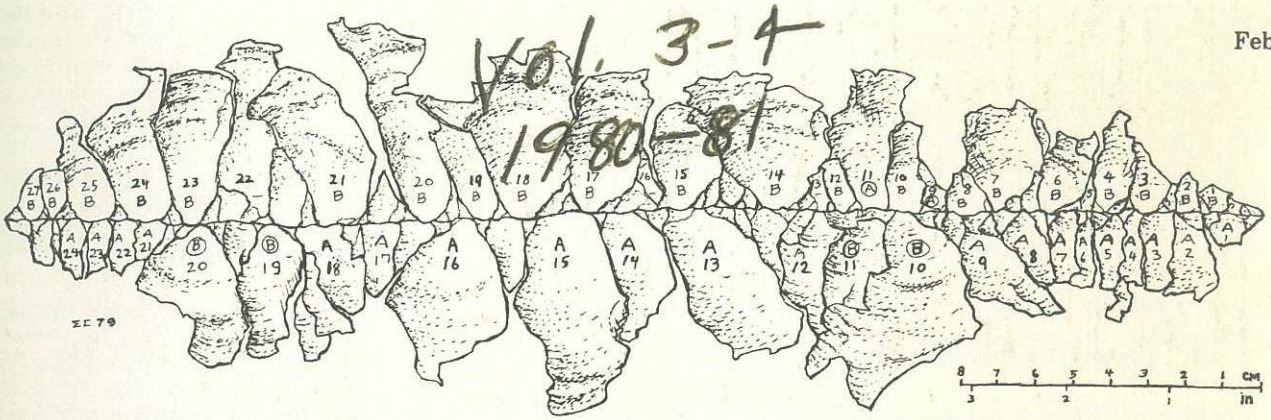
ol. 3 No. 1

February, 1980



FLINTKNAPPERS' EXCHANGE

AN EXCHANGE MEDIUM OF, BY,
AND FOR LITHIC TECHNOLOGISTS

TABLE OF CONTENTS

Published by Atechiston, Inc.

lintknapper's Exchange
techiston, Inc.
126 Constitution N.E.
lbuquerque, N.M. 87110

FE is published three times a year (Feb., May, Sept.) as an informal medium of exchange among flintknappers and lithicologists in all walks of life. Controversial issues will not be discouraged. Letters, comments, and other contributions on any aspect of lithic technology may be sent to the managing editor, Penelope Katson.

The Illustrations: Cover: both faces of one margin of one longitudinal half of a Solutrean laurel leaf #2 from Volgu, France. "Craftsman" illustrations are by Errett Callahan; "The Denver Series" illustrations are by Bob Patten; others are submitted by authors, as noted.

Flintknapper's Exchange 3(1):1980

Just thought I'd send along some comments on the articles etc. from the last F.E. (Vol. 2 No.3).

Rod Reiner's note on a two man flaking technique is interesting and I would like to see further experimentation undertaken with specifically 'aboriginal' type tools, ie. antler, bone, etc. Also, although I do understand the problems of procurement, I'd like to see less obsidian and heat treated stones used in general experiments. It is quite possible that the method of platform preparation, focus of contact, and placement of the tool tip (non-marginal?) may account for the emphasized negative bulbs of applied force. Also what are the expected advantages of this technique over normal indirect percussion and controlled direct percussion?

Patterson's note is also of interest to me and he points out some relevant values of platform preparation by abrasion. One exception I would like to take is to the statement that "The striking platform angle is one of the key variables in controlling the lengths of the flakes removed" and that "Feathered sharp edges..." should be avoided. In some instances these are correct statements, however, many edge effects (as seen on prehistoric artifacts) cannot be obtained by strong and/or steep platform useage. I would like to encourage knappers to try and go back to sharper platform angles both in percussion and pressure flaking, just to see what can be done. Also, many of the assemblages that I have worked with do not show abraded platforms (with some noteable exceptions).

Knapping Tips - Ibarra and Wellman
I am absolutely amazed at my inability to make sense out of most of the 'tips' in this article. As to fire worship influencing the morphology of projectile points - who knows. This is much like saying that the majority of prehistoric pots are either spherical or hemispherical as a result of moon worship. I find little value in dogmatic statements such as "The Lindenmeier was, however, pressure fluted, as is obvious upon observation." The implication being that any fool can see that - well it's not so obvious to this one! Upon what criteria is this observation based? What data? and what in hell is the Lindenmeier, and why is it singled out from all other Folsom points? etc., etc. Some illustrations of the step fluting technique would be helpful - I had trouble visualizing the technique from their description. As to the notched flaker - cut an antler where? use it how? I can assure anyone that is interested, that pressing flakes in one hand against a preform in the other with great force, between the thighs, is not a highly profitable exercise and may cause undue physical distress and dimished potential of a normal family life! Anyway I'd like to see some of the results of these procedures. I feel I need to point out only one more thing in this article at present. Although dubiously flattered that Wellman agrees with my using the 'bent twig' technique to form Eden points, I would like to clarify (once again) that the bent twig theory is totally erroneous and should be called 'grooved solid support' or something of the like. Also, although I have in many ways developed the technique, it was first suggested to me by Don Crabtree in 1971. I must take this opportunity to congratulate the editor(s) of *F.E.* for remaining true to the 'open to all' intent of the *F.E.* format. Including this 'article' is proof of their fealty to the cause!

Sollberger illustrates and describes a tool that I have not as yet attempted to use. Although I can visualize its function I am not convinced (yet) of its advantage. Can an antler stand the force?

I like the book review section and would like to see more in the future.

No comments at present on Patton or Callahan - the Denver series.

Rondeau contributes a well organized well presented article. I have no specific comments at this time other than a probable over-reaction to the extensive misuse (as I see it) or/of the *adjective* lithic. This once again refers to my lonely crusade to attempt to eliminate misuse of borrowed terms and the reduction of jargon in technological studies. Lithic is an *adjective* that refers to objects of stone including sand, boulders, mountains, etc. Therefore lithic technology, lithic analysis, etc. are correct whereas lithics is a noun (non-existant). As for lithic manufacture; are stones being made? and lithic replication; is one simulating quartz etc.?

Toth presents a very informative review of his on-going research in the Koobi Fora area and I look forward to reading about his experiments and findings.

Nichols - Calico Hills Hmmmmm! I'd have to examine the 'core' and know more about its context - depth alone does not necessarily make it old.

Insert - editor. Is replications a word? What ever happened to good old replicas? Probably just our over-enthusiasm to legitimize jargon.

Patterson presents a well organized article with lots of good references and makes a strong case for careful use of a highly specific terminology. His alternative terms for non-bipolar techniques seem reasonable, however, simultaneous flake detachment could be confused with the secondary multiple flakes described by Jelinek et al (Am. Ant. 36(2) 1971). Perhaps opposed simultaneous flake detachment would be more accurate (though cumbersome).

Bruce Bradley
P.O. Box 834
Oracle, Arizona 85623

* * * * * * * *

I have to commend ya'll for the work on *FE* this past year. You are going to have a hard time topping the Crabtree interview in 1980. Keep up the good work, though! Thanks.

Paul B. Graham
Staff Archaeologist
Ohio Department of Transportation
Bureau of Environmental Services
Columbus, Ohio

* * * * * * * *

In the last issue, readers were asked to send in ideas for experiments suitable to a knap-in. Only Rod Reiner and Clay Singer have responded so far. Both will receive free dinner tickets at the Little Lake, California Knap-in. And by the way, this is your last chance to register for the Little Lake, California Knap-in, April 19-20. Registration is imperative. No unregistered people will be admitted.

Register: Susan Schroeder
1704 Catron Ct., SE
Albuquerque, N.M. 87123
Tel. (505) 298-1030

* * * * * * * *

Just received another excellent issue of *FE*. I was however, disappointed to find that *FE* Editors have failed to publish my 3 April '79 letter in which I had suggested a "knap-in" in conjunction with the 45th Annual Meeting of the Society For American Archaeology, to be held in Philadelphia at the end of April of 1980. I had also considered making arrangements for plenty of good Texas Georgetown and Belton flint, and New York cherts. Now, it may be too late to coordinate with all that may be interested. I also provided what I believed to be valuable comments and suggestions pertaining to issues of *FE*, even though they may be controversial to some.
controversial to some.

As for comments on *FE* Vol. 2, No. 3, I too disagree with Patten's contention that the final stage of the Blackwater Draw Clovis point (*FE* Vol. 2, No. 2) was accomplished using "pressure" flaking methods, and therefore support Callahan's comment on same. I also submit that the fluting and basal thinning was done by direct percussion, soft hammer (statement of experience), a basic, simple method. Some retouch by pressure is evident. Likewise, the Folsom fluting discussed by Patten (*FE* Vol. 2, No. 3) may also have been direct percussion of a nearly completed preform-final stage.

It is interesting to note how closely Reiner's two-man "flicked" flakes resemble those resulting from direct percussion-soft hammer on prepared platforms, even to the degree of hinge terminations when fluting a concaved/bifaced preform (*FE* Vol. 2, No. 3). Control however, may prove to be the advantage.

While recently on a trip to California, I visited the area near the Texas Street Site, San Diego for the purpose of locating a quartzite nodule/pebble and satisfying my curiousity about it's flaking characteristics as described by Carter and Minshall. As the result of knapping out a simple chopper using direct percussion, hard hammer, hand held, I make the following observation: Medium sized nodules/pebbles of quartzite work fairly easily for bifacing. Initial flake scars and bulbs of percussion are easily recognized. The final stage however, *does not* reflect typical or classic bulbs of percussion, as demanded by some individuals concerned with identification of man-made artifacts. Hinge fracture type terminations (may have been because of a lack of follow-thru) were common. "Form" (purposeful removal of flakes in a pattern which meets the requirements of a specific function) therefore becomes especially important as an indication of artifact identification, a factor that is important to proponents of early, early man in the Americas (Geo-facts vs. artifacts argument). Good luck with your Calico problem.

I too like your new format. I am also glad that you see fit to use more photographs. Time permitting, I hope to submit an article with several fluting sequences captured on film.

Keep up the good pace. The flow of information thru this conduit known as *FLINTKNAPPER'S EXCHANGE* is both exciting and beneficial.

Major Howard D. Land
24 Hemphill Road
Eatontown, New Jersey 07724

* * * * * * * *

Sorry to inconvenience readers one more time, but please send everything (articles, subscriptions, inquiries, *everything*) to 4426 Constitution N.E., Albuquerque, N.M. 87110. We are trying to centralize everything once and for all. No more changes are anticipated.

Jackie Nichols

* * * * * * * *

J.B. Sollberger, that double pronged pressure flaking tool of yours has "rung a bell" in my memory. There is a very old list, published in 1892 (Thirteenth Annual Report of the Bureau of American Ethnology, page 140) of arrow point making descriptions among various Indian tribes credited to observations made by various ethnographers. One such observation quotes a Stephen Powers, an Ethnographer of the Veeard or Wiyot tribe (which was originally published in North American Ethnography Vol. III 1876). On page 104, Mr. Powers says of the Wiyot:

"The arrow-maker then takes a flake and gives it an approximate rough shape by striking it with a kind of hammer. He then slips over his left hand a piece of buckskin, with a hole to fit over the thumb (this buckskin is to prevent the hand from being wounded) and in his right hand he takes a pair of buckhorn pincers, tied together at the point with a thong. Holding the piece of flint in his left hand he breaks off from the edge of it a tiny fragment with the pincers by a twisting or wrenching motion."

Now, Solly, is this just my imagination or is a "pair of buckhorn pincers" possibly a double pointed flaking tool, and how about that "twisting" motion when the pressure flake is detached?

Rod Reiner
884 Bonsall
San Diego, Calif. 92114

* * * * * * * *

Received my third copy of the *Knapper* Journal. It is improving somewhat.

Am writing to ask if there are any one-handed people out there who work flint. Would like to correspond with them on how they handle their flint.

Was born one-handed and have taught myself to be a flintknapper of sorts. Generally chip bird tips and Cahokia points, but also work in the Archaic and Woodland focuses.

Mr. Reiner has asked suggestions on fluting and I'd like to advance an experiment for the Little Lake knap-in. Like him, I find that any suggestion of pressure on the face will stop the flute or step it. I believe he is correct that the point to be fluted be held by the edges. I don't believe the flute should clear the tip and leave it so thin as to shatter on impact. An example would be the flute on the Gene Titmus preform Page 4 Vol. 2 No. 3 1979.

I would like to suggest that the blank be prepared, as usual, and held by the edges to be struck. To prevent the flute from passing the tip. . .would it be possible for a second person to *pinch* the tip on its faces? The pressure should stop the flute and leave a tip much less shatter prone. Wear gloves. I am unable to try it and would appreciate it if you would let me know if it works or is un-ethical.

Would like to be in California with you professionals but time and money won't let me. Would you know if a knap-in may be planned for the central part of the country? Might be able to make one if closer to home.

Thanks for allowing me to ask about other one-handed flint chippers. Wish you all well at Little Lake and keep on chipping.

Fred Bollinger
Route 1 Box 117
Illmo, Mo. 63754

* * * * * * * *

REPORT FROM DENMARK

What a day. Nils Kjeldsen, of the Lejre Historical/Archeological Research Center here, and I went to get flint in the Stevns area of Zealand (Denmark). At Hoderup, by an ancient church perched on the very edge of the bluff, we came to the huge chalk cliffs or "klints". They are miles long in this area. And about a mile steep. Maybe 125-150 ft. actually. The loose flint was at the bottom, both in and out of the crystal clear, ice cold water. Flint was literally everywhere. The 6-10 inch layers of flint are dispersed in the damp chalk about every 3 ft. vertically, with the upper ¾ Tertiary (coarse brown flints with large areas of lighter impurities) and the lower ¼ late Cretaceous (translucent black with very few impurities--much better than Britain's Dover or Brandon flints.) We walked for hours over white-encrusted nodules 3 ft. long and 8 to 10 in. thick. Yet there were water rounded nodules down to pebble size. I went wild with my camera. No one's going to believe this.

But as the hours rolled by I came to realize, as I had many times in the past at other lithic sources, that all that glitters is not "gold"--in this case workable flint. I was being choosy of course (as was the case in the past?), as we have rather specific research goals for the seminar: pebble choppers and handaxes; Late Paleolithic (Bromme), Mesolithic (Maglemose, Konglemose, and Ertebolle), and Neolithic blade cores (1" to 12"); squared Neolithic axes (to 18"); and Neolithic/Bronze Age flint daggers (to 18"). The fact is, the vast majority of the nodules are so pitted and contorted, fractured, or mixed with impurities that it took a lot of searching to find a single suitable piece. Others might think I'm crazy as one could probably find Clovis points in every chunk. And the worst is of a better quality than most non-obsidian users in the US ever see. This is simply the best flint in the world.

I saw where Nils had been working previously. And where Thorbjorn Petersen of Copenhagen had been trying to work out squared axes. And perhaps where Bo Madsen, Denmark's finest, had knapped. I thought of Curtis Tunnell's warning in *FE* 2(2):2 for flintknappers not to defile aboriginal lithic sites and of how little this seemed to apply here. (Ordinarily I'm with Curtis all the way.) For here the sea was constantly churning up the debitage, making flakes herself, turning all into gravel. No harm was being done.

After 4 hours of work up and down 200 yds. of shore, we had but a modest pile of prepared and raw material. Or so I thought. Till we tried to lug it up the cliffs. The trail is a chalk-slide/rock climb almost straight up. We could carry perhaps 50 to 60 pounds a trip in our two leather sacks and maybe 100 in the duffle bag. The pail was useless as we needed hands for climbing. The climb up to the first ledge was impossible. Only one load, I said. A little further up, by the 100-200 year old quarry of chalky-limestone building blocks, I said never again. By the top I threw down the duffle and swore I'd never knap another flint. Take up weaving or something light. Meanwhile Nils goes jogging the 200 yds. back to the car with his load. These Danes. They're impossibly strong. I lay there gasping for breath, gradually catching it, seeing a white cloud above, some blue sky, the bright Equinox sun, a far away white sail, a fyke net off to the left, far away land at the edge of vision to the right--Sweden--, the clear water below with chalk slabs and green seaweed beneath, the sparkling white cliffs. Flint everywhere. Maybe it was worth it. I know one thing, the seminar participants can get their own flint. I'm keeping this for me. The beauty and the beast.

I get all invigorated again as my breath comes back. I lug the stones to the car and find myself drawn back down below. Damned if I'm leaving all those cores behind. I still can't get over how beautiful the stuff is. Tap it here and the flake comes out there 10" away. We make another trip. And another. Six altogether I think it was. I crawl to the car. Never again for sure. I think.

Still, there is something historic about this day for me. I had finally arrived at the white cliffs I had dreamed about all these years. Like arriving at the end of a rainbow. Equally as beautiful. And finding a value more to me than gold. Perhaps fulfilling the dream of every flintknapper who will never come here.

From the Log of **Errett Callahan**,
21 Sept. 1979:Equinox

* * * * * * * *

KNAP-IN NEWS

THE SECOND TEXAS KNAP-IN

Following an initial Texas knap-in in the spring of 1979 (Patterson, *FE* 2(2):2), a second successful knap-in was held at Belton Lake in central Texas on October 5-7, 1979. There was even better individual participation than before. Everyone had something to demonstrate and/or discuss. Again both amateurs and professional archeologists attended. Amateurs included J.B. Sollberger, W.B. Carroll, L.W. Patterson, Bob Vernon, Carey Weber, Darrell Odell and Wayne Brown. Professionals included Harry Shafer (Texas A&M), Glen Goode (Texas Highway Department), and Phil Bandy (Environment Consultants Inc.). Three Texas A&M graduate students also attended, including Jean McConal, Fred Oglesby and A.J. Taylor.

There is a tendency for knappers to concentrate on the production of highly refined bifaces, which does not cover the full range of replication subjects that could be applied to archeological problems. Phil Bandy furnished a refreshing departure from this by demonstrating replication of flint artifacts not related to refined bifaces. One demonstration was the manufacture of Guadalupe Tools (specialized adzes or gouges found in south Texas), including various stages of breakage, especially from the flake removal to form the bit. Bandy also demonstrated the use of single burin blows to replace scraper edges, and discussed experimental use of this tool type for woodworking.

Some other items covered at this knap-in included:

1. Use of very small deer antler billets (3 to 5 inch lengths) to finish thin bifaces was demonstrated by Bandy, Weber, and Sollberger. It was agreed that there is an advantage for the use of small billets for final thinning of small bifaces.
2. Sollberger suggested that teams of replicators could undertake future comparative studies of knapping results.
3. Shafer stated that Sollberger's replication of "orange peel" flakes for comparison with artifacts from the Mayan Colha site in Belize have been successful, with forthcoming publication of results. This large flake type is from transverse end flake removals for adze manufacture. This work was started at the first Texas knap-in.
4. Some of the group conducted a side trip to survey and sample new flint varieties in this general area. Heat treating tests will also be done later at home.
   As usual, there was general observation of everyone's individual knapping techniques.
6. Sollberger demonstrated use of a new double pronged pressure flaking tool, which reduces force effort required.
7. There was a discussion of fracture types in biface manufacture, and what might be done to prevent undesired fracture types.
8. Goode and Patterson demonstrated various quarrying techniques for producing flake tool blanks from large pieces of raw material, for attendees not familiar with basic quarrying operations.

As done before, various types of heat treated and raw flints were furnished for all to use. Knap-in details and logistics continue to be coordinated by Carroll, Sollberger and Patterson. The weather and central location again proved to be ideal. Spring and fall knap-ins will continue to be held in the future.

Future knap-ins will continue to be on an informal basis to allow maximum flexibility. However, some degree of organization of the program will be encouraged to consider requests for specific demonstrations and suggestions for group replication projects. As with many activities, the success of a knap-in depends on the initiative of individual participants. A high degree of enthusiasm and participation remains with attendees of the Texas knap-ins.

L. W. Patterson
418 Wycliffe
Houston, Texas 77079

* * * * * * * *

INTERNATIONAL WORK SEMINAR I: A PILOT PROJECT IN FLINTKNAPPING WORKSHOPS

During the fall of 1979, your editor spent six weeks in Denmark preparing for and executing an international workshop-seminar in lithic technology. He also taught three other lithic workshops. He was invited to direct these projects by the Lejre Research Center, Lejre, Denmark, after three years of planning. For the seminar, twelve participants from six nations gathered at Lejre, October 8-13, for a week of structured and unstructured knapping and discussions.

Participants included Horreus de Haas of the Stone Age Project in the Netherlands, Anders Fischer, Bjarne Gronnow and Jens Jonsson of the National Museum of Denmark, Hans-Ole Hansen, Nils Kjeldsen, and Soren Moses of the LRC-Center, Thomas Johansson of the Jamtlands Lans Museum in Sweden, Bo Madsen of the Kulturhistorisk Museum in Denmark, Harm Paulsen of the Landesamt fur Vor-und Fruhgeschichte of West Germany, Jan Wartena of the School in Bos in the Netherlands, and yours truly, the seminar leader. Hansen is the Founder and Director of the Lejre Center and the one who got the ball rolling on this thing in the first place.

The seminar was intended to test out a new form of international exchange among flintknappers. That is, although there were structured discussions, there were no formal "papers" read as at conferences. And although there was plenty of time for flintknapping, it was not a free-for-all as with recent knap-ins. Nor was the seminar a class in flintknapping, though teaching was involved.

I have gotten increasingly bothered by the trend at recent knap-ins for everyone to do his own thing--to the exclusion of any concerted effort on a specific problem. It seems to me that when we have a bunch of experts gathered together, that, rather than--or in addition to--just showing off our pet skills, it would be wiser to put our heads together to try to solve some specific problems. This is what we tried to do at Lejre.

In our main run of experiments we tried to define once and for all--if that is even possible--the differences between stone and antler percussion in blademaking. I'll describe this in a moment. First, however, let me share with you some of the other experiments and activities we ran. On the first day of the seminar we took the participants to the massive flint outcrops at the Stevns Chalk Cliffs of Eastern Zealand. I not only wanted them to see the raw source but to experience the work involved in quarrying (selecting) and lugging the precious material up the huge cliff. Respect for the natural material could best be engendered this way. (Knappers everywhere seem to me to waste way too much flint because of easy access.)

There on the rocky shore we got everyone to come up with 5 different ways of making Oldowan choppers, mankind's earliest recognizable tool type. This put everyone on more-or-less an equal footing, for this way they couldn't rely on their one pet technique to whip out a set of tools. Confronted with the given need and not having familiar tradition to fall back on, we were thus each compelled to work out new flaking systems on the spot, a situation the earliest man must have faced.

This done, we discussed the results and how they might relate to teaching appreciation for prehistoric lithic knowledge, or prehistory, to the general public. All of us were involved to a greater or lesser extent with practical interpretation of our skills to the public and so were all intensely interested in the teaching process itself.

Next we had everyone knap out a handaxe using a hard flint pebble, using the technique of their choice. Then we had them do another handaxe using a soft, chalky-limestone pebble. As they watched the soft stone give them results similar to antler, it quickly became clear that "hard" percussion may vary considerably according to the hardness of the stone. Previously, European archeologists have lumped all hammerstone percussion into one category, "hard hammer",--as contrasted with "soft hammer" or antler percussion. Some eyes were opened that day.

The second day we wanted the participants to compare soft stone percussion with antler percussion. Rather than simply hand them ready-made billets, we had them chop out their own fabricators using only stone tools. Biface and large flake choppers, handaxes, and flake and anvil "saws" were all tested with success. It became obvious that when one has to choose between soft stone and antler in a subsistence situation, the advantages of antler must be weighed against the time investment made in securing and preparing the antler for use. The main antlers available in Europe today are Red Deer (up to elk-sized), Reindeer, European moose, and Roe deer (small).

Participants then knapped out bifaces, compared antler and soft stone percussors. Wooden percussors were also comoared with favorable results. In addition, 8 to 10 different knapping techniques were demonstrated in order to get the point across that there is more than one "right" way to thin a biface. It was also brought forcibly home to the participants that there is far more difference between hard and soft hammerstone percussion than between soft hammerstone and antler percussion. The differences are there in the latter, but they are far more subtle than have been previously realized.

Blademaking was demonstrated on the third day, with 10 to 12 different techniques being used to show variability. Blades were made by direct and indirect means using hammerstone, antler billet, boxwood billet, punch, and pressure. A variety of new, non-conventional supporting devices were made up and used as well. Blades were struck from micro to macro in size. (Just following the seminar, a means was discovered for striking a massive Neolithic-like blade 29.6cm in length (11 5/8"). The longest in modern times?)

The main experiment was done in order to clarify the differences between "hard" and "soft" percussion in blademaking. For this, participants knapped out numerous cores using both fabricator types. We tried to keep all other variables constant so that any differences resulting might be taken as diagnostic of the percussor. The Late Paleolithic blades from Fischer's Trollesgave site in Southern Zealand, Denmark, were chosen as our models, as the interpretation of this site hinges strongly upon the definition of the blademaking technique. In all, a total of 601 fully documented blades were produced. These blades are now being measured and analyzed and the results computerized both as to quantitative and qualitative attributes so that any differences may be firmly stated.

Qualitative, non-parametric attributes which we felt flintknappers must consider, but which are usually totally lacking in quantitative anlyses, include core bulk at the time of each blade removal, extent of cortex, extent of curvature, extent of trim on the dorsal face, extent of platform isolation, platform angle in relation to striking angle, and nature of the raw material, including lithic grade and placement of impurities.

Bo Madsen, who has worked extensively with Jacques Pelegrin, Bordes and Tixier's talented protege, noted during the seminar that ours was "the largest experimental population of blades made in modern times in Europe."

The blademaking experiment took place over 3 days but was interspersed with demonstrations, by the appropriate authority, on blade and microblade retouch, Late Paleolithic tool kit assemblage replication, square section axe technologies, Danish dagger percussion and massive pressure flaking technologies. Participants also contributed to the creation of replica displays on Scandinavian tool kit assemblages, Danish dagger reduction sequences, and other exhibits for permanent display at the Lejre Center.

Throughout the 6 days of knapping, discussions were held morning and evening on topics related to specific lithic problems. We especially sought to come up with specific ways in which flintknapping may be of service to archeological methodology. And on a broader level, we sought means of using lithic technology to stimulate environmental/historical awareness in the general public. All sessions were tape recorded and subsequently transcribed. They were then compiled, with a report to the Council of Europe, into a complete, in-house report on the seminar. (This report is available upon request from the Lejre Center. Address requests to Nils Kjeldsen, Lejre Research Center, DK 4320 Lejre, Denmark.)

Questions to which we addressed ourselves during the seminar were as follows:

- In what ways did the environment in your native area actively influence the specific lithic assemblages there at various points in time and how could this most effectively be interpreted to stimulate increased environmental awareness today?
- How is the environment changed/enriched by past and present lithic activity and what concrete advice can we give the growing numbers of contemporary flintknappers to prevent their causing detrimental modification of the natural and cultural environment?
- How could the documentation and excavation of experimental sites and features serve archeology?
- Could the excavation and analysis of gunflint knapping sites be of use in interpreting prehistoric site structure?
- How may knapping demonstrations be used more effectively?
- What recurrent problems do archeologists encounter in flake countings and how many knappers clarify these problems?
- What special problems and solutions arise in interpreting prehistory to children?
- How can we engender greater respect for flint resources by existing knappers?
- What was the social status of the knapper in Neolithic society?
- What would be the optimum stone tool for survival?
- How should we deal with the problems of fakes and salted sites?
- How may films of experimental projects and flintknapping be used most appropriately?
- How can we clarify the concept "primitive", the concept "play"?
- How can we gain wider acceptance among the professional community?
- How may lithic seminars, workshops, and knap-ins be used most effectively?
- How does flintknapping aid modern environmental awareness, interpretation and education?

Spin-offs resulting from the seminar include in-depth research on square section axes by Harm Paulsen, papers on blademaking by Bo Madsen and Anders Fischer, research on prehistoric billets by Jonsson, and research on replicating Danish daggers by Callahan. American reference material on lithics, which is not generally read in Europe, was provided, with LRC serving as central library.

During the seminar, an experimental lithic workshop site (site 2.06.01:V) was set up on a hilltop and set aside for future seminars and structured experiments. After the seminar, our flaking features were covered with soil so that future experimentation will not stir up the thus-far well-documented knapping areas and so that stratigraphy may be built up and subsequently excavated and studied.

Perhaps the most far-reaching result of the seminar is the establishment at Lejre of a permanent headquarters for lithic experimentation in Europe. Nils Kjeldsen and Soren Moses will be working full-time developing displays and reference collections and creating an extensive outdoor site complex for lithic experimentation and public education. A reference collection of modern flint craftmanship is being assembled as well. Knappers who are interested in donating samples of their work should contact Nils at the address above. People come from all over to see the prehistoric settlements at Lejre--close to 100,000 a year. Most Danes are very interested in flint. It is literally everywhere, having been dragged all around by the glaciers. There is a song about how every flint chip is the heart and soul of the land. Flint is no less than the symbol of Denmark.

The Lejre Center, the Mother of all experimental research centers (see Time-Life's *The Northmen*), has for the past 15 years pioneered a new concept in outdoor, hands-on, living museums. To the large working Iron Age village, Neolithic settlement, 18th Century farmhouses, and upcoming Viking villages have now been added the beginnings of a Late Paleolithic, Stone Age settlement and lithic research area. The Center wishes to emphasize that flintknappers from around the world are welcome to undertake experimental projects, join in seminars, visit, or otherwise use the Center as a home base where they will always be welcome to do research.

In the fall of 1980 a full-scale seminar funded by the public as well as private foundations, Council of Europe, and by the Nordic Council will get underway. This will be followed by other lithic workshops, courses, and consultation. If all goes well, your editor will be having a hand in getting this ball rolling.

In conclusion, Danish flintsmiths are seeking to take the lead in lithic achievement as they did with their beautiful and massive blades, daggers, and flint axes during Neolithic times. With the interest, drive, and talent, the quality flint and the support of the prestigious Lejre Center, there is no question that all eyes could again focus on Denmark as a major leader in lithic studies.

Errett Callahan

* * * * * * * *

Knap-in Suggestion

I have a three-foot, 300 lb. plus boulder of black obsidian that I will bring to the April Little Lake Knap-in if someone can suggest how best to split and core it. Our objective would be to produce 22 inch preforms and make these into Yurok Ceremonial double-pointed knives.

The problem is that I have not been able to core anything much larger than 14 inch flakes from these large boulders, and I personally smashed a couple of boulders to "smithereens," trying to break them in half to form a striking platform.

If you have experience coring preforms of 22 inch size, or know how this was done, please share your knowledge with me by letter or write *FE*. Otherwise, I will be forced to "hoard" this boulder for another year, until I can experiment further and be sure of not destroying it, when I break it up.

Rod Reiner
884 Bonsall
San Diego, CA 92114

* * * * * * * *

GENERAL OUTLINE FOR THE PROPOSED KNAP-IN EXPERIMENT

Aims and Purposes

(1) To examine the workability and physical characteristics of the stone materials recovered from the Calico deposits, primarily the different varieties of chert and chalcedony.
(2) To attempt to replicate various tool and artifact forms recovered from subsurface deposits at Calico.
(3) To discuss and analyze specific technological aspects, characteristics, and features of the Calico assemblages and the artifact materials.

Procedures

(1) Experienced knappers will flake and otherwise work with various stone materials from Calico including (a) translucent homogeneous chalcedony, (b) mottled heterogeneous chalcedonic cherts, (c) opaque jasper, and (d) any other available materials.
(2) Knappers will attempt to reproduce various tool and artifact forms after thorough examination of specimens from the deposits, and discussion of techniques and procedures.
(3) A complete set of notes, photographs and recordings will be made of all proceedings, and later transcribed and edited in preparation for publication.
(4) All flaked and worked materials including debitage will be systematically collected and stored for further analysis.

Questions

(1) How were flakes removed? Types of hammerstones or percussor used, including weight, dimensions (shape), material, and condition ("e.g." wear pattern).
(2) Type of rest or anvil used?
(3) How were blades removed? Direct or indirect percussion?
(4) How were microblades made? What techniques were used to manufacture burins?
(5) How was the retouch produced?
(6) Can we consistantly and confidently distinguish between deliberate retouch, use-wear retouch, and post-depositional damage patterns?

Problems

(1) Missing elements and things not yet identified within the deposits, for example (a) spherical hammerstones, (b) quantities of organic material, or (c) discrete assemblages from easily identifiable occupation surfaces.
(2) The unrefined nature of most of the artifacts and tool forms -- pieces often seem heavy and thick on profile. Tools manifest minimal thinning or deliberate marginal retouch.
(3) Most artifacts are not in pristine condition -- some are freshly chipped or broken and reglued, many pieces have crushed and rounded edges (natural), and most are coated with a thin layer of clayey or scaley material, and sometimes a layer of calcite crystals.
(4) Some non-artifacts are undoubtedly included in various tool categories and must still be culled from the collections.
(5) The nature and validity of the bipolar industrial tradition or technique at Calico.

Clay A. Singer
726 Copeland Ct.
Santa Monica, Calif. 90405

* * * * * * * *

problems / solutions

A PREHISTORIC SUBSISTENCE KIT FROM CASTLE VALLEY, CENTRAL UTAH

In October, 1979, a large elk hide bundle containing a number of prehistoric artifacts was brought to my attention by Dr. David B. Madsen, Utah State Archaeologist. Our mutual interest was generated by the fact that this bundle represents a portable subsistence kit which includes bone and stone tools for the manufacture of chipped stone implements. It also contains a variety of whole and fragmented blanks and preforms, sinew, rabbit fur cordage, a sinew snare, an elk antler, a painted leather strap, a small leather ochre bundle, leggings (one of which is full of Squawbush berries and leaves), a leather palm pad, a thin small leather bundle which contained the chipped stone, and miscellaneous leather fragments. All of the items, including the bundle are in an excellent state of preservation.

The bundle was found in the spring of 1969, by Mr. Lavar Sitterud as he, a son, and grandson were out exploring for petroglyphs about 12Km east of Castle Dale, Utah (Fig. 1). While walking up an unnamed tributary of the San Rafael River they noticed a "strip of rawhide" sticking out of the soil in a small overhang. Subsequent digging revealed the bundle with the elk antler placed on top of it. The bundle had been laced closed with the leather strip which first gave the party the clue to its existence. It has no associations with a burial, architectural structure or any other cultural features and apparently represents an isolated cache.

In 1969, the Emery County museum was opened in Castle Dale, Utah, and Mr. Sitterud placed the bundle and its contents on display, where it was first noticed by Dr. Madsen. This small museum has eluded archaeologists for over 10 years and it is hoped that this article will stimulate others to capitalize on the wealth of information such institutions harbor and the genuine interest many local collectors have in advancing professional archaeology.

It is apparent that many (if not all) of the items contained in the bundle have been found elsewhere under more professional conditions, but the fact of the existence of such a bundle is extremely important in and of itself. The purpose of the article, then, is straightforward: to present the bundle and its contents in a manner that will be informative to the profession. (See Benson 1980, which deals with the bundle in more general terms.) A descriptive format has been chosen for this task for several reasons, particularly the short time I had to complete analysis and the fact that it represents an isolated cache. The bundle is treated as a complete assemblage during analysis although emphasis is placed on the chipped stone (non-perishables) and fabrication kit.

SETTING

The bundle was recovered from a small dry overhang (42Em1194) in an unnamed drainage that enters the San Rafael River about 0.6Km below Hambrick Bottoms. It is about 0.8Km up the drainage from the river and on the east side (T. 19 S., R. 9 E., Section 26, SE ¼, SE ¼, Sw ¼) at an elevation of 1646 m (5400'). The overhang was created by the advancement of an intermittant stream into the soft laminated sandstone that makes up the drainage sidewalls. Eventually the stream course altered, leaving a small terrace and the overhang a few meters above the present stream bottom (Fig. 2). The floor of the overhang is very loose, unconsolidated sand deposited by the stream and roof spall.

INVENTORY

The bundle, as found, contained a collection of perishable and nonperishable artifacts, which together constitute a basic portable subsistence kit. All of its contents, except the elk

antler, were found wrapped in the crudely tanned elk hide laced closed with a strip of buckskin (Fig. 3). A general analysis of the perishable items was completed which recorded significant attributes which were readily apparent and did not require exhaustive laboratory analyses.

Non-perishables, on the other hand, were analyzed using a 22 variable attribute list which emphasizes production technology and function (see appendix). Morphology and outline are considered but are not significant factors, as the total tool assemblage is considered "non-diagnostic" of time or cultural affiliation.

PERISHABLES

FLAKING KIT *Palm Pad* (?) (Fig. 5E). Material: Buckskin, Condition: Complete, Length: 20cm, Width: 15.5 cm, Thickness: 1.5mm, Comments: The size and loop in only one corner of this piece of buckskin allows for it to be tentatively classified as a palm pad. There are a few locations on the pad that show damage which could have occured during flaking.

Antler/Baton (Fig. 4, b, c). Material: elk antler, Condition: trunk only; all tines and branches have been cut off, Length: 73 cm, Width: 7.8 cm, Thickness: 5cm, Surface Attributes: Proximal End-This end has been battered. Distal End-Saw marks are evident where the antler was grooved to remove sections of solid antler for alternate uses. Surface-A notch 4.3 cm wide has been cut into one side and extends the entire length of antler. This strip has been removed with a burin-like tool as numerous saw markings are evident near the groove edges. Comments: The antler served as a multipurpose implement as well as a source of raw material for small tools.

Baton/Pressure Flaker (Fig. 5A). Material: Elk antler, Condition: Complete, Length: 21 cm, Width: 2.1 cm in diameter, Surface Attributes: Proximal End-This end is rounded and battered from use. There are numerous striations and nicks on the end and edges. Distal End-This end is highly polished and shows extensive nibbling and striations from use. It is nearly flat and perpendicular to longitudinal axis of the implement. Surface-From the distal end and extending up 7 cm the surface is highly polished and has a glossy appearance. The proximal surface has no polish. Comments: Polish on this tool is apparently from extensive handling and natural hand oils that have soaked into the surface.

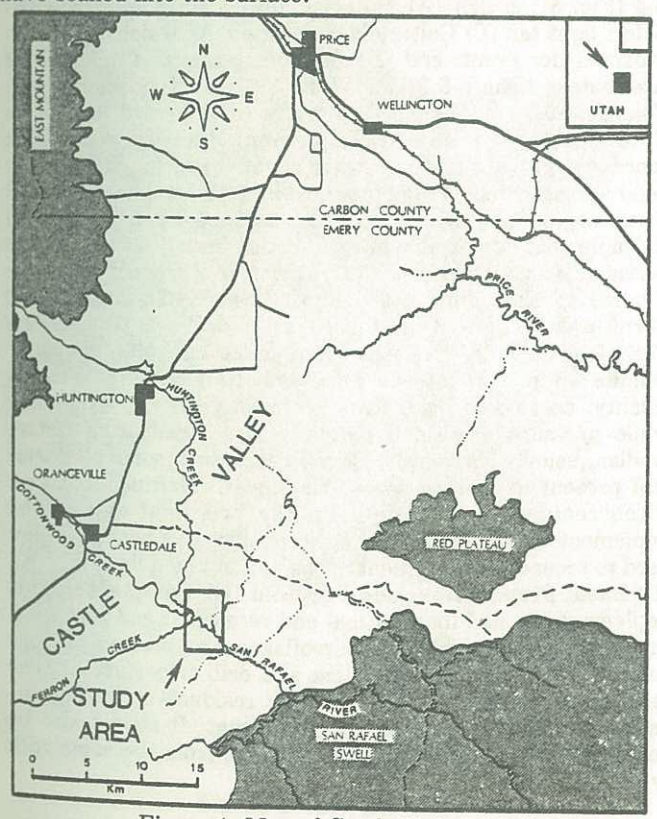


Figure 1: Map of Castle Valley, Utah

Punch (Fig. 5B) Material: Mammal longbone (elk?), Condition: Complete, Length: 20 cm, Width: 2.0 cm, Thickness: 1.5 cm, Surface Attributes: Proximal End-The proximal end is flat and shows numerous striations left by shaping. A small spall has also been removed from the ventral side as if the end has been struck. Distal End-The right side of the distal end is obliquely ground. The tip is flat and shows signs of nibbling and striations. Ventral Surface-The ventral face has portions of the medullary cavity present. The cavity begins at the proximal end and continues up to 3.5 cm from the distal end where the bone turns porous. Edges of the cavity have been ground down perpendicular to the longitudinal axis of the implement. Dorsal Surface-This side shows no shaping or modification. Comments: This implement appears to have served as a punch used for detaching flakes off of prepared cores or roughed out blanks. This is indicated by the spall off of the proximal end and the intense nibbling on the distal end. That the tool was hand held is indicated by the polish on some of the surfaces.

Notcher (Fig. 5C). Material: Antler, Condition: Complete, Length: 11.7 cm, Width: 1.3 cm, Thickness: 1.0 cm, Bevel Angle: 38o, Surface Attributes: Proximal End-Some battering of the end is present. Distal End-This end has been so shaped that it forms a bevel. There is nibbling of the edge and it is generally dull and polished. Striations are present just below the edge. Ventral Surface-This surface is porous and has been formed from the inner core of an antler. Dorsal Surface-The rough natural surface of the antler is predominant on this face. Comments: The implement was apparently a notcher and possibly secondarily used as a punch. The sides have been shaped by grinding and striations parallel to the longitudinal axis are present.

LEATHER GOODS

Outer Bundle (Fig. 3). Material: Elk hide with buckskin straps, Condition: The bundle is dessicated in spots and very brittle. It is ripped where it was folded and fungus has attacked it in a few localities. The buckskin strips are complete and in excellent condition, Length: bundle-115 cm folded; 135 cm unfolded, straps-ca 130 cm, Width: bundle-47 cm folded; 95 cm unfolded; straps ca 3 cm, Thickness: bundle-1.5 cm; straps-1.5 mm, Comments:Several knots were tied on the buckskin strap. Two at the top of the bundle are square knots while one near the bottom is an overhand knot. The bundle appears only to have been roughly tanned as it is very stiff and was prepared with urine. Loops around the edges where the buckskin strap has been threaded may not only have served to tie it closed but also to stretch it out while tanning.

Painted Strap. (Fig. 4a). Material: Elk hide, Condition: Complete, Length: 90 cm, Width: 7 cm, Thickness: 3.5 mm, Comments: This strap has been only crudely tanned is very rigid. As found, it was folded in the middle. On one end there is a loop and on the other end is the remnants of what appears to be another. These could have served as tanning loops or else as places to tie the strap onto another object (possibly the big bundle?). One side has a rough surface and is not decorated while the other is smooth and has four painted designs. Two of these are near the ends of the strap and are line and hatching motifs. The other two are near the median of the strap and in most respects are mirror images of the same embellished triangular motif. All of the designs have been outlined in black with the areas inside of the triangles painted a blueish-green. The areas between the linear motifs have been painted in orange and blueish-green as well as some of the embellishments of the triangles.

Miscellaneous Leather. Material: Elk hide and buckskin (one of these shown in Fig. 6c), Comments: Three pieces of leather, two thongs, and a segment of cordage are included here and most appear to represent miscellaneous remnants of unidentifiable items. Of special note is a square knot found on one of the thongs. The cordage segment has been twisted to create a shoestring-like piece of cordage (Fig. 6E). Also among the leather goods, an inner bundle, which contained the chipped stone tools; an ochre bundle, containing 400 grams of hematite; a buckskin legging containing 2.7 liters of Squawbush berries; and buckskin fragments.

SINEW

Raw Sinew Strand (Fig. 6B). Material: Elk or deer sinew, Length: 50 cm, Width: 3 mm, Comments: This piece of sinew is in a raw state and as such could have been used in a variety of ways.

Snare (Fig. 6A) Material: Elk or deer sinew, Condition: Complete, Length: 148 cm, Width: 3-10 mm, Comments: This sinew cordage snare was made by first twisting a single strand of sinew counterclockwise. Next the strand was doubled back on itself and then twisted in a clockwise fashion. A loop was created at the end by backsplicing the loose end of the cord into the double twisted strand.

RABBIT FUR

Cordage (Fig. 6D). Material: Rabbit fur, Condition: Fragment only, Comments: The cordage was made by twisting a strip of fur and hide in a counter clockwise direction.

BONE

Shaft or Handle (?) (Fig. 5D). Material: Bone (elk?), Condition: Tip and medial section only, Width: 5mm in diameter at the tip; 8mm diameter at the median Surface attributes: Distal End-This end has been tapered down to a smaller diameter than the main portion of the shaft. There are pitch stains on this end which extend up ca 1 cm. Proximal End-Broken. Surface Attributes-This implement served either as a shaft or as a handle. The pitch stains are probably from hafting.

NON-PERISHABLES

CHIPPED STONE

Bifaces (Fig. 7). (A) Material: cryptocrystalline basalt (B) Color: brownish black (C) Culturally Significant Adhesions: stained with ochre on both dorsal and ventral surfaces (D) Condition: complete (E) Metric Attributes: Length-38.8cm; Width-6.0 cm at median; Thickness-2.5 cm; Weight-572.2 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: generally straight parallel edges with pointed ends (H) Implement Medial Cross-section: strongly convex (I) Implement Longitudinal Cross-section: nearly straight but convex at the ends (J) Implement Production Stage Evaluation: shaped but not highly stylized (K) Traditional Tool Form Designation: large knife (L) Flaking Techniques and Patterns: percussion-collateral/pressure-retouch and edge shaping (M) General Flaking Quality: very good with large distally expanding, collateral flake scars terminating at implement median; very few hinges or checks (N) Edge Preparation: edges show grinding and platform isolation (O) Hafting Features: see comments (P) Basal Preparation: N/A (Q) Comments: Although no hafting features are noted for the item it should be mentioned that one of the surfaces has an area void of any ochre. This may be indicative of how the implement was handled by its user.

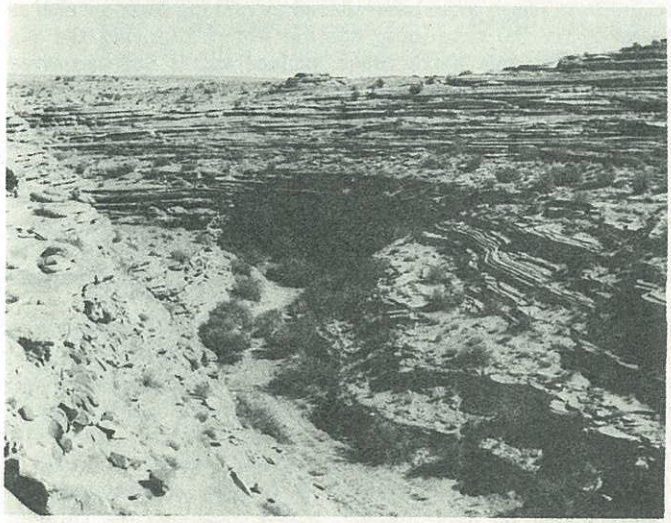


Figure 2: NE orientation of River. Site Location in Foreground.

B-2 (Fig. 8A & 9C) (A) Material: fine grained quartzite (B) Color: reddish brown (C) Culturally Significant Adhesions: none noted (D) Condition: complete (E) Metric Attributes: Length-13.5 cm; Width-5.8 cm at median; Thickness-0.8 cm; Weight-89.1 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: one edge slightly convex with the other slightly straight; pointed ends (H) Implement Medial Cross-section: slightly convex (I) Implement Longitudinal Cross-section: straight (J) Implement Production Stage Evaluation: Shaped but not highly stylized (K) Traditional Tool Form Designation: knife (L) Flaking Techniques and Patterns: percussion-collateral/pressure retouch and edge shaping (M) General Flaking Quality: good percussion flaking on one surface with large parallel flake scars terminating at the median; flake scars on other side are distally expanding but either hinge or step before median (N) Edge Preparation: major proximal platform of original flake-blank never removed; no grinding evidence noticed (O) Hafting features: N/A (P) Basal preparation: N/A (Q) Comments: This knife is exceptionally thin considering its relative size and the material it is made from.

B-3 (Fig. 8B & 9C) (A) Material: fine grained quartzite (B) Color: light tan (C) Culturally Significant Adhesions: none noted (D) Condition: complete (E) Metric Attributes: Length-13.5 cm; Width-4.1 cm at distal; Thickness-1.0 cm; Weight-5.16 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: slightly irregular convex with both ends pointed; edges converge towards distal end (H) Implement Medial Cross-section: slightly convex (I) Implement Longitudinal Cross-section: straight (J) Implement Production Stage Evaluation: shaped but not highly stylized (K) Traditional Tool Form Designation: knife (L) Flaking Techniques and Patterns: irregular precussion and pressure; pressure retouch mainly edge shaping (M) General Flaking Quality: most percussion flake scars are distally expanding with mixed terminations at varying lengths; one section of pressure flake scars are oblique parallel (N) Edge Preparation: some ground platform remnants still present (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: Many of the flake scar terminations have the end portions of the flakes still intact; appears to have had little prehistoric use.

B-4 (Fig. 8C & 9E) (A) Material: fine grained quartzite (B) Color: light tan (C) Culturally Significant Adhesions: pitch on proximal dor./vent. end (D) Condition: complete (E) Metric Attributes: Length-8.7 cm; Width-3.8 cm at proximal end; Thickness-0.7 cm; Weight-23.3 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: concave edges at median; concave edges converging to a sharp point at distal; dull pointed proximal end (H) Implement Medial Cross-section: slightly convex (Both dorsal & ventral surfaces) (I) Implement Longitudinal Cross-section: nearly straight (Both dorsal & ventral surfaces) (J) Implement Production Stage Evaluation: shaped but not highly stylized (K) Traditional Tool Form Designation: Knife-reused as a drill (?) (L) Flaking Techniques and Patterns: Percussion-irregular/pressure-oblique on median of one edge only (M) General Flaking Quality: percussion flake scars are mostly distally expanding while pressure are small parallel scars terminating before median, usually hinging (N) Edge Preparation: some platforms still present as well as some grinding (O) Hafting Features: Pitch residues are evident on the proximal end of the implement which appears to be the remains of a bonding agent used to secure the implement in the end of a handle (Fig. E). (P) Basal preparation: edge ground (Q) Comments: This implement has had its proximal end retouched and reshaped. Small pressure as well as microflakes are present on one surface indicating a secondary use as a drill or perforator. The uniqueness of the piece is the pitch residues indicating the hafting techniques used on the implement. It should also be noted that B-3, B-4, and U-1 are all made from the same rock type.

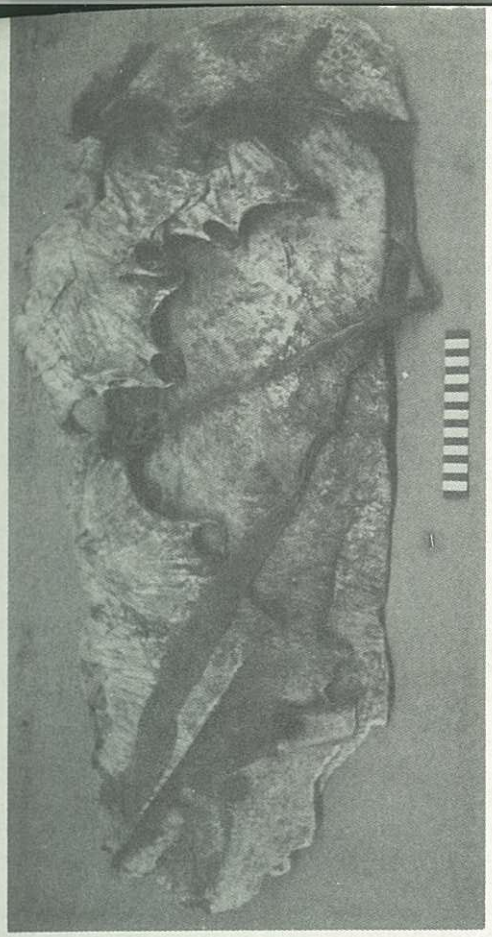


Figure 3: Outer leather covering of Bundle

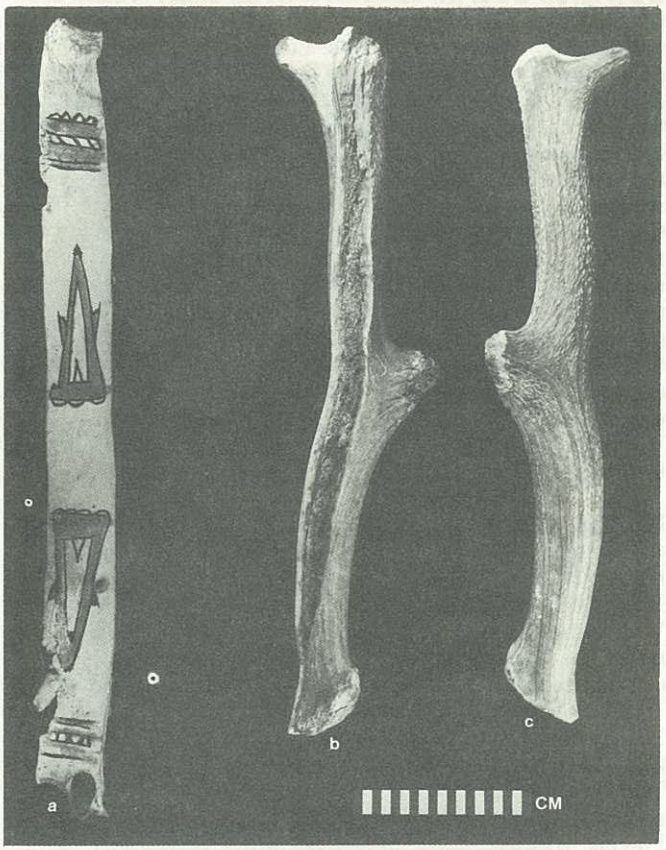


Figure 4: Leather strap and elk antler/baton

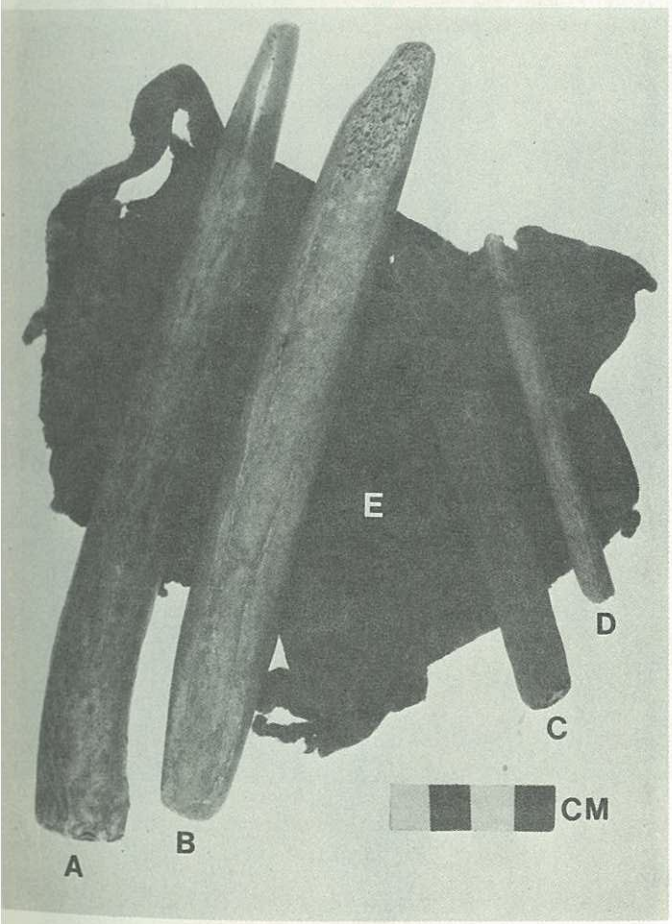


Figure 5: Knapper's Kit.

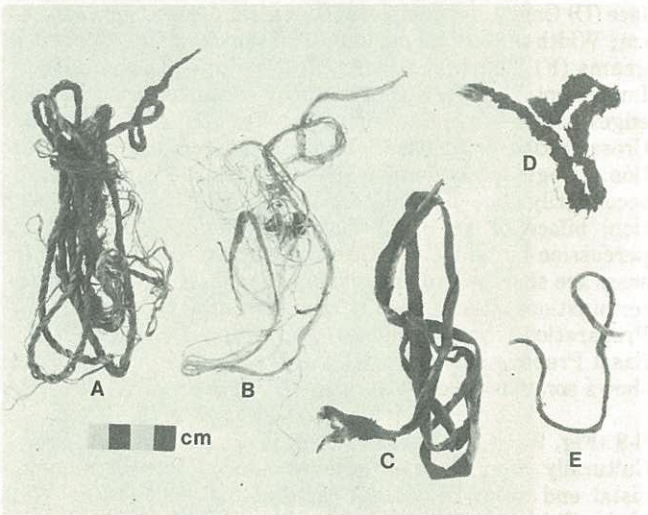


Figure 6: Sinew, Leather & Rabbit Fur Cordage.

B-5 (Fig. 8D & 9G) (A) Material: chert (B) Color: reddish brown (C) Culturally Significant Adhesions: none noted (D) Condition: complete (E) Metric Attributes: Length-6.3 cm; Width-3.4 cm at median; Thickness-0.6 cm; Weight-12.7 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: one edge is nearly straight from the proximal end to the median and then is straight, converging to the distal end; the other edge is slightly convex; distal end is sharply pointed while the proximal end is dull pointed (H) Implement Medial Cross-section: irregular (I) Implement Longitudinal Cross-section: irregular (J) Implement Production Stage Evaluation: secondarily shaped blank (K) Traditional Tool Form Designation: biface or knife (L) Flaking Techniques and Patterns: percussion-irregular; pressure-irregular (M) General Flaking Quality: Percussion flake scars are irregular and distally expanding; pressure flake scars are mainly restricted to the edges (N) Edge Preparation: some platform isolation (O) Hafting Features: N/A (P) Edge Preparation: N/A (Q) Comments: none

B-6 (Fig. 8E & Fig. 9K) (A) Material: obsidian with phenocrysts (B) Color: black (C) Culturally Significant Adhesions: none noted (D) Condition: broken in two (E) Metric Attributes: Length-6.5 cm; Width-3.2 cm at median; Thickness-0.7 cm; Weight-14.9 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: one side is strongly convex while the other is straight; both ends dull pointed (H) Implement Medial Cross-section: irregular (I) Implement Longitudinal Cross-section: irregular (J) Implement Production Stage Evaluation: secondarily shaped blank (K) Traditional Tool Form Designation: biface or knife (L) Flaking Techniques and Patterns: irregular percussion and pressure (M) General Flaking Quality: Percussion flake scars are mostly distally expanding terminating at various lengths from the edge; pressure flake scars are isolated and restricted to the edge (N) Edge Preparation: some evidence of platform isolation and set-up (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: The item was obviously broken during the thinning stage by the force of the blow hitting small inclusion.

B-7 (Fig. 8F & 9M) (A) Material: chert (B) Color: grayish brown (C) Culturally Significant Adhesions: ochre adhesions on dorsal face (D) Condition: complete (E) Metric Attributes: Length-8.7 cm; Width-3.6 cm at median; Thickness-1.4 cm; Weight-64.3 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: very irregular straight parallel edges with a convex and irregular end (H) Implement Medial Cross-section: irregular (I) Implement Longitudinal Cross-section: irregular (J) Implement Production Stage Evaluation: secondarily shaped blank (K) Traditional Tool Form Designation: biface or knife (L) Flaking Techniques and Patterns: percussion-irregular (M) General Flaking Quality: Most flake scars are short round and distally expanding with a mixture of terminations; flaking mostly crude or initial thinning (N) Edge Preparation: some grinding (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: The proximal(?) end shows some use, possibly as an end scraper.

B-8 (Fig. 9Q) (A) Material: chert (B) dark brownish grey (C) Culturally Significant Adhesions: none noted (D) Condition: distal end only (E) Metric Attributes: Length-N/A; Width-N/A; Thickness-N/A; Weight-N/A (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: distal end pointed; imcomplete (H) Implement Medial Cross-section: slightly convex (I) Implement Longitudinal Cross-section: straight (J) Implement Production Stage Evaluation: secondarily flaked blank (K) Traditional Tool Form Designation: biface or knife (L) Flaking techniques and Patterns: irregular percussion and pressure (M) General Flaking Quality: small irregular flake scars with mostly hinged and stepped terminations (N) Edge Preparation: some platforms ground and isolated (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: Item was broken when the flaker struck off a flake which hit an inclusion.

B-9 (Fig. 9H) (A) Material: variegated chert (B) Color: variegated cream and grey (C) Culturally Significant Adhesions: none noted (D) Condition: distal tip (E) Metric Attributes: Length-N/A;, Width-N/A; Thickness-N/A; Weight-N/A (F) Thermal Alteration Evidence: possibly as implement has a slight greasy feel (G) Implement Plan View Outline: slightly convex edges with moderately sharp point (H) Implement Medial Cross-section: straight (I) Implement Longitudinal Cross-section: straight (J) Implement Production Stage Evaluation: possibly a preform (K) Traditional Tool Form Designation: biface or knife (L) Flaking Techniques and Patterns: percussion only (M) General Flaking Quality: mostly distally expanding and round flake scars terminating at various lengths (N) Edge Preparation: ground and platforms isolated (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: Item appears to have been broken during thinning process as the fracture at the distal end is a crenated fracture caused when the line of force of the flakers blow hit an inclusion.

B-10 (Fig. 9S) (A) Material: chert (B) Color: light brown (C) Culturally Significant Adhesions: none noted (D) Condition: estimated ½ of original implement - medial and distal portions (E) Metric Attributes: Length-N/A; Width-3.7 cm at median; Thickness-0.5cm; Weight-N/A (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: irregular slightly converging edges with a convex distal end and a broken proximal end (H) Implement Medial Cross-section: straight on dorsal surface and slightly convex on ventral surface (I) Implement Longitudinal Cross-section: slightly convex on dorsal surface and slightly concave on ventral surface (J) Implement Production Stage Evaluation: secondarily flaked blank (K) Traditional Tool Form Designation: biface or knife (L) Flaking Techniques and Patterns: percussion-irregular (M) General Flaking Quality: flake scars largely restricted to one surface-large distally expanding flake scars terminating at median (N) Edge Preparation: some grinding on platforms still evident (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: none

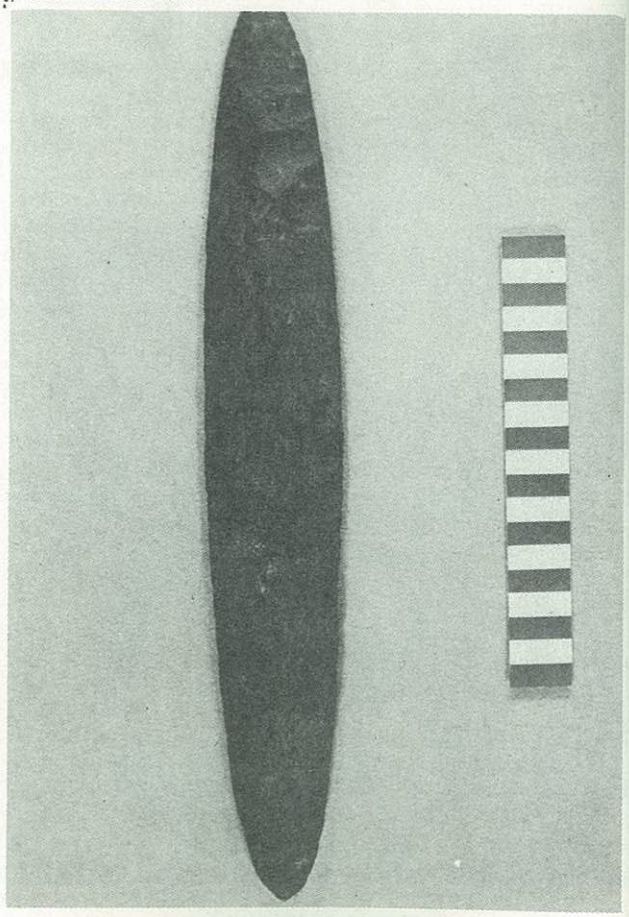


Figure 7: Large Biface

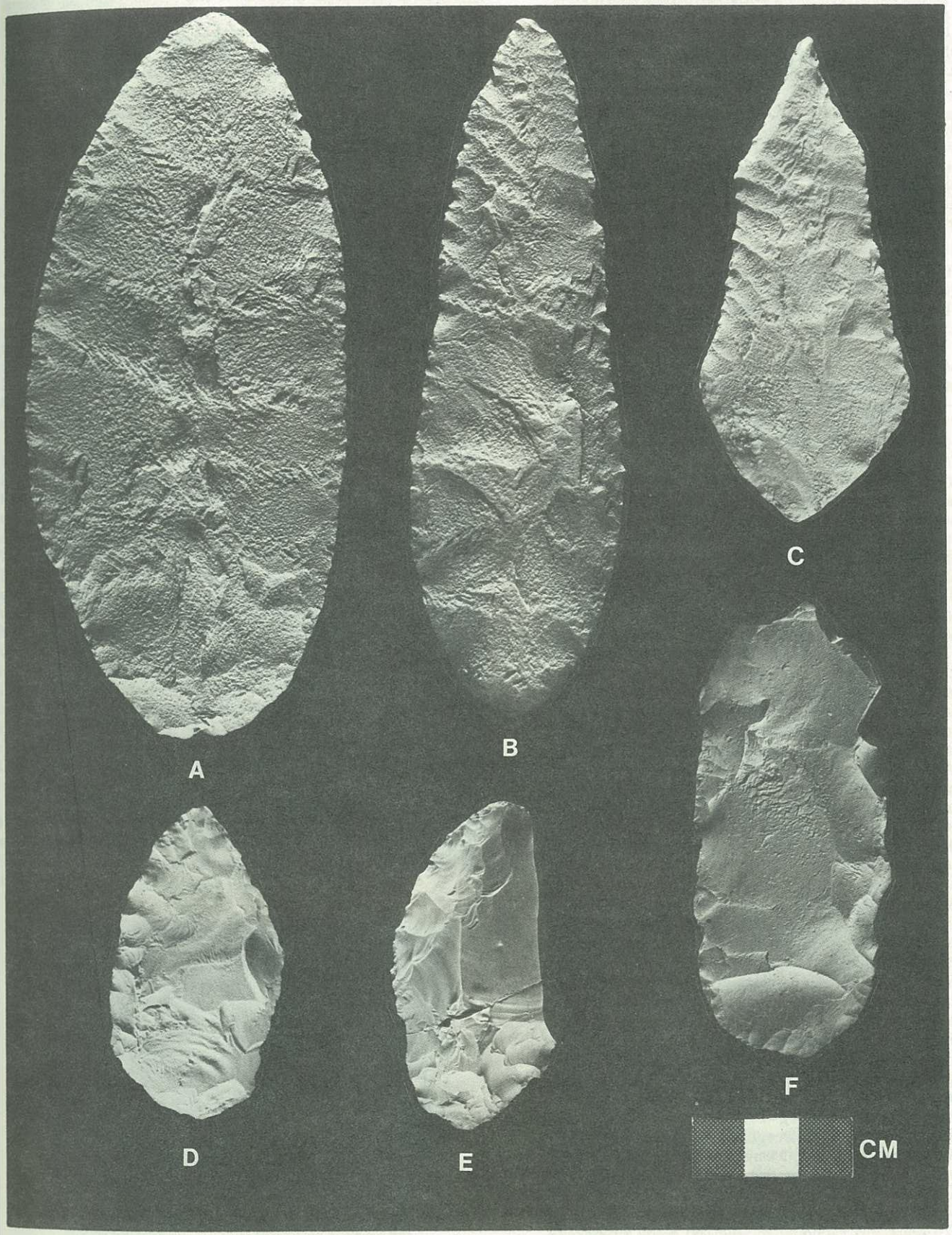


Figure 8: Chipped Stone Knives and Blanks

B-11 (Fig. 9F) (A) Material: chert (B) Color: light tan (C) Culturally Significant Adhesions: none noted (D) Condition: incomplete - distal and medial edge only (E) Metric Attributes: Length-N/A; Width-N/A; Thickness-N/A; Weight-N/A (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: distal tip sharply pointed and one edge very irregular (H) Implement Medial Cross-section: convex (I) Implement Longitudinal Cross-section: irregular (J) Implement Production Stage Evaluation: secondarily shaped blank (K) Traditional Tool Form Designation: biface or knife (L) Flaking Techniques and Patterns: percussion-irregular (M) General Flaking Quality: very mixed, irregular size and shape, flake scars terminating at various lengths (N) Edge Preparation: N/A (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: none

B-12 (Fig. 9V) (A) Material: chert (B) Color: black with white inclusions (C) Culturally Significant Adhesions: none noted (D) Condition: medial section only (E) Metric Attributes: Length-N/A; Width-N/A; Thickness-N/A; Weight-N/A (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: both edges are irregular with one slightly converging (H) Implement Medial Cross-section: strongly convex (I) Implement Longitudinal Cross-section: slightly convex (J) Implement Production Stage Evaluation: blank (K) Traditional Tool Form Designation: biface or knife (L) Flaking Techniques and Patterns: percussion irregular (M) General Flaking Quality: only a few large distally expanding flake scars (N) Edge Preparation: none (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: none

B-13 (Fig. 9I) (A) Material: chert (B) Color: variegated white with red, black, and pink inclusions (C) Culturally Signficant Adhesions: none noted (D) Condition: distal end (E) Metric Attributes: Length-N/A; Width-N/A; Thickness-N/A; Weight-N/A (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: end convex with one straight edge and the other slightly convex (H) Implement Medial Cross-section: dorsal slightly concave with the ventral straight (I) Implement Longitudinal Cross-section: dorsal irregular with ventral straight (J) Implement Production Stage Evaluation: blank (K) Traditional Tool Form Designation: knife (L) Flaking Techniques and Patterns: percussion-irregular (M) General Flaking Quality: only a few large flake scars on one side which feather out at the median (N) Edge Preparation: some platform preparation by chipping on opposite face but no grinding (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: none

B-14 (Fig. 9U) (A) Material: chert (B) Color: brown with tan inclusions (C) Culturally Significant Adhesions: none noted (D) Condition: distal end (E) Metric Attributes: Length-N/A; Width-N/A; Thickness-N/A; Weight-N/A (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: one irregular edge with the other somewhat straight, distal end convex with flat surface at very tip (H) Implement Medial Cross-section: dorsal straight with ventral irregular (I) Implement Longitudinal Cross-section: dorsal straight with ventral irregular (J) Implement Production Stage Evaluation: blank secondarily flaked (K) Traditional Tool Form Designation: biface or knife (L) Flaking Techniques and Patterns: percussion and pressure - both irregular (M) General Flaking Quality: two large inclusions, one on each side of the implement, dominate most of the flake scars causing them to terminate in a step or hinge; percussion flake scars are generally distally expanding with feathering terminations and pressure flake scars are randomly placed (N) Edge Preparation: some platform setup and grinding (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: none

UNIFACE

U-1 (Fig. 9N) (A) Material: fine grained quartzite (B) Color: light tan (C) Culturally Significant Adhesions: pitch on ventral side (D) Condition: proximal or distal(?) end (E) Metric Attributes: Length-N/A; Width-3.2 cm at median; Thickness-0.8 cm; Weight-N/A (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: convex edges with convex end (H) Implement Medial Cross-section: dorsal slightly convex with ventral straight (I) Implement Longitudinal Cross-section: dorsal slightly convex with ventral irregular (J) Implement Production Stage Evaluation: secondarily thinned flake (K) Traditional Tool Form Designation: thin uniface or scraper (L) Flaking Techniques and Patterns: percussion and pressure - both irregular (M) General Flaking Quality: only two percussion flake scars remain with one distally expanding and terminating in a feather and the other being round and short; pressure flake scars are mainly edge shaping (N) Edge Preparation: slight grinding and platform set-up by flaking the opposite surface (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: This piece may represent a section of a larger blank which broke during manufacture as it is made from the same material as B-3 and B-4, and is roughly the same width and thickness.

PROJECTILE POINT

P.P.-1 (Fig. 9J) (A) Material: obsidian (B) Color: dark grey (C) Culturally Significant Adhesions: none noted (D) Condition: medial section (E) Metric Attributes: Length-N/A; Width-N/A; Thickness-0.7 cm; Weight-N/A (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: both edges are straight and converging but distal and proximal end are indeterminate (H) Implement Medial Cross-section: slightly convex on both dorsal and ventral surfaces (I) Implement Longitudinal Cross-section: slightly convex on both dorsal and ventral surfaces (J) Implement Production Stage Evaluation: shaped and probably at one time diagnostic (K) Traditional Tool Form Designation: projectile point (atlatl point) (L) Flaking Techniques and Patterns: percussion and pressure-irregular (M) General Flaking Quality: percussion flake scars are either round or distally expanding and feather out near the median; pressure flake scars are generally confined to the implement's edges and are highly irregular in shape and size (N) Edge Preparation: edges have been ground (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: It is interesting to note that both dorsal and ventral surfaces have been ground down to remove facial arrises (ridges). The reason for this is unknown at this time. One of the edges has also had excessive grinding.

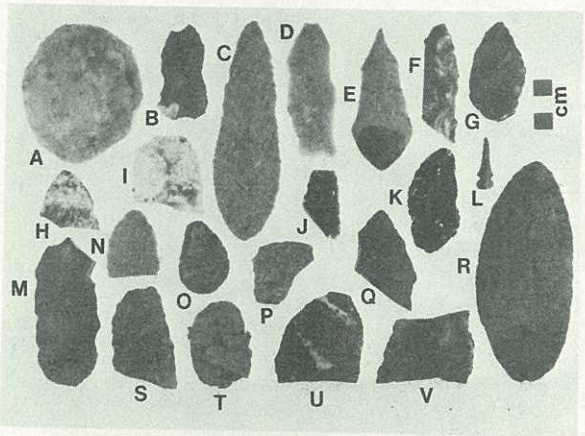


Figure 9: Chipped Stone Assemblage Minus Large Biface

FLESHER

F-1 (Fig. 9A) (A) Material: fine quartzite (B) Color: cream with brown and red inclusions (C) Culturally Significant Adhesions: one spot of pitch on ventral side (D) Condition: complete (E) Metric Attributes: Length-7.5 cm Width-8.6 cm at median; Thickness-3.0 cm at proximal, 0.7 cm at distal; Weight- 130.2 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: generally oval with proximal and distal ends broader than sides (H) Implement Medial Cross-section: irregular on dorsal surface, slightly convex on ventral surface (I) Implement Longitudinal Cross-section: irregular on both dorsal and ventral surfaces (J) Implement Production Stage Evaluation: edged piece (K) Traditional Tool Form Designation: hide scraper or flesher (L) Flaking Techniques and Patterns: precussion and pressure - irregular (M) General Flaking Quality: percussion flake/scars occur only on the ventral surface and were used to even up the edge margin; all end in a step termination only a few cm from the edge; pressure flake scars are only found on the dorsal surface edge and are short & steep so as to create the proper edge angle needed for fleshing hides (N) Edge Preparation: none noted (O) Hafting Features: probably hand held (P) Basal Preparation: N/A (Q) Comments: Many flake scar terminations have portions of the flakes remaining which may indicate minimum use of the implement.

END SCRAPERS

ES-1 (Fig. 9T) (A) Material: chert (B) Color: grayish tan (C) Culturally Significant Adhesions: none but distal end of scraper wrapped with buckskin (D) Condition: complete (E) Metric Attributes: Length-5.0 cm; Width-3.2 cm at distal end; Thickness-0.6 cm; Weight-18.5 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: one edge straight with the other slightly convex; distal end strongly convex and proximal end is straight (H) Implement Medial Cross-section: dorsal surface strongly convex with ventral surface straight (I) Implement Longitudinal Cross-section: both dorsal and ventral surfaces irregular (J) Implement Production Stage Evaluation: edged piece (K) Traditional Tool Form Designation: end scraper (L) Flaking Techniques and Patterns: pressure - irregular (M) General Flaking Quality: dorsal/distal end pressure flake scars are found primarily on the edges with a few small parallel flake scars extending inward; some irregular flake scars are also found on the right edge dorsal surface (N) Edge Preparation: none noted (O) Hafting Features: N/A (P) Basal Preparation: distal end wrapped with buckskin; implement handheld (Q) Comments: Distal edge shows small microflake scars which indicates the implement was used to some degree.

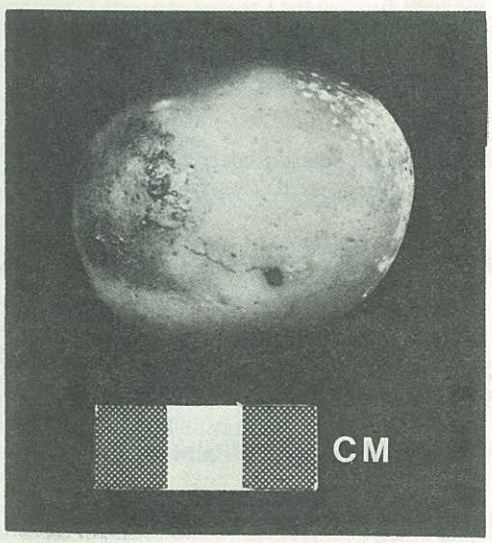


Figure 10: Hammerstone

E-5 (Fig. 90) (A) Material: chert (B) Color: tan (C) Culturally Significant Adhesions: none noted (D) Condition: complete (E) Metric Attributes: Length-4.4 cm; Width-3.1 cm at distal end; Thickness-0.5 cm; Weight-14.8 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: both edges strongly convex and converging to proximal end; proximal end somewhat pointed (dull) and distal end strongly convex (H) Implement Medial Cross-section: dorsal surface straight with truncated edges, ventral surface straight (I) Implement Longitudinal Cross-section: dorsal surface irregular with the ventral surface straight (J) Implement Production Stage Evaluation: edged piece (K) Traditional Tool Form Designation: end scraper (L) Flaking Techniques and Patterns: pressure-irregular and parallel (M) General Flaking Quality: steep short flake scars are evident on the dorsal surface all edges giving the implement a truncated cross-section (N) Edge Preparation: none noted (O) Hafting Features: none noted (P) Basal Preparation: N/A (Q) Comments: Microflake scars on the dorsal surface of the distal end indicate minimum use as a scraper.

UTILIZED FLAKES

UF-1 (Fig. 9D) (A) Material: fine grained quartzite (B) Color: cream (C) Culturally Significant Adhesions: none noted (D) Condition: complete (E) Metric Attributes: Length-8.4 cm; Width-3.2 cm at median; Thickness-0.6 cm; Weight-0.8 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: highly irregular edges with straight ends (H) Implement Medial Cross-section: dorsal surface slightly convex with ventral surface straight (I) Implement Longitudinal Cross-section: dorsal surface straight with ventral surface slightly concave (J) Implement Production Stage Evaluation: unmodified flake without cortex (blade form) (K) Traditional Tool Form Designation: utilized flake or blade (L) Flaking Techniques and Patterns: N/A (M) General Flaking Quality: N/A (N) Edge Preparation: N/A (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: none

UF-2 (Fig. 9B) (A) Material: chert (B) Color: light tan with dark brown inclusions (C) Culturally Significant Adhesions: none noted (D) Condition: complete (E) Metric Attributes: Length-5.8 cm; Width-3.0 cm at distal end; Thickness-0.7 cm; Weight-12.6 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: both edges highly irregular with distal end irregular but somewhat straight and proximal end broken (H) Implement Medial Cross-section: dorsal surface triangular with ventral surface straight (I) Implement Longitudinal Cross-section: dorsal surface slightly convex with ventral surface slightly concave (J) Implement Production Stage Evaluation: unmodified flake without cortex (blade form) (K) Traditional Tool Form Designation: utilized flake or blade (L) Flaking Techniques and Patterns: N/A (M) General Flaking Quality: N/A (N) Edge Preparation: N/A (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: none

UF-3 (Fig. 9P) (A) Material: chert (B) Color: grayish tan (C) Culturally Significant Adhesions: none noted (D) Condition: medial and distal sections (E) Metric Attributes: Length-N/A; Width-N/A; Thickness-N/A; Weight-N/A (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: edges both highly irregular with proximal end straight (H) Implement Medial Cross-section: both dorsal and ventral surfaces slightly convex (I) Implement Longitudinal Cross-section: dorsal surface slightly convex with ventral surface slightly concave (J) Implement Production Stage Evaluation: unmodified flake without cortex (K) Traditional Tool Form Designation: utilized flake (L) Flaking Techniques and Patterns: N/A (M) General Flaking Quality: N/A (N) Edge Preparation: N/A (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: none

HAMMERSTONE

H1 (Fig. 10) (A) Material: quartzite (B) Color: light reddish tan (C) Culturally Significant Adhesions: pitch in a few isolated spots (D) Condition: complete (E) Metric Attributes: Length-4.5 cm; Width-3.0 cm; Thickness-3.5 cm; Weight-120 grams (F) Thermal Alteration Evidence: none noted (G) Implement Plan View Outline: oval (H) Implement Medial Cross-section: strongly convex (on both dorsal and ventral surfaces) (I) Implement Longitudinal Cross-section: strongly convex (on both dorsal and ventral surfaces) (J) Implement Production Stage Evaluation: N/A (K) Traditional Tool Form Designation: hammerstone (L) Flaking Techniques and Patterns: N/A (M) General Flaking Quality: N/A (N) Edge Preparation: N/A (O) Hafting Features: N/A (P) Basal Preparation: N/A (Q) Comments: The implement has battering on both of the ends indicating it was used as a hammerstone.

DATING AND CULTURAL AFFIALIATION

A buckskin sample of ca 7.0 grams was submitted to Washington State University, Radiocarbon Laboratory, for C-14 dating and proved to be 600± 50 B.P. (A.D. 1350) (WSU2345). This date places the age of the bundle in an era characterized by the arrival of Shoshoni/Ute groups which later replaced the indigenous Fremont peoples of the area (Madsen 1975). As a result of this date, and the fact that the bundle contains no diagnostic chipped stone tools, assignment of the bundle to any particular group or culture is difficult. This problem is compounded even further as an "unnamed Plains-derived culture" is also present in the archaeological record of the area (Madsen and Lindsay 1977).

Despite these problems, a tentative cultural affiliation with the later Numic speaking groups rather than the Fremont seems feasible at this time. This is based on the fact that the C-14 date is at the extreme end of the Fremont occupation. There are also indications that extremely large bifaces similar to B-1 were common among Shoshoni groups in portions of the Northern Great Basin (eg. Strong 1968).

DISCUSSION

Analysis of the bundle contents confirms the fact that it does indeed contain a stone tool fabrication kit. Tools needed for the entire flaking sequence are all present. In addition to the tools are the products of manufacture. Bifacial implements representing blanks, preforms, and finished tools make up the majority of the chipped stone assemblage. Nearly all the items classified as blanks have been thinned to a point that the initial shape of the implement is apparent. Only one item appears to be at a preform stage while 12 are finished tools. It is interesting to note that all of the blanks and the preform have been broken during the manufacturing process. It is also intriguing to ask why the knapper did not discard these broken forms. Obviously they still held some form of value.

All but two of the chipped stone artifacts are made out of local cherts and quartzites which are abundant in the exposed members of the Morrison formation. A survey of the 18 recorded sites within 52Km of the bundle's location revealed that all of these sites represent lithic quarries and workshops. Undoubtedly the owner was exploiting the local rock resources to replenish his tool kit.

An interesting contrast was observed between two finished bifaces (B-3 and B-4) and the single uniface (U-1). All three of these artifacts were made from the same honey colored quartzite. U-1 shows signs of platform preparation and appears to represent the end of a broken blank or blade. B-3 and B-4, on the other hand, are finished tool forms with approximately the same width and thickness as U-1. The latter probably represents an earlier production mistake in the manufacture of either B-3 or B-4.

Several comments on hafting and handling features of the chipped stone also deserve mention here. Pitch stains on the proximal end of B-4 (Fig. 9E) indicate that it was secured in the end of a handle. I have observed a similar mode of hafting on several Anasazi knives from excavations of 42Sa14 in Southwestern Utah. These specimens consist of a chipped stone knife blade hafted into the end of a wooden handle by notching the end of the handle and seating the proximal end of the blade into the notch. The blade is held in place by pitch.

Two artifacts, one endscraper (ES-1) and a biface (B-1), were hand held. ES-1 was found with its proximal end wrapped with a tanned strip of buckskin up to its median and one of the surfaces on B-1 has an area void of ochre staining near its median. This void spot may have been created by the biface being hand held and the ochre being rubbed off by the palm and fingers of the user.

The small bone handle or shaft found in the bundle also shows signs of having a point or tool hafted to one end by pitch. The raw sinew may have also been used for hafting tools.

In conclusion, the bundle obviously represents what I have termed a portable subsistence kit. Not only does it contain a complete stone tool assemblage used for a variety of functions, but also the fabricating tools required to make such implements. Tool blanks and preforms, both the successes and failures, are also part of the assemblage. Clothing for protection, food stuffs for consumption, even ochre for ceremonial purposes is included in the bundle. All of these items have been found and recorded elsewhere, yet very few, if any, examples of *complete* subsistence kits similar to this bundle have been observed. The value of the bundle, then, depends not only in what it contains but also in the fact that it is one of the finest examples of such a subsistence kit found in the Great Basin or Southwest Plateau.

ACKNOWLEDGEMENTS

Special thanks goes to Dr. David B. Madsen who initially brought the existence of the Sitterud bundle to my attention and made all things possible. The Antiquities Section of the Division of Utah State History allowed me the use of their facilities and space and Alan Spencer helped in the actual analysis of the perishable material. Kay Sargent helped me with the illustrations and Dr. Madsen assisted with numerous editorial comments.

Michael P. Benson
ANTIQUITIES SECTION
UTAH STATE HISTORICAL SOCIETY
307 W. 2nd So. Suite 100
Salt Lake City, Utah 840101

REFERENCES CITED

Benson, Michael P.
1980 The Sitterud Bundle: A Prehistoric Cache From Central Utah. *Antiquities Section Selected Papers* Vol. 7: in press. Salt Lake City, Utah.

Madsen, David B.
1975 Dating the Paiute-Shoshoni Expansion in the Great Basin. *American Antiquity* 40(1):82-86.

Madsen, David B. and LaMar Lindsay
1977 Backhoe Village. *Antiquities Section Selected Papers* 4(12). Salt Lake City, Utah.

Nelson, Fred W. and Richard D. Holmes
1978 Trace Element Analysis of Obsidian Sources and Artifacts From Western Utah. *Antiquities Section Selected Papers* 6(15). Salt Lake City, Utah.

Spencer, F. Robert and Jesse D. Jennings et. al.
1965 *The Native Americans.* New York: Harper and Row.

Strong, Emory
1968 *Stone Age in the Great Basin.* Portland: Binford and Mort.

United States Geological Survey
1964 Geologic Map of Utah, Southwest ¼. Denver Colorado.

Wissler, Charles
1927 *North American Indians of the Plains.* New York: American Museum of Natural History Handbook Series.

Wilson, LeMoyne et. al.
1975 Soils of Utah. *Agricultural Experimental Station Bulletin No.* 492. Utah State University, Logan.

APPENDIX

General implement analysis outline used on the bundled stone items.

A. COLLECTION
B. ITEM IDENTIFIER
C. MATERIAL
D. CULTURALLY SIGNIFICANT ADHESIONS
E. ITEM CONDITION
F. METRIC ATTRIBUTES
(1) Length (2) Width (with point of maximum width) (3) Thickness (4) Weight (in grams) (5) Edge Angles (6) Tool angle gamma (angle between the longitudinal and bulbar axis)
G. ITEM FACIAL DESIGNATION (Evidence of original flake orientation)
H. THERMAL ALTERATION EVIDENCE
I. IMPLEMENT PLAN VIEW OUTLINE
(1) Left side (2) Right side (3) Proximal end (4) Distal end
J. IMPLEMENT MEDIAL CROSS-SECTION
(1) Dorsal (2) Ventral
K. IMPLEMENT LONGITUDINAL CROSS-SECTON
(1) Dorsal (2) Ventral
L. FLAKE TOOL ORIENTATION
M. ITEM THINNING STAGE EVALUATION
N. TRADITIONAL TOOL FORM DESIGNATION
O. FLAKING TECHNIQUES AND PATTERNS
P. RETOUCH AND/OR RESHAPING
Q. FLAKE SCAR TERMINATIONS
(1) Dorsal (2) Ventral
R. FLAKE SCAR SHAPE
(1) Dorsal (2) Ventral
S. EDGE PREPARATION
T. HAFTING FEATURES
U. BASAL PREPARATION
V. COMMENTS

Variables used for I. (Implement Plan View Outline)

1. convex - slight, moderate, or strong
2. concave - slight, moderate, or strong
3. straight
4. irregular - sineous
5. converging - distally or proximally

Variables used for J. and K. (Cross-sections Medial and Longitudinal)

1. convex - slight, moderate, or strong
2. concave - slight, moderate, or strong
3. straight
4. irregular - sineous
5. truncated
6. triangular

Variables used for L. (Flake Tool Orientation)

1. proximal
2. distal
3. oblique

Variables used for M. (Item Thinning Stage Evaluation)

1. Unmodified flake with/without cortex
2. Edged piece
3. primary blank
4. Secondarily flaked blank
5. Preform
6. Shaped piece but not highly diagnostic
7. Highly stylized piece where particular diagnostic attributes are evident

Variables used for Q. (Flake scar terminations)

1. Feather
2. Hinge
3. Step

Variables used for R. (Flake scar shape)

1. Distally expanding
2. Distally contracting
3. Parallel long
4. Parallel short
5. Wider than long
6. Round
7. Oval
8. Square
9. Irregular

ON LITHIC ARTIFACT LINE DRAWINGS

I have in hand *Lindenmeier, 1934-1974*: F.H.H. Roberts, Jr. and Wilmsen 1978. I am looking at Figs. 105 and 106 by Cassidy and Fig. 110 by Wilmsen. Wilmsen states (preface pp:xv): "these are among the finest drawings of artifacts ever prepared." "Valuable comparative documents in themselves."

Is it possible that anyone can believe that--in 1978? Rather than being "valuable comparative documents in themselves," they should have been destroyed--never published! If I am correct that Wilmsen drew Fig. 110, he should certainly know better, while artist Cassidy is excusable because he probably was not a student of lithic technology.

Now, will new generations read *Lindenmeier, 1934-1974* and then report some new site where all the fluted points were fluted from their tip ends? Some, half fluted from each end (Fig. 110)? Still, the text says Fig. 110 points are Pseudo fluted (not fluted)--the line drawings of points c - d says they are--from each end, on the same face. Fig. 106:f, shows basel retouch force originating from a flaking platform(s) within the points' inner face and terminating at the base margin. Am I nit-picking? Well, if the errors pointed out are repeated on other figures, how much can we believe? Line drawings are supposed to clarify technology that photography renders as blur.

Dear artists, archeologists are not arrowhead collectors any more. They seek to know more about prehistoric people and their supporting technologies. This means that you, the artist, must draw lithic artifacts in such a manner that the technology of each flake scar is fully and faithfully recorded. If you misrepresent one figure of line drawings, how then can we believe, and usefully learn from the other figures presented? May I briefly outline below why this is important.

Since Crabtree (1966) and Flenniken (1978) (to mention just two), a vast amount of work has been spent on trying to determine the method and techniques by which Early Man fluted his projectile points. A consensus has developed that probably all Clovis types and most Folsom types were fluted from preform basal ends. Yet, the line drawing artistry presented by Wilmsen and Frank H.H. Roberts (1978) clearly shows (ibid. Figs. 105-106, and part of Fig. 110) that Lindermeier Folsom was almost always fluted from distal ends. Well, clearly--in this day of technological studies, those figures

are misleading and should not have been presented. Some Folsom points *were* fluted from distal ends (Bruce Bradley, personal communication). In my attempts at replicating Folsom I make it a practice on the second flute when the first flute left the proximal end too thin on which to prepare the second platform. If line drawings are inconsistent in portraying fracture force line feature formations curving back towards flaking platforms, neither my experiments nor Early Man's artifacts can be properly presented as line drawings.

Fracture force line features should be drawn to convey a whole lot more than fracture propagation direction. By their prominence or absence, they tell you something about the stone quality (see Callahan 1979, Lithic grade scale). By their spacing, flake width, thickness, and fracture velocity is indicated. By their intersecting angles at lateral edges, and distal ends (the negative cavity ridges), clues to flaking tool types and holding patterns are registered.

In concluding, esthetic art is out. Give us skillful, accurate copies of the fracture force lines--no matter what the lithic subject may be.

J. B. Sollberger
8515 Forest Hills Blvd.
Dallas, TX 75218

Crabtree, D.E.
1966 "A stoneworker's approach to analyzing and replicating the Lindenmeier Folsom." Tebiwa 9(1):3-39.

Flenniken, J.J.
1978 "Reevaluation of the Lindenmeir Folsom: A replication experiment in lithic technology." American Antiquity 43(3): 473-480.

Wilmsen, E. N. & F. H. H. Roberts
1978 "Lindenmeir: 1934-1974" Smithsonian Contributions to Anthropology, No. 24.

FIGURE 11
USE OF CALIPER AS DEPTH GAGE

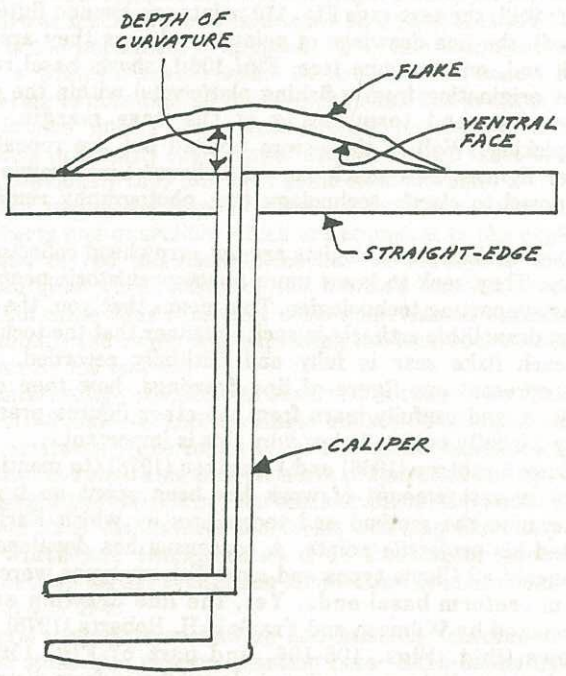


Fig. 11 - Measurement of Flake Curvature

MEASUREMENT OF FLAKE CURVATURE

There are occasions in experimental flintknapping when the measurement of the curvatures of flakes may be important for specific types of studies. Flake curvatures can be circular, elliptical or irregular. Relative to the ventral face, curvatures can be positive or negative, but are most often negative. Since the shape of flake curvature can vary, it is difficult to have an exact mathematical expression of flake curvature. However, on a relative basis of value for comparisons, *the depth of curvature from a flat plane divided by the flake length* may be used to express overall flake curvature.

A depth gage could be used to measure depth of flake curvature, but these are specialized, expensive instruments. Most calipers have a depth gage feature on the end of the instrument, and it takes little effort to adapt a caliper for use in measuring depth of curvature of flakes. One has only to attach any kind of straight-edge, such as a plastic ruler, to the depth gage end of a caliper. This is illustrated in Figure 11 for measuring the depth of curvature of the ventral surface of a flake. The straight-edge can be permanently glued to the caliper or temporarily attached with small clamps. National Camera of Englewood, Colorado, sells a device called a Caliper Converter that attaches to a caliper with machine screw pressure and provides the needed straight-edge at the end of the instrument. The arrangement shown in Figure 11 illustrates a flake with negative curvature, but this device could also be used for flakes with the reverse type of curvature. In summary, readily available calipers can be adapted for the measurement of depth of curvatures of flakes at low cost.

I do not recommend that flake curvature be included as a quantitative attribute on all lithic studies. This is a time consuming type of measurement for large quantities of flakes, and this type of measurement is only needed for some specialized types of studies.

L. W. Patterson
418 Wycliffe
Houston, Texas 77079

* * * * * * * *

COMMENT ON ERRETT'S RESPONSE TO CLOVIS ANALYSIS

In the last issue, Errett brought out an important point of contention regarding the range of variability in knapping methods and the difficulty in distinguishing technique. One of Errett's problems in accepting my analysis of the Blackwater Draw Clovis is the correct inference that the aboriginal knapper would not combine percussion and pressure unless he had good reason. Another problem is that the Clovis point in question appears to fit near the limits of either pressure or percussion as practiced by modern knappers.

Since the analysis was written, I have developed yet another technique (soft stone hammer percussion, described in a separate article) which provides attributes needed to knap in the Clovis style. While nice flat flakes are easily made with the soft stone hammer, the edges take such special care that it is easiest to finish by pressure. Pressure is still the only way I can consistently produce diving terminations and outrepasses and Errett's example doesn't seem to demonstrate that capability by baton. The case is still not closed and I am still finding more of the requisite characteristics in hammerstone percussion.

No matter that we find so many ways to produce similar results, the aboriginals knew and used different methods themselves. What we, as experts in lithic technology, have to do is define the limits and ranges of knapping methods so realistic assessments can be tested. As Crabtree has pointed out, each technique leaves its "fingerprint" if we can only learn to recognize it. Even where there is a clear area of overlap in variability between tools, there will be subtle morphological differences which are brought about by tool shape and size as

vell as platform requirements. Swinging a stone hammer will equire muscular coordination and energy expenditure distinct rom that used in using a baton to detach the same sized flake so he results are unique. Surface morphology has not yet eceived sufficient attention to be reliable in differentiating echnique. We need to make that information available as an rcheological tool.

It will take wide participation just to assemble the various ossible knapping methods, much less to describe the mitations and potential of each method. Reader response elps enormously in beginning to realize the dimensions of the roject we are tackling.

Bob Patten
888 S. Owens Ct.
Lakewood, Col. 80226

* * * * * * * *

SOFT STONE HAMMER PERCUSSION

As I have read most of the available literature on percussion napping, there seems to be a strong inference that stone ammers are good only for rough work or core reduction while uality work demands baton percussion. If recent trials are any ndication, however, it may turn out that soft stone hammers ffer the greatest overall usefulness of any percussion method. 'reliminary comparisons to archeological samples indicate that he technique was used extensively and to good advantage in rehistoric times.

In hindsight, the success of soft stone hammers perhaps hould have been expected because the physical make-up falls etween dense stone and resiliant baton. Consequently, dvantages of other hammers are combined in a single tool.

To get the most out of the hammer it should be soft but urable to avoid shock, have a gritty texture to promote pulling nd have a curved surface to facilitate predictable contact. In ddition to physical characteristics of the hammer, a loose grip n delivery of the blow is critical to the success of this echnique. Other aspects are important but more subject to ariation.

Platforms need to be solid, either by selection of an abrupt dge or through grinding. Since abrupt edges are even more seful than worked ones in this method, there is good potential or low width loss. There is also little need for platform isolation ecause the striking facet can be chosen to isolate or distribute he force as needed. Discoidal hammers can be found with edge ear which indicates localized force, and facial wear which is vidence of distributed force.

If the hammer is allowed to drop freely directly onto a latform, the mass and velocity is sufficient for good results. reater penetration and travel can be promoted best by *lowing* the velocity and firming up the blow. Increased elocity with direct blows tends to cause scooping flakes.

In order to get away with higher velocity blows, they need to e applied at a more glancing angle. The grazing stroke allows ore force to be transfered along the fracture than erpendicular to it. Squeezing the edge being worked ccomplishes the same result more effectively.

The object piece will respond differently depending on how it held. Flake travel and penetration can be promoted by utting light pressure on the face near the edge to ounterbalance the outward force and allow the inward mponent of force to predominate. High spots can be easily emoved by this treatment and it also works very well for small ieces. To get shallow "skimmer" flakes which are good for leaning ridges and edges, the object piece is very loosely upported by finger tips.

Regardless of permissable variations of approach, velocity, upport or type of platform the blow needs to be made as crisp, ose and assured as possible. If the strike is muted for any eason, the flake will not develop properly and scooping or inging is likely. While setting up for a glancing blow, practice asses should chatter as the abrasive hammer catches on the platform. Practice taps for direct blows should give clear tone.

This soft stone hammer technique is characterized by wide, expanding flakes with flat trajectories. Terminations tend to be pretty well feathered when the object piece has been squeezed, and slightly rising when the piece has been given only minimal support. Debris from early stages is vital for determining soft stone hammer use because ground platforms or abrupt edge remnants are often removed by retouch. Flat, parallel faces are normal, particularly if the squeezing technique has been used.

Smooth, flat faces are only part of the many advantages that this technique enjoys. Width loss is minimized through use of abrupt edges and otherwise minimal platform preparation. An interesting consequence is the low ratio of width loss to thickness loss which denotes efficient reduction since odd sizes and shapes can be easily salvaged. Energy requirements are very low both because of the loose stroke and the rapid flake expansion which makes fewer blows necessary.The object piece can vary within a wide range of acceptable sizes, from about one inch wide and up. This also means that nearly finished tools can be made solely by percussion. The same hammerstone can accomodate a considerable latitude in object piece size although the rule of thumb of using a hammer with the same mass as the object piece can keep a knapper out of trouble. A person possessing this technology would have a simple tool-kit which could be supplied or replaced at a moments notice from the nearest gravel deposit. No baton user could expect the same luxury.

I am beginning to suspect that use of soft stone hammers will be identified in a wide spread of cultures. Flat faced knives would be easier to produce this way than by baton in my estimation because shock is very low when the rules are followed. Many so-called crude arrow and dart points are probably a result of small scale percussion work with minimal retouch in an energy efficient approach. In western Colorado, this technology is abundantly represented with 1:6 or better W/T ratios and widths of one to three inches.

The accompanying photos (Figs. 12 and 13) show a reconstructed preform of Battle Mountain chert chipped in the Clovis style by a loosely consolidated quartzite hammer. Features to note are the consistently large flakes from start to finish which allowed reconstruction, and the efficient reduction from an abrupt edge. Finished dimensions are: width = 38mm, length = 85mm, thickness = 8mm, flute length = 27mm. Starting dimensions were: width = 52mm, length = 89mm, thickness = 19mm. Hammerstone dimensions are: diameter = 42mm, thickness = 19mm.

Bob Patten
888 S. Owens Ct.
Lakewood, Col. 80226

* * * * * * * *

I think most advanced knappers would agree with Patten on the capabilities of soft stone hammers. It's about time this got into print. I would stress, however, the great importance of using a stone that is soft *enough* for obtaining the characteristics he mentions. I have felt for a long time that hammerstones should be graded according to their hardness. It is not as simple as "hard" and "soft". I have found it useful in my own work to grade my hammers according to a 1-5 scale, covering from "soft" (1), thru "medium soft" (2), "medium" (3), "medium hard" (4), to "hard" (5). My soft hammers are some sandstones, chalky limestones, and the like, while my hard hammers are solid quartzites cherts, and other materials capable, for instance, of pecking greenstone for celts and axes while crumbling away at a slower rate than the axe.

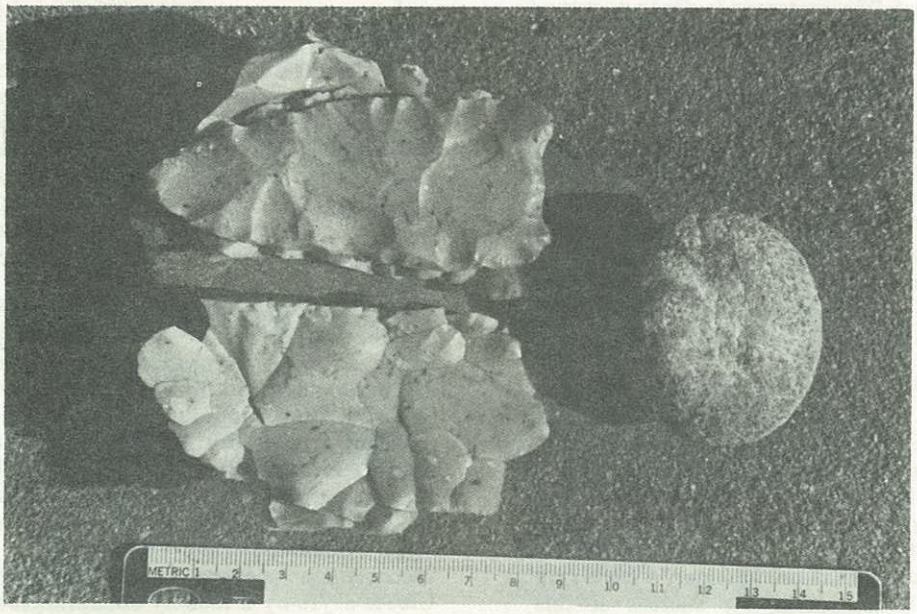
I find I can only get the characteristics Patten mentions by using what I term my soft to medium soft hammerstones. So if you have only medium to hard hammers, don't expect too much. Therefore, I must disagree with Patten that a suitable hammer is likely to be found "at a moments notice from the nearest gravel deposit." It takes some looking sometimes.

Now that we know that soft hammers are capable of doing work capable of being confused with the antler billet, let's really get down to brass tacks and define the real but subtle differences that exist between the two.

Errett Callahan

* * * * * * * *

Fig. 12. Clovis Projectile Point (Battle Mt. Chert) made by 100% softstone hammer percussion.



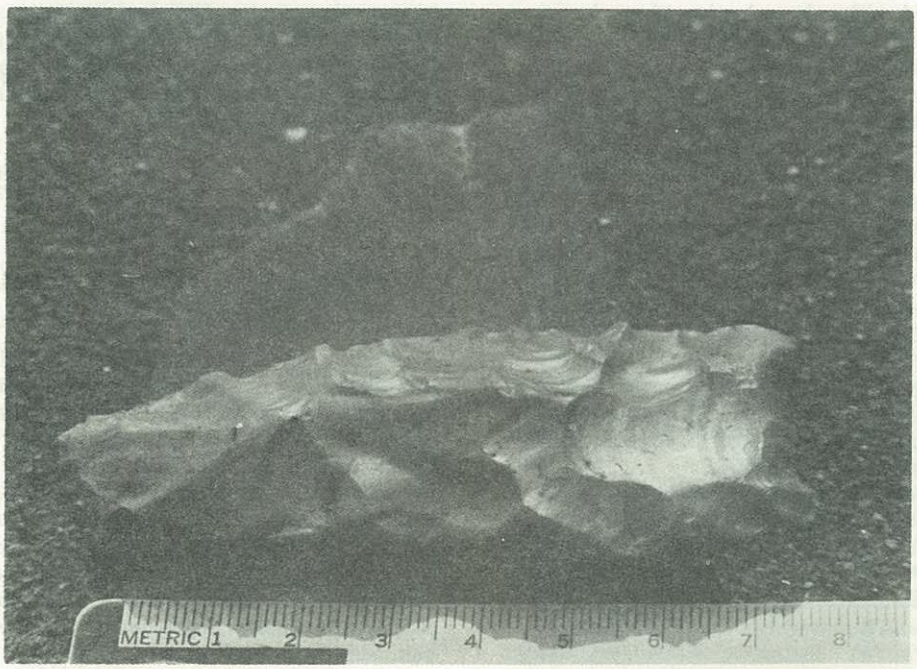


Fig. 13. Clovis style point with flakes and quartzite hammerstone.

ONGOING INDIVIDUAL RESEARCH PROJECTS AT THE WASHINGTON STATE UNIVERSITY LITHICS LABORATORY

The Lithics Lab at Washington State University, directed by Jeff Flenniken, offers students a unique opportunity to undertake a variety of research projects oriented towards replicative experimentation in diverse lithic technologies.

The students discuss their projects below.

J. Jeffrey Flenniken, Laboratory Director, has developed the analytical method Replicative Systems Analysis and applied it to the vein quartz artifacts from the Hoko River site, a hafted microlith site on the Northwest Coast. Replicative Systems Analysis involves replication of the entire lithic system from inception to deposition: selection of raw materials, heat treatment, reduction, hafting, function, and deposition.

Other experimental replicative work being conducted currently includes ground slate technology, quartz crystal microblade technology, and chipped schist technology.

C. Michael Anslinger, master's candidate, is conducting replicative research with the lithic assemblage from the Mint site, a late archaic Riverton culture site in south central Indiana. The Riverton lithic assemblage is characterized by small projectile points, perforators or gravers of the poverty point type, lanceolate blades and scrapers. The intrusive Riverton culture has no known antecedents north of the Ohio River, but shares its closest resemblance with archaic manifestations in the Tennessee River Valley.

A. Drake. Beginning Fall 1980, a study of Mesoamerican polyhedral core technology will be done. The project will study the manufacture and use of polyhedral core blades from a replicative perspective, using aboriginal materials and techniques as controls. An offshoot of this project will examine the possible advantages of using obsidian blades as surgical implements as opposed to blades consisting of stainless steel.

Donald Howes, M.A. Candidate. My thesis deals with intra-site spacial analysis, using material gathered this past summer from the Hoko River dry site. The distribution of lithic artifacts and debitage, plus data gathered from geo-chemical studies, will be analyzed by statistical and computer mapping techniques to determine the types of activity areas present at the site.

Under investigation at this time is a trace element analysis project, where we are using Neutron Activation Analysis to determine if heat treatment of chert will alter the trace element content.

Recently completed projects include a use-wear analysis of experimental obsidian blade skinning tools, a statistical analysis of edge damage patterns on cobble choppers, and a replicative analysis of Yubetsu (Shirataki) cores.

Alan Stanfell, Ph.D. candidate. His dissertation topic is the analysis of Ozette lithic artifacts. The analysis emphasizes replicative systems analysis and computer simulations to provide data demonstrating the relationships of stone tool manufacture and utilization with the wood and bone technological systems evident at the site.

Betsy Tipps, M.A. candidate. Betsy Tipps is conducting a technological analysis of flaked lithic artifacts from Glen Canyon National Recreation Area, Arizona and Utah. The artifacts were collected in conjunction with intensive survey activities. Artifacts are being examined for: 1) presence of heat treatment; 2) manufacturing sequence; 3) distance from quarry; 4) type of raw material; and 5) intra-site and inter-site difference in technology. These data will be used to establish a typology of sites and to make statements concerning site function and duration of use.

R. H. McClure, Jr., M.A. Candidate. Lithic technology of petroglyph manufacture is being analyzed as part of a larger study of the style, function, and age of the rock art of The Dalles region of the Columbia River. Investigation of tool types for the production of pecked, abraded, and incised petroglyphs will include replication of the rock art. The discovery of tools in archaeological association with the petroglyphs at two sites has enhanced this study.

Jeff Walker, M.A. candidate. Jeff Walker is conducting replication experiments to elucidate the reduction sequence and functions of lithic artifacts from the Sugar Factory Pier site, St. Kitts, West Indies. Initial direct freehand percussion is followed by bipolar reduction at this Saladoid Ceramic Age site, with a near absence of core tools and secondary retouch. Ethnographic analogy with South and Central American groups suggests bipolar reduction was used to produce stone chips for insertion in manioc grater boards, and the replicated grating and use-wear analysis indicate this was the archeological pattern.

Miranda Warburton, M.A. candidate, is currently working on a master's thesis entitled, "The Stone Tools from Tell Tlalif, Israel--A Technological Perspective." The Bronze and Iron Age blade technology was replicated and the archaeological collection classified into technological manufacturing stages based on morphological attributes indicated by the replication experiments to be diagnostic. These data combined with wear pattern analysis were then applied to economic considerations of the Bronze and Iron Age at Tell Tlalif, specifically, trade, subsistence, division of labor, and the introduction of metal.

Tim Gross, M.A. candidate. Tim Gross is currently finishing a thesis entitled, "Six Sites in the Siwa Oasis Region, Northwestern Egypt: Lithic Artifacts and Subsistence." A portion of this thesis is a descriptive analysis of six terminal Palaeolithic assemblages. Both debitage and tools were examined and such aspects of the collections as raw materials, probable manufactural technology, function, and technocultural affiliations are discussed. A brief model of tool manufactural processes is also presented.

In a related project, Tim is conducting a replicative study of wear patterns on dihedral burins from the Siwa Oasis region. Burins have been manufactured and are being used to work various materials. The observed wear is being coded and hypotheses are being tested using computer statistical packages. A report on this project should be forthcoming shortly.

Amy Gilreath, M.A. candidate in Anthropology. Amy Gilreath will be undertaking a technologically oriented analysis of lithics from the surface of a site in central Washington. The question primarily addressed will be: how do various sampling strategies employed in surface collections affect the interpretations of the lithic assemblages? Surface collections are frequently used to assess site significance. As such, it is felt that a closer examination is warranted of what information is retrieved or lost by using specific sampling techniques in the field in making surface collections.

craftsman....

GENE TITMUS

In terms of sheer talent as craftsmen and superiority in actual flintknapping techniques, I think Gene Titmus and Don Crabtree are each better than any one person has been in all of prehistory.

Jeff Flenniken, April 8, 1979

Fig. 14 A Knapping Session in the lab.

Fig. 15 Twin Falls, WSU Knap-in

Going Counterclockwise: J. Flenniken (bent over core and vise), Gene Titmus, Miranda Warburton, Don Crabtree, Amy Gilreath, Harry Oda, Don Howes, Cindy Woods (just the knees), Unknown, Alan Stanfill.

Gene Titmus was born May 31, 1936. He was raised in the Twin Falls area of Idaho--close to the Shoshone Falls on the Snake River. He is employed by the Idaho Power Company and resides outside of Jerome, Idaho. He is a long-time friend and near neighbor of Don Crabtree. Some have said that were Titmus not living as it were within the shadow of the Master, he would have received much wider acclaim, for he has developed most of his talents independently of Crabtree, despite the proximity. His Folsoms, prismatic pressure blades, parallel flaking, and eccentrics (dubbed "Titmus lace" by his friends) are second to none.

Errett Callahan

INTRODUCTION BY DON CRABTREE

I have known Gene Titmus since 1958. His father was a chief operator at Shoshone Falls Power Plant and Gene has continued on with the power company for many years. He started quite early in life as an oiler. Later he became a power plant operator at Swan Falls. At that time there was a lot of automation and so he would have to check the switchboards and operation of the power plant. When he was finished with his duties, he had considerable free time. So he spent this time in knapping. However, his interests in artifacts started at a shelter in a big hollow boulder where there were numbers of artifacts; this was quite a campsite at Shoshone Falls. So at a very early time in his life he was exposed to archeology and some of the projectile points of southern Idaho. During this time Gene and I have been friends and he has developed his own technique independently. Instead of helping him, I suggested that he do it himself. He has a holding method that is quite unique. It would appear that his points are made by a left-handed person, by pressing away and supporting with his fingers. This is a technology that appears in Mexico widely. Gene has an extremely delicate and careful touch that surpassed almost anyone else in the way of flake removal. In the meantime, when we have visitors or visiting archeologists, we usually call Gene over to meet these people; so he has been exposed to a lot of the different world technology; for instance, Richard Gould and Junius Bird with their perspective from Australia and South America. When Francois Bordes was there, three different times, Gene would come over and the three of us would work together on different technologies. So, through that, he picked up a lot of Old World technologies of blade making and microburins, and burination in industries based on blades. Also Jacques Tixier was there and this exposed Gene to a lot of the techniques of North Africa. Bruce and Helen Schroeder spent a week and Gene also accompanied us at that time. Gene has had an opportunity to contact these people and to be exposed to numerous different world technologies that I think are very valuable. Not only that, with his touch in both pressure and percussion and his development of the Meso-American blade technology, Gene has great skill in detaching the Meso-American blades by pressure. There are a number of other types, too, such as eccentrics and the other varieties of flintworking techniques with which Gene has been able to accomplish a great deal. He is also doing concentrated work in heat treatment of a variety of different materials. So overall, in flintworking technology of silicious stones and obsidian, he can add a lot of information to many problems. He has great insight into the behavior of lithic materials. Gene has been a great friend to me for many years. (This interview was conducted on the banks of the North Platte river in Casper, Wyoming, on the occasion of the Wyoming Knap-in sponsored by the Wyoming Archaeological Society, April 8, 1979.

Errett:

Gene, when did you start flintknapping and what got you into it?

Gene:

I was raised in the canyon of the Snake River at Shoshone Falls. The Indians utilized that area quite extensively, for there were a number of springs in the canyon. We used to find arrowheads lying around; they would be in the streams and springs. Anyway, as a kid I used to find them all the time--I was always interested in Indians. I never did any knapping when I was younger, and I went into the service when I was 18 and stayed there about four years. When I came back, I happened to live and go to work in the same place where I grew up. I was still finding projectile points and other artifacts lying around. One day I decided I wanted to know how they made their stone tools. With very crude beginnings using nails and steel hammers, and flakes that I picked up out of Indian sites, I started experimenting. It fascinated me so much I kept at it and have been doing it ever since. I was fortunate enough to live by Don Crabtree and after a year or so I met Don and showed him my work. He didn't try to influence me at that time in any way--he wanted me to develop on my own, he said. So, I developed a pressure flaking technique that I have never seen used anywhere except by me.

E. Yes, go into that because I'm interested in the reduction techniques you worked out on your own before you met other knappers.

G. I started with pressure flaking using flakes and chips that I would find without any prior reduction by percussion whatsoever. I think I did a year or so of pressure flaking before I went into any of the percussion stages. I worked out the parallel oblique type of flaking and before I met Don, I think I was starting to work on the Folsom points. It gets mixed together just exactly what I did do at what time.

E. How long before you met Don were you working on your own?

G. Oh, it was probably a year and a half--it's over 21 years ago--it kind of gets lost in the past when it did occur. There's no doubt that he's influenced my technique.

E. Well, good, that leads into the next question: In what specific ways have other knappers influenced your decision making?

G. Well, I've only been really exposed to Don. I don't think there have been too many others that have influenced me. Most of the people I've worked with came to me or they started by themselves. I worked with Rob Bonnichsen a long time ago. He, at that time, was working on different things flintknapping-wise. I don't think that there's too much influence other than Don.

E. Would you care to discuss the nature of your stone toolmaking kit?

G. Oh, I think I have the standard kit for flintknappers. I have all sizes of hammerstones for different reductions. In the early days I used antler pressure flaking tools. For the last quite a few years I have switched to copper. I think the replication is about the same with copper or antler. Copper saves you time resharpening your tool. I use antler billets, elk and deer, and soft hammerstones because we mainly work obsidian. I have had the opportunity to work some of the siliceous cherts and flints, but not in any great quantity.

E. How do you think the working of obsidian has influenced the tools you use?

G. You need a soft hammerstone for percussion on obsidian. Soft hammerstones also work with the chalcedony. Obsidian breaks easier than some of your other materials, but is much more brittle and requires a much more delicate touch.

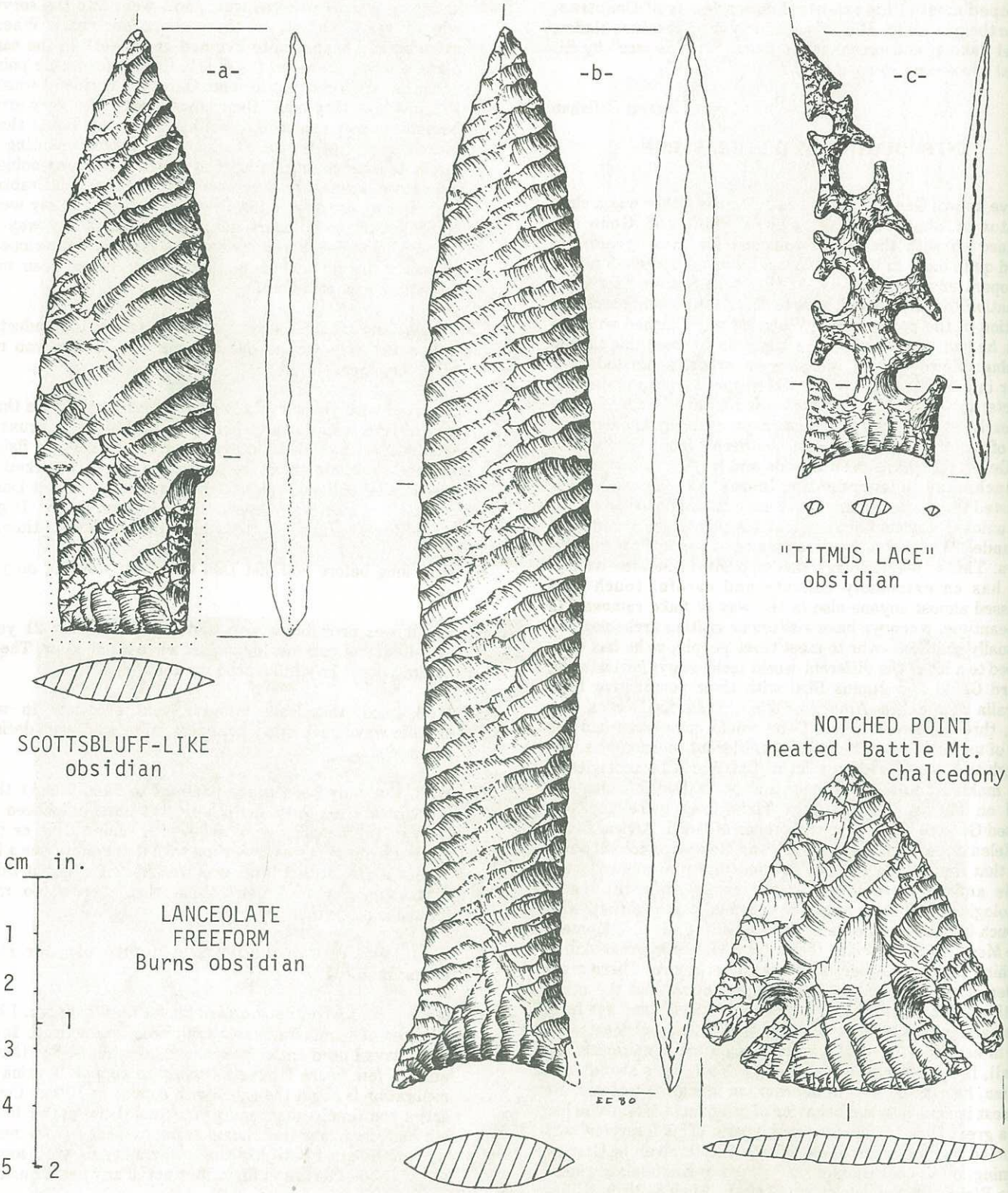
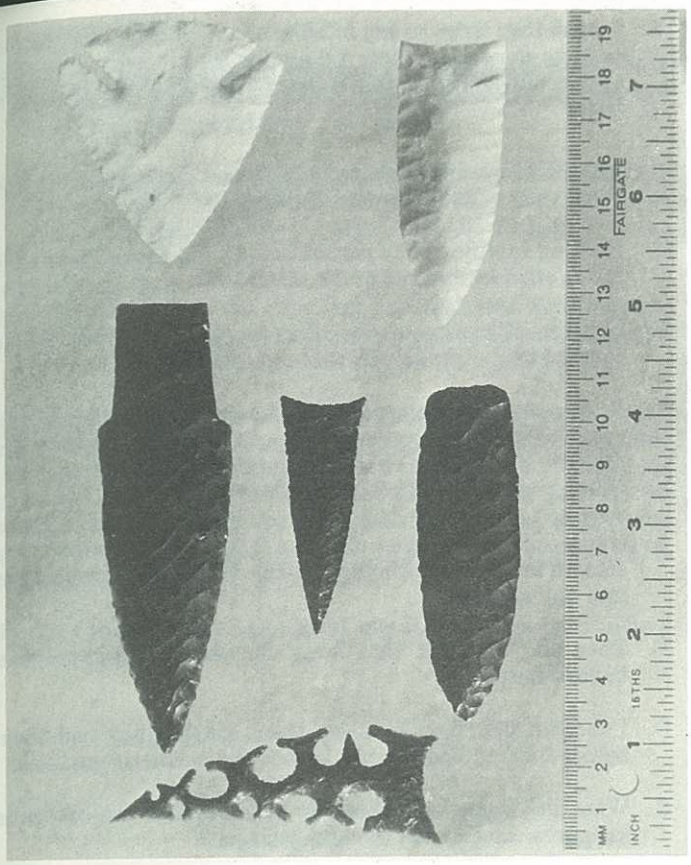
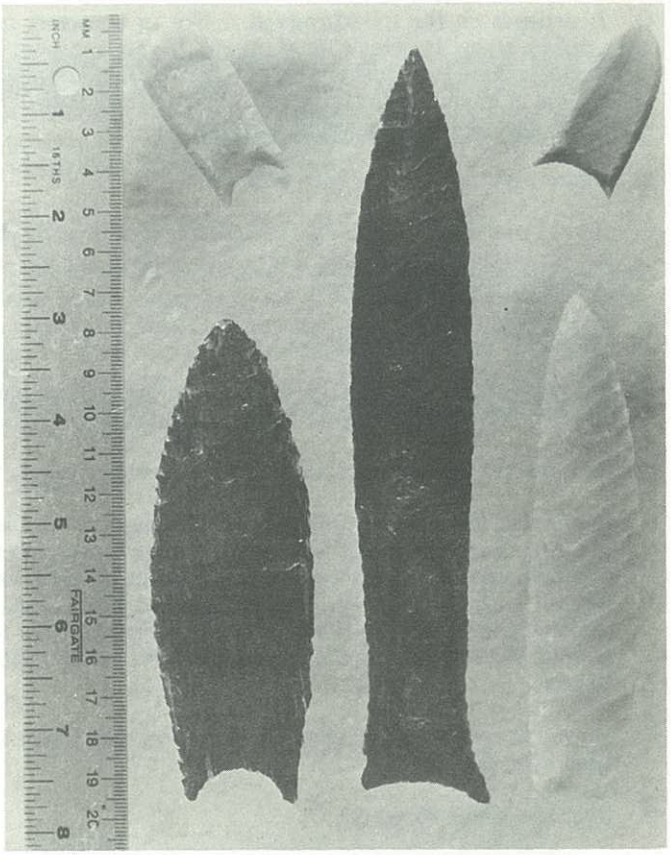


Figure 16 - Replicas by Gene Titmus





Figures 17 - 18: Replicas by Gene Titmus

E. What are your lithic reduction specialities?

G. I don't think I have really specialized in anything. I have probably tried just about every technique I have known about at one time or another although there are a few I have spent considerable time on.

E. But don't you usually work with parallel flaking or the Maya eccentrics?

G. Yes, I have made many eccentrics and done a lot of parallel flaking--so I guess you can call that a specialty. I have worked on Folsom points for the last twenty years. I don't call myself a specialist in their replication - there are too many variables. But, I do have a lot of experience in all the different types of failures and breaks you get while trying to manufacture one.

E. Have you done a lot of hafting or using your stone tools functionally?

G. Not too much in hafting - I have hunted deer with stone points, but I can't say that I have ever killed a deer with one. I hit one with a stone point, and as circumstances had it, I lost the deer. But, we've skinned deer out with bifaces and even little lanceolate points. For years when I have gone hunting I have always taken a stone tool kit, but as far as hafting is concerned, no. They were used freehand.

E. What do you do with the results of those experiments?

G. I haven't written any of them up. I guess they're put into my mind. That's where they're stored.

E. How have these functional experiments influenced the work you do when you go back to flintknapping again? For that particular model?

G. I'll say this: Any biface or any of the projectile points work fine on skinning. I don't think I'd change anything because they work so well as they are. A very sharp flake is not good for skinning because if it's too sharp, it will cut into the flesh and hide. You lose control of it slightly if it is too sharp. But, you can completely dismember a deer, skin it, and cut the legs off--the whole bit--with one biface.

E. Where do you do the work and do you document the outdoor neo-archaeological sites you're creating in any way?

G. I work in the basement of my house. All the waste goes into the county dump so I don't think that I mix anything that would be dug up again and considered aboriginal. I've never marked any of the sites when I went to a quarry--like Glass Butte--or marked where I reduced down bifaces.

E. How do you do your quarrying?

G. At Glass Butte, the nodules are usually lying on the surface. The rock hounds dig them up and throw them aside because they didn't like the material. The color wasn't right or something, so it's just a matter of going out and picking the material up. There are gravel pits in the area where white chalcedony occurs. Here again the gravels have already been dug up and all you have to do is go along and pick up the material. Most of the agates that we find are usually found at rock hound quarries. At these quarries you have to use digging bars and shovels to get the material out. Ignimbrite is usually found in road cuts or in areas that have been extensively eroded.

E. How much rough work do you do at the quarry site?

G. It depends on the time involved. I like to transport in a preform stage. It saves a lot of weight. If you transport the nodules, there is a considerable amount of waste material to get rid of later. If you transport in the preform stage, you have three times more usable material.

E. Biface preform or blade core preform?

G. Both, I would say, because if I see suitable rock for a big core for big blades or something, I may just rough it slightly and transport it in that manner.

E. But does that always happen?

G. No. Sometimes you just go around and gather the more suitable rocks and transport them in that manner.

E. How much lithic material do you go through in a year?

G. In the last few years I probably went through a thousand pounds. That's a rough estimate. In previous years I probably went through a ton or more a year in the early time when I was learning. We are fortunate to have a lot of obsidian and ignimbrite in the area so the source is not too limited. We could use up a lot of material if we really wanted to do it.

E. Do you have any idea of what your total tool production has been over the years?

G. Over the whole 20 years?

E. Yeah.

G. Mm.....5,000--I really have no idea. When I was learning, I was probably making three to four points a day at least--maybe more. In later years I haven't had time to knap as much as I used to because of other things involved, but I probably only get five or six hours a week knapping now.

E. Does that vary seasonally?

G. Probably more in winter. I have more time in the winter.

E. Where do your tools end up?

G. Oh, most of them I keep. A lot of them have been given away. Some of them go to colleges.

E. Where can one go to see examples of your work?

G. Herrett's Museum in Twin Falls has a Meso-American core and blades I made. Long Shore Community College in Seattle has a collection including a Danish dagger. Examples were sent to a college in Canada--I don't know if they would be on display there or not. They were a type of Meso-American blade which I sent them for study.

E. Do you ever sign or document your replica?

G. You mean mark them in some way? No.

E. Do you do many knapping demonstrations?

G. I do occasionally. I did one at Washington State University, College of Southern Idaho, and for different organizations like Scouts.

E. What are some of the things you feel replication has taught you about extinct peoples?

G. I think they were a very intelligent and enterprising people to have developed these things for their economy so that they could survive in this country wherever they may have been.

E. Anything specific that you've learned from your specific work with a particular tool type?

G. Nothing specific on any particular tool, but a lot of their tools are as efficient as some of the metal tools - just less durable.

E. Say the efficiency of one of these parallel flaked points compared to a similar point, non-parallel.

G. It depends on flaking technique. One type of parallel flaking removes the negative bulb and produces the sharpest edge that can be obtained on any flaked projectile point or knife. Other types of parallel flaking don't produce this fine of an edge so I think the parallel and non-parallel points would be comparable in that case. Parallel flaking does produce very smooth faces which would probably give better penetration into any animal.

E. Then do you think that fancy flintwork may have gone beyond function?

G. I think it did. Back in paleo times maybe they had their bellies full and had time to go into the aesthetic qualities.

E. What are some contributions you feel the non-academic knappers can provide the archaeologist?

G. I think they can help them with different flake analysis, point types, and the like.

E. How about the knappers that are not into analysis themselves?

G. You mean the commercial knappers?

E. No, not just that but the hobbyists who are seriously trying to do good work.

G. Now I think everybody has something to contribute. It's just a matter of their doing it. Everybody seems to come up with something different--like the knap-in today--I learned a lot of things, different ways of doing things that hadn't entered my mind. Anyone trying something sometimes can come up with a different idea.

E. What use do you think these different ideas and ways of working will be?

G. Everyone's ideas, if they are all consolidated, may help solve some of the problems that we have that we don't really understand right now.

E. Like there's been an oversimplification by the non-knappers?

G. That's a possiblility.

E. What complaints do you have against the way flintknappers have been treated or ignored over the years?

G. Well, I feel everyone has something to offer. Just because he is not a professional, he shouldn't be ignored. Everyone should have an opportunity to contribute something. If they have an idea, why not listen to it?

E. What other thought do you have that you'd like to add that we've omitted? Any random thoughts or peeves you've had over the years you'd like to get down?

G. I really don't have any peeves. I've been fortunate. I know a lot of people in the field--all of them through Don. As far as I'm concerned, I've been treated well. So I really have no peeves at all.

E. What are some of the ways that you think that flintknapping or lithic technology can be used to better advantage in the future? In other words, where do we go from here?

G. There are so many different techniques that haven't been resolved--no one person can ever hope to resolve everything (maybe only a minute portion of the whole thing) so I think there's a lot of future if people could specialize in one or two things and resolve these completely. I know this is my problem--I want to try any new technique that comes along and never pursue it far enough.

E. That sounds to me like a good way to go. It's so hard to be a jack-of-all-trades.

G. All your aboriginal people had a few certain styles and techniques that they used; they knew exactly what they were doing. Most of the knappers today try many different techniques and never really resolve any one of them down to where they can say: "This is it."

E. What other thoughts would you like to add?

G. I would like to say I think this is one of the greatest things that ever happened--all of us getting together here, exchanging ideas, talking, and watching one another work. I know I've learned a tremendous amount. I hope that everybody else has had the good experiences that I did. I want to congratulate you and Jackie for getting this whole thing going. Truly great!

E. Thank you.