

brother There are quite a few potters on the outside of the flakes of *that one single core seem to be much brighter, but that*
basically a single example
of all of the materials that they had so that it wasn't sufficient evidence to know that

there was any particular time that this took place it would cease at certain level

in Europe where this had arrived. It is apparently very ancient in the Americas, because

Folsom
the Folsomist was, no doubt, altered, many of them were ~~like that~~ and you find the color

changes and even the Clovis *appears to be* ~~appeared~~ yet, again, with other groups of people it is

not in evidence at all even in the Americas. So you wonder what the distribution of

thermal treatment
~~this sort of thing~~ was. Not too much *research* has been done on it so far ~~but I feel~~ it will be

interesting to find out *at some time* ~~later~~ on what the extent of ~~this~~ *thermal treatment* was and how far it reached.

Dapaca
Box 208
Now I have one from ~~Monaca~~ in Mexico, a white jasper, or white agate point that had *was still debiting & use. Could see*
the difference in original texture & that altered.
been altered because one of the *original* facets, you'll find ~~this~~ *facets* on the ventral side, under or

the curve side where it wouldn't be flaked entirely across, ~~would~~ *and there would* still be some of the

original material. *Showing what it* ~~original~~ looked like originally, before

it was flaked. ~~and~~ *F* even on the back, you may find some surface where they have a ~~hinge~~

hinge fracture
~~fracture~~, or a little miscalculation, *so that the* ~~that~~ the whole surface wasn't removed. ~~and~~ If it *& there is a change in luster of the chipped surface*
and the original facet, wasn't all removed, then it is quite evident that there was altering taking place ~~if~~

~~there is a change in luster in the difference of the chipping.~~ What's nice is *an* where

artifact that has you'll have the outside of the flake on one side *which is* ~~will be very~~ *coarse* and granular and *the* the underside

they will be very shiny and lustrous. *When* where they were trimming the core after it was,

heated, they'll take the outside off *& they one can see the difference in* ~~like that~~ and these are in evidence. But with a *luster of the original & unaltered material*

Q. 25.1.5
(17)

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flake, it is almost impossible to tell and
single ~~plate~~ it is better to have a ~~little~~ assemblage of them before one decides
definitely about thermal treatment.

~~what exactly has happened and as well~~ on the outside of some of our jasper nodules

in the States, ~~like some of our~~ French material, right at the cortex you'll find

a combination of
~~some of the silica jells~~ ^{(opal), with} ~~where it has a high content of water,~~ ^{& cryptocrystalline silica,} ~~is actually opal,~~ ^{which is, a combination} on the

outside. Now opal just is not suitable for artifacts. I mean you can flick it with

your finger ^{and know} ~~and know~~ it is soft. You can scratch it with a file ^{with any heat change,} ~~with any heat change,~~

it goes all to pieces, ~~it has no strength at all.~~ By the way, ~~while I am speaking of~~

~~that,~~ ^{artifact} this is one out of opal, and ^{opal} it can be worked, there are, no doubt, some points

made of opal, but many of ^{the} these points, ^{are made of} or white treated jasper ^{of low almost refractive} has the same refractive

index and luster ^{of} ~~almost that~~ opal ^{and, therefore, can be confused with opal.} is. But it is really one of the jaspers, and agates,

and chalcedonies ^{of} all of these, ~~some~~, are pretty much the same, with the exception of other

colorations coming in and ^{some} foreign material ^{and} in ~~there~~ that you will get a concentration

of some other ~~some~~ chemical salts, that will make the thing opaque, which turns it

into a jasper ^{But} ~~and~~ there is one type of jasper that I can't get altered. I don't know

why ~~but~~ ^{for the} ~~and~~ ^{alter it} ~~yet~~ Indians were able to ^{there is something that I have been doing wrong}

with that particular stone. ~~And~~ They had a great skill, ^{in altering materials.} ~~and~~ this was a ~~great~~

science ^{with} to them, this altering of ~~these things and particularly with~~ large blocks ^{of stone,} to

^{and they knew how to,} raise the heat slowly, and cool it slowly. The larger the block, the more slowly you

^{must heat + cool} had to do this, ~~but~~ with small flakes ~~in-no-doubt~~ ^{could be} ~~why~~ in actually a few hours it no

^{altered in a few hours.} ~~doubt could be done.~~ By that, I mean a half a day. At home, I ^{start heating} ~~do~~ this in the evening ~~and~~

the next morning they have cooled down sufficiently, I cover them with fine blow sand

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so ^{it} the ⁱⁿ hills ~~and~~ all the cracks and lets the heat soak in evenly all the way around.

Phil
Smith's

Don, does it look as though the Indians were accustomed to heat treating

~~with~~ the blades or ^{preforms} ~~preforms~~ or something of that sort, or do they do the whole nodule?

Cerabtree
and it had a mark

Well, in some cases you find evidence of ^{treated} cores. ^{of course the Hopewellians heated the whole core} In the ~~....~~ ^{Indians, they had} ~~make the material by altering,~~

~~get~~ sharper edge. The finer they could ~~get this~~, the finer the texture, the sharper

the edge. ~~And like~~ ~~with~~ this flint here, where it is not shiny, it is not nearly as

sharp, on the leading edge. ~~You'll~~ see little striations, I mean little saw tooth marks -

but ~~with~~ obsidian or ^a ~~the~~ glasser material ^{produces a} the sharper ~~to~~ edge, ^{the fracture} because ~~it~~ breaks out

to infinity, ~~and~~ ^{in the material, the flake is not going} if you have little granuals ~~on there it is not going to~~ be nearly as

to be nearly as

sharp and smooth as if it were a very fine textured material. ~~Now,~~ ^{evidence} ~~Most~~ of them that

I have seen ^{has} ~~have~~ been ⁱⁿ preforms that ~~they~~ ^{been} have heated, or they will take a whole series

^{of} flakes and ^{thermal treat them} ~~put them in~~, and then rework the flakes. Then again you'll find fairly sizeable

^{treated} flakes, I mean, this long and this wide, that had to come off a core ~~after it was~~

~~heated~~. However, I have not ~~see~~ found the core, ~~see~~ I'm not an Archaeologist ^{and} I'm not

out looking. I ^{would} rather stay at home and chip the stuff, then ~~I do~~ ^{to go out +} look. When I was a

boy, ^{I would go out} ~~I mean out you know,~~ and hunting and ~~things like that~~ and ^{if} there was a blowout in

the blow sand ~~and things like that~~ ^{why} I would gather, of course, what I saw on the sur-

face. I was after chips ^{and flakes} as much ^{as} artifacts, ~~and the flakes that I would find~~. This

^{is} ~~was~~ one that Dr. ^{Bardes} ~~Ford~~ was working on ~~there~~. This is quite good evidence, ^{of alteration} ~~here~~

~~alteration~~ ^{we} ~~has~~ removed a great deal of the surface, but on this side you can see the

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between heated & untreated material.

contrast. This is the untreated material ~~as it~~ ^{occurs} in its natural state.

It's very tough material, it has been treated. I'm sorry, I meant to bring an untreated piece to show the difference in character, ~~of that.~~ ^{But} we'll pass this one around

~~and~~ ^{also} there should ^{someplace here,} be an artifact of this material. This hasn't been heated enough

~~but~~ ^{but} this is pressure worked, ~~but~~ you can see that ~~in~~ this treatment ~~has~~ ^{changed the} ~~material & produced a~~ ^{stone}

→ better than this original ~~work~~ piece. ~~stone~~. But in its natural form it is extremely

tough. You can hardly take a flake from it, but this had a better alteration. This

is evidence of over-treatment. I mean ~~that~~ it got too hot on that edge, probably ^{was}

too close to the element and this piece popped out.

Daugherty

Do you feel... ~~that~~ the temperature ^{was too high or} ~~was~~ ^{it cooled too quickly} necessary. ~~changing~~ them.

Crabtree

He must have had great control to ~~make~~ ^{have altered as} large ~~of~~ pieces as he did. ~~and~~ he understood almost exactly how much ^{heat was necessary}

^{in stone} stood almost exactly how much, because there is a wide variety ~~of~~ the water content

and the ^{degree} ~~of~~ temperature ^{will vary with each material.} ~~that they will stand~~. Now, for instance, ~~in~~ one type

^{chalcidony which has} of calcidony, ~~this that is~~ a replacement and apparently goes in as ^{of} a silica gel,

will not stand very much heat. However, ^{if properly controlled,} it will ^{alter} ~~be~~ very

waxy and lustrous and ^{almost} ~~it is just~~ jewel-like, ^{almost}. While ^{the agate nodules} ~~would be~~

^{formed} ~~are filled~~ in the vesicles of the ^{ancient lava rocks} ~~ancient~~ ^{agate} ~~nodules~~

~~where they~~ apparently have micro crystals ^{forming from the outside toward the} ~~filling in from the outside,~~ leaving these ~~center,~~ leaving these patterns. These are called ^{these} ~~fortification~~ agate.

~~patterns,~~ that they call fortification agate on the inside. ^{These} ~~That~~ will stand much more

heat than ^{those formed by a} ~~these from the~~ silica jelly, ^{deposit} and there are no lines, ^{or patterns in the} ~~it is just an even con-~~

silica ~~just type of chalcidony~~
sistency of ~~these some of these replacements~~ like that. But there is even a wider

variation of *chalcidony*. ~~in changes that have taken place.~~ A friend in Montana

said he didn't think anyone could ever ~~fake~~ *fake* Montana agate. ~~He said he saw~~ *He said he saw* artifacts, but it

appeared ~~to me that it was impossible that they had a different source of material~~ *that they were of another material, rather than Montana agate.*

He was quite enlightened when he found that ~~it~~ *Montana agate* could be ~~well found~~ *worked after it was treated.*

~~aspect he is going to try that, but~~ *He* hadn't developed his notching technique because

he couldn't get enough pressure inside of the notch, ~~unless it had been heat treated.~~ *but I expect now he will try it on the treated stone.*

So he felt that they ~~were all these lancelet type of blades of flint~~ *made these artifacts all* because they ~~were of flint and agate and the stones would not allow~~ *were of flint and agate and the stones would not allow* couldn't notch them because of the pressure ~~needed for~~ *needed for* in the notching technique.

4/1/4
There is a little story that goes with this ~~one here.~~ *artifact. This is a genuine - not* ~~I must return this; this is~~

one I made.
~~not mine.~~ But this is, ~~some~~ *a type of Solutrean* apparently of ~~Solutrean~~ *Solutrean* flaking. At one end of the ~~valley,~~ *comes*

Prairie in Idaho,

the Clovis and some of this very beautiful work was done. This will give you an

example of ~~some of these great big~~ *the thickness of* disks they made, ~~in chalcidony,~~ *chalcidony* However, this piece,

apparently, ~~wasn't heated by the people that~~ *made* ~~made~~ did the Clovis ~~one,~~ *one* but we found this in

another site of a more recent ~~site~~ *occupation,* at the other end of the valley. They had ~~found~~

~~it up~~ and salvaged this material, apparently ~~an ancient site and~~ *from* ~~brought it in and~~ *brought it to*

their camp and did a little retouching,
~~had done a little touch~~ after they had heated it. Which is an odd thing ~~to do~~

With ~~that~~ *this* one, you might examine the edges, and notice that whoever did ~~this~~ *the work* originally

did the flaking on stone in
~~that it was in its normal state.~~

Lambert - asks question in French
Phil Smith translates
Don, what ~~the~~ *the* major temperatures ~~that~~ you use in this heating?

2. Chalcedony

6.

Crabtree I'm finding now over a long period of time that 450° will work on most materials.

But it must be built up very slowly, I mean, it shouldn't go over 200°, initially, for at least an hour, ^{for an hour now} at 200° and then raised to ^{from} 400 to 450. However, it will stand up to 900°.

Epstein When you put it in a pot, Can you tell us something ^{about how you do this}

Crabtree I use my wife's ^{deep} fryer. Just recently ^{discovered this} ~~was~~ a great invention, ~~you know~~ ~~like that,~~ ^{Now} she's lost ^{her} ~~her~~ deep fryer. Prior to that, I had used a ceramic oven, which will go up to 1500^F or maybe 2000^{FA} and the breaking down point of this material, or ~~take~~ a translucent agate like this, is around 1200^F. ^{At 1200°F,} ~~that~~ it will all turn white.

^{You may have found examples of this in} ~~which you have found in~~ your sites, ^{Prehistoric man was} ~~they have been able to build up that much heat in~~

his pit, ^{for} ~~course~~ you will find flints that have been entirely decomposed by heat ~~in their local~~ ^{They used} charcoal, possibly, ^{or} ~~on~~ ^{maybe by} fanning it, or something like that.

But at that ^{heat} ~~time~~ it breaks down ~~and~~ into little cubes and it ~~entirely~~ entirely disintegrates and appears to be like porcelain. You can ^{heat} ~~take~~ a translucent chalcedony, and at 1200° it will disintegrate ~~and~~ go to pieces.

Epstein: ^{Deeper, for example,} More clarification. ~~For examples~~, do you just keep ~~the~~ pieces in the pot or do you put sand in there.

Crabtree I cover it with sand. With the sand it retains the heat for a number of hours ^{I put it in the oven early in the evening - raise the temp to 450°F} afterwards, and by morning, ^{at} ~~if I turn it off by eleven o'clock, see I'm working in the~~

^{and then} ~~then~~, I turn the thing off at 11:00 PM ^{at} ~~o'clock~~. By morning it is still warm, but ~~it is~~.

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without being burned.
you can reach in and get it, ~~it's~~ workable then ~~you know to handle it,~~ ^{and can be handled.} But if you
open the oven door ~~just a regular oven,~~ ^{before this lapse of time,} the air touching ~~this or~~ ^{the stone will} ~~will~~ you
~~can hear it popping and cracking.~~ ^{cause it to pop and crack.}

Epstein Even with the sand?
Crabtree ~~if it is~~ ^{as} near the surface or exposed but I have told my wife ~~that~~ I need a stethoscope.
~~I could then sit~~ ^{and} by the oven and turn up the heat ~~to~~ ^{and when I hear the} listen ~~and~~ the first crack I turn the thing off.
L ~~When I would know it was heating it too fast.~~
Like this, ~~and I know I'm going to touch~~ Perhaps they had their ear to the sand and did
the same sort of thing.

Warrington Is there any advantage to working while it is still warm?
Crabtree I can't see any difference. ~~is~~ ^{Here} is another one ~~is~~ ^{have been removed} a few flakes on the outside
~~is~~ here Cynthia, ~~this may be old but this is the form I put these in.~~ There is a
slight change ^{of texture} ~~in~~ ^{change} this, not very much color, but it is much easier to work. This is
extremely tough. ~~There it is right there.~~ This one edge is all that has been exposed.
^{by removal of a series of small flakes.}

Drwin Williams This flake was struck off, then heat treated, and then retouched.
Crabtree Right, just on this one edge, just to test it, ~~then see~~ ^{and the results} ~~there.~~ This is some
petrified wood that is Indian-heated and worked, which is a good example of Indian work.

Here is another piece of petrified wood showing ~~that~~ the changes.

Joe Ben Wheat Don, do you know who ^{McCormick} is the guy down in S. E. Colorado who make Folsoms?

Crabtree No.

Wheat He's been making them for years and selling them around there. He works his flint
hot. He takes it in an oven and heats it just in a pan in an oven till it is just

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hot enough that he can handle it with gloves but too hot to handle it with em--
 in his bare hands and then he takes his stuff out and makes his points. He says it
 works almost like heating cheese, and what he uses as a fluter, you might be interested
 in, too, is a iron bar which comes up under the arm and it's about the length of the
 arm, curved like this, and the end ^{turns} ~~curves~~ out ^{and the end} comes over like this down into almost
 a screw driver shaped point, ^{at the end} and he holds the piece to be fluted against a log, or
 something like that, and then he, of course, has a little tip up there ^{and} as a platform
 and just one sharp blow like that. But the interesting thing to ^{me} be is ~~that~~ ^{the suggestion} ~~this is~~ ^{that this}
 is the shape of an Elk hammer.

brabtree

Well that's something. That's remarkable. He supports the point against something.

Well he has to support the point. I know that ~~that~~ is one of the techniques that I
 hadn't ^{used} ~~arrived~~ at because I have broken hundreds of them till I saw ^{the polished tips on} ~~these~~ ^{the fossils} that Marie
^{has} ~~had~~ at the museum, ~~of the polished support.~~ ~~Oh, thank you.~~

Boe

Don, does it make any difference if the temperature fluctuates a little bit?

brabtree

No. I think not, ^{with} the sand it wouldn't make too much difference. If it is
 covered with sand, it retains the heat sufficiently ^{so} ~~that~~ it doesn't make any difference.

Boe

I was thinking of the ^{Indian & his fire} and the probability ^{that there were some} ~~of the~~ fluctuation ^{there.}

brabtree

I don't think that it really makes any difference, if you don't heat ~~them~~ excessively
~~fast~~ or build ^{up the heat} ~~them~~ up too fast and let ^{the stone} ~~them~~ cool too fast, but the larger the block
^{the heat must be raised the more slowly they must be cooled.}
 the more slowly, ~~and the better control is going to be required for that sort of thing.~~

see p. 172

the platform liquid

I was trying to get a Folsom out of the French flint and ~~that one~~ collapsed. But that has been a heat-treated piece. And this is a piece of quartzite. I can see a little

in texture

change, but, prior to heating, it is ~~just~~ very difficult for me to pressure flake quartzite.

Yet, I know that it was done, ~~but~~ I started examining it under glass ~~and for the re-~~ *to see*

placement of those little sand grains, ~~that~~ if they are ~~precipitated~~ *precipitated*, the sand is a

stream sand, rather than a beach sand. ~~The~~ beach sand quartzite, ~~it~~ has a great deal

more toughness than ~~it is from a stream sand~~ *the sand quartzite* ~~has gone into a quartzite and~~ ~~if~~ it is

extremely fine, ~~well then~~ *in* it seems like the little grains are cemented with, possible

composit of chalcedony

chalcedony. You see this little matrix ~~in there~~, if you examine the quartzite with a

glass, and the finer it is, the easier it is to work. This particular piece of ~~beam's~~ *green*

quartzite is fairly coarse, ~~and so~~ there is a lot of variation in quartzites and it would

require

~~be under~~ analysis *to* actually ~~to~~ tell the workability of ~~the~~ this. ~~but~~ quartzite is quite

variable because of all the varieties of ~~stream~~ *stream* sands and the types of cementing ~~agents~~ *and*

bonding agents.

Here are some ~~right here~~ *that are* of the heat treated, showing different styles of work, however,

they are all ~~from~~ *from* the same material. Some are heated ~~a~~ *just a* little differently, some ~~are~~ *are* a little

more lusterous, possible, ~~however,~~ ~~these are others~~ they are all from the same block

of material. This is some more, but this was ~~near the surface~~ *heated* ~~the oxygen was present,~~ *and*

however these haven't changed color. They are all ~~the same~~ *piece of* off the same stone. These

four. Well, that is about all that I can tell you ~~except that~~ *other than* I am looking forward

now ~~with my deep fryer~~ *ing* to get some nice blocks of flint ~~to make some~~ *ing* of these

heating them in my deep fryer

prisms ~~on them~~ ~~and~~ they'll be interesting things, ~~the differences in sharpness~~ *to compare*

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10
eggs and

between the jasper and flints ~~compared~~ with obsidian ~~blades~~ ~~like that~~. I'm sure they won't be quite as sharp as obsidian but they will make some interesting tools.

Phil Smith

Is that ^{one} heated before you took those little blades off?

Crabtree

No. That core is natural. It's the natural Harrison County flint. This material here, but that was unheated.

Tyler

It was flaked out by pressure.

Crabtree

Yes, Same sort of thing.

Epstein

Pardon me, but at this stage of knowledge do you have any idea what the temporal or spacial distribution of the ^{heat} treatment is.

Crabtree

Haven't the slightest. Haven't any idea at all.

Tyler

I ^{am} sure you sure, there ~~is some~~ ^{are some} people in the Sahara which use ^{ed} this method, I'm sure.

They treat it, they ^{have} are flakes ^{and} then they retouch. It was found by Dr. Kosand from

Libya

Libya and I will write Dr. Kosand and he will send you some ^{tanged} arrowheads. And only the bases., ^{the stem is worked by pressure retouch} the peduncle

Crabtree

Well, I thought when I get home I would ^{cut} get me a blade to make some tabular slabs ^{uniform size} with a diamond saw blade, ^{if the slabs or flakes are not uniform} size it creates a variable in temp. control, take a large enough piece so they are uniform in size because that makes a ~~variable~~ variable

~~The longer the piece and so on like that but to have a uniform tabular selection and~~

at least carry on temperature ^{experiments} ^{up to} as far as my deep fryer will go ~~and~~ ^{heat the tabular forms in different stages of temp. and then} then we will ~~take different stages at one time like that and have enough so that thin~~

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prepare their sections and

sections ^{could} can be prepared and may be check exactly what is happening with this ^{heat} sort of

treatment. One can reserve a portion of each slab for control thing. And then somebody else may have to keep enough of that same purposes so

material that we can increase the heat to the breaking down point of this ^{experiment} sort of thing

on ^{heating and} here that we might know a little more about some of the materials of the quartz

family ^{minerals.} methods they use.

Dougherty Don, how long to send some examples of that stuff up? We can check the index fraction.

Crabtree Oh, would you? Wonderful. I don't have any fluid or anything like that.

Dougherty We have. We have the whole works.

Crabtree That would be wonderful.

Dougherty If we could get that extra little step in.

Crabtree Oh, fine. Well, I'd certainly be pleased, if you'd do that.

Tipico I'll have to write to my friend about heat treatment.

Crabtree Dr. Swanson was going to send 6 copies of the ^{Tebiva} ~~wood~~ with his heat treatment article. A very short article, ~~one~~. I don't know whether you got them or not.

Bordes I may have ^{some} sent. ^{Crabtree} Oh yes. But Dr. Swanson said he would send 6 here.

Bordes I did not receive them.

Crabtree I see, fine.

Bordes I got two.

Libya. ^{Small amount} and he will send you some fanged arrowheads ^{Tanged} And only the ~~base~~ bases, the peduncle

material that we can increase the heat to the breaking down point of this material
on here that we might have a little more about some of the materials of the parts
I really would like to see

Don, how long do you want some examples of that stuff? We can check the index

fraction.

Oh, would you, wouldn't. I don't have any kind or anything like that.

We have. We have the whole works.

That would be wonderful.

If we could get that extra little step in.

Oh, fine. Well, I'd certainly be pleased. If you'd do what.

I'll have to write you first about the material

Dr. Swanson was going to send 5 copies of the material with his next treatment

article. I very short article. I don't know whether you got them or not.

I may have sent. Oh yes. But Dr. Swanson said he would send 5 more.

I did not receive them.

I see, fine.

I got some.

De-you

Phil Smith!

Do you think that the very high solar temperatures, you may select the Sahara, would have any effect at all on the flakeability of the ~~flint~~

Crabtree

Yes. I suppose over a long period of time, particularly if it was a dark rock, it would absorb the heat. It, no doubt, would get up to ^{nearly} 200° F. And, over a long period of time could cause this ~~change~~ to take place. I mean it is certainly a possibility, that ~~it~~ ^{it} may be. But a hundred degrees or something like that. I know some of these on the surface ^{in our area} have got to that heat and they have still stayed the same ~~in our area~~ ~~there~~ but it would have to be ^{an} intensive ^{solar temp.} ~~sun heat~~ in order to do that, ~~of a solar~~ ~~temperature.~~

Phil Smith!

In the Sahara you very often find ^{pieces} of ^{flint arrow, stone} minerals which does have this

~~pot lidding~~
~~pox knitting~~ on the edge.

Of course that is a high temp - high heat, ~~Temperature~~

Crabtree

I see. It might be.

Well, ^{carnelean} ~~carnelean~~ was ^{one of} their favorite ~~stone~~ ~~at~~ ~~well~~, for several thousand years

before the time of Christ. And ^{carnelean} ~~carnelean~~ doesn't come in a ^{carnelean color,} ~~carnelean~~, normally. I mean

to find it naturally. It comes ^{as yellow} ~~in~~ ~~all~~ agate and has to be altered to make it into

a gem stone. You don't find ^{carnelean} ~~carnelean~~ very often ^{accidentally} ~~accidentally~~, unless there has been

a forest fire or something like that that has gone over. ^{Or maybe} ~~Or~~ ~~may~~ be some underground

^{the color of the stone} ~~because~~ ~~Natural~~ carnelean is a very rare stone and

yet you'll find these beautiful carnelean points ^{and} also ~~the light edge~~ ~~jewel~~ they liked

it ~~as~~ jewelry, ~~as well~~.

Thermal

Phil Smith

What color is it?

Crabtree

It's yellow and the yellow. *changed*. red. You see you can't induce hemitite

the chalcedony & it is the hemetite that makes it red,
 into ~~this, it has to go in~~or a
The iron salt must penetrate in a soluble form,
 maybe. Hemitite ~~doesn't~~ *doesn't* penetrate the stone as hemetite
 and this is what causes the red - or carnelian color,
 or caused it to make it red, and cause carnelian. Other *granular salts* will cause the sardonyx and
 you'll get sard and that sort of thing, ~~you know~~. And there is a change ~~there~~ *here*, I don't
 remember what the natural ~~thing is~~ *color was* but I end up with sardonyx. ~~In fact there is one~~
~~night here almost~~. This wood appears to be one of the forms of sard, I get ~~sard~~
 Sardonyx *and* this sort of thing.

Wm. Irving

Do you think that it is very difficult to make notches and points without heat treatment?

Crabtree

It's much more difficult.

Irving

Does this apply to most materials?

Crabtree

Yes. Other than obsidians, ~~and the salts,~~ *Basalts and* quartzite have altered slightly

but it's mainly the set group of siliceous materials. Some of these very granular things
 of silicified clays, ~~there is not much evidence of change~~ *in* ~~in~~ *of these* tabular forms of that
 sort of siliceous thing.

Dougherty

How about things like *opalized* wood and things like that? Will that change?

Crabtree;

Well, the opal just won't stand any heat at all. *But agatized* ~~the~~ wood is very good.

This ~~is~~ *agatized* is a piece of ~~agate~~ *agatized* wood, two pieces, ~~in fact,~~ *in fact,* of agatize^d wood, that the Indians
 have changed. I didn't change those but you see the changes have ~~been made~~ *taken place.*

~~That have taken place.~~

Alan Smith We didn't hear *Bill's* question over here.

Corabtree Oh.

Driving: I wondered if notches that are used on arrowpoints are difficult to make on all materials that have not been heat treated or are somewhat *more tractable than* others.

Corabtree Well, it certainly helps ~~them~~. I mean, it is much *easier* to flake and to

notch heated material than it is untreated. *Because the nearer ^{it} they come to obsidian or glass-like quality, the easier it is.* which is your ideal material for flaking ~~or your glass like~~. The more glass-like ~~the~~

material, the better control you have ~~with them like that and it~~ *Heating, makes* apparently ~~by making~~ the granules

if one can term it that, smaller, *the better,* the more flexibility you have, because the toughness is *due to* the intertwining grains of these nuclei that have bound together with your quartz crystals and you must shear those in two.

Win Driving: *is* The material is related to the Norton complex. I don't know how closely related but it is fairly closely related to that. Now the Punyuk complex ~~is~~ closely related

to the *Denbigh flint* complex. It has all of the diagnostics. This collection here is not ~~fully~~ *fully* representative but it is the best I could do on short notice. You see here

some antler that has been cut by the *grooving* ~~drum~~ technique with these *burins* which you see here. We don't have any evidence of wedges used to cut the antler but there are some small polished adzes in this site which perhaps were used for this purpose.

They weren't used for chopping *the antler* at any rate. Up above the ~~Burn~~ *burins,* you see *burin spalls* ~~Burn Falls~~

Punguk

There were as many as 20 ^{burin spalls} ~~burin spalls~~ knocked off a single ^{burin} ~~burin~~. Some of the ^{burin spalls} ~~burin spalls~~

were retouched at the ~~single~~ terminal end to use as ^{small} engraving tools. Now here you see one of the most distinctive sets of implements, the very small side blades, the side hafted blades, biface with very fine parallel retouch often with serrated edges.

You can tell that they were side blades because they are asymmetrical. One edge has been sharpened, the other edge is in mint, or new, condition. The edge that was held in the ^{antler} ~~antler~~ haft is in new condition. The outer edge has been resharpened many times.

Small tools, such as this size, are by far in the majority in a site, ^{such as this} however, there are some larger ones such as this bifaced implement here. This uniface ^{whittling} ~~whittling~~ knife

biface knife here, and possibly a lance head. All of the large tools in this complex are end-hafted. They're stuck in ^{sockets}. Only in the later periods in Northern Alaska do we get large side-hafted blades. Microblades are very common in the site, as you can see, from this representation here. They are all made of carefully selected material which is not common in the area.

^{It} May have been carried ⁱⁿ over a very long distance. Now down at the bottom of the table is material from the Norton complex, unfortunately I don't have very much of it here.

It is stratigraphically later than the ^{Denbigh-flint} complex and the complex at point. This material here, most of it came from one of two houses which was stratigraphically above the complex. You notice that the technique

of retouching ⁱⁿ the small bifaces is very different from that ^{of} these bifaces. At least

that's my impression. Also this technique appear to me ~~to~~ to be quite different from anything represented in the large tools up above. Perhaps we could stop here and wait for comments before we go on to the next material which is much older. This ~~is~~ material, I think, the ^{probably} complex dates from the third millennium B. C.

The Norton complex from the first millennium B. C., I believe. The other at the other end of the table is much older

I'm Don ~~.....~~ ^{Cerattue} and I would like to have Dr. Bordes ^{take this over}: I'm not particularly familiar with ^{burin complex it is strange to}

~~Some of this from~~ the Americas. ^W With the flaking we might do an analysis on ^{one} of these, ~~one~~ from the with the Norton complex. Of that sort

of thing there, and perhaps ^{on} of this side we might do a ^{slight} ~~slide~~ analysis. We might take the most striking example and make the comparison between some of the others and this

^{particular} that is, one, ~~here~~ ^{of this} the type of retouch on this particular tool ~~on here~~ and the thinning and ~~flaking~~ ^{the regularity} of this sort of parallel flaking. The length is much greater than

the width of the ^{flake} ~~blade~~ ^{starts} from the overlapping ^{the edge} starting from the point and the tip ^{to this} of the artifact, and the flakes carry across the face to ^{to save breaking} as to how they could have carried ~~them~~ back from both of the tips from both of the ends. ^{the opposite side,}

to save breaking the tips, of these in this manner here started at this end carrying on through ~~to the overlaps~~ ^{chattering - they} of this. You notice there is very little ~~shattering~~ ^{featuring} feathered out with ~~very little~~ just a minimum of step fracture ^{at this end,} in this ~~end~~. At this end they

did meet the other flakes on ^{the} this-side- other side. They have well controlled edges

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The flakes are 17.
It is well spaced along ^{the edge} ~~the surface~~ and ^{the bulbs} ~~not particularly deep~~ bolts of pressure are not particularly deep.

There are a few hinge fractures on this side ~~here~~ but they have been picked up

on the other side. In order to thin the tool, the pressure thinning technique was used.

~~in this particular one here.~~ You might check another one ~~here~~ on the other side.

^{You will find this material is}
~~In order to do this material you'll find an extremely fine-grained~~ compared with one

of the ^{basaltic} ~~basaltic~~ groups that we have here. ^{Look at} ~~In this type I haven't seen this one here,~~

~~but if you will~~ ^{and} make a ~~mental~~ ^{tip of the} mental calculation of the tools used for this pressure

retouch, ~~and~~ ^{keep re-sharpening the tip of the} evidently they had to heat pretty sharply to heat an antler pressure

tool to keep...it sharp.