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The Acquisition of Nonlocal Lithic Material by the Uinta Fremont

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The Uinta Mountains of northeastern Utah provide a formidable natural barrier, as well as a convenient boundary to delineate culture groups and areas. While the Uintas do form a significant obstacle to human movement, evidence indicates a long and abundant record of human activity in this mountain range. Rather than a barrier, the rain-gathering mountains may have served as an oasis in a generally dry land. The initial model for use of the Uintas argued that groups from southwestern Wyoming were primarily responsible for the presence of prehistoric materials. This model may be too simplistic, and new evidence is presented that suggests Fremont peoples in the Uinta Basin directly accessed toolstone sources in southwestern Wyoming and on the north slope of the Uintas.

WITH peaks over 4,000 m., the Uinta Mountains of northeastern Utah create a formidable natural barrier, providing a convenient boundary to separate culture groups and areas (Fig. 1). Whether geographic areas (e.g., d'Azevedo 1986:7; Frison 1991:2-7; Thompson and Pastor 1995:Fig. 1) or cultural groups (e.g., Jennings 1978:157; Shimkin 1986:309; Janetski 1991:19) are used to delineate an area of discussion, the Uinta Mountains always seem to form a boundary. In the nineteenth century, for example, the Eastern Shoshone utilized the northern flanks of the Uintas in southwestern Wyoming (Shimkin 1986:309), while the Utes are generally shown occupying the area south of the Uintas (e.g., Callaway et al. 1986:337). Several centuries earlier, Fremont horticulturalists occupied the Uinta Basin (Marwitt 1986:162), but at the same time more mobile hunter-gatherers resided in southwestern Wyoming (Frison 1991:111-116). This cultural separation may have started much earlier, as indicated by Paleoindian sites that have been found in the high plains of southwestern Wyoming, although little evidence of Paleoindian occupation has been found in the Uinta Basin (Spangler 1995:331).

Extensive research over the last seven years has provided a wealth of information showing that a considerable amount of travel occurred prehistorically across the Uintas (Loosle et al. 1993; Loosle 1995a, 1997; Malmstrom 1997; Madsen et al. 1999). Instead of a barrier, the rain-gathering mountains may have served as an oasis in a generally dry region. Although the Uintas may have been a significant obstacle to human movement, there is a long and abundant record of human activity in this mountain range. It is argued herein that the Uintas were not a barrier and that Fremont peoples in the Uinta Basin directly accessed toolstone sources in southwestern Wyoming and on the northern slope of the Uintas.

THE UINTA MOUNTAINS

The Uinta Mountains are part of the middle Rocky Mountains province (Thornbury 1965) and are the longest east-west trending mountain range in the United States. The Uintas are the highest range in Utah and are a vital source of water for local inhabitants, as well as the urban area along the Wasatch Front. The core of the Uintas is a Precambrian quartzite (Uinta quartzite) exposed as part of a geologic arch (Lewis 1970:2). Today, this core area exposed in the

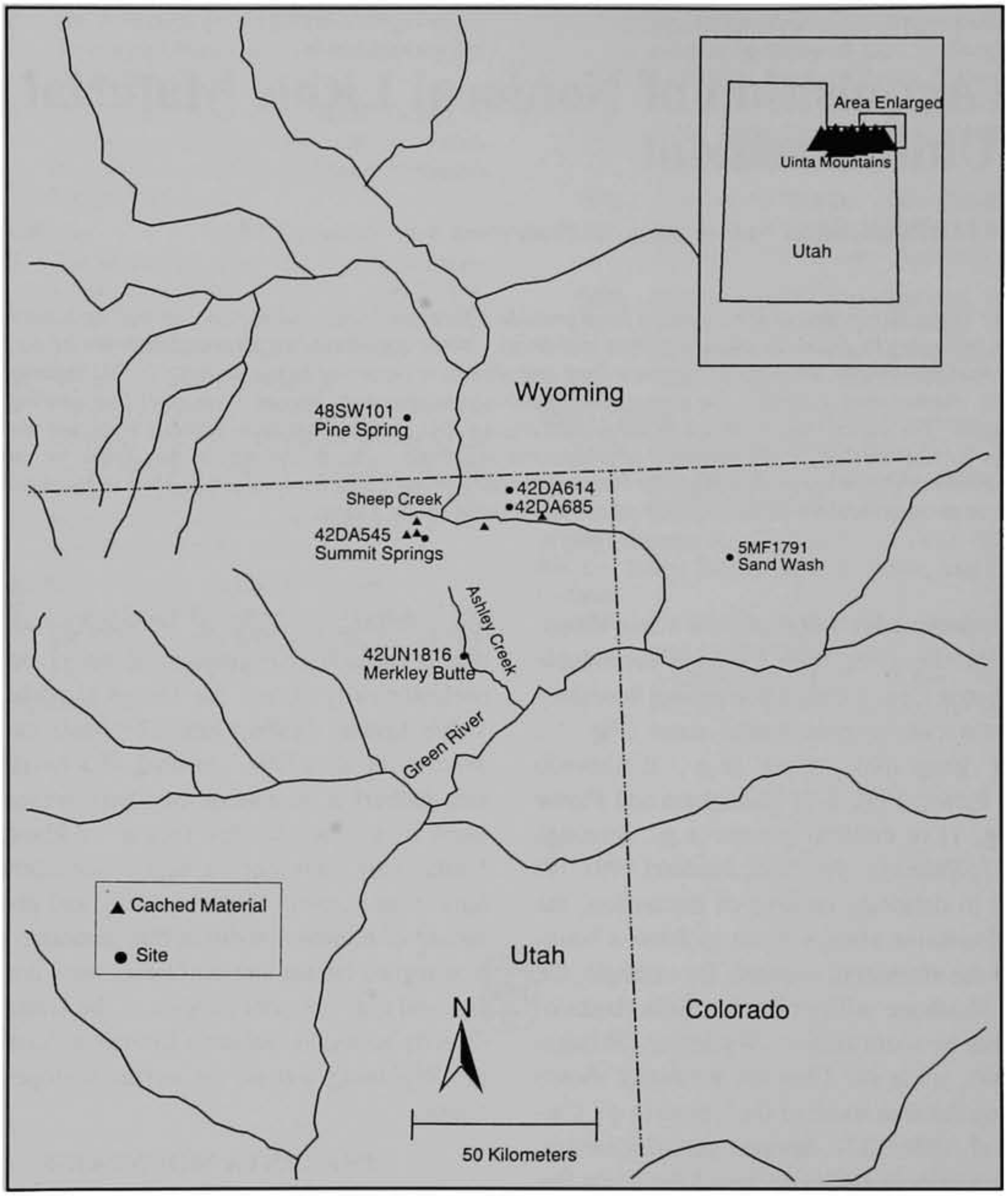

Fig. 1. Map of area showing selected sites and caches in Utah, Wyoming, and Colorado.

high Uintas is characterized by cirques, U-shaped valleys, hummocky moraines, large boulder fields, and lakes created by extensive glaciation during the last ice age. The flanks are a series of often colorful and dramatic sandstone, shale, and limestone layers that were pushed up by the uplift and exposed by deep, steep-walled canyons frequently 300 to 600 m. in depth. The high elevation, limited periods of access due to snow, exposure to elements (especially lightning), deep canyons, and miles of dense timber in the Uintas create a formidable natural barrier for human movement.

The Uintas capture a great deal of moisture, with some locations recording over 100 cm. of precipitation a year. However, the lower regions on either side receive less than 25 cm. annually. This creates a unique, diverse, and rich environment in an otherwise dry region. The Uinta Basin on the south and the Green River Basin on the north contain high deserts with sparse vegetation of shadscale and small sagebrush. On the lower flanks of the Uintas, beginning about 1,700 m. in elevation, a band of pinyon-juniper marks the transition to higher terrain. Sagebrush and aspen (at ca. 2,600 m. in elevation) distinguish the beginning of a broad plateau on the south slope. This eight- to 16-km.-wide plateau is covered mostly by dense stands of lodgepole pine (generally between 2,600 and 2,700 m. in elevation). Above the lodgepole belt is a mixed conifer zone of spruce and fir (at ca. 2,800 m. in elevation). Between 3,200 and nearly 4,000 m. are extensive areas of alpine tundra and boulder fields.

On the north slope, there is no similar plateau, so vegetation changes occur within shorter distances. Because the lodgepole belt is narrower on the north slope than on the south slope, the meadows on the north side are more accessible and create more of a mosaic pattern in the vegetation. In addition, the northeast flank of the Uintas contains a belt of ponderosa pine on the terrace above Red Canyon that has been heavily used for centuries.

Prehistorically, the natural oasis of the Uintas attracted wildlife, as well as humans, into the region. Humans could hunt game, such as bighorn sheep (*Ovis canadensis*), and harvest a variety of plant resources, such as wild potatoes (spring beauty [*Claytonia lanceolata*]), onions (10 species may have been eaten, but *Allium acuminatum* and *A. brevistylum* were collected in the Uintas, while *A. textile* was gathered at lower elevations), carrots (yampa [*Perideridia Gairdneri*]) (C. Duncan and S. Goodrich, personal communication 1998), pinyon nuts (Shimkin 1986:309), and ponderosa pine bark (C. Duncan, personal communication 1994). The major Fremont era village sites in the Uinta Basin are located on the north side of the basin along the major drainages, including Ashley, Dry Fork, Little Brush, and Cub creeks and the Uinta River, all of which are fed by the Uinta Mountains.

PREVIOUS RESEARCH

After a brief flurry of archaeological fieldwork by the University of Utah and the University of Colorado in the 1960s, only limited investigation has subsequently occurred in the Uinta Basin. Even more poorly understood is prehistoric use of the high Uintas. In 1982, 228 sites were recorded in the Ashley National Forest, but only 36 prehistoric sites were documented above the pinyon-juniper belt and all of these were below 2,500 m. in elevation.

Since 1989, over 200 sites have been documented in the high Uintas, all above 3,000 m. in elevation (e.g., Loosle 1995a; Malmstrom 1997; Madsen et al. 1999). Many of these sites are located in alpine areas with good visibility. Other sites are associated with krummholz stands or depressions in talus slopes above the tree line. These latter sites may have served as protection from the weather or as hunting blinds. However, large mammal drive lines in the alpine region like those documented in Colorado (Benedict 1996) and Wyoming (Frison 1991) have yet to be identified.

Considering the source of materials and distances which had to be covered, a model was developed to explain prehistoric use of the Uintas, wherein it was argued that they were occupied by individuals who originated from the north slope (Madsen et al. 1999). The focus of prehistoric activity was the high alpine slopes. These areas are more accessible from the north than from the south, requiring shorter travel time through a more diverse environment.

Toolstone Sources

The mountain sites that have been recorded (see Fig. 1) show a nearly total reliance on lithic material from the north slope of the Uintas. The two most common lithic materials found at prehistoric sites in the Uintas are tiger chert quarried near the Pine Springs site (48SW101) in southwest Wyoming (Sharrock 1966; Love 1977) and Sheep Creek quartzite obtained on the tributaries of Sheep Creek Canyon on the north slope of the Uintas (Erbe 1996).

The most marked characteristic of tiger chert is a tan and dark brown banding. It is found in the Eocene-Bridger Formation in the Black and Cedar mountain areas of southwestern Wyoming and into northwestern Colorado (Loosle and Koerner 1998:56). Hence, this material is sometimes referred to as Bridger Formation chert. Tiger chert is "encased within limestone beds in Bridger Formation clays, and cobbles from glacial erosion surfaces" (Sharrock 1966:37). As Love (1977:23) observed, tiger chert "produces one of the most dramatically patterned cherts in Wyoming. The banding is generally interpreted to be a preservation of stromatolitic structure by silica solutions." The banded pattern of the chert only becomes apparent on weathered pieces, so "prehistorically the material was selected for practical reasons, not aesthetic ones" (Love 1977:23). Love (1977:23) further maintained that tiger chert "has been transported widely, has been a source for at least 9700 years, and is enhanced by heat treatment." Heat treatment allowed the chert to be easily separated from the limestone parent material; as a result, a high percentage of tiger chert from archaeological sites shows signs of heating (Sharrock 1966:38-39).

Sheep Creek quartzite is a well-cemented, fine-grained quartzite that produces a conchoidal fracture. The most common color is tan or cream, with light gray also occurring. Other colors, such as dark gray, white, and red are occasionally noted. It is not unusual for some of these colors to be banded. Lag deposits of this material were extensively quarried in Sheep Creek Canyon and its drainages on the north slope of the Uintas (Erbe 1996).

It has been suggested Sheep Creek quartzite is actually a variation of Uinta quartzite (S. Bilbey, personal communication 1997), which is usually a maroon color and occurs over hundreds of square km. throughout the Uintas. Uinta quartzite was extensively utilized on the eastern end of the Uintas in Browns Park (McKibbin 1992), and several small quarries have been observed near Dutch John. The high-quality Sheep Creek quartzite occurs in a restricted area of probably less than four square km. (Erbe 1996). Its unique color may be a result of water percolation, while the quality of the material is a result of pressure and fracturing along the fault zone in Sheep Creek Canyon (S. Bilbey, personal communication 1997). Although Sheep Creek quartzite only outcrops within a limited area, it was transported extensively throughout the Uintas (Malmstrom 1997).

MERKLEY BUTTE

Questions regarding transport routes and exchange networks across the Uintas can be addressed in a more productive fashion by focusing on a particular time period. The Merkley Butte Site (42UN1816; Fig. 1) provides this opportunity (Loosle and Koerner 1998). Members of the Uinta Basin Archaeology Club, a chapter of the Utah Statewide Archaeological Society, spent six weeks in the fall of 1992 conducting salvage excavations at this heavily vandalized site. Merkley Butte is unique in many respects for a Uinta Fremont occupation. First, the site is located on a butte at 1,945 m. above sea level, ca. 120 m. above Ashley Creek near Dry Fork, rather than on a terrace near the floodplain where village sites in the Uinta Basin are typically located. Second, an averaged calibrated date places the occupation at about A.D. 1160 (930 $\pm$ 60 RCYBP [Beta-62082] and 880 $\pm$ 50 RCYBP [Beta 62083]), later than any other dated Fremont village site in the Uinta Basin (Spangler 1995:479). In addition, there may be as many as 25 to 30 structures at the site, many more than the typical hamlet of three to five that is common in the area (Marwitt 1986:169).

The results of the excavations were disappointing, as the site had been vandalized in a more systematic fashion than had been expected. However, evidence of three structures was discovered, although only one—the remains of a large brush structure—was relatively complete. A lithic workshop was found on the edge of one vandalized structure. This workshop area contained much of the debitage recovered from the site, along with several hammerstones, projectile points, preforms, bifaces, and an antler tool. As expected for a residential site, a variety of artifacts was found, indicating that a wide range of activities was performed. Manos, metates, projectile points, preforms, knives, hammerstones, drills, and bone awls were the more utilitarian items recovered. Two nearly complete jars and parts of an uncommon bowl form were also discovered. Several decorative artifacts were identified, including incised antler, a bone tube (possibly a bead or pipe fragment), bone and stone disk-shaped beads, and two styles of sandstone pendants. Evidence of a range of resource exploitation was also noted. Juniper berries, chenopodium-amaranth seeds, cactus, corn, chokecherries, and possibly pinyon and grass seeds were all used by the inhabitants of the site. Mountain sheep, deer, jackrabbit, cottontail, canid, grouse, and freshwater mussel were also consumed (Loosle and Koerner 1998).

The biggest surprise came from the chipped stone analysis. There are local chipped stone sources; however, nearly all of the debitage was of nonlocal material. A total of 52% of the debitage was tiger chert and 43% appeared to be Sheep Creek quartzite (Table 1). Nevertheless, the lithic material composition at Merkley Butte may not be so remarkable. There are no other professionally excavated collections from the Ashley/Dry Fork area; however, there is an abundance of tiger chert tools and some debitage in the private collections at McConkie Ranch on Dry Fork and in the Leo Thorne collection, which came primarily from the Ashley/Dry Fork area. In addition, tiger chert constitutes 30% to 50% of the surface debitage at other Fremont sites in the area. Several of the tools recovered from excavations at Dinosaur National Monument, about 30 km. to the east, also appeared to be tiger chert (Breternitz 1970: 87-88, Fig. 9-Ia, IIa, Fig. 10a). An important step in understanding the Fremont occupation of northeastern Utah is determining how the abundant, nonlocal lithic material was procured.

MODELS FOR THE ACQUISITION OF NONLOCAL MATERIAL

There are generally two means of obtaining nonlocal material; direct access and trade. Direct access occurs when individuals or groups journey to other localities to procure essential commodities (Alden 1982:85). Trade is the "mutual appropriate movement of goods between hands" (Renfrew 1975:4). How do we determine if Ashley/Dry Fork residents traded for tiger chert or directly accessed it? Hughes (1994: 366) felt that "distinguishing direct access from indirect access" is nearly impossible archaeologically. However, most specialists seem to rely on distance as the key factor in arguing for or against trade, although other attributes may be more useful in identifying direct access versus trade material.

Trade Model

Vehik (1990:137) demonstrated that limited access to a chert resource produces a particular trade pattern on the southern Plains. In her trade model, she predicted that sites where traded items were consumed will produce "[b]lanks and preforms, in the late stages of reduction or as finished products . . . [and that] debitage in these contexts should be limited, emphasizing noncortical material" (Vehik 1990:137). "Ovoid bifaces" are an important part of the chert trade that Vehik (1988:44) documented.

An investigation of the Great Bend aspect of the central Plains offered an opportunity to test

Table 1
RESULTS OF DEBITAGE ANALYSIS FROM SELECTED STUDY SITES

Material/Stage	Sand Wash	Summit Springs	42DA685	42DA614	Merkley Butte
Tiger chert					
primary	40 (2%)	4 (1%)	--	2 (6%)	1 (0.3%)
secondary	317 (12%)	3 (1%)	12 (12%)	3 (8%)	5 (1.5%)
tertiary	2,186 (86%)	328 (98%)	90 (88%)	31 (86%)	329 (98.2%)
Total[a]	2,543 (81%)	335 (17%)	102 (31%)	36 (67%)	335 (52%)
Sheep Creek quartzite					
primary	--	6 (0.4%)	--	--	--
secondary	--	12 (0.8%)	6 (33%)	--	--
tertiary	--	1,347 (98.8%)	12 (67%)	2 (100%)	280 (100%)
Total	--	1,365 (71%)	18 (5%)	2 (3%)	280 (43%)
Uinta quartzite					
primary	5 (5%)	--	9 (16%)	1 (11%)	--
secondary	9 (10%)	--	24 (44%)	1 (11%)	--
tertiary	78 (85%)	--	22 (40%)	7 (78%)	--
Total	92 (3%)	--	55 (17%)	9 (17%)	--
Other					
primary	24 (5%)	13 (5%)	8 (5%)	--	--
secondary	94 (18%)	15 (6%)	70 (44%)	2 (29%)	--
tertiary	399 (77%)	213 (89%)	82 (51%)	5 (71%)	32 (100%)
Total	517 (16%)	241 (12%)	160 (47%)	7 (13%)	32 (5%)

[a] Percentages in the total rows represent the total percentage of debitage of each material from each site.

Vehik's model at sites in central Kansas. Traded lithic materials had very small amounts of cortex and were found in higher percentages as finished artifacts than as debitage (Loosle 1991:161-162). Because traded material is assumed to be more costly, it would generally be used more efficiently, resulting in smaller flake size, more retouch, refinishing, and modification of marginal material (Feder 1981).

If tiger chert and Sheep Creek quartzite at Merkley Butte had been obtained through trade, the debitage would be expected to lack cortex, to be relatively small, and to comprise a smaller percentage of the assemblage relative to finished tools. Site records and personal observations by the author reflect this pattern for obsidian in the Uinta Mountains. Obsidian is a good test because the nearest source is at least 270 km. (170 mi.) distant, and it seems reasonable to assume that all obsidian in the Uinta Mountains was obtained through trade. Chemical sourcing of obsidian found in the Uintas shows that pieces were quarried from a number of sources, including sites in Idaho, Wyoming, Nevada, Utah, and New Mexico (Malmstrom 1997:60). Obsidian tools were nearly as common as obsidian debitage, and the debitage was almost always smaller than two cm. in maximum length. Obsidian projectile points were unusually small or asymmetrical, suggesting that they were made from thin flakes or small pieces that did not permit extensive finishing. Obsidian debitage also had a high rate of retouch or usewear, even on the smallest flakes.

Direct Access Models

In contrast to the trade model, material that was acquired through direct access should follow a pattern similar to the "down-the-line" model proposed by Renfrew (1975:46-48), which stated that there will be a relatively high percentage of cortical material near the source but proportionately lower quantities of cortical material at sites that are farther from the source (Fig. 2a). If there had not been adequate time to reduce the material near the quarry, there should be a high debitage to tool ratio at more distant sites.

Biface production might be a critical step in an exchange system, but what if it was also an important part of the direct access strategy? It would not be unexpected for individuals to reduce material near the source to ensure they were only transporting high-quality material and to reduce their burden. Tanner and Creasman (1986: 81) called this "economizing behavior" and it is common at sites near tiger chert outcrops (Sharrock 1966:28, 171; Tanner and Creasman 1986: 81). Economizing behavior suggests that there might be two types of direct access, casual and planned. Casual direct access occurs as part of an embedded strategy where a few nodules of material are picked up during travel or involvement in some other activity (Binford 1979). Planned direct access occurs when the primary objective of a trip is to procure a particular resource. Lithic material acquired through casual means would be reduced opportunistically and create the pattern seen in Figure 2a, where the amount of cortical material is proportionately reduced the farther a site is from the source. A group planning to visit a source would take the time at or near the source to reduce and prepare the material for transport. This would be even more important the farther the group had traveled to procure the resource.

The pattern that would be expected with biface production, either for exchange or planned direct access, is a high percentage of cortex and numerous cores at the quarry site and a high rate of cortex at sites near the source where the material was reduced to bifaces. There should then be a significant drop-off in the percentage of cortical material outside this core area and a substantial increase in smaller tertiary flakes (e.g., Tanner and Creasman 1986:78; Roth and Dibble 1998:49). The debitage distribution pattern for biface production will be similar to the model depicted in Figure 2b.

Unfortunately, with the material pattern that develops at quarry and reduction sites, it might be difficult to determine whether biface production was for trade or direct access. However, some key differences should be evident at the end or consumptive sites. According to Roth and Dibble (1998:59), "If direct procurement of certain preferred materials, or even just differential exploitation of them, occurred, we would expect high representations of these materials even some distance from their sources." Not only should we see a large amount of the material, but there should be a higher proportion of material as debitage than as finished tools. Flake size of nonlocal material acquired through planned direct access should be smaller than locally obtained materials, but there will still be a high percentage of percussion flaking and flakes over two cm. in size. There should also be a low incidence of tool reshaping and modification of marginal pieces.

Data from several sites were used to test the models described above. First, a brief description of each site is presented. The following section discusses which pattern the data match. Because of differences in analyses between various researchers, average flake size and amount of retouch could not be utilized for this comparison.

STUDY SITES

Pine Spring

Pine Spring (48SW101) is located on the upper slope of Twin Buttes, approximately 20 km. west of Green River in southwestern Wyoming, at an elevation of 2,316 m. (Sharrock 1966). The site was primarily used as a lithic workshop and quarry area. Sharrock (1966) identified three occupational layers. The Archaic occupation (Occupation 2) appeared to dominate the assemblage. A Fremont age was assigned to

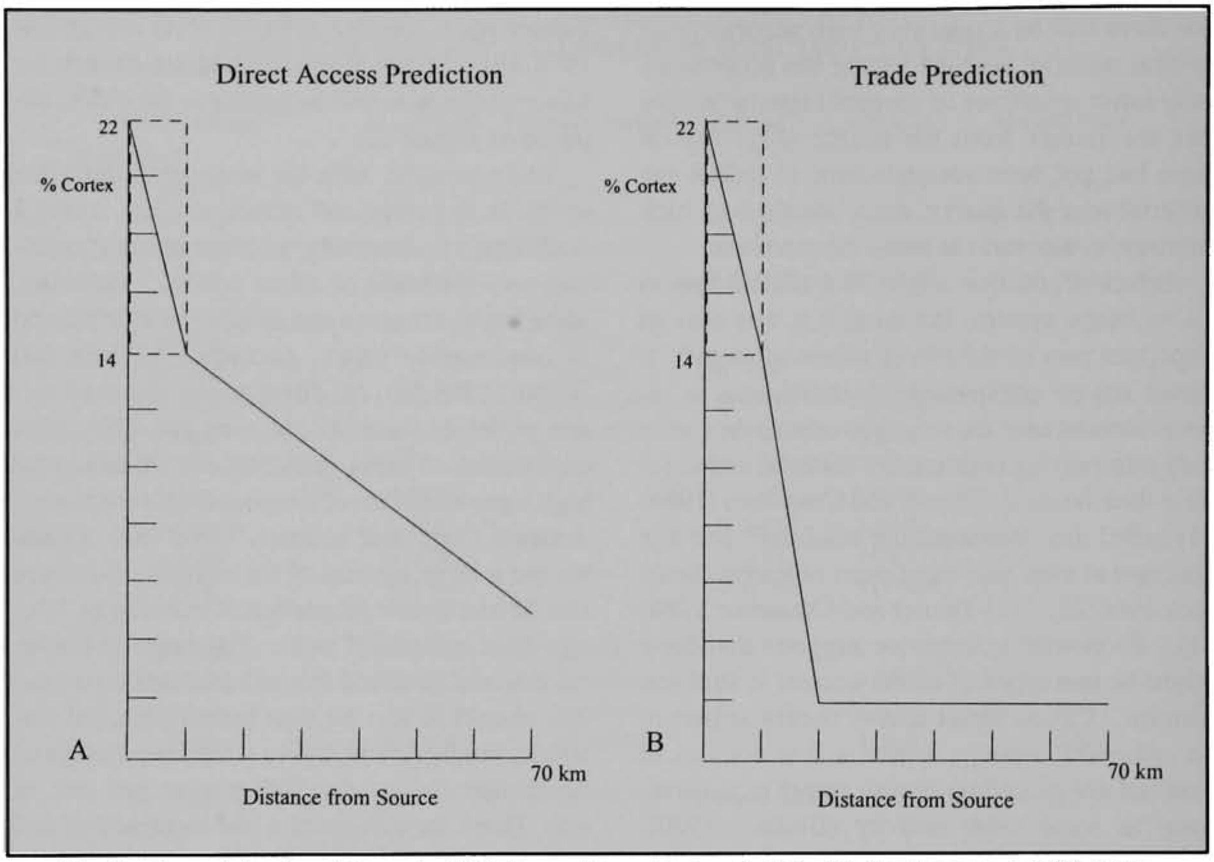

Fig. 2. Expected rates of tiger chert debitage with cortex involved in (a) direct access and (b) trade.

Occupation 3 based on pottery and a Fremont style mano (Sharrock 1966:29).

The Pine Spring site is an ideal place to develop baseline data for primary reduction of tiger chert. The site is near sources of lithic material and has evidence of Fremont occupations. It was also accessible from several possible routes across the Uintas. Sharrock (1966:102) suggested that one route may have been the Carter Military Road, which reportedly followed the path of a Ute trail and may have been used prehistorically. It is interesting to note that the road descends into the Uinta Basin just east of Ashley Creek. Because it crosses private land for the last mile or two, the exact location of the road has not been completely documented. Fort Thornburgh, the reason for development of the road, is located near the mouth of Dry Fork Canyon. The original historic route may have deviated from the modern road to avoid rugged terrain and then turned southwest along Spring Creek, joining Ashley Creek just above its confluence with Dry Fork. Merkley Butte is located less than a km. from the junction of Spring and Ashley creeks.

Unfortunately, not all of the excavated deposits at the Pine Spring site were screened, so a complete collection was not made and the recovered debitage was classified using a scheme not readily transferable to the issues discussed here (Sharrock 1966:50). Although it cannot be used for direct comparison, this site figures prominently in other discussions (see below).

Sand Wash

Unlike the Pine Spring site, the Sand Wash site (5MF1791) does have a comparable collection. This site is located in northwestern Colorado near outcrops of the Bridger Formation. It is situated on the north side of Sand Wash at an elevation of 1,871 m. (Tanner and Creasman 1986:2). There was some difficulty in dating the site, but it appears to have been occupied primarily during the Fremont period. Tanner and Creasman (1986:72) noted that occupation of Sand Wash initially occurred around 3,500 B.P., but that the "greatest intensity of use occurred after 1580 B.P., probably around 1200-1000 B.P.," and the site does not seem to have been used after 600 B.P.

There is evidence of only a low level of faunal and botanical exploitation, so primary use of the site was as "a loci for the production of chipped stone tools" (Tanner and Creasman 1986:73). The authors felt that the pattern of debitage use remained relatively constant through time (Tanner and Creasman 1986:76), so all excavated areas were combined for this study. Most of the lithic material was obtained within 300 m. of the site, so direct access is assumed. The classification scheme was: (1) primary, exhibiting 98% to 100% cortex; (2) secondary, exhibiting 2% to 98% cortex; and (3) tertiary, exhibiting less than 2% cortex (Tanner and Creasman 1986: 46).

Summit Springs Rock Shelter

Summit Springs Rock Shelter (42DA545) is located at an elevation of 2,500 m. on the north slope of the Uintas (Loosle 1992). This site is at the base of a large south-facing cliff situated at the transition zone between pinyon-juniper/ponderosa forest and aspen-lodgepole forest. It is also at a watershed divide, with one drainage flowing northwest into Sheep Creek Canyon and the lithic resources located there and another drainage creating a gentle descent into Red Canyon to the east. It served as a hunting camp and game processing center for thousands of years (Loosle 1995a), but the heaviest occupation seems to have occurred after A.D. 400, during the Fremont Period (Loosle 1997). Analysis is incomplete, but a preliminary examination of the materials from the initial excavation provides some comparative data (Loosle 1992).

Sites 42DA614 and 42DA685

Analysis of the debitage assemblages at sites 42DA614 and 42DA685 from the report for the Dutch John land exchange mitigation are included for comparison (Loosle and Johnson 2000). These sites are near the Green River and may have been on a travel route between the Green River Basin of southwestern Wyoming and the Uinta Basin.

Site 42DA614 is a small campsite with a limited array of artifacts, but does contain the remains of a brush structure with a central hearth. The site is on the east side of the Green River at an elevation of 1,932 m. A single calibrated date of A.D. 990 (1,070 ± 30 RCYBP [Beta-107704]) as well as Fremont material culture, including most of a Uinta Gray jar, Rose Spring projectile points, and a bone gaming piece, date the site to the Fremont Period.

Located just one km. south at 1,926 m. in elevation, site 42DA685 is similar to site 42DA614. This site also contained the remains of a brush structure with an interior hearth. Two calibrated dates, both with mid-ranges of A.D. 885 (1,160 ± 40 RCYBP [Beta 107707] and 1,170 ± 40 RCYBP [Beta 107708]), were obtained from this structure. Fremont material remains included corn, Rose Spring projectile points, and a unique Uinta Gray jar with a red, crosshatch design.

Site Comparison

The flake classification and material data from the Sand Wash site were combined to facilitate comparison (Table 1). At Sand Wash, 14% of the Bridger Formation cherts have some amount of cortex (primary and secondary). This is similar to the 15% of quartzite debitage with cortex but a little less than the 22% in the "other" category that exhibits cortex (Tanner and

Creasman 1986:50). For sites that are near a tiger chert/Bridger Formation source and assumed to contain material obtained through direct access, a range of 14% to 22% cortex serves as the baseline for comparison. This percentage is consistent with sites in southwest Wyoming where the lithic resources used were within 10 km. of the site (cf. Newberry and Harrison 1986: 70; Hoefer 1987:4.18). These figures apply to tiger chert obtained during the Fremont Period. Much higher rates of cortex were noted for other materials and different time periods.

The two debitage assemblages from Dutch John (42DA614 and -685) are small, but 12% to 14% of the tiger chert has cortex (Loosle and Johnson 2000). This represents the lower range of the percentage expected at sites within the source area. Renfrew (1975:46) suggested a core area of 200 to 300 km. for the down-the-line model. However, for relatively common material such as toolstone, a smaller core area would be expected. At Archaic age sites in New Mexico, for example, Chapman (1977:443-444) found a significant drop in lithic material usage five miles from the source. A much more restricted core area of 10 to 20 km. seems appropriate for the model proposed here. The two Dutch John sites are outside this zone, yet still have a relatively high percentage of cortex. The percentages at these sites are similar to the expected rate for direct access, suggesting the occupants had directly acquired their tiger chert in a casual fashion.

At Summit Springs Rock Shelter, only 2% of the tiger chert contains any cortex (Loosle 1992; Fig. 3). This is nearly the same percentage as at Merkley Butte (Loosle and Koerner 1998). Summit Springs is closer to the primary lithic sources than 42DA614 and -685, so a percentage of 14% or greater would be expected if the material had been directly accessed through casual procurement. Even more surprising is the small quantity of Sheep Creek quartzite with cortex, less than 1.3%. One documented source for the quartzite is less than five km. from the site (Erbe 1996). Summit Springs is the closest known large site to the quarry area. Since this is within the core area, it could be assumed that the site was a primary reduction locale for material to be transported across the Uintas. The dramatic reduction in the amount of cortex suggests that the lithic material brought to the site was already prepared and intended for transport. This is in contrast to the cortex rate of 23% in the "other" category, material that was probably directly accessed and not intended for transport. However, the pattern noted may also be a result of functional differences between the sites and needs clarification through additional testing.

DIRECT ACCESS OR EXCHANGE?

How did tiger chert move over 65 km. and Sheep Creek quartzite over 50 km. through difficult mountainous terrain to Fremont sites on Ashley Creek? Casual procurement through direct access may explain the amount of tiger chert in some areas near the eastern end of the Uintas, such as Dutch John and Browns Park, but it does not explain the pattern noted for most of the Uintas and the Uinta Basin. The production of bifaces appears to be an important aspect of lithic movement across the Uintas. The low incidence of cortex in debitage assemblages and common occurrence of large bifaces in the Uintas suggests considerable effort and planning for lithic acquisition. This implies trade, but the question is whether the data from Merkley Butte support this.

At Merkley Butte, average flake weight was 2.2 g. for tiger chert and 2.5 g. for Sheep Creek quartzite (Loosle and Koerner 1998). Although this is lower than the "other" category average of 6.3 g. per flake, it indicates a relatively large flake size. Feder's (1981:201) clunky, local Connecticut material averaged 1.8 g. per flake, while the higher quality traded material averaged 0.43 to 0.73 g. per flake. Differences in site assemblage and material composition would be ex-

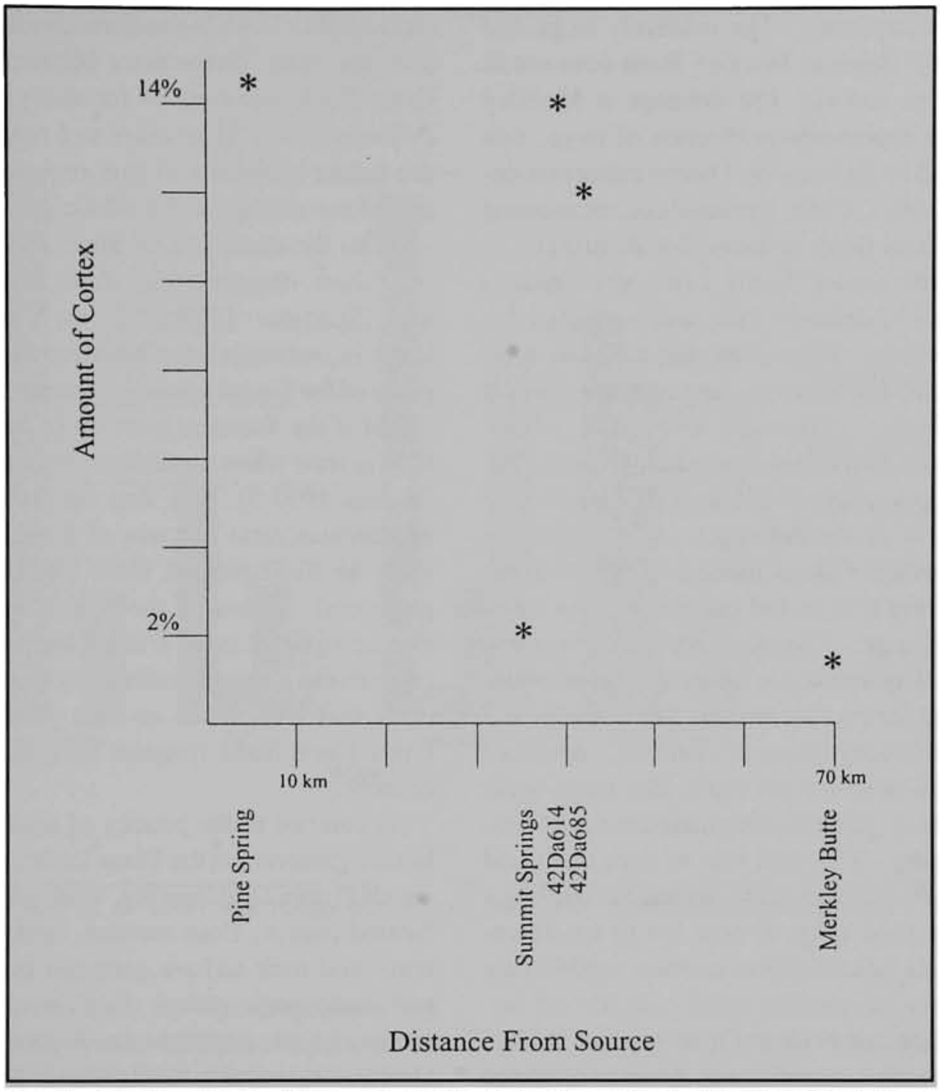

Fig. 3. The percentage of Tiger chert with cortex from sites in the Uinta Mountains.

pected when comparing Connecticut and Utah materials. However, a sample of five excavation units from Summit Springs yielded an average flake weight of 0.83 g. (n = 252) for tiger chert and 0.95 g. (n = 1,153) for Sheep Creek quartzite (Loosle 1992). Average flake weight at 42-DA614 was 1.3 g. for the total assemblage and 1.2 g. for the tiger chert flakes, while at 42DA-685, the average was 1.8 g., but only 0.9 g. for tiger chert (Loosle and Johnson 2000). The latter site is near a thin vein of relatively poor quality chert, which accounts for more than 40% of the debitage and much of the debitage weight there.

These average weights are considerably lower than those for Merkley Butte. A Merkley Butte excavation unit in the workshop area produced 121 flakes[1] with an average weight of 1.1 g. (Loosle and Koerner 1998), which is closer to the Summit Springs average. The majority of these workshop flakes is fine pressure and thinning flakes, indicating that a primary activity at Summit Springs, the Dutch John sites, and the workshop area of Merkley Butte was tool finishing and resharpening. The relatively large size of tiger chert flakes at Merkley Butte does not fit the exchange model. The debitage at Merkley Butte likely represents production of large, thin bifaces such as those in the Thorne collection described below (J. Clark, personal communication 1999), but this needs to be explored further.

The trade model (Vehik 1990) also predicts that the tool to debitage ratio will be higher for traded toolstone. Tiger chert was the most common material for finished chipped stone tools at Merkley Butte. However, only 33% of the chipped stone tools were tiger chert (versus 52% of the debitage), and 19% Sheep Creek quartzite (versus 43% of the debitage). The remaining 48% of finished tools included a variety of materials that were rare or did not occur in the debitage assemblage. The ratios for tiger chert and Sheep Creek quartzite are lower than what would be expected for traded material, but would be expected for directly accessed material. Much of the material used for the tools, like moss agate and gray chert, probably originated in southwestern Wyoming. The high rate of tiger chert and Sheep Creek quartzite in the debitage assemblage at Merkley Butte (Fig. 4) does not fit the down-the-line trade or casual procurement models (see above).

Other lines of evidence also support the hypothesis that this material was directly accessed through planned expeditions. If hunter-gatherer groups from the north slope of the Uintas had visited the Uinta Basin to trade tiger chert, some evidence of these activities would be expected. The presence of such groups near Fremont sites might be postulated through identification of non-Fremont tool types, architecture, or other traded materials. However, recovering evidence of visits by nonlocal hunter-gatherers at Fremont sites is problematic. One problem is that the Uinta Fremont relied extensively on hunting, thereby creating numerous temporary hunting camps, along with hunting tool assemblages that are found at their village sites. An analysis of projectile points from the eastern Uintas failed to detect any clear distinctions between Plains and Great Basin point styles for this period of time (Wilson 1997). Most other tool types utilized by the hunter-gatherers in this region are also not useful for distinguishing ethnic groups.

With the exception of lithic material such as tiger chert, obsidian, gray chert, and steatite vessels (Spangler 1995:523), no other nonlocal items or materials have been sourced to the area north of the Uintas. Another noteworthy question is that if the Fremont gave up horticulture from time to time when conditions made it impractical (Simms 1990:5), how can the material culture and architectural features of these mobile Fremont be distinguished from traditional hunter-gatherers? Although there is little evidence of nonlocal groups in the Uinta Basin, an abundance of Fremont material culture in the Uintas indicates that individuals or task groups from the Uinta Basin made frequent forays into the high country.

In contrast to the paucity of data for nonlocal hunter-gatherers in the Uinta Basin, Fremont materials (Uinta Gray pottery, bone gaming pieces, faceted manos, Utah metates, basketry, snares, corn, and rock art) are common in rockshelters and temporary camps throughout the Uinta Mountains and southwestern Wyoming (Day and Dibble 1963; Smith 1992; Loosle 1997; Francis and Walker 1999). Fremont hunting parties probably used such locations, but it is difficult to distinguish between a Fremont hunting/trading party and a hunter-gatherer group that may have traded with the Fremont.

Other site types from the northeastern end of the Uintas also indicate a strong Fremont presence. Residential sites with pithouses, such as Allen Creek Village (42DA791), have been recorded (Loosle 1997), as well as numerous storage facilities like those at the Hayes site (42DA-622), where large quantities of corn appear to have been stored (Loosle 1995b). In addition, rock art sites with Fremont elements at locations

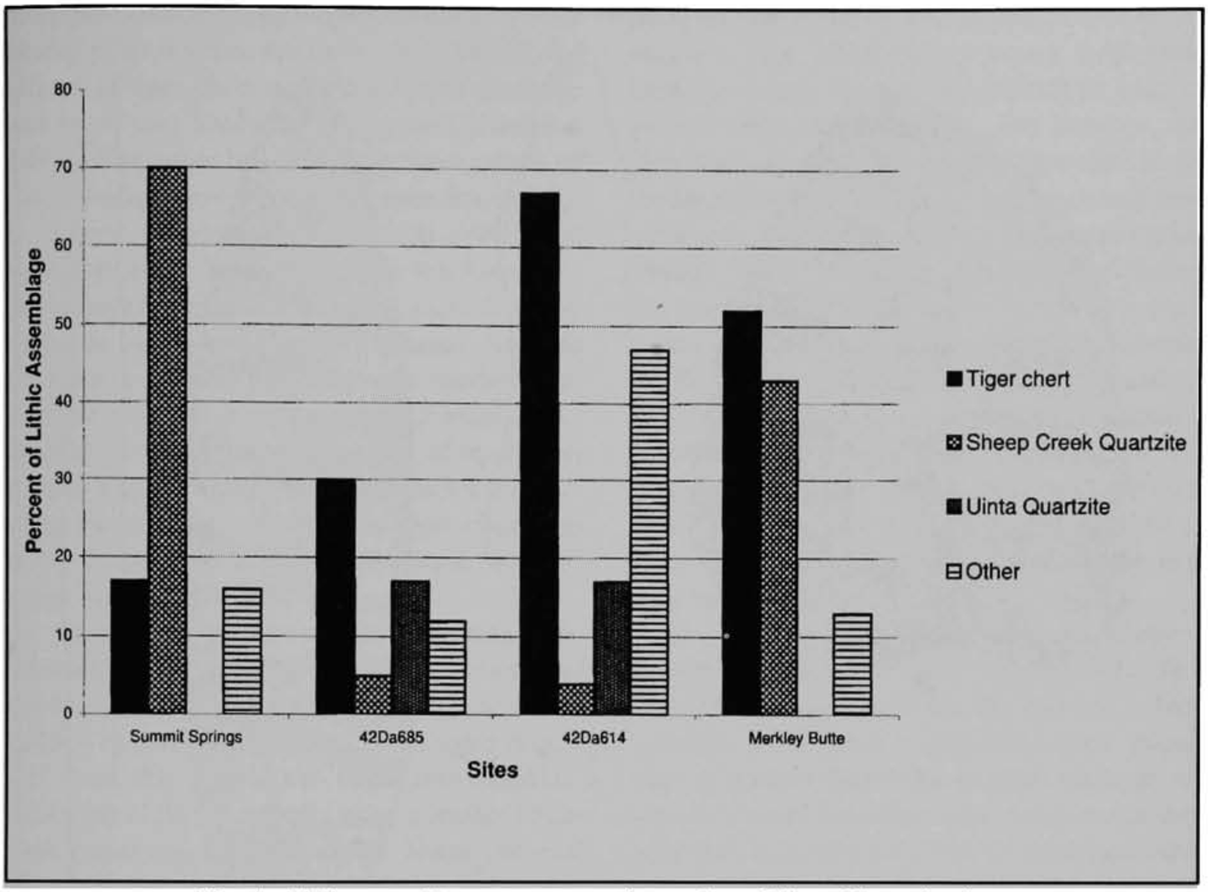

Fig. 4. Lithic assemblage percentages from selected Uinta Mountain sites.

along the Green River in Wyoming, including those at Henrys Fork, Minnies Gap, and the Blacks Fork Confluence, also seem to indicate a Fremont presence north of the Uintas.[2] The construction of these sites would have required considerable planning, energy, and time. They were not made by casual observers of the Fremont culture, but by enculturated individuals who had perhaps been raised in the Uinta Basin or had spent considerable time there.

Bifaces as a Transport Medium

Tiger chert and Sheep Creek quartzite were probably reduced to bifaces to be transported across the Uintas. Numerous large complete and fragmentary bifaces manufactured from Sheep Creek quartzite have been documented throughout the Uintas. These bifaces are similar to the "ovoid bifaces" of the southern Plains (Vehik 1988). Although not as common, tiger chert bifaces have also been recorded at some Uinta Mountain sites (Fig. 5). However, there are numerous examples of such bifaces excavated at Pine Spring (Sharrock 1966:45), Dinosaur National Monument (Breternitz 1970:20, 43, 157), and in the Leo Thorne collection.

There appear to be two functionally different types of bifaces. The most common variety was probably created as a way to transport raw material and typically is 10 to 20 cm. in length, although some in the Thorne collection are even larger. This type has large percussion flake scars, sinuous edges, and a thick midsection (Fig. 5a). Much more rare are bifaces that have

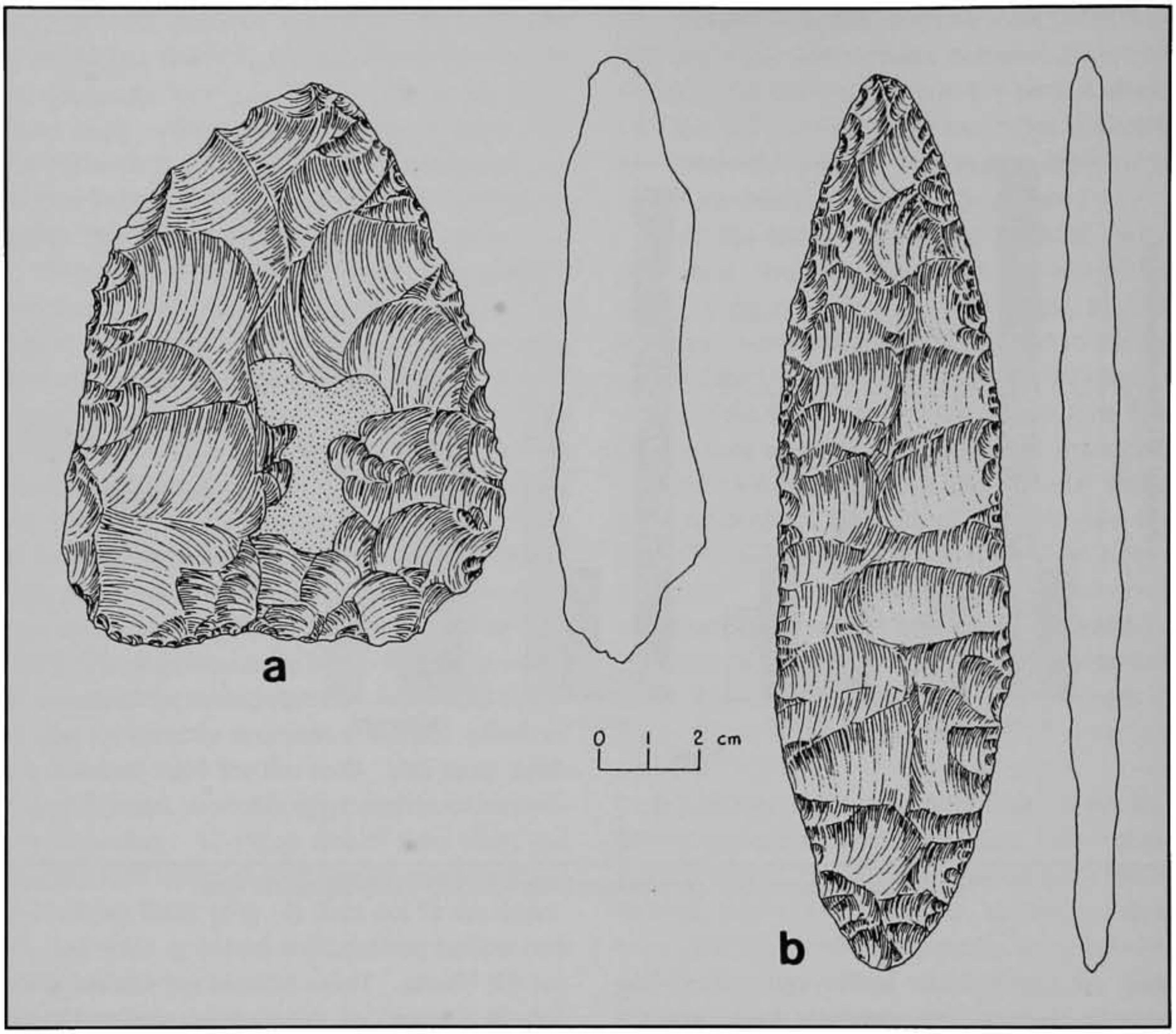

Fig. 5. Examples of the two types of tiger chert bifaces found in the Uinta Mountains.

been finished by removing large pressure flakes (Fig. 5b). These delicately thinned tools are generally from undated contexts, except one Fremont-age blade discovered at the Jones Hole sites in Dinosaur National Monument (Burton 1970: 157). The three largest tiger chert bifaces in the Thorne collection are between 30 and 40 cm. long, while only 1.0 to 1.4 cm. thick. Fragments of large, extremely thin bifaces of tiger chert can also be seen in the collections at McConkie Ranch. The large biface reduction flakes at Merkley Butte and the biface from Jones Hole suggest that Fremont craftsmen were creating these large bifaces, although their function is still unclear. The Thorne collection pieces were allegedly discovered during construction of the Greendale Canal in the eastern Uintas near Trail Creek, which provided access to Red Canyon and a Green River crossing that was important during the historic period and probably prehistorically as well. Because the Thorne bifaces were reported to have been found together, they may represent a cache.

Several caches have been reported in the Uintas (see Fig. 1). Although they do not date to the Fremont Period, these caches demonstrate that this practice occurred throughout prehistory. For example, an Archaic era cache of 37 points and bifaces of tiger chert and Sheep Creek quartzite was found near Sheep Creek Canyon (Broadbent 1992). Two other biface or large flake caches of unknown age have been found near this site (L. Broadbent, personal communication 1994). The Late Prehistoric John Gale cache from southern Wyoming (Miller et al. 1991:54), an Archaic age cache at Swelter Shelter in Dinosaur National Monument (Leach 1970:132), and another in an Archaic house pit in northwestern Colorado (McDonald 1999) suggest that caching of tiger chert bifaces was not limited to the Uintas nor the Fremont Period, and indicates that tiger chert was being transported in other directions, not just south across the Uintas.

Another interesting example of caching is the Sitterud Bundle, now located in the Museum of the San Rafael in Castle Dale, Utah. Discovered in 1968 by Lavar Sitterud in a rockshelter in central Utah, this bundle was dated between A.D. 1250 and 1450.[3] It appears to be a leather backpack containing a toolmaking kit. Snares, several elk antler batons, a leather hand pad, and a variety of raw materials were in the pack. Most of the flakes and bifaces of lithic material were probably local varieties. However, the pack held at least one biface that is similar to Sheep Creek quartzite and two biface fragments that appear to be tiger chert, suggesting that these materials were distributed well beyond the Uinta Basin. The pack also contained a large biface that is probably basalt. Its length and width are similar to the Thorne collection bifaces, but it is considerably thicker.

LITHIC PROCUREMENT

The evidence recovered to date suggests that horticulturalists from the Uinta Basin visited the north slope of the Uintas to procure lithic material. Although some material may have been traded, the pattern of debitage for much of the Uintas indicates that Uinta Basin horticulturalists quarried the material and reduced it near the source. Tiger chert occurs over a large area; however, many sources are difficult to knap or provide only small nodules. For instance, the abundant, secondarily deposited tiger chert along the Henrys Fork is not knappable, even with heat treatment (W. Reed, personal communication 1995). The small quarry sites near Pine Spring did not produce the large bifaces that have been found. The wide range of tiger chert material (R. Kelly, personal communication 1998) and the bifaces larger than 15 cm. reported by Sharrock (1966:43) probably represent material that was brought to the site from other outcrops for reduction (Sharrock 1966:38). It would have taken some time and exploration to identify the best sources of this material.

The Fremont probably practiced an embedded strategy (Binford 1979:259) similar to what Holen (1991) documented for the Pawnee. Each summer, the Pawnee would leave their village sites in eastern Nebraska to hunt bison in the western part of the state. Part of the reason they went this direction was that an important lithic resource was located in southwestern Nebraska and northwestern Kansas. The lithic source influenced the general direction the hunting parties went looking for game. In the example herein, Fremont hunting parties would head north from their village sites along the southern base of the Uintas into and across the mountains to hunt mountain sheep and also to procure lithic materials.

CONCLUSION

The dominance of lithic material from southwestern Wyoming and the north slope of the Uinta Mountains in Uinta Basin Fremont assemblages indicates that the Uinta Mountains were not the impenetrable barrier that was once suspected. Prehistorically, the Uintas were visited extensively, and frequently used transport routes crossed them. The procurement of tiger chert and Sheep Creek quartzite was complex, with direct access a major factor, although in some cases exchange may have been involved. The model that appears to best explain the occurrence of nonlocal lithic material at village sites on Ashley Creek is that parties of horticulturalists traveled to the north to hunt mountain sheep and obtain tiger chert and Sheep Creek quartzite. The model presented here probably simplifies a complex and variable system of procurement and needs to be refined with additional data. The abundance of nonlocal lithics in the Uinta Basin and Fremont material culture on the north slope of the Uintas and along the Green River indicates a degree of mobility among Uinta Basin horticultural groups that has not been demonstrated previously.

NOTES

1. At Merkley Butte, 57 one-meter units with a cultural layer between 20 and 40 cm. in depth were excavated to yield 647 pieces of debitage; at Summit Springs, several one-meter squares contained over 1,100 pieces of debitage in every 10 cm. level.

2. Information on Fremont rock art in Wyoming was obtained by the author from U.S. Forest Service site forms and through the author's personal observations.

3. Information on the Sitterud Bundle was obtained from the display label at the Museum of the San Rafael in Castle Dale, Utah.

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