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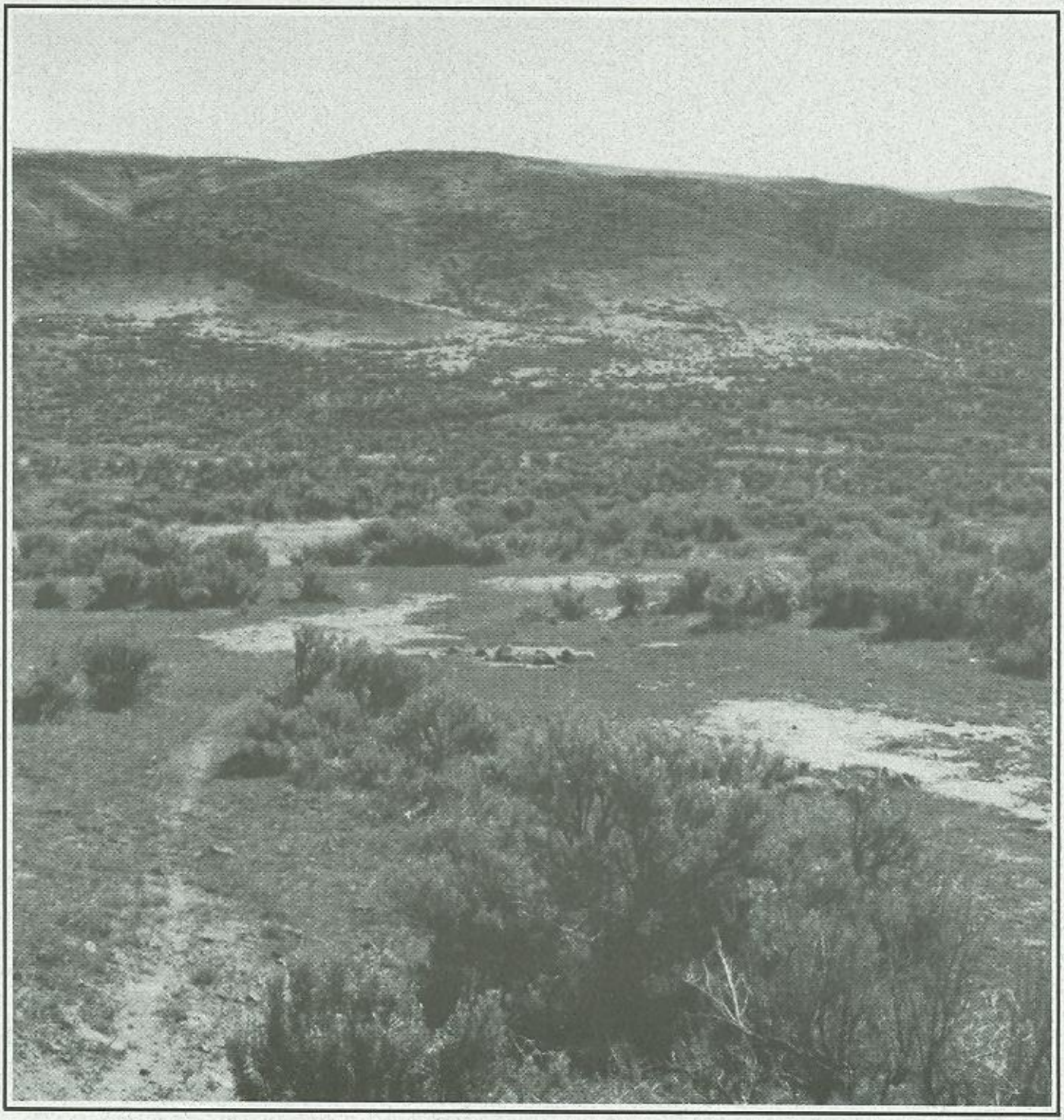

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Cover: Bell Mare Site, King Hill, Idaho

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ARTICLES AND REPORTS

ARCHAEOLOGICAL TEST EXCAVATIONS AT THE BELL MARE SITE (10-EL-948), KING HILL, IDAHO

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Boise State University

INTRODUCTION AND SETTING

In August, 1989, a field crew from Boise State University conducted limited test excavations at the Bell Mare site (10-EL-948). The tests were undertaken as a part of a cooperative program with the Shoshone District Bureau of Land Management. The purpose of the investigation was to determine the type and intensity of aboriginal activity for the purposes of management. The area is a fragile microriparian zone located some distance above Clover Creek near King Hill, Idaho. The zone is supported by water flowing from large springs near the upper rimrock of the Snake River Canyon. The springs create the east and west forks of Bell Mare Creek which flows into Clover Creek. Indications are that the environmental zone area was substantially larger and wetter at several intervals during the past. Bureau specialists hypothesized that the area could have been a fishery during wet intervals and that salmon might have ascended Bell Mare from Clover Creek, known to have supported fish runs historically. The tests were conducted to determine whether cultural deposits contained evidence of fish or fishing activity, establish the general age of the site and identify the range of any additional uses of the area.

THE SITE

The site is characterized by extensive lithic debitage covering an area approximately 60 x 60 meters and lying on the east and west sides of Bell Mare Creek. The scatter extends approximately 30 meters up low-lying escarpments some 10 meters above the creek. The west side of the creek shows considerable evidence of dry springs or seeps. This area, along with much of the rest of the site, includes extreme durapan to 30-40 cm. below surface at which point melon size basalt cobbles are encountered. It would appear that these are the result of dynamic hydrologic events which have moved materials down Bell Mare Creek and provided a major source of basalt.

The site area was mapped from a datum established adjacent to the roadway near the creek (see Figure 2), with corner stakes placed at 10 meter intervals north-south/east-west from the datum to the outer limits of the site area. Four test pits were excavated to an average depth of 40 cm. An almost complete carpet of basalt boulders prevented excavation below the 40 cm level. Two units were placed near the confluence of Bell Mare where there appeared to be considerable alluvial deposition. One unit was placed above the escarpment on the west side of the creek and a small shovel test was excavated in the area of dry seeps on the east side of the creek. The latter test produced no evidence of cultural activity but substantially confirmed the view that the previous discharge had been quite significant.

TEST UNITS

As noted, four test units were excavated. All units were unstratified. Excavation was by arbitrary 10 cm. levels with all sediments passing through an 1/8" hardware mesh. Sediment samples were taken from all units. Sediments were so excessively hard that geologist's picks were used to loosen material before attempting to pass it through the screen. No features were encountered.

Test Unit 1 (N4-6 W11-12)

This unit was located on the west side of the road (see Figure 2) where considerable debris covers a relatively small area. Sediments were medium to dark brown sand containing noticeable quantities of pea gravels. The greater number of lithic flakes and tools were recovered from the upper 10 cm. of the unit. An extensive sterile durapan was encountered at 30 cm. below pit datum.

Test Unit 2 (S29-30 E23-25)

Unit 2, located at the point of confluence, contained dark grey alluvial sediments interspersed with naturally occurring organic material and basalt rocks averaging 10-20 cm. in diameter. Lithic flakes were noted throughout the deposit though no artifacts were recovered. The excavation was discontinued at 50 cm. below surface as we encountered an extensive pavement of large basalt cobbles.

Test Unit 3 (S20-21 E21-23)

The third unit, which is also situated near the confluence of the east and west forks, produced debitage but no artifacts, though two groundstone pestles (possible hammerstones) were recovered from the surface. Dark grey

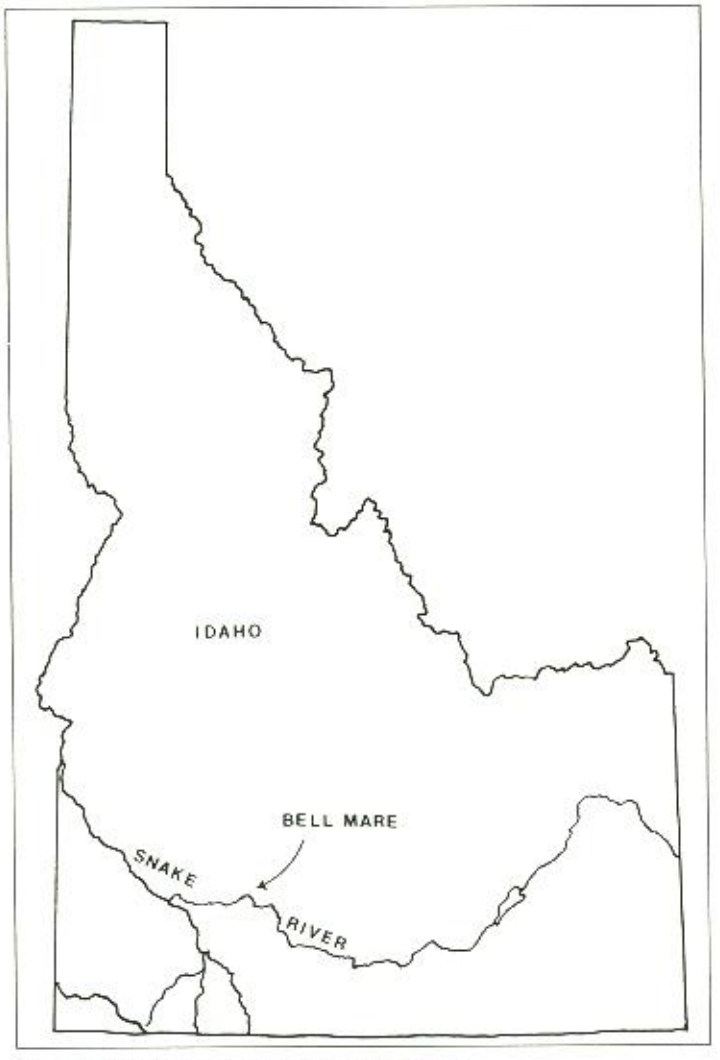

Figure 1. Map Showing the Location of Bell Mare

alluvium was interspersed with basalt nodules 7-27 cm. in diameter. The sediments below 20 cm. were highly compacted. Notably, debitage appeared to concentrate above the level of large basalt cobbles found at approximately 40 cm. (as with Unit 2). This may result from materials being washed down stream during increased flow.

Test Unit 4 (S55-57 W50-51)

The fourth unit is located on the east side of Bell Mare Creek above the small escarpment. Sediments are light brown to dark tan sand lying above a hard durapan at approximately 30 cm. A single exhausted core and a few flakes of basalt and cryptocrystalline silicates were recovered.

MATERIAL CULTURE

The distribution of artifacts from Bell Mare are shown in Table 1.

The formed artifact assemblage is obviously limited and in combination with the quantity and variety of early stage debitage, suggests quarrying and manufacturing activity occurred at the site. The following typology includes description of form, size (using greatest length, width and thickness measurements), material type, provenience and catalog numbers.

PROJECTILE POINTS

Eastgate Point

Number of Specimens: 1

Form: Triangular point with corner notches and expanding basal elements with concave base. Tip missing.

Size: 2.3 (L) x 1.6 (W) x 0.4 (T) cm.

Material Type: Obsidian

Provenience: Surface

Catalog: 13

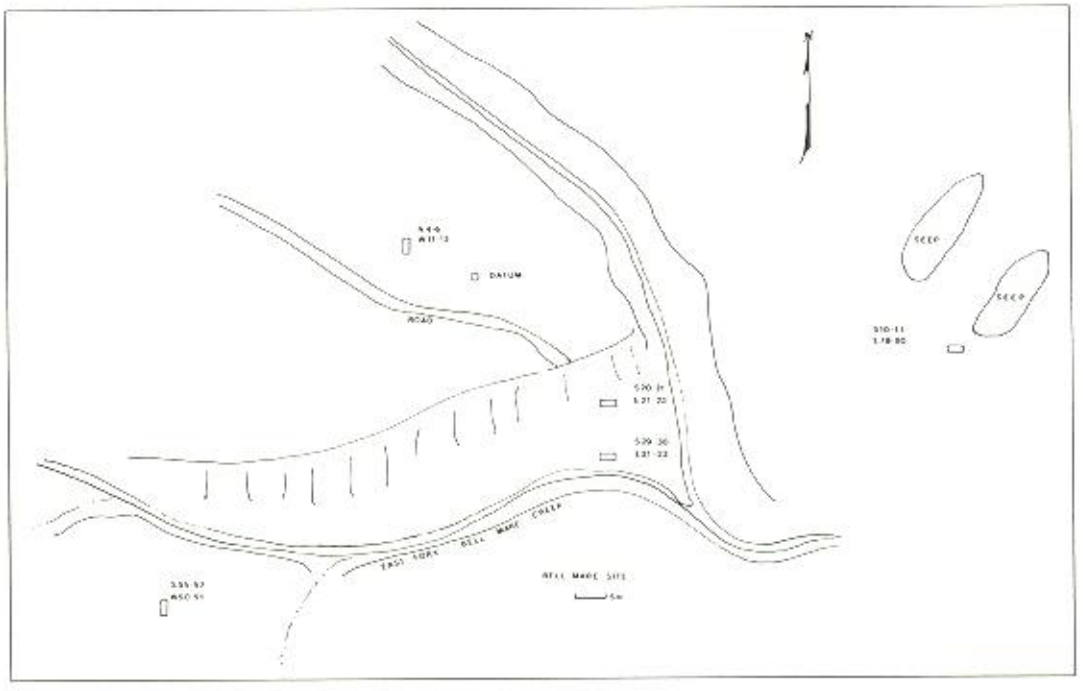

Figure 2. Plan Map of Bell Mare Site.

Corner Notched Point
Number of Specimens: 1
Form: Triangular point with corner notches. A portion of the base is missing. Tip has indications the point was used as a drill.
Size: 2.8 (L) x 2.2 (W) x 0.4 (T) cm.
Material Type: Obsidian
Provenience: N 5.75 W 11.26
Catalog: 12

Biface Fragments
Number of Specimens: 5
Form: Specimens are bifacially flaked. Three are tips or bases: One ovate in form with irregular flaking pattern (#11, CCS); one triangular in form with irregular flaking pattern (#32, basalt); and one irregular basalt base (#43).One specimen is the lateral section of a biface (#22).
Size Range: 1.5-2.9 (L) x .7-2.9 (W) x 0.4-0.9 (T)
Material Type: Basalt, CCS
Provenience: 3-N6-W12; 1-E20-21, E21-23 and 1-screen. 4-0-10 cm., 1-10-20 cm.
Catalog: 11, 22, 32, 43, and 47

Utilized Flake
Number of Specimens: 1
Form: Lateral section of an ovate flake. Exhibits flaking pattern with indications of some retouching.
Size: 2.6 (L) x 1.6 (W) x 0.5 (T)
Material Type: Basalt
Provenience: N6-W12, 10-20 cm.
Catalog: 41

Hammerstone Fragment
Number of Specimens: 1
Form: Triangular river cobble fragment. Tip of the triangular edge exhibits extensive battering on both sides.
Size: 7.2 (L) x 6.3 (W) x 4.8 (T) cm.
Material Type: Andesite
Provenience: N6-W12, 10-20 cm.
Catalog: 29

Groundstone
Number of Specimens: 1
Form: Oblong cobble, almost bread loaf in shape except that one end is narrower than the other. Narrow end exhibits excessive battering. The narrow end also exhibits three smooth, slick, polished surfaces with one surface (bottom) encompassing the entire length of the mano. The round end exhibits excessive battering and also has a heavy layer of patina that cover sparse areas on the dorsal surface.
Size: 14.8 (L) x 8.1 (W) x 5.9 (T)
Material Type:
Provenience: S20.66, E22.85. surface.
Catalog: 2

TABLE 1.
FREQUENCY DISTRIBUTION OF ARTIFACTS

Tools	Surface	0-10 cm	10-20 cm	Total
Groundstone	2			2
Exhausted Cores	2	3	1	6
Cores	1	4	3	8
Scrapers		3	1	4
Biface Fragments	1	3	1	5
Hammerstone			1	1
Utilized Flake			1	1
Bone-Burned Fragment		3	2	5
Eastgate Point	1			1
Corner Notched Point			1	1
Total	7	16	11	34

Mano
Number of Specimens: 1
Form: This specimen is half of a discarded mano. The proximal end exhibits a smooth flat surface. The dorsal surface is irregular and does not exhibit any wear. Two distal ends parallel to each other exhibit heavy edge battering.
Size: 12.5 (L) x 6.3 (W) x 5.2 (T)
Material Type:
Provenience: S20.40, E22.96. surface.
Catalog: 1

Scrapers
Number of Specimens: 4
Form: All specimens are unifacial. Two specimens (#7 & #9, basalt) are large and irregular in form. They both exhibit edge modification on lateral margins. These scrapers are more representative of large thinning flakes with a slight trace of cortex. Specimen #8 (basalt) is triangular, exhibits edge modification on its distal end. Specimen was also cortex on the opposite distal margin. Specimen #37 (basalt) is ovate with an irregular flaking pattern.
Size Range: 8.4-6.4 (L) x 5.7-3.7 (W) x 2.6-2.1 (T).
Material Type: Basalt
Provenience: 7, 8, & 37 -N6W12, 0-10 cm. and 9- N6W12, 0-12 cm.
Catalog: 7, 8, 9 and 37

Exhausted Cores
Number of Specimens: 5
Form: All cores are irregular in shape, conical, angular.
Size Range: 2.4-3.3 (L) c 2.2-3.2 (W) x 1.9-3.1 (T)
Material Type: 4 Basalt, 1 CCS
Provenience: 33 & 34 - N6W12, 0-10 cm.; 42 - N6W12, 10-20; 44 & 46 - S20-21 E21-23, Screen 0-10.
Catalog: 33, 34, 42, 44 and 46

Cores

Number of Specimens: 8

Form: Six specimens are conical in shape and exhibit at least four to six flaking faces and two specimens are angular with one having a multitude of faces and also exhibiting battering on two edges (#36). Four specimens exhibit at least one surface with cortex.

Size Range: 3.5-8.1 (L) x 3.5-5.5 (W) x 2.3-4.5 (T)

Material Type: Basalt

Provenience: 5 - N6W12, 0-10; 1 - N6W12, 10-20; 1 - S57W50, 0-10; 1 - S20-21 E21-21, 0-10 (Screen)

Catalog: 3, 4, 5, 6, 23, 35, 36 and 45

Biface Core

Number of Specimens: 1

Form: Specimen is a large decortication flake, oval in shape with extensive edge battering. Specimen exhibits flaking on both faces suggesting it is also a large core.

Size: 12.6 (L) x 8.8 (W) x 4.5 (T)

Material Type: Basalt

Provenience: N6W12, 10-20

Catalog: 40

The material culture inventory suggests a limited range of activities. Most items are typically associated with the reduction of stone for tool manufacturing. The groundstone items have extensive end battering, which is most likely associated with the quarry activities.

LITHIC AND BONE DEBITAGE

The distribution of lithic debitage by material type demonstrates an almost exclusive use of basalt (98%), reflecting the extraction and trimming of basalt nodules found along Bell Mare Creek. Only very small quantities of cryptocrystalline materials were recovered. Notably, the cryptocrystalline material is not available in and around the Bell Mare locality, suggesting that it may have been transported to the site. The majority of the materials are from Unit N6W12. Only four bone fragments were recovered from the site.

TABLE 2.
FREQUENCY DISTRIBUTION OF LITHIC DEBRIS

	Level	BAS	CCS	OBS
Unit 1 N6 W12	0-10	1148	56	15
	10-20	1024	37	11
	20-30	11	0	0
Unit 2 S29-30 E23-25	0-10	55	0	1
	10-20	51	9	2
	20-30	22	0	1
	30-40	31	0	1
	40-50	19	0	0
Unit 3 S20-21 E21-23	0-10	54	5	2
	10-20	46	1	2
	20-30	14	0	1
Unit 4 S55-57 W50-51	0-10	39	0	0
	10-20	0	0	0
	20-30	25	0	1
Total		2539	108	37

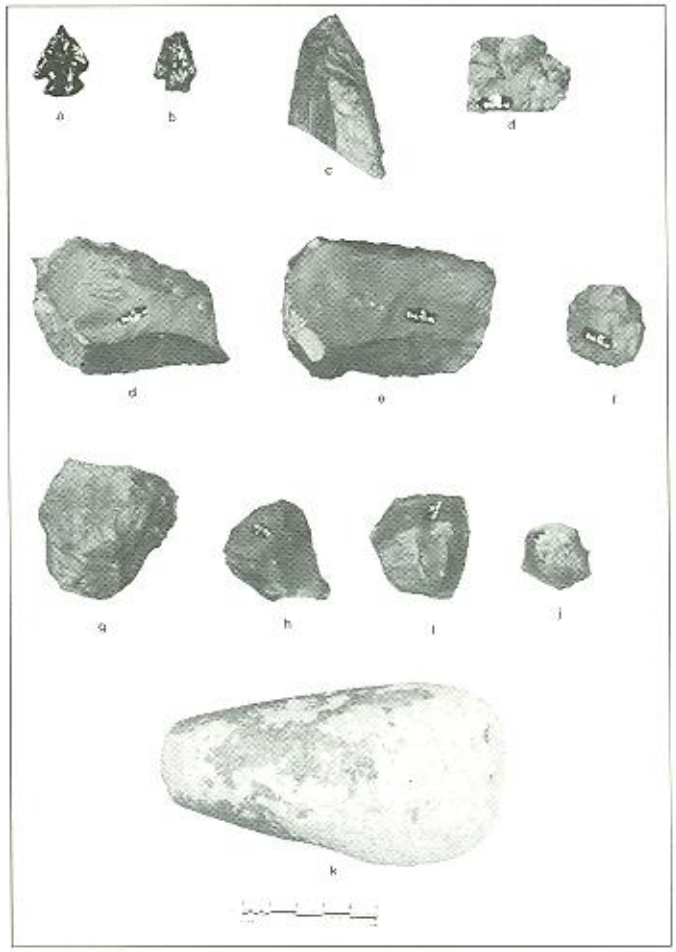

Figure 3. a, Corner Notched Point; b, Eastgate Point; c-d, Biface Fragments; e-f, Scrapers; g-i, Cores; j, Exhausted Core; k, Pestle.

TABLE 3.
FREQUENCY DISTRIBUTION OF FLAKE TYPES

	Level	CRT	SH	TH	P	SEC
Unit 1 N6 W12	0-10	40	219	166	708	81
	10-20	45	156	82	716	68
	20-30	0	1	2	7	1
Unit 2 S29-30 E23-25	0-10	5	12	15	22	2
	10-20	2	7	14	36	3
	20-30	1	3	8	8	3
	30-40	1	4	10	12	
	40-50	1	0	6	10	2
Unit 3 S20-21 E21-23	0-10	2	9	12	36	2
	10-20	3	10	12	21	3
	20-30	0	0	6	8	1
Unit 4 S55-57 W51-50	0-10	3	8	10	18	0
	10-20	4	10	11	33	4
	20-30	0	4	7	15	0
Total		107	443	361	1650	170

The analysis of the lithic debitage was conducted using a stage reduction model. To facilitate the analysis, only five categories were identified. These included cortical flakes, shatter, large thinning flakes, primary and secondary flakes. Thinning flakes were defined as long (2-3

cm.), thick flakes with noticeable platform remnants. Primary and secondary reduction flakes were defined on the basis of size (Primary=1-2 cm. in length). The distribution of flake types suggests early stage manufacture. As a check of the analysis, Magne's (1989) stage model was used to check c. 10% of the assemblage. The majority of flakes, with respect to flake scars, are what Magne would consider early and middle stage flakes. This further suggests early stage reduction. Notable in both instances are few cortical flakes and large numbers of primary flakes. The primary flakes suggest that nodules or large flakes struck from nodules were being reduced to portable sizes. The lack of secondary flakes strengthens the interpretation of early stage activities.

CONCLUSIONS

Our investigation of the Bell Mare site answered some of our questions regarding the type and intensity of activity. No evidence was recovered which would suggest any fishing activities. At the same time, the investigations do confirm previous extensive discharge from the springs and seeps in and around the location. We do not discount completely the possibility that fish could have ascended the stream course during intervals when the water levels were substantially greater.

The hydrologic activity of the springs has, over a significant period of time, served to expose and sort medium sized basalt cobbles along its course. The test excavations suggest that the major aboriginal activity at Bell Mare focused upon procurement and preliminary processing of these basalts, some of which occurred during the Late Archaic, as evidenced by the presence of Rosegate type materials. Survey north along the East Fork of Bell Mare noted several areas adjacent to the stream where considerable reduction activity had taken place. Most notable is the distribution of very large reduction flakes (10-20 cm. diameter) exhibiting little or no modification. The flake assemblage is suggestive of the prospecting activity recently described by Wilke and Schroth (1989). As such, Bell Mare may represent a type of lithic reduction not previously described in southwest Idaho. It is important, however, to note that large flakes do not necessarily mean prospecting activities. In this context, a high frequency of primary flakes suggests that some materials were being modified into portable sizes. Indeed, the composition of basalt within the study area include a range of relatively fine to coarse grained materials. Though some cryptocrystalline and obsidian debris is present, these materials appear part of an assemblage brought to the Bell Mare locality by peoples utilizing the basalt source. Survey failed to locate any sources of materials other than basalt in or adjacent to Bell Mare.

In this context, Bell Mare raises questions regarding technological organization of collector vs. forager assemblages (cf. Binford 1980). Do the material remains of sites along the Middle Snake River reflect the type of assemblages often associated with collectors as implied by Steward's (1938) account, or do they represent the expedient technologies characteristic of foragers? Central to the problem is the question of how assemblage diversity and behavioral variability are explained. Archaeologists have commonly described a range of site types based upon biface reduction strategies. Indeed, our use of a generalized reduction model and Magne's (1985) classification system suggest that the locality is a quarry site or "early stage manufacturing" site. Unfortunately, this does not account for expedient tool production, thereby ignoring some of the behavioral variability which may be represented at many so-called "lithic scatters". This is, in part, the point made by Wilke and Schroth (1989). There is a need for more detailed analyses which reflect the greater range of organizational variation among local hunter-gatherers.

The extent to which the site is related to activities at the Clover Creek site or Three Island Crossing site is difficult to assess, though a significant basalt assemblage is characteristic of Clover Creek (see Plew and Gould 1990). Indeed, 94% of the Clover Creek assemblage consists of basalt with evidence of early stage manufacture in a Late Archaic time frame. The extensive use of basalt has also been noted at 10-EL-44 near Swiss Valley (Plew and Woods 1987). While it seems clear that Bell Mare is a likely source of some of the basalt occurring in sites between Glenns Ferry and Bliss, basalt cobbles are scattered extensively across the area. It seems likely, however, that peoples living at Clover Creek may have journeyed to and from the site area on a daily basis. This may be significant in so far as the expedient nature of the material assemblage of Bell Mare might indicate use by foragers.

The Bell Mare locality is of considerable interest, as few sites of this type have been described within the vicinity. The possibility of prospecting activity of the type described by Wilke and Schroth (1989) suggests that further delineation of site variability will prove useful in identifying technological organization associated with varying degrees of mobility characteristic of collectors and foragers of the Middle Snake River.

ACKNOWLEDGEMENTS

The field crew for the Bell Mare Project included Russell Gould, Christine McGarvin, Cammie Sayer, and Paul Bouffard. The project was a cooperative effort between Boise State University and the Shoshone District BLM. We would like to thank the District, and in particular, Mark Druss and John Lytle, for their support and assistance.

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SHORT CONTRIBUTIONS

BOOK REVIEW

INSECTS AS FOOD: ABORIGINAL ENTOMOPHAGY IN THE GREAT BASIN

Mark Q. Sutton. Ballena Press Anthropological Papers, No.33. Menlo Park, CA: Ballena Press, 1988. 121pp. $17.95 (paper)

Reviewed by Wendy J. Nelson
University of California, Davis

Mark Sutton's *Insects as Food* is a well intentioned effort to heighten awareness of the aboriginal use of insects as a means of subsistence, a subject matter often overlooked. Sutton's introduction, the first of twelve chapters, provides an overview of previous and somewhat limited research on entomophagy. Sutton offers a concise explanation of the types and nature of data used, primarily ethnohistoric and ethnographic. Based on these data, Sutton argues that insects were a critical resource and often played an important role in the prehistoric diet.

The ten chapters that follow offer data on these major insect groups: grasshoppers and locusts, crickets, caterpillars, flies, cicadas, mesquite beetles, ants, bees and yellowjackets, honeydew, and other insects. Each chapter includes sections describing the species life cycle, distribution (i.e., seasonality and abundance) within the Great Basin, and, nutritive data (where available). He then presents the ethnohistoric, ethnographic, and archaeological data pertaining to the species and concludes the chapter with a brief discussion.

Chapter twelve presents a more general summary and discussion. According to Sutton, the available data indicate that significant scheduling, travelling and labor was involved in insect acquisition and processing and implies that while not as substantial as pinyon or some small seeds, "insects probably constituted a major rather than a minor resource in the Great Basin" (p. 86). Some of the data summarized here will be of particular value to those interested in the study of gender, as there is a conspicuous bias in the ethnographic record toward insect procurement as a female activity (p. 85).

The strength of the book comes from the ethnohistoric and ethnographic accounts, which provide detailed descriptions of all phases of insect procurement, mostly through quotations from journals and ethnographies. Sutton acknowledges the biases inherent in these data as when different species are lumped collectively (e.g., crickets and locusts) or misidentified, but, on the whole appears to accept them as reliable to the extent that they indicate the aboriginal importance of insect procurement. This leads to the occasional contradiction. For instance, Sutton suggests that the absence of ethnographic reports of *Hydropyrus hians* (shore flies) consumption on the Great Salt Lake, despite their availability, should be discounted because "...it is difficult to imagine that they were not used, especially given the ethnographic data from other areas" (p.45). The evident assumption here, that the consumption of a resource is directly dependent on its availability, seems questionable, as optimal foraging theories routinely tell us. One must consider the availability of other, potentially higher rank, resources in the area at that time of year, as well as the long term demands of the subsistence system. The point is that ethnographic and ethnohistoric data should be used with caution.

The archaeological data, by contrast, are scant, and these sections mostly deal with methods to archaeologically identify species. With some species we are encouraged to look for body parts, i.e., legs, wings, and exoskeletal remains, in caches, hearths, and human coprolites; with others we are directed more to technology (e.g., pits, trenches, collecting tubes, caches, and baskets). However, the evidence in the archaeological record has been difficult to associate, convincingly, with insect consumption. It's quite probable that insect parts have been retrieved in flotation analyses, but have been previously considered unimportant as a food resource.

Sutton squarely faces the problems encountered in attempting to establish archaeological evidence of insect consumption. Preservation is rare, especially given extensive processing that is often involved (e.g., pounding). In addition, routine methods of archaeological recovery are often inefficient for this purpose and sometimes themselves destructive. This is less a problem when procurement is documented indirectly by the presence of a distinctive technology (e.g., features). Even here, how-

ever, natural processes may destroy potentially important evidence. Sutton offers an example of the archaeological evidence for trench rings around trees for the collection of the Pandora moth caterpillar, whereby, according to Basgall and Weaver, the rings would be obliterated from the record within 300-500 years due to tree growth (p. 38).

In the case of technology, however, the more basic problem is one of recognition. Ethnographic accounts describe the use of milling stones that could be incorrectly identified for seed processing. Seed beaters, used traditionally for seed gathering, may also be used for grasshopper procurement. It may be difficult to determine whether a roasting pit was used for grasshopper processing or for some other foodstuff. Sutton is convinced that most of the problems can be overcome with the development of new data recovery techniques.

By far the weakest portion of the volume is the nutritional data. The data are inconsistent, and some of the information used does not refer to New World species (see Table 1 and 3, pp. 14 and 16). Sutton lists proteins, fat, carbohydrates and calories for some species, but could find complete nutritional data for only one, the Pandora moth. Ironically, Sutton stresses the importance of such data to calculate cost/benefit ratios. Obviously, to be truly useful for optimal foraging modelling more complete nutritional data will be necessary. The data do point out the high fat content of fly and moth larvae, which were often added to foods that were lacking fat and may have increased the total nutritional benefit of these foods.

The ecological data on seasonality and distribution of insect species should be helpful in understanding settlement/subsistence patterns. Sutton argues that economic systems must be understood as wholes, of which insects were a part. This has several implications, not the least of which is how was insect procurement integrated into aboriginal economic systems? For example, were insects taken as encountered in the course of other activities, or was a special segment of the seasonal round devoted to their extraction (e.g., the Mono Indian's collection of the Pandora moth larvae), and did this vary by region or season?

Of particular interest to investigators in Idaho will be the ethnographic accounts of ant consumption near the Snake River in the west-central part of the state (p.63). Ogden observed ants being consumed in winter (collected in the morning) and noted that they contained more fat than locusts and were preferred to them. Other reports speak of women processing ants into soup with manos and metates (p. 64).

Archaeological records in Idaho have revealed little or no evidence of insects as a food source. This is surprising because the geographical distribution of crickets, grasshoppers and locusts, and Pandora moth are within the confines of Idaho, and the ethnographic record clearly documents in addition to ants, the consumption and processing of cicadas. The absence of archaeological evidence, however, may only indicate inattention on the part of archaeologists.

The stated goal of Sutton's study is to develop an awareness of the aboriginal use of insects. In this he is successful. He provides a fair synthesis of the scant literature, and raises questions that could be tested archaeologically. He concludes that insects played a larger role in aboriginal diet than previously noted. Sutton comments, "This attitude must be revised in order to gain a fuller understanding of aboriginal economic systems" (p. 81).

The study of entomophagy is at best immature and with renewed interest it may yield valuable research. *Insects as Food* is not a field manual, nor does it claim to be, so we still have to rely on a field guide of insects for identification purposes. However, after reading Sutton's volume we may be more tempted to use such a guide in our research.

BOOK REVIEW

TIME, ENERGY AND STONE TOOLS

Edited by Robin Torrence. New Directions in Archaeology, Cambridge University Press, 1989. x+124 pp., hardcover, $44.50, maps, illustrations, references, index.

Reviewed by James C. Woods
College of Southern Idaho

This book is divided into eleven chapters including an introductory chapter by Robin Torrence and a concluding chapter by Michael Jochim that serves as a discussion and critical review. It contains a collective bibliography, and is fully indexed. Most of the papers were originally presented at the 27th Annual Meeting of the Society for American Archaeology in 1982, although some were revised following the symposium and discussion.

In general, the authors attempt to revitalize lithic studies by examining variability of stone tools, not in a descriptive sense, but by demonstrating that this variability is the result of attempts to minimize time or energy expenditure by the tool makers or tool users. In this regard, this collection of papers is highly successful. However, the full impact of this volume is only clearly evident after reading the final chapter, and readers might benefit from reading the papers in this volume in reverse order.

One of the most frequently heard complaints about lithic analysis is the difficulty in applying results to the understanding of human behavior. While this collection of papers does not offer any innovative ways of conducting lithic analysis, it offers a more important contribution in its ability to suggest how to use stone tools to explain how technology was manipulated to solve specific problems.

The papers in this volume focus on theoretical approaches to understanding stone tools, and as a result, some are not necessarily practical. Jochim, in the concluding chapter, warns that some of the models are so abstract that they may not relate to real people using stone tools. He offers two recommendations including the incorporation of lithic studies into synchronous analyses of other data, and more controlled experiments involving the manufacture and use of stone tools.

This publication suffers from a general paucity of illustrations which in many instances would have greatly enhanced the message of the authors. For just one example, in a chapter examining how lithic studies might elucidate mobility strategies at the Koster site, there is a full-page photo of the excavations at Koster, but not a single illustration to provide the reader with an example of what the author considers specialized tools, unifacial tools, or an illustration that would show the distinction between serrated, denticulate, and notched edges. Perhaps the shortage of illustrations would not be as conspicuous if more concise definitions were presented, a suggestion echoed by Jochim in the final chapter. He questions, for example, how resharpening is distinguished from edge shaping or blunting.

The introductory chapter by Torrence introduces many of the specialized terms used throughout the other chapters. Concepts such as optimization and currencies are introduced and discussed in a succinct manner. In the context of stone tools, an optimal strategy is one which produces the most favorable ratio of cost to benefit. Costs and benefits can be calculated by using any number of factors, but before the calculations can be expressed, the factors must be clearly defined. The factors which are being weighed in the cost to benefit formula are called currencies and can include time, energy, or information exchange, among others.

In this chapter, Torrence states that the goal of this publication was to "stimulate archaeologists to understand stone tools, not simply describe them", a goal which will undoubtedly be reached.

Brian Hayden examines the evolution of resharpening techniques used on bifacial tools. He proposes that the changes from hard-hammer to soft-hammer percussion, and from pressure-flaking to edge-grinding were in response to efforts to conserve raw material. This hypothesis assumes that hard-hammer percussion resharpening is more wasteful of raw material than soft-hammer. It is also dependant on Hayden's assumption that the "conservation of raw material becomes an increasingly important consideration". Why would conservation become increasingly important? After centuries of use, substantial quantities of raw material are still available today in many places where ground bit tools were developed (ie Maya lowlands, Northern Europe). It would be useful to examine this same problem using other currencies. For example, Hayden suggests that ground margins are much less susceptible to damage, thus requiring less tool rejuvenation. It would seem that the conservation of energy is a more suitable factor encouraging the development of ground margins than conservation of raw material.

Hayden also suggests that cutting requirements increased through time. He states that these increases were the most significant stimulus in the evolution of resharpening strategies. One could argue this either way. For example, with the development of more refined food preparation techniques, an increasing exploitation of plant food resources, and decreasing emphasis on large fauna, it would seem that cutting requirements could decrease over time.

In chapter 3, Camilli examines stone tool assemblage diversity at sites on Cedar Mesa, Utah. She offers sound criticism of much traditional archaeological sampling where the major unit of study is the site. She suggests that the study of occupations is more important, and reviews how discrete occupations can be delineated by careful

comparison of different tool functions and variation in assemblage content within the site.

In the following chapter, Morrow and Jefferies focus on imported chert artifacts found at the Black Earth Site in southern Illinois. While traditional explanations suggest the non-local stone could have been acquired through exchange networks or trips organized specifically to acquire stone, the authors analysis suggests that the stone may have been acquired as a secondary benefit during seasonal migrations. The authors compare the use of local and non-local cherts at the site, and while the numbers of local materials are in excess of the imported stone, the ratios of local to non-local stone are consistent throughout all tool and debitage categories. The authors propose that non-local cherts were not used in a preferential manner and were probably not considered to be more costly than the local materials.

In chapter 5, Jeske presents a hypothesis suggesting that as raw material gets more expensive, certain economizing measures will be adopted including standardization in form, reduction in size, and extension of tool life. However, one is inclined to argue that standardization is not an economizing technique, nor is reduction in size. He states that "blanks can be removed from cores with less waste of raw material than random, amorphous flakes". The highly variable form of nearly all toolstone nodules will force knappers to waste large percentages of any given sample in order to produce standardized flakes, blades, or bifaces. Further, starting with a larger tool or core will allow more opportunities for resharpening. Thus, in some instances, economizing measures might be expressed by obtaining the largest possible functional piece from a given mass of raw material.

He indicates that "the types of resources for which an artifact is used play an important role in determining the raw material selected, the energy invested in tool manufacture, the artifact's use-life and the discard rates." This is a very testable hypothesis but the example provided does not support this statement. He suggests that designers of projectiles intended to be used for deer hunting would spend considerable time with point manufacture and maintenance, the points would be well-made, manufactured from high-quality material, and used many times before they were discarded. In some Great Basin contexts, exactly the opposite is suggested. Projectile points are made of common materials and made using techniques that are far less than energy intensive.

He distinguishes expensive from inexpensive raw material on the basis of distance from the source to the site. This contrasts sharply with the chapter by Morrow and Jefferies wherein imbedded procurement is used to explain presence of non-local materials, making them much less costly than if they had been acquired through exchange or explicit quarrying excursions.

He also suggests that expensive artifacts should show more signs of wear than inexpensive artifacts. This discounts evidence from mortuary contexts where artifacts made of more exotic materials were not used at all. Further, all costs of raw materials are equated to distance from its source and there is no allowance for form or size of the raw material, required quarry strategies, temperatures needed for heat treatment, or tangible working qualities of the raw material.

In chapter 6, Lurie proposes that mobility strategies at the Koster site evolved from highly mobile during the Middle Archaic Period to a more sedentary strategy in later periods. She proposed that this change in mobility might best be reflected in the variability in raw materials used in a stone tool assemblage as well as variability in the types of artifacts recovered. She offers a number of expectations of variability to be found between different types of mobility strategies. These expectations are tested, and the conclusion is that the results are somewhat disappointing. While the research method is sound, the basic expectations were dubious. For example, she states that there will be more specialized tools in logistical components and more multipurpose tools in residential components. One could think of a multitude of ethnographic exceptions to this statement. Another questionable assumption concerns the authors belief that the percentage of "unusual" chert used at Koster should decrease over time. Why should those sources be depleted in ancient times when many of them are still available today? There are also archaeological corollaries where new sources were located during later periods of a site occupation. The author also suggests that heat treatment adds to the cost of raw materials. While the initial cost may be higher, heat treating allows more and better-quality flakes to be removed from a core, lessening the amount of subsequent work necessary to produce a biface and increasing the number of potentially useful flakes, thus effectively increasing the efficiency of raw material usage.

Lurie states in her conclusion that a "greater understanding of raw material sources, raw material quality, and thermal alteration of Burlington chert would be valuable in testing our expectations with greater confidence." This same idea is echoed in the final chapter by Jochim. Finally, the author states that none of the Koster debitage was analyzed, then suggests that debitage may be a better indicator of technological variations than formal artifacts.

The next chapter by Torrence is largely concerned with how stone tool technology can serve as a risk managing mechanism. She states that it is "differences in the form and severity of the risk associated with each type of subsistence which largely determine variability in stone tools." This line of reasoning has potential to help explain much of the observed variations in stone tool assemblages. However, this chapter also relies on several assumptions that merit a cautionary note. As one example, Torrence states that casual reduction sequences are an inefficient use of energy or raw material. In reality, expedient reduction sequences can often result in a highly efficient use of raw material and energy.

Torrence relates assemblage variation to the concept of risk which she defines as the probability of failing to meet dietary requirements. She cites evidence of a devolution in lithic technology as noted in many parts of the world, not resulting from an attempt to avoid expending energy, but as a response to a decrease in risk resulting from the advent of agriculture and pastoralism.

While some other authors suggest that toolmakers and users try to economize on time for its own sake, Torrence believes the ultimate goal was actually an attempt to minimize risk. This was accomplished, she believes, by use of a more complex technology. Thus, higher resource stress would increase risk and encourage the use of a

more complex stone tool assemblage. In this regard, Torrence offers a way to equate stone tool assemblage diversity with environmental conditions, something not possible using more traditional avenues of stone tool analysis.

The next two chapters are particularly insightful and in themselves justify the purchase of this publication. In chapter 8, Boydston examines the relationship of ground adzes to flaked adzes from the central United States. He uses a time-constraint model borrowed from biology which states that people will select the most optimal method to fulfill a goal. He applies this model in test alternative woodcutting technologies. The author states that one way to determine if a particular technique is optimal is to calculate the time required to produce the tool itself. Thus, ground stone has a high cost but also has a high benefit. Conversely, chipped stone has a low cost to benefit ratio, but both have their distinct advantages. While other authors suggest that the change from chipped to ground stone technologies occurred sequentially and can best be interpreted as an evolutionary improvement, Boydston counters that these diverse technologies could have been utilized in response to different environmental and functional factors irregardless of their complexity. As needs and resources changed, certain seemingly more advanced technologies could be replaced by more basic tools.

In chapter 9, Myers examines the long-recognized technological differences between early and late Mesolithic assemblages in Britain. The author argues that differences in hunting strategies influenced the variation in the technology of projectiles.

Myers suggests that societies heavily dependent on animal resources, particularly those in areas with marked seasonality, will be concerned with the reduction of risks. Societies dependent on plant resources will be more concerned with managing time. Thus, the change in projectile point morphology evident during the Mesolithic of Britain might best be explained by a change in the amount of risk associated with hunting. The author cites the change from intercept strategies during earlier periods to encounter strategies during later periods.

Gero presents one of the more unusual approaches to understanding assemblage diversity in chapter 10. She attempts to demonstrate that stone tools can convey important social messages. She explains how variables such as rarity of raw material, artifact size, artifact longevity, complexity of production, and restrictiveness of production can serve as axis of variability against which lithic assemblages can be compared. However, like many other papers in this volume, her basic hypotheses are dependant on a number of assumptions that are suspect and in need of testing. For example, in determining restrictiveness of production, she discusses the role of specialist and what forms of archaeological data might indicate involvement by specialists. She proposes that collateral flaking can only be produced by specialists, an argument that is questionable as demonstrated by the observation that some beginning flintknapping students can be producing collateral flaking given only a few weeks of experience.

In examining the length of artifact use-lives, she proposes that a measure of longevity can be derived from examination of evidence of reworking. This is indeed a difficult task. What attributes did she use as evidence that tools were rejuvenated? She also implies that biface breakage was a result of use, discounting the high frequency of manufacturing breakage recorded in many experimental studies. She also looks for associations between use of rare raw materials and increasing social complexity, although measurable variation could simply be a product of the discovery of new sources, or depletion of existing sources.

Measuring of flake dimensions to determine standardization also seems like a curious exercise. If standardized flake cores are not in the assemblage, then one might predict diversity in flake sizes, no matter what the intent or skill of the knapper.

Estimating flake use-life by measuring the percentage of tool perimeter exhibiting use is very problematic. Some tools can be used for great lengths of time without showing signs of damage where others can show severe damage in a matter of a few moments of use. Use-wear studies have shown that the amount of damage cannot serve as an indicator of use-life. Her basic assumption was that significant edge damage could carry social information, what about socially-significant bloodletting instruments where edge damage is almost non-existent.

Finally, she suggests that subtractive technologies (i.e., flaked stone) must be ultimately replaced by additive technologies (ie, ceramics) in order to increase the amount of social information that can be conveyed. This discounts the apparent importance of eccentrics or caches of ocher-stained bifaces recovered in burial contexts which apparently conveyed substantial social information.

The final chapter by Jochim presents a review of the other ten chapters and addresses the benefits and limitations of using models borrowed from evolutionary theory in biology in the study of stone tool diversity. He reiterates Torrence's introductory statements concerning the importance of developing new methods to acquire information from stone tool assemblages, but questions the general nature of the variables being weighed in many papers in this volume. For example, he is concerned about the complex nature of the factors affecting raw material use or artifact size, and submits that there are several sound technological responses to any problem. For one example he lists seven different factors that could affect artifact size.

Jochim suggests that the best means of improving the quality of information from lithic studies is to merge them with other lines of investigation of cultural change. As an example, his chapter incorporates an examination of stone tool assemblage variability within a comparison of organizational changes evident during the German and British Mesolithic.

Time, Energy and Stone Tools is a collection of essays organized under a common theme of recognizing technology as one way in which people solve problems. These essays provide ample stimulus for further work. Anyone interested in technology and replicative studies can find herein numerous inspirations for the development of controlled experiments. In particular, experiments designed to assist in the understanding of raw material variability and its influence on assemblage vari-

ability are desperately needed. If there is one major flaw in these papers, it is in the lack of reference to experimental data to support assumptions. Jochim cites our inadequate knowledge of variables affecting the relative costs of raw materials, yet this is the very kind of problem that could be addressed in a carefully designed experimental program.

While new experiments could elucidate some of the issues suggested in these chapters, there is also a large body of existing data derived from previous experimental work that the authors of these chapters circumvented. While it can be argued that the majority of modern lithic technologists have employed different models than those proposed in this collection of papers, the results of previous replication studies can offer insights into technological problems that would help avoid many of the ambiguous assumptions discussed above.

Anyone looking for new perspectives on applying stone tool data to their understanding of the prehistoric past will find in these pages ideas for gleaning information from stone tools and debitage, the largest class of material culture remaining for us to study.

INSTRUCTIONS FOR PREPARING DESCRIPTIVE NOTES FOR THE IDAHO ARCHAEOLOGIST

An important and continuing function of the *Idaho Archaeologist* is the publication of descriptive artifact notes. Previous issues of the journal have published notes on unusual chipped stone and ceramic artifacts, fiber bags, hoof rattles, rock art panels and fish traps. The notes have become important in establishing the temporal and geographic range of material culture in southern Idaho. Members of the society and others interested in submitting descriptive notes or papers are asked to use the following guidelines:

(1) Provide one or two paragraphs which introduce the history of the discovery, the location or physical setting and general distribution of similar finds in Idaho.

(2) Provide a description of the artifacts. This should include description of form and any preparation or modification which might suggest function or use. Include metric measurements of length, width, and thickness. If the object has notable features describe and provide measurements of them. In the case of an object having a series of notches along one margin or edge, be sure to include the number of notches, and their length, width and depth (see Huntley 1991).

With chipped stone artifacts, it is important to describe the modification of the margins or edges, observing grinding, serration or other alteration. The description of flake scars or patterns may be useful. Are flake scar patterns collateral or irregular? Might they be considered primary or secondary scars?

If the object is ceramic, groundstone or slate describe any surface treatment. If pottery, are sherds polished, burnished, incised? What is the interior and surface color and what type of temper was used? Is the vessel form discernable and what are vessel wall thicknesses? Can the pottery be identified as a particular type, e.g. Intermountain Ware?

(3) Provide a location map and photograph or line drawing of the object. A metric scale/units should be used when preparing illustrations.

If you require assistance please contact the editorial staff of the journal. The staff can assist you with description and preparation of illustrations. You may reach the journal staff at (208)-385-3023 or 385-3444.

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