, 13th Session Held in New York, pp. 107-130. Eschenbach printing company, Easton PA. (digital copy available at <http://books.google.com/books>)
- Perry, Tom
 2011 Island Duel. *Get Lost Magazine* 30:76-78. <http://www.thomasperry.com/?portfolio=island-duel>
 2012 Wogasia: Santa Catalina's Spear Fighting Festival. *Solomons* 57:19-21. (<http://www.thomasperry.com/?portfolio=prepare-for-battle-wogasia>)
- Pérusse, Daniel
 1993 Cultural and Reproductive Success in Industrial Societies: Testing the Relationship at the Proximate and Ultimate Levels. *Behavioral and Brain Sciences* 16:267-322.
- Pettigrew, Devin B.
 2012 Atlatl Weights: A function of preference for specific gripping and throwing techniques. Electronic document, http://basketmakeratlatl.com/?page_id=418, accessed 22 March 2013.
- Plog, Fred
 1979 Prehistory: Western Anasazi. In *Southwest*, edited by A. Ortiz, pp. 108–130. Handbook of the North American Indians, Vol. 9, W. C. Sturtevant, general editor. Smithsonian Institution Press, Washington, D.C.

- Poore, R.Z., M.J. Pavich and H.D. Grissino-Mayer
 2005 Record of the North American Southwest Monsoon from Gulf of Mexico Sediment Cores. *Geology* 33:209-212.
- Potter, James M. and Jason P. Chuipka
 2010 Perimortem mutilation of human remains in an early village in the American Southwest: A case for ethnic violence. *Journal of Anthropological Archaeology* 29:507-523.
- Prudden, T. Mitchell
 1897 An Elder Brother to the Cliff-Dweller. *Harper's Monthly Magazine* 95(5):56-63.
- Quinlan, Angus R
 2000 The Ventriloquist's Dummy: A Critical Review of Shamanism and Rock Art in Far Western North America. *Journal of California and Great Basin Anthropology* 22:92-108.
- Quirolo, Mary M.
 1988 *Culture History of Canyon Del Muerto, Arizona: Basketmaker II - Pueblo I*. M.A. Theses, Simon Fraser University, Burnaby.
- Read, Dwight W. and Steven A. LeBlanc
 2003 Population Growth, Carrying Capacity and Conflict. *Current Anthropology* 44:59-85.
- Reed, Alan D
 2012 A Radiocarbon Date for the Tamarron Site (5LP326): A Basketmaker II Habitation in the Animas Valley. *Southwestern Lore* 78(3):17-24.
- Reed, Alan D., and R.E. Kainer
 1978 The Tamarron Site, 5LP326. *Southwestern Lore* 44:1-47.
- Reed, Alan D., and S.A. McDonald
 1988 Archaeological Investigations at Three Lithic Scatters and Eight Culturally Peeled Tree Sites along the West Dolores Road, Montezuma and Dolores Counties, Colorado. Report on file, National Park Service, Interagency Archaeological Service, Denver.
- Reed, Erik K.
 1951 Culture Areas of the Pre-Hispanic Southwest. *New Mexico Quarterly* 21:428-439.
- Reed, Paul F. and Phil R. Geib
 2013 Sedentism, Social Change, Warfare, and the Bow in the Ancient Pueblo Southwest. *Evolutionary Anthropology* 22:103110.
- Reimer, P. J., M. G. L. Baillie, E. Bard, A. Bayliss, J. W. Beck, P. G. Blackwell, C. Bronk Ramsey, C. E. Buck, G. S. Burr, R. L. Edwards, M. Friedrich, P. M. Grootes, T. P. Guilderson, I. Hajdas, T. J. Heaton, A. G. Hogg, K. A. Hughen, K. F. Kaiser, B. Kromer, F. G. McCormac, S. W. Manning, R. W. Reimer, D. A. Richards, J. R. Southon, S. Talamo, C. S. M. Turney, J. van der Plicht, and C. E. Weyhenmeyer
 2009 IntCal09 and Marine09 Radiocarbon Age Calibration Curves, 0–50,000 Years Cal BP. *Radiocarbon* 51:1111-1150.
- Restall, Matthew and John F. Chuchiak
 2002 A Reevaluation of the Authenticity of Fray Diego de Landa's Relación de las Cosas de Yucatán. *Ethnohistory* 49:651-669
- Revolon, Sandra
 2003 Wogasia Un Rituel des Premiers Fruits à Aorigi (Santa Catalina, Sud-est des Îles Salomon). *Anthropos* 98:379-396.
- Ringle, William M.
 2009 The Art of War: Imagery of The Upper Temple of the Jaguars, Chichen Itza. *Ancient Mesoamerica* 20:15–44.

- Ringle, William M. and George J. Bey III
 2009 The Face of the Itzas. In *The Art of Urbanism. How Mesoamerican Kingdoms Represented Themselves in Architecture and Imagery*, edited by William L. Fash and Leonardo Lopez Lujan, pp. 329-383. Dumbarton Oaks Research Library And Collection, Washington, D.C. Harvard University Press, Cambridge, MA
- Robarchek, Clayton A.
 1990 Motivations and Material Causes: On the Explanation of Conflict and War. In *The Anthropology of War*, edited by Jonathan Haas, pp. 56-76. Cambridge University Press, Cambridge.
- Roberts, Frank H.H.
 1929 *Recent Archaeological Developments in the Vicinity of El Paso, Texas*. Smithsonian Miscellaneous Collections Vol. 81, No. 1. Washington, D.C.
- Robins, Michael R.
 1997a Modeling the San Juan Basketmaker Socio-Economic Organization: A Preliminary Study in Rock Art and Social Dynamics. In *Early Farmers in the Northern Southwest: Papers on Chronometry, Social Dynamics, and Ecology*, edited by Francis E. Smiley and Michael R. Robins, pp.73-120. Animas-La Plata Archaeological Project Research Paper No. 7. Bureau of Reclamation, USDI, Denver.
 1997b *Modeling San Juan Basketmaker Socio-Economic Organization: A Preliminary Study in Rock Art and Social Dynamics*. MA thesis, Department of Anthropology, Northern Arizona University, Flagstaff.
 2002 Status and Social Power: Rock Art as Prestige Technology among the San Juan Basketmakers of Southeastern Utah. In *Traditions, Transitions and Technologies: Themes in Southwest Archaeology*, edited by Sarah H. Schlanger, pp. 386-400. University Press of Colorado, Boulder.
- Robins, Michael R. and Kelley Hays-Gilpin
 2000 The Bird in the Basket: Basketmaker III Iconography. In *Foundations of Anasazi Culture: The Basketmaker - Pueblo Transition*, edited by Paul F. Reed. pp. 231-247, University of Utah Press, Salt Lake City.
- Rodríguez, Dehmian B.
 2006 *Más Allá de las Imágenes de la Guerra y la Captura: Evidencias Iconográficas de la Existencia de un Arte Marcial Autóctono entre los Mayas del Período Clásico*. Facultad de Ciencias Antropológicas, Universidad Autónoma de Yucatán.
- Roksandic, Mirjana (editor)
 2004 *Violent Interactions in the Mesolithic. Evidence and Meaning*. British Archaeological Reports International Series 1237, Archaeopress, Oxford.
- Roksandic, Mirjana
 2006 Violence in the Mesolithic. *Documenta Praehistorica* XXXIII:165-182
- Rohn, Arthur H. and William M. Ferguson
 2006 *Puebloan Ruins of the Southwest*. University of New Mexico Press, Albuquerque.
- Roscoe, Paul
 2011 Dead Birds: The “Theater” of War among the Dugum Dani. *American Anthropologist* 113:56–70.
- Roth, Barbara J. and Andrea Freeman
 2008 The Middle Archaic Period and the Transition to Agriculture in the Sonoran Desert of Southern Arizona. *Kiva* 73:321-353.
- Roth, Barbara J. and Bruce B. Huckell
 1992 Cortaro Points and the Archaic of Southern Arizona. *Kiva* 57:353-370.
- Roth, Barbara J., Elizabeth Toney and Leon Lorentzen
 2011 The Advent of Bow and Arrow Technology in the Mimbres Mogollon Region. *Kiva* 77:87-109

- Routson, Cody C., Connie A. Woodhouse, and Jonathan T. Overpeck
 2011 Second Century Megadrought in the Rio Grande Headwaters, Colorado: How Unusual was Medieval Drought? *Geophysical Research Letters* 38(22) (L22703, doi:10.1029/2011GL050015, 2011)
- Sandberg, Sigfred
 1950 *An Anthropological Investigation of the Correo Snake Pit*. M.A. Thesis, Department of Anthropology, University of New Mexico, Albuquerque.
- Schaafsma, Polly.
 1971 *The Rock Art of Utah*. Papers of the Peabody Museum of Archaeology and Ethnology Vol. 65. Harvard University, Cambridge.
 1980 *Indian Rock Art of the Southwest*. School of American Research, Santa Fe. University of New Mexico Press, Albuquerque.
 1994 Trance and Transformation in the Canyons: Shamanism and Early Rock Art on the Colorado Plateau. In *Shamanism and Rock Art in North America*, edited by Solveig A. Turpin, pp. 45–71. Special Publication 1, Rock Art Foundation Inc., San Antonio.
 2000 *Warrior, Shield and Star: Imagery and Ideology of Pueblo Warfare*. Western Edge Press, Santa Fe.
 2007 Head Trophies and Scalping: Images in Southwest Rock Art. In *The Taking and Displaying of Human Body Parts as Trophies by Amerindians*, edited by Richard J. Chacon and David H. Dye, pp. 90-123. Springer, New York.
 2013 *Images and Power. Rock Art and Ethics*. Springer, New York.
- Schaafsma, Polly and M. Jane Young
 1983 Early Masks and Faces in Southwest Rock Art. In *Collected Papers in Honor of Charlie R. Steen, Jr.*, edited by Nancy L. Fox, pp. 11-33. Papers of the Archaeological Society of New Mexico 8. Albuquerque Archaeological Society Press, Albuquerque.
- Schele, Linda and Peter Mathews
 1998 *The Code of Kings: The Language of Seven Sacred Maya Temples and Tombs*. Scribner, New York City. They think that fending sticks were perhaps for offense rather than defense (note 72 on p 374)
- Schilz, Allan J.
 1979 *The Desha Caves: Two Basketmaker Sites in Southeast Utah*. M.A. Thesis, California State University, Long Beach. University Microfilms, Ann Arbor.
- Schmidt, Peter
 1990 Chichén Itzá and Prosperity in Yucatan. In *Mexico: Splendors of Thirty Centuries*, Metropolitan Museum of Art, pp. 182-211. Bulfinch Press, New York.
- Scott, Michael W.
 2013 Dance-clubs of south-east Solomon Islands. In *Melanesia: Art and Encounter*, edited by Lissant Bolton, Nicholas Thomas, Elizabeth Bonshek, Julie Adams, and Ben Burt, pp. 245-247. British Museum, London.
- Serafin, Stanley, Carlos Peraza Lope and Eunice Uc González
 2014 Bioarchaeological Investigation of Ancient Maya Violence and Warfare in Inland Northwest Yucatan, Mexico. *American Journal of Physical Anthropology* 154:140–151.
- Service, Elman R.
 1967 *Primitive Social Organization: An Evolutionary Perspective*. Random House, New York.
- Sharrock, Floyd W., Kent C. Day, and David S. Dibble
 1963 *1961 Excavations, Glen Canyon Area*. Anthropological Paper 63. University of Utah, Salt Lake City.
- Sherer, Lorraine M.
 1994 *Bitterness Road, The Mojave: 1604-1860*. Ballena Press Anthropological Papers No. 41. Menlo Park.

- Shipek, Florence C.
1968 *The Autobiography of Delfina Cuero, a Diegueño Indian*. Dawson's Book Shop, Los Angeles.
- Shlain, Leonard
2003 *Sex, Time, and Power: How Women's Sexuality Shaped Human Evolution*. Penguin Books, New York.
- Shott, Michael J.
1997 Stones and Shafts Redux: The Metric Discrimination of Chipped Stone Dart and Arrow Points. *American Antiquity* 62:86-101.
- Simpson, Lesley (editor)
1961 *Journal of José Longinos Martínez*. John Howell Books, San Francisco.
- Skertchly, S.B.J.
1879 *On the Manufacture of Gun-flints, the Methods of Excavating for Flint, the Age of Palaeolithic Man, and the Connexion between Neolithic Art and the Gun-flint Trade*. Geological Survey Memoirs. HMSO, London.
- Skibo, James M.
1992 *Pottery Function: A Use-Alteration Perspective*. Plenum Press, New York.
- Sliva, R. Jane
1999 Cienega Points and Late Archaic Period Chronology in the Southern Southwest. *Kiva* 64:339-367.
2005 Developments in Flaked Stone Technology during the Transition to Agriculture. In *Material Cultures and Lifeways of Early Agricultural Communities in Southern Arizona*, edited by R. Jane Sliva, pp.47-98. Anthropological Paper No. 35, Center for Desert Archaeology, Tucson.
- Smiley, Francis E.
1994 The Agricultural Transition in the Northern Southwest: Patterns in the Current Chronometric Data. *Kiva* 60:165-189.
2002 The First Black Mesa Farmers. The White Dog and Lolomai Phases. In *Prehistoric Culture Change on the Colorado Plateau: Ten Thousand Years on Black Mesa*, edited by Shirley Powell and Francis E. Smiley, pp. 37-65. University of Arizona Press, Tucson.
- Smiley, Francis E., and William J. Parry
1992 Rethinking the Agricultural Transition in the Northern Southwest: Evidence from Three Fir Shelter. MS on file, Navajo Nation Historic Preservation Department, Window Rock, Arizona.
- Smiley, Francis E., IV, William J. Parry, and George J. Gumerman
1986 Early Agriculture in the Black Mesa/Marsh Pass Region of Arizona: New Chronometric Data and Recent Excavations at Three Fir Shelter. Paper presented at the 51st Annual Meeting of the Society for American Archaeology, New Orleans.
- Smiley, Francis E., and Michael R. Robins
2005 Help for the Looted Rockshelters of the Colorado Plateau in a New Century of Archaeology: New Basketmaker II Research on the Great Comb Ridge. In *The Colorado Plateau II: Biophysical, Socioeconomic, and Cultural Research*, edited by Charles Van Riper and David J. Mattson, pp. 319-332. University of Arizona Press, Tucson.
- Smith, Gerald A.
1977 *The Mojave Indians: Historic Indians of San Bernardino County*. San Bernardino County Museum Association, San Bernardino.
- Solometo, Julie P.
2004 The Conduct and Consequences of War: Dimensions of Conflict in East-Central Arizona. Ph.D. dissertation, University of Michigan,
2006 The Dimensions of War: Conflict and Culture Change in Central Arizona. In *The Archaeology of Warfare*, edited by E. N. Arkush and M. W. Allen, pp. 23-65. University Press of Florida, Gainesville.

- Sparkman, Philip S.
 1908 The Culture of the Luiseno Indians. *University of California Publications in American Archaeology and Ethnology* 8(4).
- Spier, Leslie
 1923 Southern Diegueño Customs. *University of California Publications in American Archaeology and Ethnology* 20(16).
 1928 Havasupai: Ethnography. *American Museum of Natural History Anthropological Papers* 29(3):81-392.
- Sponsel, Leslie E.
 1998 Yanomami: An Arena of Conflict and Aggression in the Amazon. *Aggressive Behavior* 24:97-122.
- Spurr, Kimberly, L. Theodore Neff, and Peter Bungart
 1998 *NAGPRA Excavations at Three Prehistoric sites on Black Mesa, Arizona, for Peabody Western Coal Company*. Navajo Nation Archaeology Department Report No. 96-19, Addendum I. Window Rock, Arizona.
- Starzecka, Dorota C. and B. A. L. Cranstone
 1974 *The Solomon Islanders*. British Museum Publications, London.
- Stephen, Alexander M.
 1936 *Hopi Journal*. Edited by Elsie C. Parsons. Columbia University Contributions to Anthropology, Vol. 23, Columbia University Press, New York.
- Stevenson, Matilda C.
 1904 *The Zuni Indians: The Mythology, Esoteric Fraternities, and Ceremonies*. Annual Report of the Bureau of American Ethnology 23. Smithsonian Institution, Washington, D.C.
- Stewart, Kenneth M.
 1947 Mohave Warfare. *Southwestern Journal of Anthropology* 3:257-278.
- Stone, Pamela K.
 2012 Contextualizing Death and Trauma at Canyon del Muerto. *Landscapes of Violence* 2(2):Article 4. (available at: <http://scholarworks.umass.edu/lov/vol2/iss2/4>)
- Tagg, Martin D.
 1996 Early Cultigens from Fresnal Shelter, Southeastern New Mexico. *American Antiquity* 61:311-324.
- Taylor, Walter W.
 1966 Archaic Cultures Adjacent to the Northeastern Frontiers of Meso-America. In *Handbook of Middle American Indians*, edited by G.F. Ekholm and G.R. Willey, pp.59-94. University of Texas Press, Austin.
- Thomas, David H.
 1978 Arrowheads and Atlatl Darts: How the Stones Got the Shaft. *American Antiquity* 43:461-472.
- Tozzer, Alfred M.
 1941 *Landa's Relacion de las Cosas de Yucatán*. Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. 18. Harvard University, Cambridge, MA.
 1957 *Chichen Itza and its Cenote of Sacrifice: A Comparative Study of Contemporaneous Maya and Toltec*. Memoirs of the Peabody Museum of Archaeology and Ethnology Volumes XI and XII, Harvard University. Cambridge, MA.
- Tuohy, Donald R.
 2002 Archaeological Curved Throwing Sticks from Fish Cave, near Fallon, Nevada. *Journal of California and Great Basin Anthropology*, 24(1):13-19.
- Turchin, Peter and Andrey Korotayev
 2006 Population Dynamics and Internal Warfare: A Reconsideration. *Social Evolution & History* 5:112-147.

- Turner, Christy G., II, and Jacqueline A. Turner
 1990 Perimortem Damage to Human Skeletal Remains from Wupatki National Monument, Northern Arizona. *Kiva* 55:187-212.
 1999 *Man Corn: Cannibalism and Violence in the Prehistoric American Southwest*. University of Utah Press, Salt Lake City.
- Turpin, Solveig
 1994a Lower Pecos Prehistory: The View from the Caves. In *The Caves and Karst of Texas*, edited by W. R. Elliott and G. Veni, pp. 69–84. National Speleological Society, Huntsville, Alabama.
 1994b On a Wing and a Prayer: Flight Metaphors in Pecos River Art. In *Shamanism and Rock Art in North America*, edited by Solveig A. Turpin, pp. 73-102. Rock Art Foundation, San Antonio.
 2011 Size Matters: The Transition from Religious to Secular Art in the Lower Pecos Region. In *American Indian Rock Art*, 37, edited by Mavis Greer, John Greer, and Peggy Whitehead, pp. 1–15. ARARA Publications, Glendale, AZ.
- Valde-Nowak, Pawel, Adam Nadachowski, and Mieczyslaw Wolsan
 1987 Upper Palaeolithic Boomerang Made of a Mammoth Tusk in South Poland. *Nature* 329:436-438.
- Vanpool, Todd L.
 2006 The Survival of Archaic Technology in an Agricultural World: How the Atlatl and Dart Endured in the North American Southwest. *Kiva* 71:429–452.
- Vaughan, Patrick
 1985 *Use-wear Analysis of Flaked Stone Tools*. University of Arizona Press, Tucson.
- Waguespack, Nicole M., Todd A. Surovell, Allen Denoyer, Alice Dallow, Adam Savage, Jamie Hyneman, and Dan Tapster
 2009 Making a Point: Wood- versus Stone-Tipped Projectiles. *Antiquity* 83:786-800.
- Walker, Phillip L.
 2001 A Bioarchaeological Perspective on the History of Violence. *Annual Review of Anthropology* 30: 573–596.
- Wasuka, Moffat R.
 2013 *Wogasia : Festival of Fertility and Other Ceremonies of Aorigi*. Bdub Graphic Solutions, Honiara, Solomon Islands.
- Wendorf, Fred
 1968 Site 117: A Nubian Final Paleolithic Graveyard near Jebel Sahaba Sudan. In *Prehistory of Nubia*, edited by Fred Wendorf, pp. 945-995. Fort Burgwin Research Center & Southern Methodist Press, Dallas.
- Wetherill, Richard
 1895 Original Field Catalogue of the First Wetherill Collection, 1893-94, Hyde Exploring Expedition. American Museum of Natural History, Anthropology Archives and Collections No. 1895-34, New York City
- Whallon, R.
 1989 Elements of Cultural Change in the Later Paleolithic. In *The Human Revolution: Behavioral and Biological Perspectives on the Origins of Modern Humans*, edited by P. A. Mellars and C. B. Stringer, pp. 433-457. Princeton University Press, Princeton.
- Whitley, David S.
 1998 Meaning and Metaphor in the Coso Petroglyphs: Understanding Great Basin Rock Art. In *Coso Rock Art: a New Perspective*, edited by Elva Younkin, pp 109–76. Publication 12, Maturango Museum, Ridgecrest, CA.
 2000 *Art of the Shaman: Rock Art of California*. University of Utah Press, Salt Lake City.
- Whitley, David S., Joseph M. Simon, and Ronald I. Dorn
 1999 The Vision Quest in the Coso Range. *American Indian Rock Art* 25:1 -31.

- Whittaker, John C.
 2007a Clovis Atlatls? Hemmings' Evidence from Florida Rivers. *The Atlatl* 20(3):14.
 2007b Late Survival of Atlatls in the American Southwest? *The Atlatl* 20(1):10–12.
 2012 Ambiguous Endurance. Late Atlatls in the American Southwest? *Kiva* 78:79–97.
 2015 Fire-and-Water Knapping: Origins of a Lithic Folk Tale. *Lithic Technology* 40:40-51.
- Whittaker, John C. and Kathryn A. Kamp
 2007 How Fast Does a Dart Go? Unpublished ms. In possession off the author (available at <http://users.skynet.be/fa057790/HOWFAST.pdf>).
- Wiessner, Polly
 2006 From Spears to M-16s: Testing the Imbalance of Power Hypothesis among the Enga. *Journal of Anthropological Research* 62:165-191.
- Wills, Wirt H.
 1988 *Early Prehistoric Agriculture in the American Southwest*. School of American Research Press, Santa Fe.
- Winslow, Diane L. and Lynda M. Blair
 2003 *Mitigation. Black Dog Mesa Archaeological Complex (26CK5686/BLM 53-7216). Volume II – Black Dog Cave*. Harry Reid Center for Environmental Studies, University of Nevada, Las Vegas.
- Wormington, H. M.
 1961 *Prehistoric Indians of the Southwest*. Popular Series No. 7 (Fifth Printing). Denver Museum of Natural History, Denver.
- Wrangham, Richard W.
 1980 An ecological Model of Female-bonded Primate Groups. *Behaviour* 75:262–300.
 1999 Evolution of Coalitionary Killing. *Yearbook of Physical Anthropology* 42:1–30.
- Wright, Quincy
 1965 *A Study of War*. revised edition Volumes 1 and 2. University of Chicago Press, Chicago.
- Wylie, Alison
 1985 The Reaction Against Analogy. In *Advances in Archaeological Method and Theory, Volume 8*, edited by Michael B. Schiffer, pp. 63-111. Academic Press, New York.
 2002 *Thinking From Things: Essays in the Philosophy of Archaeology*. University of California Press, Berkeley.
- Younger, Stephen M.
 2014 Violence and Warfare in Precontact Melanesia. *Journal of Anthropology* 2014:1-14.