(Bordes working flint with hammer
Crabtree working obsidian with soft hammer)

Crabtree: I have two flintknapping terms for these breaks, one is a step-fracture and the other a hinge-fracture. The hinge fracture has this dip as the flake turned and went out on that side and so stopped there; but the step fracture has broken off short. It's stepped off with usually a little air space underneath but still adhering and it carried through and broke off short. That's the purpose of a step fracture to go in and meet the termination of the flake from the other side. The hinge fracture can be used to produce flakes that will be worked into scrapers and that sort of thing. (Chipping continues)
I'm squaring up the flakes so that we have a center both ways and it will have a rounded contour. My fingers are feeling this underneath. You don't see them or what is actually happening, but you do feel it. It's like working in the dark. Like the first time the boy shaved in the mirror - everything came out in reverse. These are difficult to do because you have a dip and you must come in underneath on this side in order to carry the flake through to that side. This is one - the edge is just a little further. These are short. I have changed angles so I don't go back in and hinge and get a step fracture on that side. I was following the ridges through. You can't strike this way, or you lose the tip. My fingers are supporting the tip at the same time.

Alan Smith : What did you mean, Don, you couldn't strike this way? You couldn't strike which way?

Crabtree: You can't strike out toward the tip. You'll lose it. So you keep the force coming back in towards the central part of the mass of stone. There was a thinning flake to take this through here on this side. I have a little ridge. You see now we have a little more regularity for striking these ridges on this side. Here, now I may lose the tip, but it's a thinning technique and I find by using a slight Levallois technique that it works better. But I find I need a little pad, a little support, on the underside. Here, I can show you what I mean by shock. I drag the tool here. It's quite different from Dr. Borde's technique. This is taking too much shock to do this. I'm afraid I'll lose the other end of it but we don't particularly care. I've got a little too much platform - a little too round. But it will stand a lot of shock. With this type of platform, even obsidian will stand this much shock. If you leave a little hump out at this here, it helps the accuracy. It is distorted. I got a double flake, but it illustrates a thinning flake.

Tixier: Did you say this was a Levallois technique?

Bordes: We use the same technique, yes.

Crabtree: But maybe a little different.

Bordes: In the striking, yes.

Crabtree: It appears to be a bipolar break. We have a little ridge on the center here which we have to eliminate.

(Flaking continues with occasional edge shearing)

Alan Smith: Are you trying to flatten it out now, Don?

Crabtree: Yes.

Tixier: (French)

Bordes: Oui.

Crabtree: I was surprised that Dr. Bordes holds his artifact in the same style at the edge as I do, but he uses a different indirect blow with the hammer than I do, which has been very instructive for me. And with practice, I think that I will have a great deal more control than by using a flat edge of the antler. I got it! A bad one! It crushed. If I had polished that a little bit I could have taken that one on through here.

Bordes: Asks question - unintelligeable.

Crabtree: No, it's a little harder. I think I'm not used to the hammer - I'm over exerting myself.

Bordes: Ya, I know. Don't use it to try to knock off the end.

Crabtree: It's just a beautiful tool that you have here - this percussion tool.

Bordes: But you have to use it more.

Crabtree: Here, just to demonstrate the sort of thinning in these areas. We'll make a Solutrean here.

Bordes: And from that they went on by pressure?

Crabtree: Yes. This is sure a sorry blank. We'll try it anyhow. I'll get this ridge off by using pressure. I can remove some of these knots and this also has a curve but by pressure we can eliminate that.

Tixier and Bordes: Converse in French

Crabtree: Well, I got some bad ones, but that is how one learns by studying the poor areas and just how to eliminate them. For demonstration, sometimes it is better to use sawn blanks. But this illustrates the mistakes as well as the correct way.

(Further chipping)

I am preparing the edge so it will bite into the tool, whereas if I leave the leading edge sharp, it will crush. And once you have crushed the area you have created step fractures and you have to reestablish a flake from the opposite edge of the artifact. There, I crushed it - see. And it will just keep

on crushing unless one prepares a new platform and gets underneath this crushed part.

Bordes: This blank is terrible!

Crabtree: Well it's really better for demonstration than a real good one because there are just steps and stages that go into the preparation that you never see in the final finished artifact. Notice the direction in which the flakes are coming back in. These are crushed but I'll try to pick these up on the other side to thin that down. But the pressure is always away from the tip and the pointing technique you'll see different styles. You can't press out this way away from the base without breaking the tip. There are about three or four different ways to flake the tips. So if you just flake in this manner, it will result in a double bevel. Then when the flaking is pressed from the tip to the base, some flakes will be beautiful and straight like this, then others will be at a slant. But you'll always find a difference in the change of direction in flaking right at the tips. And there are about three different techniques that are used for producing this. Now I am working backhanded and actually left-handed and it is not my normal technique. When I hinge these off, I meet the hinged flakes on the opposite side and its starting to thin it down just a little more. You normally would not think that you would thin by pressure, but it is possible to do this. You see by using this pad, the flakes crush. But by supporting the artifact with a little piece of leather, or something, under the back you'll sometimes save your flakes. But it will give the flakes a little different character and you have to watch here that you don't get too much pressure on that side or it will pop in the center. But, actually, you don't give it as much pressure with your fingers because while you are doing this it will cause it to break. But it will work. And now maybe I can leave a flake still adhering to the artifact to show how the material bends. This may prove my contention that one has a muscular reaction that allows him to feel the material bend and to stop the flake at the desired place. I mean there is that much flexing and bending in the material. Some materials are intractible, but there is a certain amount of elasticity in all materials. For instance, a glass cutter will score his glass and sometimes you can watch the crack move ahead with the scoring and actually see the crack slowly open. Twenty-five years ago the Massachusetts Institute of Technology did some spark photography on glass breakage and they measured the speed of fracture with this photography. They threw a baseball at a window which was supported on all four corners. The striking caused it to baloon out and it pulled in on the sides and the cracks opened up at the rate of a rifle bullet. But, actually, under different circumstances, the opening of the cracks could be measured in parts of seconds. So it depends on how one breaks glass.

Alan Smith: Did you mean to say, Don, at least I understood you to say, that flakes had a different character when you used a pad?

Crabtree: They do have. They will feather out and also they give off a different sound which is very important to the worker. I hear a popping sound - not a snap. But when I apply inward and downward pressure, I am forcing a mass of material ahead of the pressure tool and someplace I must stop the flake or else it will remove the opposite side of the artifact. But, with the pad, it's faster and it will feather out the flake. By feathering, I mean that the flake terminates with an infinitesimal edge.

Alan Smith: And you can tell by a flake whether a pad is used or not?

Crabtree: Well, if the pad is used, the flakes will go across the median line and must be stopped before they reach the opposite edge. Then they will be met by flakes from the opposite side and will stop as a step-fracture and not a hinge-fracture. You see, the flake will break off short with a sharp edge break or a step-fracture. As you lift the flake off that makes a sharp right angle break at the end of the flake rather than a hinge-fracture. Flakes are usually crushed or broken when using a pad - but there are certain characteristics on an artifact that can indicate use of a pad. So, I don't really think you can tell from just a flake. You see this flake was bent out. From here you can't bend it out because your pad is in the way and so this is typical of a leather pad technique. Some types of artifacts are covered with these little scales, these little micro-scales, of little step-fractures while others have none. And some techniques show the flakes met in the center with a step-fracture. But that leaves the artifact with a slight concavity, particularly with thin artifacts, the flakes will meet in the center. But there may be many individual characteristics and behavior patterns of pressure flaking - each will be distinctive. With this particular group, one could not set any hard and fast rules that would apply to all artifacts. One must study many groups to see if they all have similar characteristics of workmanship. But certain big,wide collateral flakes must meet with a step-fracture in the middle. If they have hinge-fractures, they will be slightly concave in the middle of the artifact. It is better to get a step-fracture in the center than meet it from the opposite side - then you will get a perfectly flat surface. But with a hinge-fracture, it sometimes goes too deep into the artifact and must not go off the other side. Oh, I forgot, we were on T.V. - we were supposed to be doing a demonstration. But these different methods of holding come up while we are working along with different flaking techniques. When I am working at home, I will try to put down some notes on fracture for interpreting purposes. That was a rebound there. This holding style that I am using now is my normal way of holding when I am knapping. The other holding methods are changes and it takes me longer to do the flaking. But the step-fracture produces a more refined flaking so let's try another one.

Dougherty: Where do you put the tool? Right along the edge here, sort of like so - right in the middle?

Crabtree: Uh, huh. If you'll notice I leave this razor-sharp on the edges. I mean this is just as sharp as a razor, yet, no crushing. So I take off the edge with the platform and that leaves a cutting edge. Now, here, this will break down to that point there so I'll move the tool just back of this line of operation here and then I'll apply inward and downward pressure but if the pressure isn't applied right, it will hinge again. But I hope to pick it up on the opposite side, but sometimes one ends up with a mass of stone in the center. Now, the only way to overcome this is to come through here and meet that. I'm trying to get this knot out of the middle here and I'm taking fairly heavy bites with the tool. The desired thickness of the flake determines how far in one sets the tool. See, that removed the heavy mass in the center. This is now distorted and can be finished as a knife instead of a spear. If I continue this technique now with this distorted flake, it will just be more concave than it is now.

Dougherty: When you set the tool, you go along a little ahead of this hump here and then push down that way - is that right?

Crabtree: Yes, that's right. I will move the tool in so that it is directly in line with this groove with the force. Now, with this flake, if I were going to take off another projection here, I would move ahead and set my platform right here to take a flake off here and use that ridge to guide the next flake. But you start at one point or the other. These were not symmetrical flakes, but were distorted. Notice the even flaking on some of the samples here. This guides and controls the symmetry and regularity. If you have a series of precision flaking, it is because it was regular from start to finish. They must be evenly graduated all the way with the same spacing, for each time the tool has to be set exactly in line. If a pressure tool with a longer handle is used, then there is no quivver in the wrist. Dr. Bordes uses a longer handled tool and the percussion method of striking and delivering the blow to the edge of the artifact at right angles to the longitudinal axis which give the same results as when I tilt the artifact but still following the same ridge pattern. There are certain advantages to using this technique, for one can follow the flake directly in line with the ridge. So even a longer handled tool can produce flatter and better controlled flakes. However, I am used to a handle that is shorter and am a little akward with the longer-handled tool. I think a longer-handled tool gives more precision and regularity without the wrist movement.

Irwin: (French)

Crabtree: Well, let's make the flaking curve over the artifact and meet it on the opposite side. This will demonstrate the bending of flakes. See this little flake still attached to the artifact. I can move it just by the pressure of the fingernail. It might be a little easier here if we could pick up this ridge. Here is a little step-fracture. We can scrape down this edge to make a platform. I'd like to do a series

of flakes off the edge of this artifact to show how the worker can leave a razor-sharp edge. This is a dulled edge now and it is nearly worthless as a tool. So I will resharpen the edge by removing a series of flakes, taking the platform with the flake and a sharp edge will result without crushing. I am applying inward and downward pressure and directing the force toward the base to keep from breaking the tip. By the sound, you can tell the type of flake removal and the pressure tool is moved ahead over the next ridge. I know, from practice, the position of the ridge even though it is underneath and I can't see it. I know where the flake is going, so I don't have to turn the artifact over after each flake removal to see what happens. I'm changing the direction of the flaking pattern to a slant now.

Alan Smith: Have you done this enough so that you can really remember the underside?

Crabtree: Oh yes. I can tell what happens just by the sound and the feel. But if I hear it go "crunch", or if it makes a noise like a mouse crying, I know there is something wrong.

Alan Smith: You can actually visualize the under surface?

Crabtree: Well, I visualize it by feel. Most of this is done mentally, actually. And to get the flakes to meet together exactly in the center is like trying to touch the tips of two needles together blindfolded. Because the angle of flake removal is so critical that to make them meet in the center by just feel, rather than sight, creates quite a problem. I am amazed at the degree of precision of some of the aboriginal points. With great precision they removed long, thin flakes only an eighth of an inch wide and they carried them to the center. It's simply amazing. I've forgotten the surface character of this artifact, so we'll have to have a look here. I am trying to establish a little projection. The finer the projection and the more preparation, the easier the flake is detached. However, this is a long one and it went clear across and off the other side and took off the opposite edge. There isn't much that I can do with this now.

Epstein: Did you say that you can smell it?

Crabtree: No - but I do feel with the hand. I don't use my sense of smell, but I do hear.

Wheat: Did you ever try to chip oil shale?

Crabtree: No, I haven't.

Wheat: You could use smell there.

Crabtree: You could smell that? Well phosphate rock smells a little too.

Bordes: Well, when you work flint with a stone hammer and you miss your blow, you smell it. There is a kind of crushed flint and you smell it.

Shaw: There is some cherty limestone that you can smell too.

Crabtree: There are many hazards to flintknapping. I have had to change one of my techniques because of the cut nerve in this finger. I used to catch the flakes between my fingers but once a flake crushed and went into the finger and cut the nerve. Now, I have to use this different technique, which allows the obsidian particles to fly in the air and, at one time, I developed a cough from breathing this type of stone dust. If, for my pad, I use cloth instead of leather, it collects the dust residue and will cause a cough. Over a prolonged period of time, it is possible that a flint worker could get silicosis. It might be one way of identifying one of the stoneworkers in burials. There may be an accumulation of silicious dust in the lungs from doing this kind of work.

Bordes: With obsidian, yes.

Crabtree: In the strong sunlight you can see the dust fly in the air. This technique of using a rag as a pad to protect the first and second fingers give a whole new character to the flakes. I'll try to demonstrate this technique. You get quite a bit of leverage, but you lose strength in your fingers for they must support the artifact. But you can develop a flaking curve and catch the flake between the first and second fingers. The pad should be soft between the fingers and supported by the thumb and the flakes are being removed at a diagonal. You can feel them very well and for some reason the character developed by this technique cannot be duplicated by the normal palm-supported technique. I don't know - I get a true and better flake and it is straighter by using this technique. Then again, I've used a crutch for removing large flakes and I notice that some aboriginals, no doubt, used this method for large artifacts. If the artifact is supported on a rest, or a block, you end up with a whole bunch of step-fractures, all the way along. Without a crutch, but using a rest, the flakes have no place to go and these little flakes go into the artifact causing step-fractures. The rest method was, no doubt, used for knife sharpening and retouching. This technique causes a beveling of the edge similar to artifacts found in the Mississippi Valley showing they have been retouched and then retouched again, causing excessive beveling. When they are resharpened like this and the artifact is supported, it creates a distinctive edge character. But it is not adaptable for making other than very thick arrowpoints. I have noticed that some of the diamond cross-section pieces have this same support character with the flakes sharply feathered out. Hand-holding will not produce this character for there is too much rolling of the flesh and you do need a solid support like this piece of rubber or some heavy neck leather or something like that. This feathering out shows a definite support method. There is shock, but the hand rolls on thru and actually you are controlling the flake with your left hand although the right hand is a little more fixed. Butler and I tried out several students on flintknapping and each one had a different technique and each holding method had merit, but each method gave a little different character to the artifact.

For instance, Dr. Bordes doesn't feel comfortable using this holding method so he has a different style. Perhaps the aboriginal child learned from his father and so we have different holding methods. I recall seeing a collection and every artifact in the bunch looked like it had been made by the same man yet there were big ones, little ones, and all types. They all had little step fractures but well done. It appeared that one worker had produced all of them yet they were all found at a buffalo jump. So these things seem to be somewhat characteristic. Examining different collections, different groups, will, no doubt, show up the variations because we can't make an analysis with just one point - we need an assemblage. For instance, look how many different styles and techniques we find in Clovis. It would be interesting for someone to do a little paper on Clovis techniques and the variety of fluting, edging, grinding, surface character, etc.

Wheat: Bill Rousa did a little paper on that. It's published in the Ohio State Archaeologist. He recognizes about three styles of fluting techniques.

Crabtree: Is that so. I haven't read it, but it sounds interesting.

(Interruption in Recording Time)

(Lunch, no doubt.)

Crabtree: What do you think of this, Dr. Bordes? This is no preparation. He may have been going to take another series and decided there goes the buffalo. Let's take out and we'll fix this later. Because it's just not quite right.

Bordes: Ya, ya.

Wheat: Maybe they used it as a drill - for a pipe or something.

Crabtree: Well, but it's like it is unfinished.

Bordes: Ya, ya, but let me tell you something. It looks to me like the man was not very clever. Because yesterday when I tried my pressure I got exactly the same edge and I could not go further. It was too wide and I could do nothing, so I just left it and began my percussion. But this one is a wrong one you know. And it could be because the man was not very good - you know it strikes me.

Crabtree But on this side he was able to control the pressure very well.

Bordes: Ya, ya, all right. But you know on this side, if you remember, I did fairly good pressure work and when I wanted to go on the other side, I couldn't. I got exactly that. So I will say that he was a man that was learning.

Crabtree: Well, some of these techniques require backhand work and it's almost like using a left hand. I mean it is awkward to use one position and then turn around and change direction of flaking. Your muscles are just not keyed to the different technique and you use different muscles for your own technique. Therefore, you are not as accurate. Like with writing - we are used to a table support and it is hard to

stand up and write with just hand support. This artifact of Dick's indicates that the worker hadn't finished the one edge. Maybe he had sufficient weight for that particular type of projectile point and he didn't want to take any more off of it and he wanted a balanced set - so he left it. Maybe he felt the point was good enough as it is for penetration so he may have decided this is good enough.

Bordes: Ya, ya, ya. But on the other hand they were certainly a paradoxical people. Some people were very handy with their hands - others were not so good and people were learning you know. What can you say - maybe they were children learning to work flint and so some of the flint which looks rather crude and just beginners work. Could be that too, or it could be that the man was in a hurry - he was just starting and he wanted a spearhead to kill something and would fix it after. Why not.

Tixier: Because of his wife?

Bordes: No. Never underestimate the power of the women.

Crabtree: Notice the tears and the flake character. Why certain flakes were certain shapes and then a comparison of the slight crushing of the edge. You can see a part of a platform preparation still left on these right here.

Bordes: There is one thing I shall try. To work obsidian with a soft hammer.

Crabtree: So there is not so much shock.

Bordes: Ya, ya, ya. Perhaps. The best thing to work obsidian by percussion would be to find something that is a little softer than this. Not much, but a little. I know I work with box wood for a very long time. The best box wood hammer is just about like the worst of antler.

Crabtree: Let's use a wooden billet on this and see the difference.

Bordes: Let's see, I will try with wood.

Crabtree: Good. Very good

(Lapse in recording time)

Bordes: You know this part of tool, the edge is just crushed but the crushing becomes a part because this is a tool now and then also because I am not too much happy with this anymore and that is exactly why I throw this out. I would like to hold it here. It would be better to hold it like that, but I could say that perhaps it would be good to keep this in that shape, as an example, because I am not sure I can go on now.

Crabtree: Like a preform. It doesn't have the appearance of a regular preform.

Bordes: No,no,no,no,no. That's something else. You know I am now very sure that the man, a man you know who was very handy with a wood hammer and enough obsidian could make things almost as regular as the one you have made by pressure. Not the small one but the wider retouch. I am fairly positive of this because, look, and I have no technique with obsidian.

Ah, that's an idea, you have some idea, and if you have some time, you'll notice this interesting way of retouch meets the center. But certainly I have seen Egyptian and some Egyptian knives, you know, that met in the center.

Dougherty: Don, could we get you to try one more blade with two different people doing it.

Crabtree: Well, if I could get some way to save some of the flakes or blades. This wood billet I have may be a little hard, it may be a little rugged.

Bordes:- I would not like to say anything against Crabtree who does such a beautiful job of pressure flaking, but I guess somebody who works flint or obsidian every day by percussion could get things almost as regular as the big ones. I don't speak of the small ones or the crazy chips and so on. But regular forms and ordinary knives or projectile points you can get by percussion almost to the point of pressure when someone is really trained.

Wheat: What differences would show up on the points on these?

Bordes: Well, not much to someone clever. Technically when you are really controlling your percussion you take out long, long flakes with a very small platform and it looks very much like pressure.

Wheat: But there is a difference in the way the flake turns loose. That is in the pressure - the pressure builds up slowly and then it's released suddenly and on the percussion it's hit suddenly.

Bordes: Ya. But all that is a matter of the ratio between the hardness of the hammer and the hardness of the material. The hardness of the material you are working. If the hardness is about the same, you know there is not much apparent between pressure and percussion.

Wheat: Well, this is what I wanted to know.

Bordes: Not much. There is, for instance, any of the tools made by Crabtree you can see very easily it's made by pressure. But in some other case like a lot of Laurel Leaves in France - well, I am not enough of an expert.

Crabtree: The large one that went around here that I did - that is percussion.

Bordes: Ya, ya - no question. We will look at them at the Museum Thursday morning. We'll look at the Solutrean work and you will see that some were made by pressure - no question. The shouldered points and Willow Leaves. Most of the Willow Leaves were made by percussion, no question. But on some of the Laurel Leaves - who knows.

(Stone chipping continues)

Crabtree: Yes, that's good.

Bordes: When you have a good hammer, it works good. This one will

be a little more out. You can take clear across. I am fairly sure that most of the Solutrean Laurel Leaves were begun like that. But not too much of a shock.

Tixier: (french)

Crabtree Oh, that's good.

Bordes: The only thing you have to do is each time to strike correctly. I don't do it any more good but you see that's the general idea.

Crabtree: That's a good thing to bring out here.

Bordes: Let's see. Always when you want to demonstrate something you miss it. And perhaps with this tool and technique it makes it look like you are doing it like that and were not even looking. And at the time you were looking at it there. God damn! If you pick up a lump of flint and you try to work it first you can't work it well and the, if you work flint by perousion with your hand out - that's bad.

Alan Smith: Then there is a little difference then, whether it has moisture or not?

Bordes: Pardon me.

Alan Smith: There is a little difference whether it has moisture or not.

Bordes: Yes, there is a small difference. This one crushed much more than the other.

Tixier: Ah! May I see the bottom seat?

Crabtree: Just a minute and see whether we get a different flake character here.

Epstein: You use hard wood - you mean it is worn down here?

Crabtree: Yes - it needs to be a little softer.

Dougherty: Are you going to file it down a little?

Crabtree: Well, it needs to be bruised so it will hang on.

Dougherty: Isee - soft huh?

Crabtree: This is a hard piece here.

Alan Smith: Can you do better work, Don when you work fast?

Crabtree: No. I just don't want to take that much time here. One should take more time to study each flake removal. However, I am feeling underneath with my hand. But there is so much to cover in just four or five days that I am working fast. This is flat and it's going to be a little difficult to get a ridge established to guide the flakes. This flake is thin and it may have a few internal strains. On the corter there are little bruises indicating movement or where it has been

pounded a little bit indicating internal strains. I'd like to examine the flakes removed by the billet. If I get the same platform character then when the edge of the artifact bites into the wood billet and the flake detaches from the artifact, the character will be identifiable. It's the length that requires this much striking. I'm afraid of this end. Can't get these pulled loose here.

Alan Smith: You seem to hold your billet at quite a different angle in relation to the piece than Dr. Bordes does.

Crabtree: Dr. Bordes strikes into the body of the artifact and has much better control. I think there are a lot of advantages to this billet. Because you'll get perfectly flat flakes with a billet but I find that if I drag it on the edge of the artifact, I get better control and it lessens the shock. I'm not used to the shock that I will get from this billet.

Alan Smith: I didn't mean to suggest that you change, Don.

Crabtree: No, no, I understand. The impact area is critical. I'm not getting the edge character that I want.

Alan Smith: I merely wanted to check my observation.

Crabtree: Good - that's good. What I really wanted you to see is this. The wooden billet pulls this edge away and leaves a little different flake character. I'm not quite doing it right for demonstration of the use of a wood billet but it will show a little different edge character than a harder striking tool. The stone will dig in slightly into the wood and pull the edge away and leave a sharp edge. This is just an example of an artifact produced with a wood billet. It's not a good flake; it's not quite what I'd like to show as billet struck. I just hit in too far. Because the tolerance from this distance must be accurate on the edge, but it shows a little edge character.

Tixier: Your stick is too heavy.

Crabtree: Yes. This is not the best stick.

Tixier: This is good for hand ax.

Crabtree: The billet needs to be shorter. I wonder if a piece of harder wood would work better on flint. To bring out the character a little better with the harder wood.

Bordes: You won't get this corner like that. Oh, you can with wood, but with a different angle.

Crabtree: No, you see, it's too hard on my thumb.

Bordes: Like that. So you shall try with stone here.

Crabtree: It crushed on that side.

Tixier: Ah, there it is - bladlets. Yes, that's good.

Crabtree: I had a flat side and I just flaked this one out to a ridge.

Bordes: So, Alan Smith, you are the chairman?

Alan Smith: Oh, yes - I hope.

Bordes: So you direct the discussion.

Alan Smith: Well, let's have Don tell us something about the thermal treatment.

Crabtree: I will try to explain something of my initial interest in the treatment. As a boy I would find discards and flakes and it was like stealing flakes from the Indians but they always seemed to be of the best flint. I knew that their flint was a little better than any I could find, but I did not know why. I noticed pot lids and overheated pieces of flint and they were always lusterous and shiny and in one particular area where there was chalcedony flakes they were waxy beautiful flakes but the material in situ was a fortification agate with banding which is very tough and it was difficult to pressure flake. Yet, the Indian had made beautiful bifaces and arrowpoints and it was of this material - still it looked different than the raw material. So I tried heating the stone and I got a change of colbr and I got pot lids from overheating. But I did discover that the heated material worked easier and better after the treatment and it changed in texture and color. The yellows will change to reds where oxygen is present. Sometimes there is no color change but there is a texture change and refractive index seems to have changed as well. In 1939 we had some tests run at Batelle Institute. The electronic microscope was used and we checked some altered material from Flintridge, Ohio. It was some material that I happened to have on hand. They found that molecularly there is a nuclei and around this radiating crystals, after the heat treatment, these are reduced which is against most of the laws of molecular theories. When metals are cooled or annealed very slowly, or heated slowly without chilling suddenly, the crystals will increase in size and length and we get flexibility. With stone, by the slow heating and cooling we have a similar change, but a little reverse of the metals. But with certain quartz family minerals, some will alter by this heat treatment. This is Harrison County, Indiana flint and it shows an over-heating and this is the resulting pot lid. This is an Indian flake from Montana picked up on the surface showing the altering. Notice that I removed a little flake on this side and it shows the change. What the age of this is I don't know for it is on loan to me by Lou Napton from Missoula. The technique shown on this flake is unique because of the very tiny striking platform. I hope you won't mind that I took an extra flake off the side here to show the change back of the color. This was the original texture after it was heated. This was the surface texture prior to heating. This was apparently a discard perhaps because of this hinge fracture. I'll pass this around to show the difference in texture between the original facets and the worked side. It shows a reversion back. What the rate of speed of reversion is, I don't know. However, the hardness of this material is still the same. Because they heated some pieces for pressure work doesn't mean that they heated all of them. Most of the drills

are not of treated material. They wanted to retain the toughness of the stone. When you find these awls and drills they are generally untreated. I'll pass around another one in association. This was unheated material showing it can be worked but it's much easier to work after it is altered. This is unaltered Harrison County flint. The artifact with it has not been altered. But you can see a slight change. I think there are two flakes on one edge. This edge right here shows a slight change after it was heated. But if your material is of good enough quality there is no necessity to alter. In 1940 when Dr. Shetrone came to France, he sent back several tons of material similar to the flint that Dr. Tixier brought here and I was lucky enough to get some of it. This is some material done by pressure and this was about as good as I could do with pressure work at that time. This is an old point of that material and this is unaltered French flint.

Tixier: Without treating?

Crabtree: Yes. This one is without treating. These pieces are treated on one side. This shows how large a flake can be removed by just hand-held pressure after the treatment. This one here was from a sawn blank but just to demonstrate the thinness and the length of flakes that can be removed and how much control can be gained by altering. With untreated material you get little micro-flakes because it is extremely tough. There are quite a few potlids on the outside of this one and the flakes of that one single core seem to be much brighter, but that was only a single example so there wasn't sufficient evidence to be sure of the treatment. Thermal treatment is apparently very ancient in the Americas, because the Folsom was, no doubt, altered, and the color changes are apparent even in Clovis. Yet, again, with other groups of poeple it is not in evidence at all even in the Americas. So one wonders what the distribution of thermal treatment really was. Not too much research has been done on it so far, and it will be interesting to find out at a later date what the extent of thermal treatment was and how far it reached into time. This is an artifact from Oaxaca, Mexico - a white jasper or white agate point - that had been altered for one of the original facets of the material was still adhering and I could see the difference in original texture and that altered. Sometimes on the backs of the artifacts you may find some surface that has a hinge fracture, or a little miscalculation so that the whole surface was not removed. And, if it wasn't all removed and there is a change in lustre of the chipped surface and the original facet, then it is quite evident that there was altering taking place. What really helps is an artifact that has the outside of the flake on one side which is very coarse and granular and on the underside the material will be very shiny and lusterous. Usually, in trimming a core after it was heated, the outside was removed and then one can see the difference in luster between the original and the inside treated material. But with a single flake, it is almost impossible to tell and it is better to have an assemblage of flakes before one decides definitely about thermal treatment.

On the outside of some of our jasper nodules in the States, like some of the French material, right at the cortex you'll find a combination of silica jells (opal) with a high content

of water and cryptocrystalline silicas which is actually opal, or a combination. Now opal just is not suitable for artifacts because it is unduly brittel. It is soft, and you can scratch it with a file and the finished artifact would have little strength. It cannot be treated for with any heat change it goes all to pieces. By the way, this artifact is one of opal showing opal can and was, at times, worked. There are, no doubt, some points made of opal but many of the points are made of white treated jasper and have almost the same refractive index and luster of opal and, therefore, can be confused with opal. But there is one type of jasper that I can't get altered. It comes from a site near my home and we call it Breneau Jasper. There is something I am doing wrong in the heating, for the Indians were able to alter it. However, they were very skilled in treating materials, it was a science with them. They were even able to alter large blocks of stone and they knew how to raise the heat slowly and how to cool it slowly. The larger the block, the more slowly you must heat and cool. But small flakes could be altered in a few hours. By that I mean half a day. At home, I start heating in the evening and the next morning the stone has cooled down sufficiently to work. I cover them with fine blow sand so it fills in all the cracks and lets the heat soak in evenly all around.

Epstein: Don, does it look as though the Indians were accustomed to heat treating the blades or preforms or something of that sort, or do they do the whole nodule?

Crabtree: Well, in some cases you find evidence of treated cores. Of course, the Hopwellians heated the whole core and it had a much sharper edge. The finer they could make the material by altering, the finer the texture, the sharper the edge. Like this flint here = which 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 obsidian or a glassier material produces a sharper edge because the fracture breaks out to infinity. If you have little granules in the material, the flake is not going to be nearly as sharp and smooth as if it were a very fine-textured material. Most of the treated evidence that I have seen has been in preforms that have been altered. Or they would take a whole series of flakes and thermal treat them and then rework the flakes. Then, again, you'll find fairly sizeable treated flakes that had to come off a core after it was heated. However, I have not found the core.

I'm not an Archaeologist and, therefore, I'm not out looking. I would rather stay at home and chip the stuff then to go out and look. When I was a boy, I would go out hunting and if there was a blowout in the blow sand I would gater, of course, what I saw on the surface. I was after chips and flakes as much as artifacts. This is a treated piece that Dr. Bordes was working on. This is very good evidence of alteration. We have removed a great deal of the surface, but on this side you can see the contrast between heated and untreated material. This is the untreated material as it occurs in its natural state. It is very tough material and it has been treated now and is quite workable. I'm sorry, I meant to bring an untreated piece to show the difference in character. But we'll pass this one around and there should also be an artifact somewhere here of this material. This hasn't been heated enough but this is pressure worked. You can see that this treatment changed the material and produced a better stone than this original piece. 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 it got too hot on that edge, probably was too close to the element and this piece popped out.

Epstein: Do you feel that the temperature was too high or it cooled too quickly?

Crabtree: Well, not necessarily. It could just be that one edge was exposed or got too close to the heat. He must have had great control to have altered as large a piece as he did. And he understood almost exactly how much heat was necessary because there is a wide variety of the water content in stone and the degree of temperature will vary with each material. Now, for instance, one type of chalcedony,which has a replacement of silica jell, will not stand very much heat. However, if properly controlled, it will alter beautifully and be very waxy and lusterous and almost jewel-like. While the agate nodules formed in the vesicules of the ancient lava rocks apparently have microcrystals forming from the outside.toward the center, leaving these patterns. These are called fortification agate. These will stand much more heat then those formed by a silica jell deposit.

There are no lines or patterns in the silica jell type of chalcedony. But there is even a wider variation of chalcedony. A friend in Montana said he didn't think anyone could ever flake Montana agate. He said he saw artifacts, but it appeared that they were of another material rather than Montana agate. He was quite enlightened when he found that Montana agate could be worked after it was treated. He hadn't developed his notching technique because he couldn't get enough pressure inside of the notch, but I expect now he will try it on the treated stone. So he felt that they made there artifacts all lancelot in shape because they were of flint and agate and the stone would not allow the pressure needed for the notching technique. There is a little story that goes with this artifact. This is a genuine - not one I made. But this is, apparently, a type of Solutrean flaking. At one end of the Camas Prairie in Idaho, the Clovis and some of this very beautiful work was done. This will give you an example of the thinness of some of these great big chalcedony disks they made. However, this piece, apparently, wasn't heated by the same people that made the Clovis, for we found this in another site of a more recent occupation, at the other end of the valley. They had salvaged this material, apparently, from an ancient site and brought it to their camp and did a little retouching after they had heated it, which is an odd thing. With this one, you might examine the edges, and notice that whoever did the work originally did the flaking on stone in its normal state.

Cambier: Asks question in French.

Phil Smith translates: Don, what are the major temperatures that you use in this heating?

Crabtree: I'm finding now over a long period of time that 450°F will work on most materials. But it must be built up very slowly, I mean, it shouldn't go over 200°F initially, for at least an hour. At 200°F for an hour and then raised to from 400°F to 450°F However, it will stand up to 900°F

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 I discovered this great invention. Now she's lost her deep fryer. Prior to that, I had used a ceramic oven, which will go up to 1500°F or maybe 2000°F. And the breaking down point of this material, or a translucent agate like this, is around 1200°F. At 1200°F, it will all turn white. You may have found examples of this in your sites. Prehistoric man was able to build up that much heat in his pit, for you will find flints that have been entirely decomposed by heat. They used charcoal, possibly, or maybe by fanning it, or something like that. But at that heat it breaks down into little cubes and it entirely disintergrates and appears to be like porcelain. You can heat a translucent chalcedony, and at 1200°F it will disintergrate and go to pieces.

Epstein: More clarification. Do you, for example, 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 temperature to 450°F., and then I turn the thing off at 11:00 p.m. By morning it is still warm, but you can reach in and get it without being burned. It's workable then and can be handled. But if you open the oven door before this lapse of time, the air touching the stone will cause it to pop and crack.

Epstein: Even in the sand?

Crabtree: If it is near the surface or exposed, but as I have told my wife I need a stethoscope. I could then sit by the oven and turn up the heat and listen and when I hear the first crack I turn the thing off. Like this. Then I would know if I was heating it too fast. Perhaps they had their ear to the sand and did the same sort of thing.

Wormington: Is there any advantage to working while it is still warm?

Crabtree: I can't see any difference. Here is another one. A few flakes have been removed on the outside, ~~here~~. There is a slight change of texture not very much color change, but it is much easier to work. This is extremely tough. This one edge is all that has been exposed by removal of a series of small flakes.

Irwin Williams: This flake was struck off, then heat treated, and then retouched.

Crabtree: Right, just on this one edge, just to test it, and see the results. 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 the changes.

Joe Ben Wheat: Don, do you know who McCormick is, the guy down in S.E. Colorado who makes Folsoms?

Crabtree: No.

Joe Ben 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 hot enough that he can handle it with gloves but too hot to handle it 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 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 a platform and just one sharp blow like that. But the interesting thing to me is the suggestion that this is the shape of an Elk ~~hammer~~ antler.

REEL 2

Crabtree: Well, that's something. That's remarkable. He supports the point against something. Well he has to support the point. I know that is one of the techniques that I hadn't used because I have broken hundreds of them till I saw the polished tips on the folsoms that Marie has at the museum.

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

Crabtree: 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 it doesn't make any difference.

Alex Smith: I was thinking of the Indian and his fire and the probability that there was some fluctuation there.

Crabtree: I don't think that it really makes any difference, if you don't heat excessively or build up the heat too fast and let the stone cool too fast. But the larger the block the more slowly the heat must be raised and the more slowly they must be cooled. I was trying to get a Folsom out of the French flint and the platform collapsed. But that has been a heat-treated piece. And this is a piece of quartzite. I can see a little change in texture but, prior to heating, it is very difficult for me to pressure flake quartzite. Yet, I know that it was done. I started examining it under glass to see the replacement of those little sand grains. If they are brecciated, the sand is a stream sand, rather than a beach sand. The beach sand quartzite has a great deal more toughness than the stream sand quartzite. If it is extremely fine, it seems like the little grains are cemented with, possibly, chalcedony. You see this little matrix composed of chalcedony, if you examine the quartzite with a glass, and the finer it is, the easier it is to work. This particular piece of green quartzite is fairly coarse. There is a lot of variation in quartzites and it would require analysis to actually tell the workability of this. Quartzite is quite variable because of all the varieties of stream sands and the types of cementing and bonding agents. Here are some that are heat treated, showing different styles of work, however, they are all from the same material. Some are heated just a little differently, some are a little more lustrous, possibly. However, they are all from the same block of material. This is some more, but his was heated near the surface and the oxygen was present, however, these haven't changed color. They are all off the same piece of stone, these four. Well, that is about all that I can tell you other than I am looking forward now to getting some nice blocks of flint, heating them in my deep fryer, and making some of these prisms. They'll be interesting things to compare the differences in sharpness between the jasper and agates and flints with obsidian blades. I'm sure they won't be quite as sharp as obsidian but they will make some interesting tools.

Dougherty: Was that core 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.

REEL 2

Tixier: 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.

Tixier: I am sure there are some people in the Sahara which used this method, I'm sure. They treat it, they have flakes and then they retouch. It was found by Dr. Kosand from Libba 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.

Crabtree: Well, I thought when I get home I would cut some uniform size tabular slabs with a diamond saw blade. If the slabs or flakes are not uniform size it creates a variable in temperature control. I want to have a uniform tabular selection and at least carry on temperature experiments up to as far as my deep fryer will go. Then we will heat the tabular forms in different stages of temperature and then prepare thin sections and check exactly what is happening with this heat treatment. One can reserve a portion of each slab for control purposes so we can increase the heat to the breaking down point of this experiment on heating and we might know a little more about some of the materials of the quartz family minerals.

Daugherty: Don, [illegible] send some examples of that stuff up? We can check the index [illegible]. refraction

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

Daugherty: We have. We have the whole works.

Crabtree: That would be wonderful.

Daugherty: If we could get that extra little step in.

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

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

Crabtree: Dr. Swanson was going to send 6 sep copies of the Tebiwa with his heat treatment article. A very short article. I don't know whether you got them or not.

Bordes: I may have some.

Crabtree: Oh yes. But Dr. Swanson said he would send 5 sep here.

Bordes: I did not receive them.

REEL 2

Crabtree: I see [redacted].

Bordes: I got two.

Phil Smith: Do you think that the very high solar temperatures, ~~you may select~~ in a place like the Sahara, would have any effect at all on the flakeability of the flint?

Crabtree: → I don't know. 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 may do that. 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 but it would have to be an intensive solar temperature in order to ~~do that~~ make the change.

Phil Smith: In the Sahara you very often find pieces of flint arrow stone which does have this pot lidding on the edge. Of course, that is a high temperature - high heat.

Crabtree: I see. It might be. Well, carnelian was one of their favorite for several thousand years before the time of Christ. And carnelian doesn't come in a carnelian color, normally. I mean to find it naturally. It comes as yellow agate and has to be altered to make it into a gem stone. You don't find carnelian very often accidentally, unless there has been a forest fire or something like that that has gone over. Or maybe some underground thermal temperature that may have altered the color of the stone. Natural carnelian is a very rare stone and yet you'll find these beautiful carnelian points and also they liked it for jewelry.

Phil Smith: What color is it?

Crabtree: It's yellow and the yellow changed red. You see you can't induce hemetite into the chalcedony and it is the hemetite that makes it red. The iron salt must penetrate in a soluable form. Hemetite doesn't penetrate the stone as hemetite and this is what causes the red or carnelian color. Other mineral salts will cause the sardonyx and you'll get sard and that sort of thing. And there is a change here. I don't remember what the natural color was but I end up with sardonyx. This wood appears to be one of the forms of sard. ~~[redacted] this sort of thing.~~

William 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. Basalts and quartzite have altered slightly but it's mainly the set group of silicious materials. Some of these very granular things of silicified clays. There is not much evidence in change of these tabular forms of that sort of silicious thing.

Daugherty: 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 wood is very good. This is a piece of agatized wood - two pieces, in fact that the Indians have changed. I didn't change those but you see the changes have taken place.

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

Crabtree: Oh.

Irving: 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.

Crabtree: Well, it certainly helps to have the material altered. It is much easier to flake and to notch treated material than it is untreated. Because the nearer it comes to obsidian - or a glass-like quality which is an ideal material for pressure work - the easier it is. The more glass-like the material, the better control one has. Heating, apparently, makes the granules, if one can term it that, smaller. The more flexibility the stone has, the better because the toughness is due to the intertwining grains of these nuclei that have bound together with the quartz crystals and they must be sheared in two.

(Lapse in recording time)

Irving: This material is related to the Norton complex. I don't know how closely related but it is fairly closely related to that. Now the Punuk complex is closely related to the Benbigh flint complex. It has all of the diagnostics. This collection here is not 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 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 burins, you see burin spalls. There were as many as twenty burin spalls knocked off a single burin. Some of the burin spalls were retouched at the 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 assymmetrical. One edge has been sharpened, the other edge is in mint, or new, condition. The edge that was held in the 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 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 ~~x~~ carried in over a very long distance. Now down at the bottom of the table is material from the Norton comples. Unfortunately I don't have very much of it here. It is stratigraphically later than the Denbigh flint complex and the Punuk complex at Punuk point. This material here, most of it came from one of two houses which was stratigraphically above the Punuk complex. You notice that the technique of retouching in the small bifaces is very different from that on these bifaces. At least that's my impression. Also this technique appears to me 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 material, I think, the Punuk complex probably 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.

Crabtree: I would like to have Dr. Bordes take this over. I'm not too familiar with the burin complex. It is strange to the Americas. With the flaking we might do an analysis of one of these from the Punuk with the Norton complex. We might take the best example and make the comparison between some of the others and this particular one. That is, regarding the type of retouch, the thinning and the regularity of this type of parallel flaking. The length if much greater than the width of the flake. The overlapping starts from the edge of the artifact and the flakes have been carried across the face to save breaking the opposide side. You will notice there is very little chattering. They feathered out with just a minimum of step fracture at this end. They did meet the other flakes on the other side. They have well controlled edges. The flakes are well spaced along the edge and the bulbs of pressure are not particularly deep. There are a few hinge fractures on this side but they have been picked up on the other side. In order to thin the tool, the pressure thinning thechnique was used. You will note that the material is extremely fine-grained compared with one of the basaltic groups. Look at this type and make a mental calculation of the tip of the tools used for this pressure retouch. Evidentally they had to keep re-sharpening the tip of the antler pressure tool to keep it in working condition.

(Lapse in recording)

REEL 2

Crabtree: We have little short shell-like fractures here with deep bulbs of pressure. But, it is unique to a pressure retouch and a serration in the same operation. This one shows more of a random technique without any regularity of flaking. They did use the same technique in their serrations in order to leave this, but it has much more pronounced bulbs of force. They moved their tool ahead, and they haven't followed the ridge in order to guide the flake with the precision they did on the other sets of tools.

~~Irving~~ ~~Smith~~: Could that be due to a difference in the material?

Crabtree The material is slightly more granular, however, the texture remains almost the same. It's a little different in character of workmanship than you find on the other one. They hadn't sufficient control as they had on the first bipoint that we mentioned. Part of this looks like a retouching and it ~~may~~ be a resharpening operation that they used. It may have been resharpened and utilized as a knife. With the burin points and scrapers you might point out in which order you would like them analyzed. I'm just not quite sure, but some of these scars could have been from function, as the flakes are removed without a great deal ~~more~~ of precision. This scraper is interesting. Notice how they would curve the flakes over and terminate them at the edge. It's not too common with a scraper technique to have this regularity of flaking. However, this has been abraded slightly from use, but it is a well formed scraper from a single flake. Notice the point of force at this end. It's quite small without any overhang left on this side as the flake was detached. Of course, it is hard to tell the original length of the flake, but it was much longer than it is now. It may have been made by resharpening a much longer flake in order to get this character. There seems to be very little ~~pressure work on~~ compression in this material, however, it is a very fine grade of dark jaspet. This one is another type of a flake scraper. The same sort of a

flat pressure tip on the two of them. These are identical in preparation, almost like the indirect percussion technique ~~work involving~~ that we were doing a few minutes ago. I mean it is quite comparable. But they have a little better platform preparation on this side without the long overlap on each side of the burin flake as this would spread and carry on through. Some of the ~~the burin flakes and~~ microblades are quite reminiscent of the Hopwellian type of blade. In some cases they use a single ridge and sometimes they use a double ridge. You might sort out some of the proximal ends of the pressure points ~~that~~ which are very characteristic of the Valley of Mexico preparation. It appears there is a little polishing done on the end of this flake for a platform. But this is very distinct. Notice how they have cleared their pressure point on both sides of the platform so the flake is more easily detached. From the precision of the flaking it appears that pressure may have been used in this case. I don't know whether one could set an antler tool to this side and strike with this degree of accuracy and precision. I would lean a little toward the pressure technique rather than the percussion on this side, because of the shock of the tool. You can't distinguish between this section of the obsidian blade and one from the Valley of Mexico. You can see the directions of the little striations on this side from the tearing of the flake from the core. But it is just a single section and we don't know what the length of that one was but it appears to be almost like the Valley of Mexico core.

Irving: Don, may I interrupt? Do you have access to.....(inaudible)

Also here are drawings of cores from which the microblades probably came. I don't know whether you can say anything about the drawings. I'm sorry I don't have the cores themselves here.

Crabtree: Well, the cores are quite distinctively different from the Valley of Mexico cores, and they are typical Hopwellian ~~sort of things~~ Type B. Because these are rectangular cores, ~~like~~ cubed shaped, they could keep following across the face of the core like the experiment we were doing on the long tabular block of obsidian with the same sort of a technique. But they are vertical with the face, apparently, rather than leading back in underneath and preparing a slant this way. These are vertically downward from ~~this sort of thing~~ the top of the core.

Irving: There seems to be two sub-types one with the platform at a 90° angle and the other with a platform at anywhere from a 35° to 40° angle.

Crabtree: Are they all of obsidian?

Irving: No.

Crabtree: The flakes that were removed vertical from the core, would there be a difference in the types of the pressure points or platforms. Do these flakes and the jaspers indicate two different techniques?

Irving: No, I don't believe so, I think there might be a chronological difference rather than a technological one.,

Crabtree: ~~This group in here is~~ quite ~~different~~.

Irving: That is quite different.

Crabtree: I'll turn it over to Dr. Bordes now.

Bordes: Well, I have some comments to make. On difference - well, it is quite a new culture for me. This type of tools I don't know quite well. First thing, have you any idea of the use of these microblades?

Irving: Not very much except that I believe that they were used in a manner similar to the small bifaces. They were probably hafted in a row in a groove along an antler arrowpoint, or perhaps a knife. In another collection very similar to this, many microblades have one edge removed by a sort of a burin blow which made one edge square. It's almost like a backed blade but not made by

retouch.

Bordes: Well, they show a little special use, anyway.

Irving: Not very much.

Bordes: They are almost fresh. Another thing about the percussion of these microblades, they are very straight. But I don't think quite possible to make them by percussion. I shall try this afternoon to show you if it can be done. And, of the cores, some are certainly cores only these, you know, look very much like some kinds of carenated scraper. Could be, you know, that they are at the same time, cores and tools.

Irwin: Could be.

Bordes: It will be interesting to see of these little retouch on the drawings are made by utilization or made on purpose.

Irving: I think there is occasionally abrasion on the obsidian cores. It doesn't show up on the cores of chert or jasper.

Bordes: But obsidian, of course, is very brittle.

Irving: Yes.

Bordes: Because if it was found in France it would be classified as a carenated scraper. But this blade, of course, you say that the part which was inside the wooden shaft - was it was fresh and the outside has been sharpened time and again.

Irving: I believe so.

Bordes: It is quite possible. Have you found such things in the shaft?

Irving: At Trail Creek, I believe they found such things and at Epiutak which is much later. They are very common.

Bordes: Because you know that we have probably things like that in the Upper Paleolithic. Not this type but what we call lamelle la dau and we are pretty sure that they were. Those that we found, you know the problem which is up into the shaft and so that one question I ask.

REEL 2

Irving: Many of the small bifaces are assymetrical when they are in mint condition. And those, I believe, were also hafted in the side but it's not definite in any one case.

Bordes: Another thing which is very strange are your burins. They are out of this world as far as burins go. It seems to have been a very strange way of making them. They can be burins, of course, but it looks as if they took some small flake with a kind of end fracture most of them, going there, and used that ~~in its technical term~~ as a striking platform to take off the burin blow, or else they made this kind of end by bifacial retouch before striking the burin blow which is something quite strange because it is ~~characteristic~~ completely different from the techniques of the Upper Paleolithic in which you find ~~where~~ there as good a ~~technical~~ striking form as possible to take off the burin blow.

Here it is a very queer striking platform. Or perhaps they did it after. I don't have light enough! No, no, no, it was struck on this end - this ~~valuable~~ dihedral striking platform - very strange.

Irving: Excuse me, but looking at the whole collection of 175 of these burins, you find, well, there is one burin blank with no spalls knocked off. It's simply a triangular flake retouched to this shape, a trapasoidal flake. And the retouch is already there on ~~the surface~~ this end.

Bordes: Ya, ya, ya!

Irving: But they also did subsequent retouch on some of them.

Bordes: But most of them have this ~~same~~ strange preparation which is completely different. There is one which is more right of burins. It's amusing. There has been first a burin blow like that in the longitudional line and probably after that the burin was used, ~~t~~ they made some retouch and perhaps they took it under a burin blow. I'm not quite sure. It's difficult to tell. It could be a fracture. ~~It could be.~~

REEL 2

Irving: There are many broken burins. This is the broken end of a burin, and so is this.

Bordes: Of course. But you have always this strange queer preparation. I will try tomorrow to make something like that. This is the first time I have seen something like that. As for your burin spall - yes some of them have been sharpened really to make something of a small borers, micro-borers.

Irving: These pieces of antler were cut with burins, I believe.

Bordes: Ya, it looks like. But your small burins, you know

Ya, ya, ya, no question. That has been done with a burin. But it looks as if these were rather light tools for this little work. Well, it could well be that this special preparation is another manner to make a type of burin which is fairly common in the Upper Paleolithic in France which is, I don't know how to say it, or to describe it in English because a round barrow or round of point of barrow and it works like that. And that could be same thing. Different way to make the same to get the same results. Ronde

Ah, these are scrapers! Small scrapers!

These are nice.

And these could be Solutrean.

I can show you exactly the same in upper Solutrean.

Irving: These are so consistent in size that I think that they were made to fit almost a standardized handle.

Bordes: Ya.

And this? This one ah, this is a funny Solutrean, this one

Ah, you say that this is a knife.

Irving: I believe so, yea. There are other examples that fall in the same category.

Bordes: Why?

Irving: The other examples have such ideas taken off here. They are bigger and triangular this way. I think that it was held in the handle this way and sharpened down to this little point.

REEL 2

Bordes: Ya. Here is a burin blow.

Irving: Yes. For sharpening perhaps.

Bordes: Ah. I don't know. I think they missed.

Irving: Accidental?

Bordes: Either it was an accident or they tried to make a burin and they missed it. But, let me see. Oh, there is no question. There is another burin blow at the other end. They made a burin out of it - an ordinary burin.

Irving: That I think was a hafted knife, whittling knife.

Bordes: Ya. It could well be. I am not familiar with the Arctic culture. I am following up with something, that's working with flint tools. And what difference what you are working with. If it is to cut something soft well then it pays to put handle but if you want to work something hard you use more time putting the handle on flint than you would making other tools. So I wonder really if most of these things ~~we are~~ were hafted.

Irving: Many of these have lots of retouch. No they're sharpened many many times. Always on one edge not on the other edge.

Bordes: Ya, ya, ya.

Irving: Some have grinding or polishing along these basal edges which, I think, may have to do with hafting because of the end scrapers and the burins also.

Bordes: With ~~[illegible] it was~~ hafting or with holding, you know. The other doesn't matter, you know. I know that in Artic, the people had hafted tools and I am fairly sure that the Upper Paleolithic and then in the middle had some hafted tools. But you know, the time you spent to put the haft to a thin knife is so big compared to the time ~~you might~~ your knife can really be of use that I wonder. ~~How does~~ another thing ~~feel~~ about the sharpening of the edge. Of course, it's sharpening in a way, but I will say that nothings cuts as well as a fresh flake without any sharpening. So if I will project the preparation of a....Ah, what is the word.

Irving: Make the edge stronger.

Bordes: Ya. To do it. I don't find the word.

Crabtree: Change the angle?

Bordes: No.

Irwin: Scrape?

Bordes: Rather than to make it sharp and also to change the end of it because with a fresh flake you can cut meat very easily, but as soon as you work on something hard, it crushes and becomes serrated in a bad way and you can do not much with it. With this, it cuts less with the retouch. It's much less cutting. I would not do that you see with a fresh flake, but you can scratch or score the skin without cutting edge. And if you want to work on something hard, well, this was done with a blade, delight a blade with some reutilization. You can see by the undulations. It bites and then slips, and bites, and slips. When you want something really good really smooth you use a technique which is different and which I think was used by the Upper Paleolithic. You work that on the side of the burin like that.

Irving: Many of these burins have that kind of use retouch. This one does.

Bordes: Let me see.

Irving: It's pretty hard to see. No. It's not here, I'm sorry.

Bordes: Not this one.

Irving: No. I'm very sorry.

Tixier: The other is burin spall.

Bordes: Ah, yeah it could well be. Just stop the recording one minute.

Irving: Yes. Do you see any signs of heat treatment or can you tell?

Crabtree: Without the core, I find it difficult. I find that these are indicative of heat treatment. The other is very fine-grained. With the core, one could perhaps pick up a facet of the outside of the original surface for comparison. I don't see any of the outside edges of the cores on these particular ones.

This hafted knife with the burin point or whatever, has, of course, a retouch on the outside. But it appears to be the same texture throughout. This is the entire flake but one would have to study the cores to determine whether there was any difference in texture. I hate to start an argument with Dr. Bordes about the retouched edge of this artifact, but actually, by retouching you can produce an extremely razor-sharp edge. But this example appears to have been sheared and the flakes hinged back by function, from scraping, and these little short flakes are broken back inward and they are not full length out to the edge. But by setting the platform ahead each time, you can leave the same sharp edge by the pressure retouch. However, as Dr. Bordes said, for regular cutting, a fresh struck flake is much sharper. A fresh struck flake has more regularity, but hasn't the strength of a pressure retouched edge. By retouching properly you can still leave that razor edge. However, it won't have the regularity of the original flake itself. But it appears there has been heat treatment particularly with this sort of chert. That's almost opal-like in texture, and it is not opal. It's one of the hard cherts or agates or siliceous materials. I think that is all the comments I have on this particular piece other than they may have devised two methods of detaching these burins which is not likely. By percussion on obsidian you get undulations and these are extremely flat and extremely smooth on the side. My experience with obsidian and direct or indirect percussion has been a flake with many ripples from compression. It would be difficult to determine the placement of the tools without the core. But from these broken pieces these short flakes and the size of the platform and the very flatness of the flake on all three sides, this edge and this edge, and underneath, the surface appears to be very smooth and extremely regular. This is not too characteristic of a percussion blow on obsidian. With the chert and using pressure we have more strength and there is not much undulation

in the flakes detached.

Bordes: Here are some percussion small blades.

Crabtree: Yes. You see on the edges of this blade the slight compression from percussion. This one is thicker and of flint and it won't compress as much but it does have a slight compression. But the heavier the dorsal ridge on the flake, the less compression there can be. The thinner the flake, the greater the amount of undulation.

Epstein: Dr. Bordes, where are those specimens from?

Bordes: This? I made them. Just some small blades made by percussion.

Crabtree: This is quite a flat one but it is a bit thick. It's thickness eliminates the undulations. This is a little thinner one and you see a few of these waves but it's not as obvious in flint as it is in obsidian. So perhaps it could indicate maybe two methods of detaching.

Bordes: These are not the best that can be made by percussion.

Crabtree: Right, right.

Bordes: I will try to make better and see if they compare with this.

Crabtree: True.

Irving: Shall we move on to the ~~Anagula~~ ANANGULA specimens then?

Tixier: I think there were many innocent remarks made on this bladelet and also on this burin. An important thing on this burin, I think, is they were polished. It is the first time I see the two techniques of polishing and then burin spalls. I never saw this even, I think, Professor YOSHIZAKI show me things like this.

Irving: Possibly, possibly. I don't know of any from Japan. But it's possible that some should show up.

Bordes: No, not from Japan - from Alaska.

Irving: From Alaska more likely. But if they were from Alaska they were probably from the very same site. He has some of my specimens.

Tixier: Something very characteristic in this burin ~~on~~ there, here, you see, a notch. And this notch was always removed always remade before every burin spall. I think this is very important. It's a very complicated technique, you see. Both these bladelets. I've rather nothing to say after Mr. Crabtree and Prof. Bordes, but I think there is one important thing on this one, we can see the preparation of the core. You see. And I think this preparation was like some preparation - Yes. Here is. The original thing is the underform by striking the platform and the bladelets. It is very, very sharp. I never saw this but in Egyptian Proto-dynastic. There are such cores or carenated scrapers with this very, very cutting edge, you see.

Epstein: Professor Tixier, how does the notching compare in regard to the burins of the Norton Complex?

Tixier: I think it's a notch.

Epstein: How well does this compare to the Noille technique? Would you?

Tixier: I think it's just the contrary. In Noille's technique the notch is made to control the end of the burin spall. Here, I think, the notch is made to have the burin spalls longer, you see. I think it's just the contrary.

Bordes: Could be. It could be, but I'm not so sure. It could be.

Irving: It could be to eliminate the jagged edge left over if the burin is to be used later for scraping.

Bordes: No. But the better thing would be to try and make some of these burins and see if it works.

Tixier: The problem is what part of this burin was used? And why polished the two biface and dorsal face. Why, where?

Irving: Relatively soft material as compared with the other burins.

Bordes: What is this material?

REEL 2

Irving: I don't know. It's a relatively soft either volcanic or sedimentary material, but it is used for no other artifacts at the site.

Bordes: And this, this polishing could be the result of working, you know. Working like that going inside the groove.

Tixier: Yes, but this one is polished all around.

Bordes: Ah, yes; but you can also use the side to cut. With a burin, you know. You can do a lot of things with a burin, except kill your mother-in-law.

Byers: Isn't polishing characteristic of the burin blanks in the Arctic Small Tool tradition all the way across to the Atlantic.

Irving: Burins are very commonly polished when they show up in SARQAQ) and pre-Dorset type. The same sort of polishing and often more extensive than that which shows up on these. That is sometimes almost the whole implement is covered by polishing and then the burin spalls are removed after that. Does that answer your question.

Byers: That's what I had in mind. This is true in the Labradore burins too and the Dorset,

Irving: I believe so. Yes, and Hudson Bay and throughout the Arctic ARCHIPELAGO and in Greenland. In SARQAQ and Greenland almost all the burins are polished like this.

Epstein: Bill, can one see a direction in polishing here? What I'm thinking of is, some of the materials from El Inga that Bob Bell has. He has a side scraper, concave side scraper, that shows definite striations in the direction of the edge; just straight away from the edge, and I'm wondering whether there is any direction visable in the polishing of your burins.

Irving: The striations that I have seen go in all directions. The striations go in all directions on these burins as far as I can make out and there is no complete regularity. They are at several different angles to each other.

Epstein: Well then another question comes to mind. If possibly they are not the result of use, Mr. Crabtree, do you see any possible connection here between this polishing on the surface, or what seems to be the surface, and possibly the edge polishing that you've been using in working flint?

Crabtree: Well, Jerry, I haven't examined the burins. I left this up to the people who are familiar with burins and I am not familiar with them and I really didn't examine these. With burin technique, I have had little experience. So I'd rather not make any statement regarding that.

Epstein: Well, just an idea. I was wondering here whether you use edge grinding as a technique of strengthening the edge so that it can withstand impact.

Crabtree: Yes.

Epstein: And I'm wondering here whether this grinding which is on the surface may possible prevent, or make the burin edge that much sharper because it may possible just prevent flaking on the other side.

Irving: That's possible, Jerry, but I'll point out that some burins made of soft material, or all burins made of soft material, are polished on the faces. Almost all the burins made of chert or chalcedony, jasper, or whatever it may be, have edge grinding on most of the edges. But they don't have polishing on the faces. The edge grinding may well have something to do with preparing the platform for knocking off burin spalls, but it occurs on other edges as well so that it may have had something to do with protecting your fingers when using it or hafting the thing. The polished burins, I think, when you examine all ~~20~~ two or ~~12~~ twelve from the site, it looks as though the polishing was a way of obtaining the shape of the tool, but there are other ways to interpret.

Bordes: The best would be to experiment, and see how we can make these. Well are there questions on this material? Well lets go to the throwing ones ...

Irving: The material at the other end of the table is from the [redacted] ANANGULA site in the Aleutian Islands excavated by Professor [redacted]. Laughlin

(rest of statement inaudible) Also on Reel 4(C) inaudible Reel 4(C)

This material is very close to the
shore line of the old Bearing strait
It is on a very small island off of the —
North Island
the island could have been occupied ~~9000~~ 8000 years
ago — — the sequence of the
That is about all I can say

(1) I will point out that obsidean ~~was used~~ almost
wholly — here as obsidean —

(2) The transverse burins show wear on one edge which
suggests that they may have been used as end
scrapers. many of the blades — the large blades
show — Core tablets
such as the — there are characteristic of the core
site. The
tablets

all of the micro blades — full size micro blades are
without any statistical — It's very —
Apart from that I'll point out that the stone lamps
are stone — there are some of the
traces of an excavated dwelling —
subterranean type
Beyond this there isn't much that I
can say about it, the pottery is
dissertation —

Bordes: Reel 4(1) This is definitely not an upper Paleolithic site even if there are special things. Well about the size of the cores and the size of the blades. It seems like these people have not too much in blades but they went on and on because the cores are small. And it seems they had two kinds of blades. Big blades were struck by either hammer technique or punch technique perhaps. And also smaller and more regular blades which were struck from a special core and I believe that Tixier knows this type of core quite well in North Africa. The doublets are quite normal. There is nothing special to them except that some seems to have been slightly worked after into a kind of tool. The retouched blades are certainly retouched on purpose. This one is probably just utilization but that is certainly retouched on purpose. Looks a little like Aurignacion or Upper Magdalenian blades. This also ~~is retouch~~, I wonder if this is a fracture or if it is trying to make a longitudional burin. I am not sure. It is difficult to tell. But if it was to make a burin, well. ~~There~~ are some similarities, some slight similarities with the technique used on the other side. The striking platform is dihedral and perhaps slightly polished. I am not sure. I would need a better glass than we have here. If it is a burin. It could be a fracture. So the transversal burins they look very much like some from the raw material in France. What we call transverse burin and natural retouch. They made retouch more or less abrupt and took one or two burin blows on the edge and gave some these burins which are quite normal. This one is slightly on a notch, not quite. More or less. Slightly, I said. This one also you could lose them in a lower Magdalenian site in France and except for the nature of the material you could not take them out after. The end scraper seems short. One of them is even of the thumbnail variety - like in Azalian or late Magdalenean. There is nothing special to them. They are good, nice, small scrapers. Some seems from the picture burin short blades. This could be a burin spall, but I am not sure. It could be also a small blade.

Reel 3(2) Is retouched on purpose There

Irving: These are thought to be burin spalls.

Bordes: Ya, these are. These are burin spalls and short ones. Since they are coming from transverse burins most of them. So they can be longer than the width of a blade, of course. Ya, it's an interesting thing. I guess I have said all I have to say of this small amount of material and I leave to Tixier to say more about the cores.

~~35~~ 36A

Tixier: After all, I think it would be very interesting to try to get the relation between raw material and tools. Perhaps all end scrapers or thumb nail scrapers would be made in obsidian and all transverse burins on blades in another raw material.

Irving: I believe that is almost the case, but not exactly tru. This is very nearly true, if not exactly true. Almost all of the end scrapers are made of obsidian. I believe very few of the transverse burins, if any, are made of obsidian.

Tixier: I tried to make such a work for Neolithic sites of Southwest Sahara. All bifacial retouch was made in green jasper. All microblades and all geometric microlith and all microburins were made in flint or chalcedony, you see. And all polished material in another raw material which is a volcanic one. I think basalt - or something like that. I think it is very interesting.

Irving: It is. Especially when you contrast the Anagula material with that from the Punuk complex in which end scrapers are never made of obsidian.

Tixier: It is a different region I think. All these cores and bladlets, they are very familiar. It's very funny for me because it's small cores.

Irving: Small cores.

Tixier: Small cores. Ah, exactly, but exactly the upper Capsien technique from North Africa. They prepare their core. The preparation is like that of a hand ax, you see. We call this core "Abone evequevan" - like the hat of a Bishop. And then, they prepare their striking platform with only little, little flakes but these little flakes have the hollow bulb, you see. They pushed out bladlets perhaps by pressure, perhaps by punch, and then they were always refreshing their striking platform, always, always, always. They were turning all around their core. It's something different like this core. They were turning all around and they proceed here and here and here. I think these cores were held in wood vise or some other means like the obsidian cores. It's very interesting. And the characteristic of this bladlet is they have edge - very regular edge - very straight edge - and a little bulb, a short bulb but well marked, you see.

Wormington: Bill, did you, by any chance, have a chance to compare these cores with the pictures of the Siberian cores that I sent to Mc Cartney?

Irving: I have not.

Wormington: They seem extraordinarily like the material from the Lake Baikal area, and I have sent McCartney a whole series of photographs of the Siberian cores. I think you'll find they are very similar.

Irving: (Reel 5 (2)) I've not compared the pictures that you sent McCartney with these myself. I'm not surprised to hear this, however. At the same time, there are many rather trivial variations in core technique which show up between Alaska and the Far East.

And the taxonomy of these things is something that mystifies me at this point. Beyond saying that they have similarity, I can't carry it much farther now. I can recognize certain differences between, for instance, the Sikotz micro-blade cores in Japan and any that we see here on the table. But I don't know how significant these differences are.

Epstein: I went to the American Museum of Natural History and looked at the material that Nelson had brought back from Tibet. And for what these comments are worth, I could see no difference in the blades themselves. They had minute platforms small at the tip at the point of percussion that they could possibly be. But the cores from Tibet in the American Museum collection were very, very small and very narrow whereas these are quite wide. And, perhaps because they were so very small, the faceting on theplatform was much more delicate and perhaps much more precise. But other than in terms of the width of the core, the techniques were very, very similar.

Irving: Very similar. If you'll pasa me down the drawings of the Campus material - the other ones at the far end of the table. These are drawings of the cores from the Campus site made by Yoshizaki and you'll notice that these, too, are very narrow and they contrast to a certain extent with these, both in the platform preparation and in the preparation of this leading or distal edge of the core. They are perfectly consistent. I think these are different from the Arctic Small Tool tradition cores. They may have something in common with some of these Aleutian cores but look much more like Nelson and Barringer's cores from central Asia, to me, than do either of these. But this is just an impression and it may not be very significant because I still don't understand the permutation of all these features that go into cores. They are very difficult for me to figure out.

Tixier: I think the first one who spoke about transverse burins is Vignard. The problem is purely in Egypt. Do you think so?

Phil Smith: Definitely.

Tixier: And what about your conception of Vignard's burins?

Phil Smith: Yes, they look very much like some that Vignard had.

Tixier: Did you try?

Phil Smith: No, I didn't. I went to ~~Niger~~ Niger Valley but I could never find any burins. But they also look like those that McBurney has.

Tixier: At Ed Dabba - Cyrenaica.

Phil Smith: Ed Dabba in North Africa. Now I find that Chmielewski has reported from Poland that they also occur in the upper Volta and Lebanon. So possibly they have a wider distribution than Vignard thought originally. Technologically they appear to be the same.

Irving: May I interpolate that these transverse burins are, while not identical to the burins from Shirataki and Sakkotso sites

in Japan, they approach those Japanese burins more closely than any others that we have found in Alaska. Somewhat similar burins, different in detail, but still somewhat similar to those that I spoke of just a moment ago. These were recognized by Yoshizaki just recently.

Bordes: I think there is a difference in these burins and those from Cyrenaica. The burin spall is not at all the same. It looks very much like, let's say for instance, lower Magdalenian than the material from Cyrenaica.

Phil Smith: Yes. Chmielewski has recently suggest that the Cyrenaica burins were produced by a twisting technique rather than a burin blow and he says that he has produced them himself.

Bordes: I would like to see that.

Phil Smith: So would I.

Bordes: After seeing what Crabtree has done, I will never say again that something is impossible. But I would love to see this twisting business. Because I have made Cyrenaica burins and they are not difficult to make but they are quite a different technique than this.

Crabtree: Thanks, Dr. Bordes. There seems to be a little different preparation technique in a few of these flakes showing flats where the burins have been detached. Of this type here, I think two are the flats and the others have slightly different end preparation. This is remarkable work with basalt. The end character has disappeared, but it is extremely tough material - awfully hard to work. But this particular piece shows a great deal of control. But back to the core. This one is a very interesting core because of the edge preparation. It seems similar to the polyhedral preparation. However, he lost the angle on this side here preventing it from being a perfectly round polyhedral core. And each one has, as Dr. Tixier said, the individual platform preparation. But the remarkable thing is this feathering out to the edge without undercutting too badly. A slight hinge fracture on this side. This one is a single facet of the original surface, but it certainly appears to demonstrate the heating technique. Here is one facet untreated and you see the joining flakes after they were detached showing the heating of this side and the change in texture.

Irving ~~Irving~~: This is the most regular of the small Anangula cores.

Crabtree: I think it is quite obvious the change in texture of this unworked facet in relation to the worked material.

Bordes: Ya, ya. Do you think that these blades have been pushed out by pressure?

Crabtree: Well at least supported solidly here at the bottom so that the blades will feather out. But the support of an anvil is needed in order to get this to clear and get this shearing and feathering out to a straight sharp edge. If the core is not supported, the blades or flakes will curl under the bottom of the core. These bubls of force are quite obvious

and distinctive and it is difficult to tell if the indirect punch was used or pressure or percussion. But the straightness of the flakes indicates support with an anvil. The precision shown on this core would indicate that if percussion was used it would almost involve the use of an indirect tool. However, if one had your ability at percussion, Dr. Bordes, it is possible that percussion could be the method of manufacture, but I feel it would still need the support of an anvil. I rather think it is some form of pressure technique but I would have to do a lot more experimenting before I could determine the difference in the fineness of work done by pressure vs. percussion.

Bordes: I agree, but always to experiment.

Crabtree: Uh, huh.

Bordes: Any other question on this material.

(Lapse in recording time)

Irving: These points are interesting. Oh, there are some technological features that are interesting but they are mainly interesting because they probably come from the first occupation of the Barren Grounds after glaciation. And evidence now seems to indicate that the country was deglaciated eight or nine thousand years ago which would bring them into line with their identification as Agate Basin Points. The only material readily available for use there is this quartzite which you see that most of them are made of. These things, I just asked Professor Byers about and he agreed that they might well be comparable to the work-like implements that come from Debert site and Bullbrook and one or two other sites. Am I misrepresenting you?

Byers: No, not at all.

Crabtree: I am unfamiliar with quartzite and I have done very little work with it. These show an extreme amount of control and the cross section is very regular and double convex. The difficulty of handling this material in relation to other material is because of it containing little granules of sand that have become cemented together giving less edge strength and allowing platforms to crush. Inspection with the glass indicates this is made up of beach sand rather than stream sand. Stream sand is more of a breccia and more angular which makes the mass more homogeneous. I find that the beach sand type of quartzite is a little different in working character. However, these are little round grains that appear to be Lake or Beach sand but the thinning of this coarse material, which is extremely granular, shows a great deal of control. To have thinned the artifact to this degree and leave a sharp edge on this type of material is extremely difficult.

Irving: May I identify those? Things that are tentatively called something like Plainview but it's hard to nail them down because the material is poor.

Crabtree: Now this is something else again. The material on these artifacts appears almost impossible to work and it would certainly take a very expert person to handle material as coarse and granular as this. This is even much worse than quartzite; there is no comparison. It just does not give sufficient edge strength. And with this coarse material, which has intertwining grains, there is not the flexibility that we find in a fine-grained material. The platform will collapse before you can carry the flakes over the surface. However, this shows the ability to carry the flakes over and to meet them exactly in the middle with no step-fractures and no hinge-fractures. It's a remarkable piece of work and it is comparable to some of the illustrations I have seen of El Jobo using the same type of technique and leaving the same worked character. The character seems to be the same as in South America when quartzite was used for this type of Lancelot blades. And if these were mingled with the South American blades, I don't think one would be able to tell the difference. Are they comparable in style and workmanship, Marie?

Wormington: Somewhat similar, I think.

Crabtree: Now these pieces here are of decidedly different material than the other granular quartz. This looks like a very fine material which would permit excellent control and it appears that they did have control. However, the work on a couple of the others is almost equal to this fine-grained material. It shows a great deal of artistry and symmetry of edge technique.

Irving: This is different in type from the Lancelot point. It is different in technique, or can you tell from this material? This and this are similar in shape at any rate.

Crabtree: This one here has pressure going in at a right angle. Flakes are slightly oblique. This one is slightly oblique and between the two - here and here -.are the last row of flakes which indicates a technique of flaking on one side in one way for a right handed man and a left handed man will turn the artifact over. However, these flakes were removed at the same time, and these were removed at the same time rather than alternating. Because of the regularity of this one, it is hard to tell the difference. The material is not sufficiently distinctive to define the flakes and actually determine the characteristics of workmanship. But the smoothness and the regularity of flaking shows a little better flaking technique. They were held at different angles to produce this thicker material. They had thinned this type of a side-notched down, so they had a routine angle of thinning, which is a little distinctive. The straighter the angle, the more risk of step-fractures. With the steeper angle on this side, the risk is less and it is easier to carry the flaking through. These will carry thru and terminate. But in thinning, the steeper the angle is from the edge, the more chance of step-fractures. This is a very remarkable work in quartzite and this one of Bull quartz - as I call it - is just impossible to thin. This is a little thick but the work is very good and there are indications of basal thinning. In relation to El Jobo, this one does have hinge fractures and step-fractures and it is not comparable, as I had thought.

It does not compare in regularity of flaking and symmetry. That's all that I can determine from this group. The basal thinning and the basal grinding is interesting and the corner notching and the meeting of the collateral flakes. This one also has a slight basal thinning with well controlled flakes. It is very difficult with this type of material to get these long, narrow flakes and at the same time bend them over the surface. Some of these flakes do carry on over which would indicate the method of holding in the hands. This one is unique. This shows a reverse back-hand instead of the natural shoulder pressure to make the flakes meet on the opposite side indicating it was done in the left-handed manner. Unless this was done by a left-handed man. This one also is a left-handed technique which is unusual. This one is quite direct in toward the center but these back-handed techniques indicate that pressure was applied away from the worker or that the left hand was used. Pushing away from the body lessens the leverage when pressure is used and these do indicate pressure. It is difficult to hold the artifact against the thigh - press down with the shoulder and catch the flake between the fingers and, at the same time, force the flake out away from the body. The usual method is to hold the artifact in the palm of the hand and press toward the body which gives a diagonal flake going ~~toward~~ from the tip ~~rather than~~ to the base of the artifact.

Tixier: I pick up a piece and I think this is a bit of Lanoelot point and now it is just like the so-called Piece esquillee of France of Upper Paleolithic.

Irving: Is it really?

Tixier: I think so. I think so.

Irving: I don't know these

Tixier: I think Madame Bordes. Madame Bordes should speak.

Irving: I would be very pleased to have this identification.

Tixier: Have to see and to say.

Madame Bordes: Yes. On this side.

Tixier: Both sides.

Madam Bordes: This.

Irving: There is one other example, I believe.

Tixier: How do you call this?

Irving: It's a new feature to us and we don't have a name unless Professor Byers wants to suggest one on the basis of his material. These things that are comparable to your Debert and Bullbrook wedges.

Byers: Will, I think the word wedge is probably useful.

Irving: It looks as though they will be called wedges.

Tixier: It looks like Piece esquillee of the upper Paleolithic of France.

Phil Smith: A couple of years ago I saw those from Bullbrook and last week I saw those from Debert in Detroit. They look very much the same. The kind you find in North Africa, as you ~~say~~ said. George MacDonald has used the term lozenge for several years. Of course, this is something which will have to be decided by you people, as you say.

Byers: If their function is wedges and they are known to have been used as wedges, I think wedges is far the better term to use for them. A characteristic of bipolar flaking.

Phil Smith: Yes, if we could be sure that they were used as wedges.

Byers: Of course that work of Semenov indicates that the similar forms can be produced in that way. George has produced his that way, experimentally that is. Not the ones from Debert.

Tixier: There is a problem about Piece Esquiellee because I know Piece Esquillee in flint, quartzite and also Sacarroline quartz. But the matter of utilization, I don't know.

Irving: I've been told, but I am sure that I remember myself, that similar things were found at Star Carr in pieces of antler that had been grooved. Does anyone recall whether that's the case? George MacDonald mentioned this as a European example of this technique.

Tixier: A European one?

Irving: At Star Carr in England. Yorkshire, I guess. The Mezolithic site that Clark is doing his report about.

Jelinek: Looking at the quartzite material from Quiwate, I'm very much struck by the similarity and control of the material although not the specific forms with the material from the George Lakewell Colonies on the North shore of Lake Huron that Greenman excavated and with, in general, what Quimby calls the Aqua Plano industry which recently shows up in the Great Lakes area as apparently an industry related to the late Plano industry of the Northern plains. Frequently this material is done in quartzite and always, I think, shows the same precision control of the material that you see in the specimens here. This, I think, would tend to link this material in time to the horizon that can be postulated between eight and nine thousand, B.C. or perhaps a slight bit later for the specimens from Quiwat.

Irving: Thank you, Arthur. I get the same impression from comparing this material with the material from Wisconsin. I'd like to ask Dr. Wormington if this compares with any material that she has from Alberta.

Wormington: Yes. Quite closely I would say. Not excavated - surface collections.

Irving:= This is all from surface sites, as well.

Irwin: May I make a comment. Notice on two of these projectile points bases there are strokes that resemble burin strokes.

Irving: They look very much like that.

Irwin: I wonder how they were not created in their beginning stages of use by the wedge or something. This is the type of fracture that necessitated pounding down on.

Irving: I'd hesitate to say. There are several burin facets or burin-like facets but what they mean I am not sure. It's hard, at least hard for me, to detect any wear patterns on this quartzite.

Bordes: It seems from the choice of material that these poor people had not much. And so I think it is quite natural that when they broke a point that they should make a burin on it. It's easy enough and also a lot of time in the Solutrean. On a broken Laurel Leaf they made a burin, or a double burin, or a burin and a blow here or a scraper on a burin and so on.

Wormington: It's rather interesting, I think, that of the Alberta material all the points of this shape are of quartzite whereas our finely parallel flake points of Scotts Bluff, Eden, etc. are done in very fine-grained chalcedonies. But whereever we get this particular form, it is always made of quartzite.

Irving: This is also true in Wisconsin where most of the Lancelot points of this general form are made in quartzite whereas most of the Archaic material is made in some sort of chert.

Wormington: This is quite consistent in the Alberta material.

Crabtree: This shape of point is adaptable to this material in order to give it sufficient strength - to make it of sufficient thickness and with a tapering edge. If you would try to thin this material down for a narrow point, it will fracture. And it hasn't the strength of chalcedony because of the lack of intertwining grains and so this shape is very good for this type of material.

Alan Smith: Should we perhaps move to another discussion.

Dave Byers Collection

Byers: This collection is from Debert, Nova Scotia. We have three radiocarbon dates of nine thousand B.B. plus or minus fifty years. Other dates will follow and we can't tell how it will come out. It's typical Eastern Paleo-Indian site with fluted points and non-fluted points of the same shape. The material is chalcedony of various colors and of various textures. It is faulted and faulted chalcedony and, as a result, there is no prophesying the form that the points will take or the artifacts will take. One thing that is characteristic of it, is a great quantity of scrapers. I see that I did not bring any end scrapers with me - there are end scrapers with graving spurs. There are many of these little so-called gravers or perforators. We thought that we had exhausted cores, but I think that those are wedges. They seem to be characterized by bipolar flaking. Burin spalls, I think, are simply spalls that come off of these

ers:

wedges. Advanced publicity went out talking about micro-blade tradition but I'm sure that this was completely erroneous and these are simply these wedges. The great number of flakes are all retouched for side scraping purposes. Almost no flake is unretouched in some place. Some of the flakes look like blades, but we have found no cores and there are no true blades that we see. There are chance similarities to them. Anyone have any question?

Bordes: Well, first question. Where is the dividing line between these two ~~sides~~ sites here?

Byers: Right here.

Bordes: Does this belong to this? O.K.

Byers: Yes.

Bordes: Well, first of all, the first thing I see here are beautiful Piece esquiellee which could come from any, let's say for instance the lower Magdalenian One from Laugerie Haute. Exactly the same kind. This also is beautiful. What was the use of this thing, ~~whereas as a wedge it is quite~~ possible. Another similarity with lower Magdalenian is this multiple perforator which are very common in Magdalenian One also. Of course it's just a convergence - no. I don't want to have my Magdalenians swimming thru the Altantic. But it is interesting to see this convergence. And there you have which looks to me as a perfectly good blade retouched on the two sides in a way you can find in the Aurignacian of the Proto-Magdalenian or even some Mousterian. It's really a good retouched blade. Side scrapers on Flakes which could very well be Mousterian, as well. Or some in the upper Paleolithic in the Solutrean too. I must say that with the materials they had they did a fairly good job, because the poor guys were not troubled by material you know. About this big - oh, that's a beautiful Foliate point. That could be Solutrean, too - but not quite. There is a trace of polishing by use on some of the facets it seems. Or perhaps this was a little too out or they took too much out for their taste and they tried to rub it out and were not patient enough. This big fluted point on this side there is fluting, no question. What do you think, Mr. Crabtree?

Crabtree: Yes, I think so.

Bordes: But on the other side, I don't see any fluting.

Byers: There is no fluting on the other side.

Bordes: I see just a flat face on a flake. This is also, no question, not very well. They should have taken lessons from Crabtree. But, well, they did what they could, poor guys. I could not do the same, so I had better say nothing. They are nice, considering the materials. This one is good material over there. Don't you think so?

Crabtree: Very excellent.

Bordes: Very good material.

Crabtree: It certainly is.

Bordes: And they did not much better with this very good material than they did with this coarse material. That was a fracture and they did nothing. It could have been rather easy to take this imperfection out, but they did not seem to bother with it. It served their purpose as it was. They were not perfectionists, your people.

Byers: That fracture may have been made by the boy who found it.

Bordes: No. No. I don't know. I'm sure not. That fracture is old and you have some flakes coming out of it. It was taken as a pressure platform from here. So it's old, you see - this one, no question. Ah, here is an end scraper. You said you brought none, but here is one.

Byers: Well.

Bordes: Yes, no question. That's a nice end scraper with retouch all around but that's an end scraper. What else. That - no it's not an end scraper. It's a kind of Foliate or scraper with bifacial retouch. That's also a kind of side scraper. You know, that is very funny. We could select some tools here and make some good Mousterian and some good, not complete, but some Lower Magdalenian and a little bit of Solutrean. You know, what is striking in this American Culture is that they have characters which are found ~~in~~ scattered in → Old World Culture and which you have got right here. This Piece Esquiellee is very good. Well, now that is probably also Piece Esquiellee but at the extreme end.

Tixier: I didn't describe this in my thesis. All this group of pieces is from Piece Esquiellee. This is not a burin spall I think. First of all there is no burin and it is, I think, the last shape of the Piece Esquiellee. (French)

Phil Smith: Yes. Yes. Yes.

Bordes: When you strike too much on a Piece Esquiellee and use it time and again at the end it fractures not burin like that, but in Octagon way and gives you this kind of prism. That I can do very easily for you to show you in two minutes if you want. For it is very easy to do.

Byers: I think these are the exhausted cores that John Whitoff found at the Shoop's site.

Bordes: I think it is not a core. It is not.

Tixier: No, it is not a core.

Byers: But this is what John Whitoff calls an exhausted core.

Bordes: But they are not.

Byers: They are these Piece Esquiellee.

Bordes: Ya, they are, no question about it. Well, what else is to be said, not much. Except the rhyolite.

Byers: Yes, they had rhyolite for hammerstones, but they did not use it for projectile points or tools.

Bordes: Well, that's a flake, you know. Could have been used as a crude flake to cut, you know.

Tixier: Scraper.

Bordes: Scraper? No, I don't think so. You could make a scraper, but they didn't. And what else - not much except in point of techniques which I leave to Crabtree if he likes.

Crabtree: This is a unique flake. The fluting flake was removed from this side here. And he was apparently successful on this side. This force line indicates that he had removed this flake first but he made a miscalculation and broke the leading edge on that side and apparently discarded it. This is quite obviously heat-treated. Because this is the natural textures of agates and jaspers and this shows that retouching was done before the stone had been altered. There is no indication of altering on this particular one, but the natural form and texture is very typical of agates before alteration. However, this particular one has an original facet left on the edge showing retouch was done after heat treatment. Here is another one showing this flake was taken off at one retouch and this flake later. This flaking was done prior to heat treatment, this was done after treatment showing the change of texture. Some are a little hard to define but from the luster it appears that they certainly have been altered. This is a granular texture with one original facet left on that side. Apparently they were able to control the heating very well for the size of these slabs and big tabular pieces of agate indicate that they were apparently able to heat very large masses. When large pieces of stone are altered it is not too common to find even one small facet of the original texture adhering. Alteration is a little hard to identify on fluted surfaces. Thisone over here, as Dr. Bordes suggested, is pressure flaked. It is quite heavy and quite large and, no doubt, needed an intermediate tool in the manufacture. Because by manual pressure alone, it would be very difficult to detach a flake of this size. This one, as Dr. Bordes suggested, looks like one of the block faults or shirinkage of the natural outside of the block of stone that they have just utilized as an artifact. Sometimes material from gravels get a natural stream polishing.

Byers: Don, I should tell you that all this stuff comes right out of the Lava.

Crabtree: Is that so.

Byers: This is not gravel.

Crabtree: I see.

Byers. This is from Lava filling.

Bordes: From what?

Byers: This quartzite, I mean, this chalcedony is filling in the lava in Triassic lave and the direction of the Ice Flow would have carried any gravel from the ice into one hundred-fifty

to two hundred feet of water even at the time the site was occupied.

Crabtree: This one here was the only indication that gave me the idea of gravel. I was trying to get across the point that one can distinguish between origins of material. The exterior surface can indicate whether the material was from alluvials, natural fault planes or casts of cavities such as Dr.Byers mentioned. By studying the outer surface you can tell if it was a cobble rock or whether it was rolled in a stream bed and bruised. Usually the distal ends, the overhang, and the cortex will determine the source. Does this array go with them as well? This Felspar?

Byers: No.

Jelinek: Mr. Crabtree, these fluted points here, would your conclusions be that most of them were done by percussion.

Crabtree: I haven't examined the others on both sides. But these are not true fluting flakes. They are more of a basal thinning and they do not correspond with the fluting techniques. However, they are characteristic of some Clovis. Later on today I will show you four different examples of Clovis techniques. Some are true fluting that very closely resemble the Folsom. But again you'll find even two or three flakes removed from the base which is more of a basal thinning technique to provide, no doubt, better clearance for the shaft. This basal thinning would also add to the strength of the hafting. If you'll notice the platform preparation on this one. The detaching of this one flake here indicates a little different technique. Instead of the platform being polished prior to striking they appear to be unprepared and, therefore indicate that they were made by direct percussion. Percussion is also indicated because of the undulations on this particular one and they show lack of accuracy in percussion because the flake was not regular and uniform which is typical of some Clovis. But the basal thinning here is good. But it hasn't been done with enough regularity to clear this flake on both sides so the flute could be detached and carried thru to the tip of the artifact. This one here is somewhat the same slight basal thinning but they haven't accomplished fluting. This flake shows a feathering of the edges which indicates a sharp snap of the pressure tool rather than forcing the flake over the entire surface of the artifact. They stopped the flake like the one that Marie had that showed the flakes going up and over the surface and meeting at the edge the flakes from the opposite side and with a great deal of regularity. This is a little different technique. Now this one, instead of being straight in Collateral flakes, or going towards the tip, the flakes are going in reverse. You seldon ever see this back-flaking in our Western United States.

Wormington: From the viewpoint of typeology, one of the particularly interesting things about this is the depth of the concavity of the base which is quite unlike our Western Clovis which have a very shallow concavity. And this does seem quite distinctive.

Byers: The Debert points, I think, are quite distinct from the others in that some of them have a very deep concavity. Some pieces that I didn't bring with me have even a deeper concavity than some of these. For this reason, they are very rarely found complete. Most of them have the ears broken off of them.

Bordes: Shall we go to the next one.

Byers: This other collection here is from the Bullbrook site in Ipswitch, Mass. On which we have a radiocarbon date of seven thousand B.C. plus or minus two hundred fifty on three samples. I am not at all sure, in fact I'm quite sure that this isn't the full date of the site. It was a big site like the Debert site and it must have been occupied for a long time. I think that perhaps this is the terminal date. Many elements in the Bullbrook industry suggests that there was a blade industry but on the other hand we find no cores. And quite obviously it was a flake industry. Again the flakes were utilized for scrapers of all sorts. The fluted points, of which I have a few samples that were loaned to me by collectors, are different from the Debert points in many ways. The bases are not nearly as deeply concave, the flutes sometimes run for a long distance, sometimes they don't. Sometimes there is multiple fluting and almost, I can't say statistically the number of points, but I think the majority of points have multiple fluting. There are those Piece Esquillee. Again, I seem to have left out the end scrapers, except for a few. Many of them have a graver or perforatorrpoint on the end. The end scrapers from both sites characteristically have these littler perforators points on one corner in many cases. Not all of them do, but a great many of them do. Broad flat flakes are retouched. Many of them seem to have been worked with a shearing technique as opposed to a retouch. This applies to both sites. This one, for instance. And the use of both edges of a flake seems to be characteristic.

Reel 5(3) unedited

Bordes: There is one thing on which I don't agree with Dr. Byers. It is this business about no blades. I see several of them in our definition, which is not as strict as an American on. But I am very sure that this can be classified as a blade. And also probably this. That wide blade and this one also. They are wide blades, of course, but they are blades anyway. But you have a lot of flakes that's true - with beautiful double side scrapers which could be also quite Mousterian and with a good retouch but which could well have been done by direct percussion. I don't see anything impossible in that. Looks like. Yeah. Even that. And there are some end scrapers with this little point at the other end which I would hesitate to call a borer because it's so small. It's rather like an epine - I don't know how to say it in English. Yes, it's a saw. Because we call it an epine here. It's too small; it's not even a micro borer. A micro borer - the point would be longer. It's something special. It's a saw. Some end scrapers, Piece Esquillee, of course, and then the point which are better made, I think, than the preceeding ones. Here there is a kind of fluting, I think. But they were not very

efficient and here it is double. That looks like what I tried to do sometimes. Oh, those are better. This one is good. The other side they missed. They were experimenting with this it seems. From time to time they did one.

Tixier: Perhaps because of the raw material.

Bordes: Uh, I wonder. I don't know. Ah, here is a try. They even prepared for it. But probably either they stopped or the blow went wild. Now this one also is good. It looks a little bit like a broken Folsom this one.

Crabtree: Very much.

Bordes: This one is good. This is not very much like Folsom - rather like Clovis fluting. They were certainly not very good with fluting but they knew how to do it. They had the general idea, no question.

yers: I should say that you do not see the best pieces from this site. The best pieces are either on eshibit in the Museum or either in the hands of private collecters and I could not get them.

rdes: Ah, It's a pity. You have this problem, too.

Byers: Yes. The fluted points from this site include pieces of the equivalent of those from the Naco Mammoth and the Llano Mammoth site and also some from the Lindenmeier site, but not the long ones with long pointed ears - they are from my site.

Crabtree: There is one here that the edges shows indications of the thermal treatment. On the other side it shows the original surface.

Bordes: It could be burned, too. It could be a burin. Ya, not a good one and on one such piece and only one, I would not say that this culture has burins. But watch out for that. It could be. Because that's a burin blow, no question. Is it intentional? That another question.

Crabtree: This flake is quite distinctive in the manner of detachment. It's like some in Marie Wormington's collection. Almost side struck blade technique. They use the lateral surface of the distal end of the flake instead of a single blade struck down the side of a core on a tabular piece. This technique allows removing a straight piece of material to work on - almost side struck. The fluting of the Bullbrook is certainly a refinement of the Nova Scotia material in techniques.

Byers: I think that this probably reflects the stone.

Crabtree: It could very well be; it could very well.

Bordes: About this flake, I wonder. I wonder if they did not intend to take a very wide flake and it broke. It is quite possible because, you know, if there are many flakes like that, all right. That's an indication of a technique. But you can make a flake like that just like on a core and one can well go like that without any purpose.

Crabtree: If you had an assemblage of this stuff, it would be better. But this one here is something that is a little different. I mean of striking down here and then moving back rather than turning it up on edge to follow this ridge to guide the next flake. And it could have been an accidental thing.

Bordes: Ya, ya. Could well be.

Byers: If we could get the entire collection and analyze it, then perhaps we could say something about the industry. But when I say it is a blade industry, I didn't mean to say it ~~was just a blade industry. There are flakes like we get in blades and occassionally we get blades.~~ there are pish flakes - occasionally they get blades.

End of Reel 3(2)

Byers: I brought them along because they have that typical flat, archaic flaking. These are the things that are supposed to resemble Eskimo artifacts. As you can see they bear no resemblance to any thing that showed. (Blank spot in tape) The ground slights that come up with this material look curiously like the ground slights that come from the Northwest coast. (blank spot in tape) These people used Felsite to make finished tools.

(blank spot in tape)

Bordes: What are those little thumbnail scrapers? From which culture?

Byers: They're from Bullbrook.

Bordes: Ah, from the one we have seen this morning. Ah, they are beautiful.

Byers: And here is one with this with this little point on here.

Bordes: Ya, this one too. Ya.

Tixier: Is this a Folsom type?

Byers: Yes, those are from the Bullbrook site.

Bordes: Well, about these big points. It seems that most of them have been made by percussion you are right, with perhaps some little pressure. But I am not even sure of that. In this material, I wonder what pressure would give. Not much.

Byers: Not much.

Bordes: This is different material. This fine - what is it, quartzite?

Byers: Quartzite.

Bordes: Quartzite. It's good one, and there I think I can see some pressure work. What do you think, Mr. Crabtree?

Crabtree: I think this is a typical step-fracturing of pressure flaking on a coarse-grained material. And with material from a site of this antiquity it is possible that some of these could have popped off from the frost. It's quite indicative of coarse material, untreated agates and jaspers. They apparently did not use the heat treatment yet and did not need it because this is a superb piece of chalcedony. And the character of the work on the two is just about equal. Almost a duplication. It is suprising the skill with which they handle this quartzite. However, it is a very fine-grained quartzite and allowed them to carry a good flake over the surface. But they didn't do much better with this good agate because here are these little tiny micro-flakes hanging on the surface. The work is comparable on both pieces yet they are very different materials. The chalcedony is quite adaptable to heat treatment and the quartzite will change and work alittle better but there is no evidence of thermal change on either of them. It looks

You can see by this tiny little quartz tool then it gets on into the late Woodland stuff and begins to look something like the quartz. It is usually a very poor quality of flaking I think the stemming platforms often appear unretouched & the stems & points are one of the characteristics of this group.

like it could be probably more of a pressure retouch on the stem than on the base. These flakes are just random with no regularity at all. And they have ground stems. There is a slight curve left on the artifact and also some of the original blade surface which indicates the blade rather than the core technique.

Byers: Don, not to argue with you, but the mineralogists say that they are both quartzite from the Canadian shale.

Bordes: This one too?

Crabtree: Both of them are quartzite/

Bordes: Oh, well.

Crabtree: The texture of this one appears to be typical of untreated agate to me. I would have to look with a glass to see whether they are composed of sand grains but this is quite definitely a quartzite. But I thought that this other one was chalcedony.

Bordes: If it is a quartzite, it is a very, very fine-grained quartzite. Finer than I have ever seen.

Tixier: There is quartzite like this in Belgium.

Bordes: I have seen it. Oh, it is not as fine as that.

Tixier: It is finer.

Bordes: No, no.

Tixier: Oh yes, I saw.

Bordes: No, No. After a point. I will tell you something, Tixier, and you will agree with me. Classification by mineralogists and classification by prehistoric people were not the same.

Tixier: Quite different, yes.

Bordes: It doesn't matter the nature of the rock, it doesn't matter so much as the texture of the rock. And I am very sure that as soon as it was as fine as that - Paleolithic people did call it flint and to Hell with the differences. And they were right. Because you know, I have seen a lot of things that I call flint and I'm sure Paleolithic people did call flint and which have fancy names in mineralogical classification but they work like flints so they are flints. At least as far as we are interested, you know. And these quartz points are rather funny, you know. Those poor people must have been quite desperate to use that you know. Ya, they did a beautiful job in this terrible material. It's not bad - it's terrible.

Crabtree: It is like tombstones to work with.

Bordes: Ya, ya. Oh, ya, it's terrible stuff. And they did quite well with it. Of course, they could not make anything flat.

Byers: There is the raw material.

Bordes: Oh ya, I know it. We have the same in France.

Byers: Pebble quartz - off the beach.

Bordes: We have the same in France and it's very simple to do something with it. From time to time in this material you'll find a pebble of good quality and then you can get almost as good as in flint. But that's not very often, and it did not happen often to these poor people. If I can see from what is there. And that is something else. What kind of material is it?

Byers: That's felspar.

Bordes: Felsite. Well, that's not very good. Ah, that is better. Ah, this one. Ah, there is perhaps some pressure flaking on this one. And that's something in this material, also.

Tixier: This one is a finished tool or unfinished?

Crabtree: This one appears to be done by percussion and I think Dr. Bordes will agree,

Bordes: Yes, it seems to be percussion.

Crabtree: It's very poor material and it crushed. No edge strength apparently and the work is very poor. Now with this material better work could have been done but look at these little step-fractures and it's just as poorly done as the poor material but it may be because they used a hammerstone on the edges and did not have the control that Dr. Bordes has. If they had used an antler billet and not the hammerstone and had changed the angle of force they could have perhaps detached the flake without the crushing. But in this case, it looks like they used a hard hammerstone and that they miscalculated.

Bordes: But this is rather good in another way. For the material, it is a rather good work - flat retouch, long enough for the material. It's not bad. Perhaps I wonder if there is not some type of pressure. Look at that.

Crabtree: May be.

Bordes: Here, see these flakes.

Crabtree: The material is so coarse that it is hard to determine the flaking pattern. The regularity of the edge would indicate that they had excellent control.

Bordes: You have to see. Look at this retouch. This tool here.

Tixier: Is this type of an arrowhead frequent or rare?

Byers: That's very common in later times.

Tixier: Concave ~~by this~~ *base*.

Byers: Concave base, yes.

Tixier: Straight edges and pointed.

[illegible]s: Straight, yes.

Tixier: And triangular in form.

Bordes: Well, something more to say about that? Nothing?

Alan Smith: Well, shall we move to the next collection then?

Bordes: Ya, I think we move.

Coe Collection

Coe: Because of the location of the collection on the table, I'LL have to take it up a little bit at a time. It goes from Virginia to Florida and Ohio to Alabama. The closest material to the Bullbrook is thislot right in here from the Williamson site in Virginia. I don't know whether you want to move this out now or what. This is a site in the tidewater section of Virginia close to the Atlantic coast quite a few miles from Massasachusets but not too unlike the Bullbrook material and if you place of this site, such as the Shoop site in Pennsylvania in between you have a certain relationship. You'll notice that there is one point that is fairly well fluted but the others tend to have very little fluting. A couple of blanks, unfinished points, flakes, end scrapers, and these little short stubby things. Whatever you want to call them. I suggest that we take up one lot at a time that way perhaps it would be lessconfusing.

Bordes: All of that. All ~~xxx~~ from the same site?

Coe: This is all from the same site.

Bordes: Ya. This also?

Coe: Yes.

Bordes: Oh, ya. Well what did you think of ~~that~~ it?

Crabtree: There is a great deal of resemblance between this technique and the Bullbrook material. They are very comparable. An interesting thing with this one is that it whows it was broken in fluting on the first try for the flake curles over ~~x~~ the end and broke the point. The first initial flute shows that there was no raised platform preparation This would indicate why they went down so deep in order to accomplish fluting. Thisone here was successful. It's broken from shock and from flexing. These three proximal ends indicate almost the same technique as the Bullbrook material. There is no indication in any of these of any thermal treatment. These are very heavy points, of course, and the shapes are almost reminiscent of the Folsom material. But no indication of Folsom technique. That's about all I can say on this. There was one single flake that has the same end characteristic of the Bullbrook ends.

Bordes: Yeah.

Daugherty Don, is that a blade fragment?

Bordes: Oh, well it's a blade of course. Well, but something which is curious is this tool. ~~But it's not a burin, I don't know what it is.~~

Tixier This burer
Bordes: Oh, its not a burer - I don't know what it is.
Tixier: Perhaps it had been ~~plex escaliers~~ a Piece Esquillée and then a burer or drill.

Bordes: Coul d be. I don't knew.

Corbett It's hard to say.

Bordes: It's ~~some kind of~~. the same kind also.

Corbett: This is a portion of ½ a blade and there is a slight amount of what looks like pressure retouch. The retouch is fairly well spaced on the edges ~~of the retouching on that blade.~~

Bordes: Yes it could be.
It could be percussion too you know.

Byers That's a characteristics of all these sites, there are a lot of these in Bullbrook and there are a lot of those in ~~De Bert, Schupe~~ Debert and the Shoop site too.

Bordes: Well.

Coe: Move to the next.

Tixier: There was one level only.?

Coe: This was only surface material. Only surface material.
Tixier Oh, only surface material.
Coe. If we move on to the next lot we have this representative from the Carolina Piedmont area. This goes into part of Va. and South Carolina but still is along the Atlantic Coast but it is a upland area not too unlike this area of France, in thru this region. What I have is from one site which is called a ~~Hartaway~~ Hardaway site. It contains

a very good representation of quite a long period of time. The earliest material must be equal to the Clovis material and then subsequent occupations ~~coming~~ come on down to ~~historic~~ historic times actually. The first items here are the oldest. Actually this is a Clovis point that's been reworked, corner notched coming in at this later time. The scraping tools that we found with the earlier complex of this sort and with these later points you get these little end scrapers that seem to be characteristic of the Williamson site. Following this in time we come up to material of this sort which is dateable in a number of places at around 9000 years ago, 7000 B. C. So all this is earlier and certainly this goes back to at least 10,000 B. C. without any difficulty. Following this, you get quite a change in style and finally at around 4000 B. C. points very similar to the ones that were discussed this mornigg. This is one of the points from Canada. I just laid over here for comparison. Many of these are made from quartzite too. This is a section of a unfinished point. Finally the latest material is about 2000 B. C. similar to the Northeastern big blades such as you have this point. While I am talking about this I would like to mention a second site which is Russel Cave. Actually it's in Alabama but very close to the Georgia line and the lowest level in Russel Cave, which is dated at 7000 B. C., is almost identiaal in type to this period on the ~~Hartaway~~ Hardaway site.

Bards! ~~Well, Border speaking~~. I won't get very much into the points which are too special which is a business for American ~~Anthropologist~~ typologists. But here, for instance, I see a nice scraper and what is a typical Levallois flake and I wonder if you have really the Levallois ~~the~~ cores.

Because you can get ~~some~~ one Levallois flake or even two Levallois flakes from cores which are not very typical but this one is really first rate, you know. ~~Then there are~~ And then you have a lot of side scrapers too, end scraper ~~on~~ on a retouched blade , and a beautiful, it could be Aurignacian. This is rather strange.

Have you many like that?

Coe: A number.

Bordes: Yes. That's a kind of.

Coe: The side scrapers are more common but this type occurs frequently.

Bordes: That is not a Aurignacian blade. It is something special.

Irwin: Yes, those thing are common in the Paleo-Indian. You find it at Lindenmeier

Bordes: This one?

~~Take that other blade from the other assemblage~~

Irwin: Yes, I expect that broken blade from the other assemblage comes from one of these things that has been cracked in the middle.

Bordes: Yes, yes probably and then these end scrapers with a lot of retouch like in the Solutrean. ~~This takes~~ They did partake of this mania of the Solutreans to make much more retouch than was necessary. They ~~are~~ just loved it. ~~Just lovely~~, Ya. ya, and this one too. Completely bifacially ~~completely~~ retouched. Beautiful side scraper. Could be Solutrean

Tipier: Yes, And Spanish.

Bordes: Ah yes. Very small platform very oblique. Could be wood struck .... or something like that.

Bordes: Well.

Crabtree: It's surprising the refinement and the thinning control of this age material. Good retouching of this particular style and good thinning technique. Very fine denticulation on the edges. I don't know whether it is distinctive or not, but thispoint is a larger form of the same denticulation. Deep bulbs of pressure. This edging is a little like some of the very refined work of the Liddenmeier site, only a different technique of fluting. But I am particularly interested in this very unique type of serration. It appears the point was serrated and flaked at the same time. They balanced the flakes one opposite the other on this side and took this one off, then this one, and used this for shaping the artifact, which is quite unique. If you'll notice here on this artifact the same technique is not present and the serrations are only done from one side.

Tixier: Reel 5 (1) It is common in South Sahara and in French Guiana.

Crabtree: It is not particularly common in the States.

Tixier: That serration. One retouch on each side in the notch. See.

Crabtree: In the notch ♦ right.

Tixier: In the notch.

Crabtree: It leaves a distinctive sort of character here with the ridge down the center, actually a diamond-shaped cross section.

Tixier: I think it needs a very thin compressore, you see. Very narrow tool.

Crabtree: Very narrow tool in order to do this. On this one, the retouching is very good.

Tixier: Is it a pressure one?

Crabtree: Yes, on both sides and has basal thinning. There does appear to be a difference in age between the time the pressure flaking was done and the notching was done. However, the original work was very excellent and there is just a slight retouch here showing not nearly the control of the first work on the artifact.

Tixier: Did they try to flute it?

Crabtree: Yes, on both sides. These heavy massive objects appear to be done all by percussion. No pressure retouc h on any of these. This appears to be all the percussion method. We might check these out to see if this technique of all from one side carries on thru and it apparently does. However, here it shows up again of using the two sides, but not quite the refinement of this one. But the same feathering out at the center. Indications on this side of the stone lead me to believe that this material was heat-treated. However, not having any of the flakes, or the cores, one can't make that a final decision. I am looking for one facet of the original surface left on this to be sure. But these

three or four pieces appear to have been altered. I think that is all I have to offer for this group. This shows quite a distinctive basal thinning, it almost appears to be fluting using a flake technique or a blade technique.

Bordes: Oh, yeah. It may be made by percussion yet.

Crabtree: I am about through with thisone. Maybe some of the edges might have had slight retouching but they appear to be almost entirely by percussion. This is a portion of a blade. In order to get the diamond shape, he was working on this ridge to bring the flakes over from both sides to get the contours to form a roughed-out preform, and by using this blade instead of the core. Did you get to examine these, Dr. Bordes? These feel slick but I can't see any basal grinding on them.

Bordes: No. They have certainly been made by percussion, most of them.

Crabtree: I don't see any sign of pressure retouch on any of them.

Bordes: No. No. That's percussion.

Irwin-Williams: I wonder if you could comment on the possible methods of production of that Levallois-like flake. What kind of method could have been used. Also on the blade. The gray blade over there near the scraper.

Bordes: It is quite defined.

Irwin-Williams: Yes. Well, I wondered if you could comment on them.

Bordes: Well, there is not much more to say about the Levallois flake. When you say it is Levallois flake it carries its own definition in itself. That means a flake that has been made on a prepared core to have the shape of the flake predetermined before you struck it off. And that means that somewhere you have prepared cores. No question. This one, I am positive it cannot be even a chance of Levallois. It's too much typical.

Irwin-Williams: Well, that very interesting. I wondered if there was any possible method of telling whether a flake of this kind would have been struck off with an anvil as you demonstrated, or with a percussion instrument.

Bordes: Oh, that's another question. But I would say from the way it has been struck that it has been struck with a stone, not an anvil. This size of a Levallois flake is very easy to get off with a stone hammer. It's when they are bigger that you are obliged to use an anvil technique.

Crabtree: Dr. What might like to say something about this. Is this from an ancient man site? They seem to be all flaked from one edge on this graver.

Bordes: That's a borer all right.

Wheat: This is a fairly typical thing in the recent Folsom horizon. We got a variety of these. Some of them, incidentally, are flat pointed on the end, a little chisel point rather than this. And this, along with the very tiny, what we used to call gravers, nobody really knows much about them or the use for it - some suggest they were used for tatooing.

Bordes: This, well, is it not in the Folsom that you have needles with eyes?

Wheat: Yes.

Bordes: With that you can make a hole in the needle. Oh, ya, I did it. With this one, it would be quite all right. You have to sharpen it a tiny little bit and then it works After that, it becomes blunt and you sharpen it again, and you can make a hole in a needle very easily with that. I would not be surprised if it were something like that. Or I like the borers of the Upper Paleolithic. You can ruin your good needles. It is better to make a hole in the skin before you bore with the needle. It goes much better. With that you can make also the first hole and then you go with your needle and thread thru it. No question.

Wormington: Are there any that big with Folsom, Joe?

Wheat: Yes, with the Vanhorn Folsom material I can show you several of them.

Epstein: Mr. Crabtree, you mentioned looking at that material and also the material we saw this morning. You distinguished between thinning and fluting and I was just wondering if you could explain that just a little bit better. As to how you can determine which is which.

Crabtree: Well, with the fluting, Gerry, there is a platform preparation. For instance, this one here indicates fluting and that the flake was probably removed from a platform projecting high above the base. The channel flake has been shortened on the base of this particular artifact. The normal thing is to prepare a hump or projection here to serve as a platform. Then when the flake is flexing and bending, it is a single controlled operation. Fluting requires a refinement technique of placing and preparing the platform properly in the center and at the proper angle. Also, the prepared artifact, before fluting, must be of the proper shape. Must have the proper surface retouch and must have a ridge - or a greater mass - in the center, or the median line. Basal thinning does not require all this preparation for it is merely to take off surplus material from a thick, weighty piece when the artifact is not suitable for hafting. It does require a striking projection at the base, but not a prepared platform and the thinning is done by simple percussion blows which need not be as calculated as the fluting technique.

What they were striving for on this point is a basal thinning for specialized hafting. Such as this. See here, when the artifact is not suitable for hafting, it is thinned down by simple percussion blows that do not require

the accuracy of fluting. There is quite a difference between basal thinning and a regular fluting technique. And I imagine two different techniques were used on these two artifacts. On this one, they have started far back here with a fairly heavy mass to guide the flake. And this must have been a fairly high ridge to have held that narrowness the full length of the artifact. Here we have basal thinning which might be mistaken for fluting, but it has been thinned by simple percussion while these are single flakes and are actually fluting flakes. Some of these may be an attempt to produce fluting but they miscalculated and ended up with indiscriminate blows. It is hard to describe the difference between the two techniques. It may be that basal thinning is sometimes called fluting, but close examination of the artifact scars will reveal that it was not initially designed for fluting. Just the reverse analysis will reveal when the worker miscalculated on his fluting blow and ended up with basal thinning.

Bordes:= Oh ya, ya.

Epstein: Are these from the same site, Dr. Coe, or not?

Coe: No. One of these is from Alabama and this is from Kentucky.

Crabtree: This one would demonstrate a very definite technique here of a fluting process. A shearing off of the tips with both first and second flakes and this is a very definite and diagnostic technique. Quite different from basal thinning. Fluting ismuch more of a refinement and actually a specialized technique while basal thinning is generally just to lessen or thin the base of the artifact to facilitate the hafting.

Tixier: What about -

Bordes: That is something else - just speak about the other.

Coe: Maybe it would be better to take them in the order that they are on the table. You may have more room. Before we go to the Kentucky sample, I would like to say that it is a direct connection between France and this site in addition to the Levallois flakes. In 1914, the French company started to develop a hydroelectric plant on this very piece of property.

Bordes: Oh ya, that's French Colonies.

Coe: In developing the backward area of the Piedmont. But in 1916, other events transpired and work was continued by the Hardaway Company, hence the name Hardaway site. So the Kentucky sample includes a few point types, at random, again all from the surface. One type is called Cumberland. That is the long usually fluted type. Clovis. Then a Quad point which is unfluted and one they call Meserve. Then a few flakes and end scrapers. This lot right here.

Bordes: You call this type Cumberland?

Coe: That is called the Cumberland type.

Bordes: Yes, because it so happens that I have one in my Lab from Tennessee which is exactly a little longer. You have seen it. What? A little longer. It was a beautiful thinning. Ah, this one, well, I think this one fell on a rock or something like that. I don't think it is a graver or a burin. I think it just fell hard on some stone. It happens also in the Solutrean and it did happen to me when I shot arrows with flint head and I got a beautiful set of burins like that.

Coe: It never was fluted either to any extent.

Bordes: Yes, that is an amusing thing. And all that comes from around the same part?

Coe: Now, the next lot comes from Alabama.

Bordes: Ah, yes, this level.

Coe: From one site.

Bordes: Ah, ya, this. O.K.

Coe: This lot is all from Alabama. One site. This is all surface, from anywhere in Kentucky. This is one site in Alabama.

Bordes: Always the same way to cover the scrapers with retouch like in the Solutrean. But where is Mr. Solutrean? Ah, here he is - dreaming. Same thing. And always the side scrapers that could well be Mousterian or Solutrean also. And this, oh well, Pheasant culture. This kind of small bifacial borer or something like that. And also beautiful retouched blades. Look. It is almost a Willow Leaf. And lots of retouched blades and scrapers, concave and convex on blades and small blades with fine retouch. And those, that's a kind of scraper you could find that in Mousterian too. Retouched blades, reused. A flake with some retouch - utilization. Typical Levallois. Yea, yea. Again this kind of Magdalenian I borer. Big borer. These fluted points with channel flake.

Tixier: But what a beautiful Levallois technique?

Bordes: Ya, ya. That's the same thing. This is another Solutrean-like scraper. Well. But perhaps Mr. Crabtree has something to say on some of this.

Crabtree: Not a great deal. I did notice the refinement of spacing of the platforms of force on this artifact, but on this one it is not as well defined. This one whows nothing other than we have an occurance of these at a site in Idaho. They have a "parrot beak" sort of thing, carefully chipped back and as many as five beaks on the same tool. Probably quite a definite use for these - for grooving bone, etd. They are always made of jasper, never of obsidian. The end of this flake appears to be almost a square end without too much preparation, but certainly well-controlled and unifacially flaked.

Bordes: About that, I would not say it is the kind of thing we call Parrot Beak. I will show you in the Museum that that is something quite different. I can make one and show you

exactly what it is. That's a kind of backed-beak but nothing to do with the Parrot Beak.

Crabtree: These, don't you think have quite a change or difference between this and the regular Cumberland style?

Bordes: Oh, this one, ya. It is flatter. It is more thinning than fluting.

Crabtree: It seems like almost a whole different method or style between these two.

Bordes: The technique of flaking is not the same either. That is something different. Ya, of course.

Wheat: I have a question here, Dr. Bordes. You called this a Levallois technique.

Bordes: Oh, no. That's a kind of joke.

Wheat: I know it is a kind of joke. I follow your reasoning here. But my question actually concerns whether the flute is before the side chipping or, in other words, which came first - the side chipping or the fluting.

Bordes: Ah, well. That's something not easy to tell. Here I think with this one, I wonder if the flute was not before the flake. Look at it.

Wheat: That goes in there you see. That's what I was getting at. Because several places the side chipping actually truncates the flute.

Bordes: But in other places - there were on other types. You know that tool here. No question here. Yes, there isno question. On this one it could be, but it is difficult to tell, you know. If it was really the end of the flake or if it is a section of this flake by the fluting. It is not very easy to tell.

Crabtree: With the glass you can see the compression and rings. When you look at these scars, if the rings have been sheared at the ends, they will have been intersected by the channel flake. These channel flakes will be intereected b the retouch if it is done after fluting.

Bordes: Yes, but you can see most of them, but not always.

Crabtree: But at the [illegible]c tip it is quite obvious there.

Bordes: Yea, it seems there is rather two of them.

Coe: The next lot is -

Irwin-Williams: Could I interrupt for a second? I wonder if you could comment, Dr. Bordes, on possible methods of producing these blades here that you mentioned.

Bordes: Oh, well - this one is difficult to tell. It could well be wood struck. It could also be with a punch. You know,

sometimes the difference is so little between that it is almost impossible to tell and I am very sorry that I can't say more. You have seen yourself on blades I have made, some difference of striking platform when the punch is nearer or further from the edge and we are to strike more or less strongly.

Irwin-Williams: So a wide variety of techniques could produce these kinds of blades.

Bordes: Oh yes, certainly. If we had one or more of the blades from this site, we could tell statistically that they used more of this or this technique. But on five or six - no soap.

Tixier: We need the raw material.

Bordes: Ya, ya.

Coe: The next lot is also from Alabama but a little to the West. The six at the top are similar to what you have seen but the other two are more triangular in form and somewhat different. The latter group is called Redstone by the people of Alabama.

Tixier: The concave bladelet is always ground.

Bordes: Yes, yes, yes.

Tixier: And after fluting.

Crabtree: Thisone was broken in manufacture. This is a well-defined well spaced blade. We'll go back a little bit to the difference between basal thinning and the spacing of this one here. This type of a pressure point is very characteristic of the fluting type flake with the distal end of the channel step-fracturing. However, when they finished the blade, they could take these little diagonal flakes off on each side of the bulbar scar. This is the reason, with the Folsom, we always have these side flakes on the basal end. It removed the heavy bulb and gave a straight line on through. This is a very interesting example of fluting flaking technique.

End of Reel 6(1)

Byers: This is very interesting, indeed, because in the Bullbrook site this flake is taken out first and then this is taken out later. We have points, some blanks, that show the two side flakes taken out first and this piece isolated, prepared to take out this flake. And then it was turned over and the platform beveled on the other side and a piece isolated in the same way but taking out this fluting flake. It is interesting to see the difference of order in detachment of the flakes.

Crabtree: Yes, that's a real interesting observation of clearing the channel flakes so that it is released more easily by parting with the artifact.

Tixier: Is there a special name for these flakes coming from fluting.

Bordes: Channel flakes. Don.

Crabtree: This is interesting. If they had gone another quarter of an inch, it would have broken the artifact. A step fracture is an interesting thing to observe. Direct downward pressure andmaking a hinge and the flake still adhering to the artifact. And they were able to follow directly on through and stop them where they wanted them to terminate right next to the tip. This type of a step fractu e is a common occurance and is not a hinge fracture and the flake is still actually adhering. Thisone has, of course, a little different form and it does not seem to be characteristic to the normal wide ends necessary to keep the flake from spreading. You would make this wider and a little heavier here at the tip in order to carry the flake on through. Here they were using a narrow thinning technique which increased the chance of losing the distal end of the point. It is interesting that this technique developed with this particular shaped point.

Coe: This is a Redstone type.

Tixier: Don Crabtree, are points which are fluted shaped like this to determine the intention of fluting?

Crabtree: Somewhat. Because you are going to feather out the channel at the distal end and you need this shape for strength and also for supporting the tip. I mean to carry the flake entirely through to the tip you must have a fairly solid, rugges preform. I have found now that I must have a little additional material at the tip for support to prevent the channel flake from hinging. Otherwise, the tip will be removed. Actually, you are splitting the point in three pieces. If the midsection of the artifact is not thick enough and does not have a ridge, or a double convexity, the flake will spread and break the artifact. So, the force must be directed at the proper angle from the base to the tip in order to get a perfect termination of the channel flake. So, to answer your question, you do need this specially designed preform. The channel flake is part of a cone and, therefore, tends to spread and to prevent this spreading, the shape of the preform must have mass to contain the force.

Start of Reel 6(2)

Irwin: I suggest you look at that like Don suggested to see whether the the secondary retouch was put on before or after Was this flaking done before or after the fluting? The fluting could is rather much lighter in addition to having it heavier. be done when a heavier point This is a Folsom style. was

Coe: The next lot of material is about from two hundred miles North in Tennessee. There are three points. Two are the from the Cumberland type and one of these is called Clovis type. Then the other items are from the Nuckolls site in Northern central Tennessee. Fairly large blades to start with.

Dougherty: Could I ask a question? What do you find in the way of debitage cores and things along with this? I am curious as to how big a flake or blade you have to make one of these points like thisone - the thick one. It doesn't show much curve. Is that a substantially larger blade to start with or flake which has been whittled down to the smaller shape, or do you have cores to go with these?

Coe: As far as the Nuckolls site goes, this is all collected by

amateur individuals and the total inventory I don't know. There are cores of one kind or another, some very crude ones. None as finely prepared as the ones we have been talking about. Apparently they must have used a fairly large blade to start with.

Daugherty: Don, could I ask you what kind of a flake do you think that would look like when you started out. The thickness of that suggests that it could have been some substantial size or is that necessarily true?

Crabtree: It would have been considerably larger. In doing this type of work, I prefer to start with a very thick blade. Shocks and strains are present in a fairly thin blade whereas a larger mass will have greater strength. I use, you might say a miniature core technique. Because, if you use a blade that is fairly close to the thickness of the artifact, its inherent strains will not absorbe the shock. On this particular point there is almost a bipolar technique indicating that a support was used. But, you'll notice he still saved the point. I prefer to use a shearing between the base and the tip so the forces do not oppose one another. This eliminates a bi-polar break where the forces would oppose each other. The point I am trying to bring out is that shearing eliminates this opposition of forces.

[illegible]

Dougherty: What happened? Did he pick this up.

Crabtree: Probably he repositioned the artifact on the support and then he retouched the tip for you can see these flakes are over-lapping the previous scars. I mean, if he was going to take this flute off, he would isolate the platform. His angle of force may have changed or the artifact may have broken at the distal end. So instead of a shearing between the tip and the base, he got a opposing forces from the tip to the base and they met in the middle. It is a wonder it didn't collapse, but it didn't. This has heavy undulations on this side from the shock. Apparently this was a mis-calculation. But it does show the merits of shearing. This may not be the proper term, but I can't think of another word for it.

Daugherty: Another question. Is this material, and this material over here - I notice those scrapers and point similarities. Is this about the same material from different sites?

Coe: You mean the points or the stone?

Daugherty: Yes. I mean culturally is it very similar.

Coe: Yes:

Daugherty: I mean is it classified the same broad grouping.

Bordes: Well, I have something to say about this last group. Here is a double end scraper. And if I remember right, that is the first we have seen. Are there other of those - these double

end scrapers?

Coe: Occasionally.

Bordes: Occasionally. Here also is a composite tool again. A scraper with a borer at the other end. But that I have already seen in this collection but not this double scraper.

Coe: On the broader flakes frequently they utilize the whole circumferance.

Bordes: Yea, but it isnot a matter of that. Here it is retouched, you know. It is a double scraper on retouched blade, but the important thing for me there is a scraper at both ends and I have not seen that until now.

Coe: The next lot of material is again from Northern Alabama. It shows a number of early types. Some we haven't seen before and in the lower corner is a small lot of material from the Stanfield-Worley rock shelter lower level. I think some might be interested in the so-called Quad points. And in what they are calling Dalton in Alabama. These are the Quads - these are the Daltons. This is a Dalton from the lower level of the rock shelter.

Crabtree: There is an amazing amount of refinement in this retouch. This one here has been abraded on the edge. Notice these two with the very fine, extremely fine work on the edges. Almost a sinuous edge. They are very finely worked. That one is - and this one too. They have a little different order of flaking on this side. This one is edge ground. This is apparently the last flake here. Then they didn't bother to take these off, the little diagonal flakes like on the Folsom. Folsom took off these two laterals to clear what bulb was left, but they did clear the platform prior to fluting. These Cumberlands are considerably finer and much better retouched than the others that we have seen so far. This is some very unusual material - hardly identifiable. I haven't seen any like this before. The flaking of the edge character is very similar to the fluting style.

Irwin Williams: Does that have preparatory side flakes before it had preparation of the main flake on one side?

Crabtree: This one appears to have been freed before this one. This is apparently the last flake and then they didn't bother afterwards to take off the two laterals like they did in the Folsom to clear what bulb was left. But they did isolate the platform before taking off the flake, Cynthia. But these are considerably finer and much better retouch than the others we have seen so far.

Coe: These are the Cumberland type.

Crabtree: See here, Dr. Wheat, how characteristic they are of almost your Southwest material. Very fine dentate sort of thing. Very unusual material. It is hardly identifiable. I've never seen anything like that before. Very unusual, ~~xxxxxxxxxxxx~~ It is unfluted but the edge character is very similar to the fluted style. Apparently it just wasn't needed.

Bordes: Oh yeah, yeah. Look at this one with the tentative fluting on one end and a kind of thinning on the other. It is something in between.

Crabtree: It looks like a very coarse material, but awfully lusterous. Here, oh, I thought we had another one of the burins, but he just missed and that was a flat. It might give some indication of the method of manufacture. The question came up by Dr. Daugherty whether this was done from a core or a blade. But this indicates that it is almost a part of a core.

Bordes: Could be. It could also be a point that was longer at first, then broken and then done again. Something like that which was done again. Could be. I don't know.

Crabtree: Another retouch.

Daugherty. What would cause that flaking, that rippling down there?

Crabtree: It was flexing just as it was coming off. It was chattering slightly. Considerable compression right at the far end.

Daugherty: Would that indicate a certain type of blow?

Crabtree: Well, with percussion this is a little more pronounced. But sometimes this can be caused if the surface is a little irregular. However, this was caused by compression as the flake was parting from the back portion and before this happened, it undulated just before it tore loose and was detached. It was slightly flexing from this point. Say if it moved two millionth of an inch, and your angle started to change, you get this chattering here at the end. I mean it's actually flexing as it comes off the end. While here, it tears in a pattern till it hits the weak point and as the flake is leaving it goes over the irregularity and up and down and still hangs on as it hinges. I didn't explain that very well.

Coe: This point is from Florida, the peninsula. It's not a very good example of a Clovis type. They call it Swanee type, Dalton type. You see there is very little resemblance between what they call a Dalton in Florida and a Dalton in Alabama. Then a notched variety. Of some interest to some of you is this specimen which is called a gouge.

Tixier: An adz. That is an adz.

Bordes: I don't know. I don't know what it is.

Tixier: Such kind of tool exists in the Neolithic from Thiute, in Egypt. It was studied by - -

Phil Smith: Thompson

Tixier: No, it's not Thompson - it's Arkin.

Coe: This specimen is not an accident. Quite a few of them have been excavated from a particular level.

Tixier: These are also in the Sahara and the Neolithic. But there is a little polishing here and those I know. And it seems

to be working wood you see. Making bowls. And the removing is there is a little polishing and then percussion and then polishing, percussion, polishing, percussion. This is the same tool. It 's very familiar to me.

Bordes: And in this corner, what is this?

Coe: In that corner we have O'Howell material. We go back North now just a little bit. Three old specimens and I have some more in a box I'll bring over before we get to the Hopewell.

Crabtree: It's surprising the variety of fluting techniques that is shown here. This appears to be Flintridge,Ohio material. These are, no doubt, heat-treated. This tabular piece is of silicious clay and is fairly granular but after they have been treated they work very well. These have wide, collateral flakes and basal polishing which is quite a classic stye. Notice that nearly all of them have step fractures rather than hinge fractures. They were able to stop the flake here rather than hinging off. But they were able to stop at the right time. These are basally ground. Collateral thinning and very nicely done. The detaching of these flakes is part of the blade technique. the flakes on both sides show evidence of this.

Coe: Those are Adena type. Ground blades.

Crabtree: Adena type. Apparently made from beautifully detached flakes.

Bordes: What material is this?

Crabtree: They call this Flintridge,Ohio flint near the Buckeye Lake out of Columbus,Ohio. They say this clear material comes from across the Ohio River in Southern Ohio. Whether it does or not, I don't know. I mean this is their contention.

Bordes: What do you think of the technique? It looks percussion.

Crabtree: Percussion, yes it is. And well done. Extremely well done.

Bordes: Is there not a little pressure here perhaps?

Crabtree: I think so on that part, but the flatness of these collateral flakes is amazing.

Bordes: Oh, ya, ya, ya. Oh, that's beautiful! You see this one, they did not dare make it fluting on the two sides I think.

Crabtree: There just wasn't sufficient curve in order to flute on this side. It was too flat to contain the forces for removing a flute and they knew that before they did it. Cynithis, if this spacing were better, it would resemble Hell Gap. Well, it's not like the alternate,opposite Hell Gap technique. But they are wide collateral terminating flakes. There is a slight similarity to Hell Gap but a different technique was used. Not nearly the refinement of the Hell Gap point.

Bordes: That looks partly percussion too. The other side, I am not so sure. But it could be percussion and pressure but then, if it is pressure, it is rather wide flakes.

Crabtree: They are almost too wide for pressure flakes. I mean, your limitation with this type of material is too great to remove that width of flake by pressure and how they avoided getting the deep bulbs, I don't know. It is a very interesting technique that I don't fully understand. The bulbar scars are diffused. No pressure.

Bordes: Yes. But perhaps it has been slightly cut - this flake. Here you have secondary flakes which destroy a possible negative bulb.

Crabtree: Very nicely done.

Coe: That one that you are identifying is Plano in Ohio.

Tixier: This is Plano point?

Bordes: Ya.

Crabtree: This is a jewel of percussion work. Very fine.

Bordes: And here.

Crabtree: Was it found in a cremation. There are a few fire checks showing here and it appears to have been in a fire. Oh, it was cracked and repaired. It's a good job of repairing. These ~~xxxx xxxxxxxxxx~~ on this side appear to be pressure, but they are very broad. But of course they could be big thinning collateral flakes. This one was all from one side, curved to this point. From here clear thru almost to the opposite edge and well over an inch wide. Same thing here.

Bordes: And there are small cores here with the same technique that we have seen this morning.

Tixier: And heat treating, yes?

Crabtree: You can see the heat treatment. Very evident.

Tixier: Very easy. See it is very easy.

Bordes: That's a core, of course. This is a little different, perhaps

Tixier: But it looks like a burin.

Bordes: But it looks like a - like it has been done on a burin after.

Crabtree: Dr. Coe, is this a common type of their cores to make a polyhedral with flats. It's the first one that I have seen from that area. Nearly all of them are rectangular.

Coe: I don't know what the percentage might be but these are not uncommon. Both in Ohio and Illinois.

Crabtree: It's interesting. Each time they prepared a new platform for this particular type of flake. Here is, apparently, a bi-directional core. It's almost like one of the burin type of things.

Bordes: Ya, ya. We have same thing in the Upper Paleolithic. But there are three little blades which are interesting. This one has an abrupt retouch on a part on the one edge. If it had been on all of the edges, it could have been called Lallame La Dou. It's the only thing that I have seen that looks a little bit like that. This one is a nice denticulated with not too much retouch. That's a strange interesting one also and this one shows some inverse retouch overlaid by utilization rather than that. But poorly treated, don't you think so.?

Crabtree: Notice the points.

Bordes: Ya, it's very small. And here you have a double bulb.

Irving: May I ask a question about these cores and blades? Cores or micro-blades, whatever they may be. The arctic specimens that you looked at this morning probably date from just a little earlier than these. It might be interesting to compare the techniques on the Arctic specimens and these. Can you, off-hand, make such a comparison?

Bordes: Well, you know, about this comparison of techniques there is one thing. We are getting too much food at the same time and no time to digest it. So I don't remember quite well exactly where are your blades. This one I hold is a truncation Small truncation of this micro blade.

Crabtree: The blades that you have from the Arctic had a little greater curve than these. However, the core demonstrated that they were able to take off very straight flakes and they were a little more minute. They seem to hold a better from and they had better control. But the basal technique of preparing each time appears to be almost the same in placement of the tool of clearing and freeing the flake at the basal end before it was detached. That technique appears to be almost identical with this. But some of these have a slant while yours were flat almost a perfectly flat surface. However, this is the first one that I have seen. And to make a comparison, you would almost have to lay them out side by side and take them one at a time in order to determine the similarity or difference

Irving: One rather distinctive feature common to both of them is that on some of these cores, the angle between the striking platform and the fluted surface from which the micro blade was struck was thirty to forty-five degrees. And some of these, and also on some of the Arctic ones. And this is a rare feature in North America. Of course in both cases there are cores with right angles. Ninety degrees between the striking platform and the fluted surface. These are a little more irregular than most of the Arctic cores. There is a lot of variation in those when you get over into the Central Arctic.

Crabtree: There are two examples here. This one is a type of rectangular core and this one was from a polyhedral core. If you'll look at the basal portions of those. One is a rectangular core with a slant to provide a platform for removal of blades.

Irving: Flat fluted surface.

Crabtree: And the other one has the flat surface which indicates the polyhedral core type. This one has an angle too on the edge, while this is perfectly flat. Well, this is a beautiful collection from the Eastern United States. Along with the Bullbrook and other assemblages, we have covered a lot of ground today.

Tixier: May I show you some Piece Esquillee from North Africa?

Alan Smith: While Mr. Tixier is moving his specimens, I wonder whether it would be a good idea before we break up tonight if we could take five or ten minutes for Dr. Bordes and Don Crabtree to give us a brief summary perhaps using the blackboard of how you tell percussion from pressure.

Crabtree: We have.

Alan Smith: But all the time you say I think this is pressure and I think this is percussion. The question is what are you looking for or what seems to be the points that are diagnostic.

Bordes: Now that can be done up to a point. I shall try to do it with the help of Crabtree. Well, it is just the kind of thing you see and you are very much embarassed to explain. But I shall try anyway. That is one of the reasons why it would be good for typeologists and archaeologists to work flint by himself even if he does not come up to the efficiency of Crabtree.

(Lapse in recording time)

Jelinek Collection

Jelinek: I brought in several different kinds of batches of material. You'll see as I go along that I don't have as many points as other people because I thought that we would probably be intetested in debitage as well. The earliest group of material here would include the three bifaces at the far corner of the table. These all belong to, in general, the same stone flaking tradition which built up in the late Archaic in the Midwestern area and is the same sort of tradition that includes the biface from the Adena culture that Dr. Coe had yesterday. Now, my impression of each of these points, at least the two biggest ones, is that the primary technique of manufacture is percussion - well controlled percussion - with perhaps pressure used in finishing the edge. The next group includes these brown micro-blades and cores from Poverty Point in Louisiana and these are generally also assigned to a late Archaic context. This would place them perhaps around 900 B.C. or so. However, more recent studies of the

distribution of these sites in relation to other material in the vicinity of New Orleans indicates that they may be somewhat later than this. The Poverty Point stone industry is characterized by small cores, small blades, and frequently pointed small blades which are currently interpreted as being pointed thru heavy wear and retouch caused by use. The retouch on these blades is generally unifacial and generally on both edges of the blade. It seems to be that it is extemely infrequent to encounter one of these blades which has been retouched on the bulbar surface. The group below the Poverty Point material and including the three corner-notched projectile points off th the left, is Illinois Hopewell. And, in this group, I would say again that the projectile points are probably out of the same tradition that produced the red ocher Archaic points just above, and the points are probably made largely by controlled soft hammer percussion, with perhaps finishing by pressure. Again this would be merely my interpretation. Under these points are three flakes of light chert which are biface debatage, probably coming from the manufacture of points and one larger flake of dark gray material which is probably derived from what is called a cache blade, in regard to the Hopewell culture, large ovate biface generally found in concentrations of up to a dozen or more and representing apparently concentrated wealth in the form of stone material which could be worked into large implements at a later date. The manufacture of these ovate bifaces again would probably currently be interpreted as percussion. Then there is the smaller blade industry which may or may not relate to the Poverty Point micro blades. If the current interpretations of distributions of

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Poverty Point around New Orleans are correct , the time horizons of these two blade techniques would be quite close otherwise they would be separated by several hundred years . The perimetrical cores here are fairly characteristic of Illinois Hopewell micro blades . You get some idea of the size range of blades and cores from the sample here and again the technique, I would interpret from what we have seen here, would be one of, I would suspect, indirect persussion with a punch because of the small striking platforms on the blades and the amount of rippling which seems to appear frequently on the cores. However, there are a few specimens there which show very little rippling on the bulbar surface of the blades and it would be interesting to hear comments on whether these might be formed by pressure techniques similar to those which were used the other day to manufacture obsidian blades. The final group of material from the Midwest is the group of rather irregular cores out of white chert and the spalls below the cores from Cahokia and these materials come from a time horizon , oh, perhaps 500 or more years later than the Hopewell blade material from the same area , but they seem to represent a distinct tradition. There does not, in intravening cultures, appear to be a carry over in manufacture of similar flakes At the same time these are quite distinctive in their thickness and their similarity to burin spalls as opposed to the more lenticular material from the Hopewell industries. It would appear that the product sought in this flaking was the spall itself from the usage marks on the spalls and the lack of usage marks on the cores. Again usage here appears somewhat similar to the usage on the Poverty Point implements indicating,

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perhaps, some kind of lateral pressure, taking off short stubby flakes and eventually grinding the edge to a certain degree. I think maybe we might have some comments on this Midwestern material first and then go on to the High Plains material.

Bordes Well, I will begin. First the red ocher. There is a very beautiful half of a white point, which looks like a very, very good percussion work with perhaps, I don't know, some either pressure or indirect percussion, Because here it is really, there are some flakes which are really very, very well controlled. Not beyond the possibility of somebody who would be working with flint everyday, however. The other, about the same comment. That's a nice piece of work, anyway. The smaller one could be pehhaps some pressure. What do you think of it, Crabtree?

Crabtree It appears to be pressure. Very similar to some of your Solutrean material, with almost the same type of flaking technique used here, like much of the material we saw in the museum yesterday.

Bordes Look as if people like the Solutrean in France used percussion for big points and when they got smaller went to pressure. I think so. Well, then the Poverty Point, La. Well, it's a small blade, but there are a lot of borers I think. I think there are a lot of borers here. Well, anyway what we call borers in France. No question, and some are bigger and remind me of some Sahara stuff more used to drill. Some hand stone.

Tixier And perhaps some ostrich eggs. I think these pieces are, like

French ~~Frech plex~~ — persona .... They are very, very nice and little ones and I think we can see here a sort of grinding that ~~was~~ it is used. Just ~~in~~ on the ~~front~~ point.

Bordes: Ah, ya. Yes, it has been used to drill some ~~other stuff~~ rather stuff material. That is something else. That's a notch, a notch is a notch, is a notch. And for ~~those are~~ the cores, small cores with ~~something else coming~~ lamelles taken off. Well, I don't think it is impossible to make them by ~~the actu of~~ direct percussion. I did things like that very easily. It's no more difficult to make that by direct percussion than to make a ~~cabinet~~ carenate scraper. Could be, however, it seems to be a special preparation of the striking platform that would call for punch work, Because with this preparation or perhaps only with a wooden stick or the antler it could be also. .... But certainly not what I call direct percussion. About now.

Jelinek: Just a minute. Irving, did you have some comment on those cores?

Bordes: This one is different.

Irving: Nothing very enlightening. The usual absence of the faceted platform distinguishes it from most of the Hopewell cores I think and also from ~~these~~ most of the Arctic cores. The cores of this sort which are pretty simple also occur elsewhere in the Missouri Valley in Arkansas and South Dakota but not much is known about their chronology and probably much older than the Poverty Point and Missouri Valley but this is just a possibility as of yet.

Jelinek: Geoffrey, did you want to say something about these? ~~About this....... size.~~ About the stone size.

Cole: My only comment was related to the quanitity of these small ~~cores~~ borers. If they were used for boring than they must have ~~used~~ produced a fantasic quantity ~~quantitiies~~ of drilled objects.

which are in evidence. The Poverty Point type sites uses these little bores or gravers in the term of thousands, dozen and hundred. Also the material available are small bones 2 or 3 inches in diameter other than the larger...... material..

Bordes: Well, I got this Poverty Point material again. Here is a core which is at first look different, but which has been used as a kind of hammer and this looks to me as if was used as a hammer and it is not a percussion, I think, a platform for a punch. W ll, for bores you know, flint tools are very easy to make and are very quickly worn out . And I don't know if there there are any seal or things like that in this material, but if I rember well, in the Southern...... where they made these seal, there is also thousands and thousand of these blades. Well let's go Illinois Hopewell. That's middle Woodland.

Jelinek: That's right.

Bordes: Well, just one minute. It doens't matter (sneeze) [it gives life to the recording.]

Well there is a point, I think wait what Jelinek says is quite all right. It looks like aperhaps percussion work., competent, nothing exceptional and perhaps a little pressure to finish off [finish it. Something] Here perhaps a little more pressure . These blades you say were made by punch technique. I will......... many of them. It could be, It could well be. I wonder if it was not by oblique striking with . This could be punch but others you know this really not much of a striking platform . Of course, I can use a blade as a punch but that would be necessary. This one could be.

Jelinek: The platform is too small but.

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Bordes; No, I don't think it's too small because we don't know enough still about punch technique. But I would say that it is working with small punch and really good people working it. That's quite possible. And these flakes are certainly the flakes at the beginning of the making of these points. There is no question about it. They are absolutely identical to the Solutrean flakes or the flakes you find in the Mousterian tradition where they have very thin hand axes also. That' no question. This one is another thing. Was struck hard. The platform is gone more or less now. It is a small platform, that could be punch but then, and this that leaves the cores, which of course, looks a little like it was made with a punch. This one, not all of them, perhaps but no special preparation. And these discoidal other things which are interesting. I don't think they are cores, you know. They are tools. Kind of discoidal scrapers, more or less bifacial. And here that if this man had struck a little low, he would have taken out of it a beautiful Levallois flake. Now there is ... Cahokia. Cahokia is another thing. There is a lot of small tools made on lamelle or burin spalls with very abrupt retouch. On two or three side, which remind me very much of Saharan Tixier Bordes The drills of the Sahara Here also they were certainly drilling something. What I don't know. And this very ..... elongated cores look like burin form ..... perhaps they are just cores It's very difficult to tell.. end of Reel 6(2)

Crabtree: Look at this thin biface. Removing a flake of this size requires special platform preparation. This one indicates the same sort of platform preparation, however, the pressure appears to all be done unifacially. There is a slight amount of pressure retouching here on this edge, but this particular point show only percussion on this side. It shows edge sharpening by pressure retouch on one side only and the platform was removed along with the flakes leaving a very sharp edge. The others appear to have been sharpened from both sides using a special bifacial retouch to straighten the edge. Most of these indicate special core preparation particularly in orienting the platform to increase the accuracy and leave no overhang. This one shows a better utilization of the core. Heat treatment is also indicated here. Look at this scar which is the point pf force. Notice there is a direct line between the top and the base which indicates the use of a support or anvil. A few of the flakes may have been removed by pressure on this one. It seems that the treated material was pressure worked while the untreated material shows wider flakes indicating percussion. This is obviously the side of a heat-treated core. This one shows a flat platform so it, no doubt, came from a cylindrical core rather than a conical type. These coresmay have been used as tools, but primarily they were made for cores. These cores show step fractures which prevented the worker from going further and they appear to have been discared before they were exhausted.

All of these have been treated. The original untreated surface is on the dorsal side while it shows luster on the ventral surface from the change. This one also is altered and shows some platform preparation, but the core is nearly exhausted. Now, this one does not show the refinement of core preparation and you can see that the worker was losing the shape of his core and could not keep it cylindrical in form.

This blade also shows a change in texture. These also show abrasion on the ends indicating a support method. This is an untreated core very likely done by direct percussion. This one is flattened slightly at the bottom. This core shows that the blades were removed from both ends in a bi-polar manner and it also shows a grinding of the platform. The ends of these flakes look like the worker held the core in his hand and then, with a punch, removed these small flakes. A single ridge was followed to get this type of triangular flake. We have two styles of micro-blades here. Some are triangular and others trapezoidal in shape. Here are a couple of the triangular blades, unretouched, and show no use pattern.

Jelínek: Do you see any evidence of heat treating on this last group which is the Cahokia material?

Crabtree: Not a great deal. This is slightly obvious on this particular one. The others don't show any change of texture at all. When the worker was removing this flake he also severed the end of his core, and there he was all thru with working on this one. But it looks to me like they invariably altered their material when they were doing this small blade technique. This material is quite lusterous but they utilized all of the surface and I can't find any of the original surface and, therefore, can not be sure of the altering on this one. This one is definitely untreated and notice that it is very granular compared to the others. This definitely shows the change of texture between the altered and untreated materials. I think that is about all I can say on this batch. Dr. Bordes do you want to comment?

Bordes: Not very much except that I am not quite sure that this is a core. It's a piece of thing but I see here some trace of work to transform into some kind of tool - denticulate or hollow scraper. I don't think there would be any core preparation as neat as that.

Tixier: Don Crabtree says here we have a beautiful and well retouched cutting edge from projectile point of Hopewell. If this is a cutting edge, can we speak about this and tell these pieces projecting. Here is a problem. Is this a projectile or is this a double scraper or knife.

Jelinek. Well, this is an interesting problem but one which I had already noted because these normally just from the form in the silhouette are classified as projectiles. But they are obviously quite large to be used as projectiles Although they would be used with a spear thrower or dart shaft. But this problem of use is an interesting one, and one which I don't recall seeing mentioned. Perhaps some of the other people here are familiar with Woodland material.

Crabtree: Well, I do think that this point is just a little unique. It has all been done by percussion on the one side. Normally you have a right and left-handed usage for a knife. However, this was sharpened on both sides by pressure retouching. This, of course, has been used, but it leaves a straight very sharp edge for a hafted knife. I really don't know much about function, but if you were going to use this as a projectile point you would balance it out and make it doubly convex rather than having almost a uniface for this would give it additional strength. In the technique of shaping, it would have been more perfectly balanced for a projectile point. A point that is doubly convex rather than flat on one side will be much stronger.

(There is no page 84)

Jelinek: Can you recall anything about function on these Middle Woodland points, Geoffrey? Or will anyone postulate the use of this knife.

Coe: We might add that most of your Middle Woodland points that are true projectiles are much smaller than this. That these seem to be the exception in size.

Bordes: Well, over there - there is something on this point that I have not seen. That is kind of Solutrean blow that could well come from a projectile point falling on something hard rather than the knife work. But after that, after this burin blow, the point has been pounded in a scraper-like way and it could well be that these poeople liked standardized tools and used the same thing sometimes as projectile point and other times as knives. Because, you know, to make this burin blow by using it as a knife you would really have to try to cut hard and be really strong yourself.

Alan Smith: I suggest that perhaps Madame ~~Gouchard~~ Guichard would like to look at the Mousterian.

Madam ~~Gouchard~~ Guichard: No. No,no.

Jelinek: Well, we will go on to this last batch of material. This is virtually all debitage material. There are no deliberately manufactured implements that I am aware of in this set. The four small boxes here contain debris in the first three

from manufacture or retouch of end scrapers, apparently. These all come from the Llano Estacado Blackwater Draw area of the ~~Southwest~~, where stone is extremely scarce in the natural occurence. The flakes all show a very characteristic battering ~~and~~ the bulbar end which is presumably the old worn edge of the scraper as I would ~~it~~ interpret it and at the striking platform itself , there is almost inevitably a small polished facet, but very small . Frequently these flakes after having been struck off , have been retouched and reused and- indicating possibly again the scarcity of stone in this area. The fourth box is composed mostly of small flakes of bifacial débitage which superficially might be confused with the end scraper retouch type of flake. I think that perhaps through balancing of analysis in this manner in a débitage, one can come up with more in the way of function or, at any rate, traditional difference within flaking industries and we have seen now, and this is the sort of thing I have been trying to start. The other two batches of material are all from a single late Archaic site adjacent to the Pecos River on the high plains and demonstrate the differences in débitage when different types of material are available . The multicolored material is from typical river gravels along the Pecos but in this particular- particular area , there was a banded chert also available and the banded chert débitage on this site presumably flaked by the same people using possibly the same techniques as the gravel material, is quite distinctive. There is much higher percentage of flakes of bifacial retouch in the banded chert débitage and much in

[illegible] of course

general of coarser, cruder flaking exhibited in the other material with the exception of the small pebbles of chalcedony which in these industries, again, are used largely for bifacial retouch, I think. Any comments or shall I start.

Bordes! Well, I have comments to do. First about the ~~end scraper~~ retouched, ~~end scraper retouch~~ well for some of them I have the causes. No. ~~Not~~

And among these small flakes it seems to me that ~~on~~ them they have made some kind of very small tools which are not very easy to see and it will be necessary to have time to go thru all of them, one by one, to see what they are. But I can see a lot of small ~~percussions~~ truncations.

Jelinek Yes, there are.

Bordes! Good or bad, or just some of use retouch, or perhaps crushing, but here for instance is one which is certainly very good.

Jelinek! Yes, yes.

Bordes! No question. And that, to me, is more than the flake on which tool.

Jelinek Yes, a very high percentage of these points show retouch.

Bordes! This, you know, for instance this one, can be a kind of butt scraper made of on a flake, a short flake. But this one could be also just like that on the ground and somebody stepped on it. This is not very characteristic, but the ones we are holding, this one there is definitely a tool. That is made on purpose, no question. It's a small truncated ~~faceted~~ flake and perhaps if you have it will be interesting to look at these little

things in your culture because most of the time except for small blades, I have not seen very much small things in this American stuff. No, that's just nothing

Jelinek There is a very fine retouch.

Bordes Ya, it happeds .

Jelinek I looked at most of these under a binocular microscrope and, yes.

Bordes Well, it would be interesting I think to go closely into this matter. Most of these are just small flakes with so small a retouch that it could be anything but things like that though are just definitely tools.

Jelinek: What do you think of the origin of these flakes on end scraper retouch.

Bordes: Some, yes. Some I agree, others no. Good is the best thing I can do is to prepare A batch of end scrapers flakes and then ~~you will~~ I will.... and you put them in a box and after that you can look and compare.

Jelinek I've tried this.

Bordes Ya, you have tried it. Well, then perhaps you have a heavy hand with all your end scrapers because this for instance ~~to an extent~~ I don't think this ever was the end of a scraper. It's a little ~~perfect so~~ too thick too. But perhaps it is a bad end ~~it's a bottom~~ scraper on the other hand. But this one you know, have you found those like that?

Jelinek Oh, yes there are others.

Bordes Well, to me that is as much a tool as a beautiful point. And what you say is there are others. from flaking off bifacial things ~~or something~~.

Jelinek I think so.

Bordes Ya, I think so. Most of them, of course I have not time to look thru all of them but for instance this one is perhaps from a ~~percussion too~~ bifacial tool, It could also be from an end scraper. It's very difficult to tell one thing from the other.

Jelinek Yes, well, this was why I put them in.

Bordes: Yea. What are these little bits?

[illegible]

Jelinek: But most of these are interesting in showing this crescent shape.

Bordes Oh, yes, yes, yes.

Jelinek Striking platform

Bordes Oh, yes, most of them are made from

Jelinek With abrasion adjacent to this and all the features that we ~~have been~~ brought out

Bordes: And now for this bigger batch which come from the Pecos.

Jelinek These are the Archaic materials . There probably isn't much to say about them. I just brought them in to show the contrast.

Bordes: Ya, ya, ya, this/is/ there is, there, is there is, that could be also a thing of ~~percussion~~ bifacial work. But, here, for instance, I see, for me it these is a very nice and denticulate tool. No. question.

Jelinek Yes, Oh, ~~they are~~ there are tools in there all right.

Bordes: OK. They are all right. Nice side scraper, no question. Godd, good. Not very good material. I think it can be worked.

Jelinek: These were just random selections out of bags of unanalyzed material.

Bordes: It could be cores, it could be much. Ya. And this is from the same origin but different material?

Jelinek: That's right. This is altered and unaltered chert which occurs locally.

Bordes: A lot of small flakes which could be of bifacial tools. Here they took off the platform. You know, that is something very strange. It happens also in the older culture. Quite ordinary flakes without any retouch but they took off the burin. As if this could be a tool by itself for the taking off of the burin. And flakes, no retouch on the flakes. Here it is broken and you can't tell. I knew perfectly big flakes like that with not one retouch except that they took off the burin. Ah, that's nice! What? There is nothing else to say except they certainly used a soft hammer technique to remove the blade. Mr. Crabtree.

Crabtree: I think that the function has been well explained. There is one quite obvious thing in this collection. On certain finer-grained material they haven't used the ~~xxx~~ thermal treatment. But when they did do the fine pressure retouch, the material appears to be altered. There is only two positive indications here of the treatment. Here is the

natural facet and this is the treated side, demonstrating the changes of texture. These are practically the same materials and they show the change very well. When they did alter their material, they apparently used various small flakes which gave them better control of the thermal temperatures than they would have had if they had altered large blocks of this material. This debitage of small flakes shows quite a uniformity of flaking. This is evident by the types of bulbs of force left on the flakes and also on the ends when the flakes were not used for some purpose and we have the distal end intact. These outside thinning flakes show that apparently they did produce some quite large tools in relation to these knives over here. Of course, there is no comparison between the two tools other than demonstrating the difference in technology. I mean the similarity in technology between using well controlled thinning flakes showing very small platforms. This overhang indicates the use of a billet as the tool. This would relieve the shock as the flakes terminated at the ends. This material here resembles ignumbrite. I think that is about all I have to say about this material.

Bordes: Well, I have on last thing to say about this collection. And that is that I have been very much interested to see a little of American debitage. Not only the beautiful, wonderful tools. And I congratulate Art Jelinek for bringing it. Because it is less glamorous than the beautiful tools but in its way it is interesting. I am sure that all of these people that are here are aware of the necessity to pick up not only nice points, but also the flakes. These dumb flakes will take so much space and are so heavy but can give a lot of information.

Irwin-Williams Collection (Blackwater Draw)

Wormington These Blackwater Draw blades might be good to discuss in discussing blades.

Bordes: Yes, we will have to have some more space for them.

Jelinek We'll have to move the table.

Bordes: Start again, Cynthia.

Irwin Williams We have a collection here of blades and blade-like objects from the Clovis type site at Blackwater Draw in New Mexico. This is a collection of George Agogino and I might add that these are not the best blades that are usually found with that Clovis. Most of these specimens were either in the hands of reluctant amateurs or were out for illustration, which is usually the case.

[redacted]. In any case, there is a pretty wide selction of them this kind of material here, including some tools made on blades and, in addition, a few things which should be of interest , a few little ß flakes which are found in these boil springs, as they are called locally and which show a very high degree of polish and luster which perpaps we can-pre compare and comtrast to the greasy luster which you find on heat treated material . Well, those are all the preliminary comments on the material. Do you want comment on it now?

Border ~~Well, this is Borden speaking~~. Seems to me that there is a nice lot of blades here, with some retouch and very good scrapers which looks ~~like the~~ very much like the Upper Paleo lithic in the open site sense. This one for instance point has a good retouch on the two sides and it could well be Aurignacian or something like that. This blade that I hold now has a very narrow large striking platform , good bulb, and it looks very much like either a punch technique or pressure technique. But pressure , my guess is that it is a little too big, so it must be punch technique. This one has the striking platform removed. Looks like punch technique too. ~~And the same idea~~, perhaps not this one. This one could be struck with a wooden hammer, billet or something like that. The smaller ones, this could be struck also by wooden billet, but it's very difficult to tell. This one could be also struck with a wooden billet, but it could also be punch technique. Sometimes it is ~~difficult~~ almost impossible to make the difference. There is here one tool that could pass one in France for a point a face plane of the lower Solutrean, ~~for the ..... of lower Silurian~~. And it is even better than the one I found yesterday .....

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Well, after all perhaps they did swim the Atlantic. Something looks like a punch technique for most of the blades from what I can see. But really there are not enough blades to be quite sure. Some are certainly made by punch but were they were all made by punch technique or was it several different techniques. I think that always there are several techniques used. Following the shape of the core, the type of the blade, and sometimes you begin something with punch technique and then you miss one blade and you , you keep again your core by using direct percussion, or indirect percussion and even stone percussion and then you go on again with punch and so forth. I don't think there has been any culture in the world who used only one technique for making blades. That would have been crazy and they were not crazy. Now what do you think, Don?

Curtiss Dr. Bordes, there are two distinctive types of flakes here, and as you say, there are several techniques used in this particular case. And with the Folsom complex, this was seemingly a common thing to abrade and polish the points of force, [illegible]. There are two of these that have demonstrated that but, as you say, with this array of flakes it is difficult to say. With the others you can see the square ends but most of them have been reutilized and deformed or crushed in their manufacture and then reshaped as this scraper style here. But a distinctive behavior pattern apparently of the Folsom technique is the polishing of this to withstand enough force to drive it straight thru and have a straight flakes carrying clear thru to the end with a very small implement

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impact point. There is one other flake here that you'll ...

Bordes: ya, ya That would certainly make a punch technique. And this polishing, evidence of this polishing, is less slippery than the normal pressure flakes.

Crabtree: It gives a greater strenght, much great strength to distribute the force all the way thru. There is another one here of the same style that showed this and it is abraded as well.

Bordes: Not much is left of it.

Crabtree: Some will keep dragging their tools to give a little additonal strength. This seems to be a very, very definite procedure of abrading theses slightly in order to get this long narrow flake.

Bordes: This small faceting on this one probably some rubbing on some stone, or something

Crabtree: May have been. Some show untreated material, and some show that they did use the alteration, this one material here is very unique. It almost borders on the opal. No indications of heat treatment, but an extremely fine grain material and exquisite work could be done with that sort of material.

Bordes: Oh, yea,

Jelinek: Part of that is that boil spring polishing on there.

Bordes: Yea. That is not a polishing.

Jelinek: I think it's the same material as this

Bordes: As this. all right.

Crabtree: With a little different refinement.

Bordes: Yea, but that's a very good material . I would love to have some, a big block of this material.

Crabtree: Oh, yes, this is beautiful material. Some of the finest in this ~~source~~ type of quartz family minerals.

Bordes: We have things like that in flint but its not as big a block ~~black~~ but ~~so~~ if you are lucky ~~and in~~ you'll find one nodule in two or three thousand, which are like that.

Tixier: ~~Claire speaking~~. This bright polished by some boil spring material is very common in North Africa . Lots, and lot, lot, of flint tools from Lower Paleolithic ~~and~~ to Neolithic which are mixed and boiled and rolled in the sand or the springs, and sometimes there is bifaced handaxes from Lower Paleolithic which are used more than one centimeter by some boiling springs .

Crabtree: Is that so.

Bordes: Well, look, Crabtree, was this is it ~~this~~ not a change of aspect between this small flake and this.

Crabtree: Yes, this could be..........

Bordes: It could be. treated

Crabtree: Very clearly so, You see, Cynthia, on this side.

Irwin Williams: Oh, yes, indeed. By gosh.

~~That was great on here~~

Bordes: This is heat treated this one.

Cynthia: There is a change of texture. It's quite obvious in that particular piece ~~enough~~ Here is another piece ~~here is another piece here.~~ I ~~din't~~ didn't look at the edge but this appears to be

untreated natural material, ~~here with this.~~

Irwin-Williams: By the look of this, this would have been in , stop me if I am wrong, this would have been treated. We can say that, after it was made into a blade because The relatively coarse outer surface is all over the blade but not in the small fracture off the side.

Crabtree: One other thing that I would like to bring out is the wide range of material with the small collection showing how they favored good material. They stayed with a certain consistency, a certain type of material, ~~or other~~ but here we range all the way thru from quartzite to one of the finest grained most beautiful materials and apparently they had utilized all ~~one~~ of these things. Whether there was some particular spe~~cial~~ ~~things~~ material that they liked for these uniface tools maybe for its toughness or something like that . Notice the similarity in character flakes, ~~of that sort~~ of ~~thing.~~ ~~Which~~ It is interesting the range of texture of material, heat treated, untreated quartzite to almost the opalescence character. Probably two different technqiues or three here of your first roughing out and the final very special preparations of the point of force percussion, pressure or a combination of the two [illegible] or the punch technique.

Bordes: That is something amusing on this beautiful material . A man tried to pressure retouch and then probably, he got disgusted with this ridge and did not bother to go on so he threw it away. See more two beautiful flakes than to hook with it.

That means that probably he found that this flake was not big enough or that he had

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a lot of material and did not care very much about it. That is a flat, it's a flake which has been taken out of something which has been retouched. Ya, it could be also a side scraper. Could have been something like that .

Irving: Are there very many other artifacts made of quartzite from this locality?

Irwin Williams: There are a number but certainly the favorite material is this finer grained chert and chalcedony.

Irving: Could these two things that look like points of face plane are both made of quartzite, but nothing else is , I wonder if that is of any significance or is that just .

Bordes: Well, this could have been of this kind point of face plane, of flint or of chert, I don't know you call it. We could never figure the difference between flint and chert.

Irwin Williams: I think this apparent selection of quartzite for making these point of face plane things is purely artifical due to the fact that some of the chert makes much better ones and they are much easier to take photographs of and illustrate so it is all for illustration.

Irwin: Irwin speaking. One of the problems of the whole Blackwater area is, as I think Art pointed out earlier, is that there just isn't much flint locally and they went a great distance. They went over to the Albates quarry in, you don't have any Albates material! But there is albates in the tool assemblage. Most of this chert comes from the Edwards Plateau. I don't know about quartzite.

Irwin Williams: There is certainly none available locally and there is a tendency, as Art pointed out earlier, to use everything and to resharpen all the tools down to the point of uselessness. Perhaps this accounts in some part for the use of some of the tiny resharpening flakes as tools after they have been struck off.

Jelinek: I have the impression that this is more characteristic of the later industries of the Blackwater Draw and a little less characteristic of the Paleo-Indian material. The topography may have been somewhat different during the time the Paleo-Indians were present and then there may have been accessible exposures of the material closer. In some degree, anyway. At least in terms of the quartzite which occurs in large pebbles in the gravels of this area. And it is exposed in tremendous quantities along the edge of the Llano Estacado up to the North of the Blackwater Draw. I think the quartzite would probably have been the most accessible material, being maybe twenty-five miles away. Whereas, the other finer materials would have had to have been brought a greater distance.

Crabtree: No preparation on that one. end of Reel 8 (1)

Irwin Williams: What of thisone?

Crabtree: It has been shaped to clear and free the flake and increase the degree of accuracy. Notice the very flat flake with almost no overhang and no bulb of percussion.

Bordes: For that I must tell something. Every time you use cortex as the striking platform, you have a much more diffused and smaller bulb.

Start Reel 8(2)

Wormington: We have quite a mixed bag here. I think we'll start perhaps with the Folsom material because I believe we have some pieces here broken in the process of manufacture which may be of some interest. This is Folsom material from Lindenmeier. This is perhaps, I suspect, a preform. These I would suspect were broken in manufacture. These are some of the channel flakes that were removed in the course of fluting. This is a very characteristic type of scraper with this little projection on one side. Perhaps you would like to comment on this before we go on to other material.

Bordes: That's something else?

Wormington: That's something else. This is just the Folsom material, right here.

Crabtree: This one here is remarkably thin. The flute has been detached with a step fracture at the end showing a great deal of control. Their ability to stop the flake by a step fracture rather than a hinge. I would like to define a little of the difference between a step and a hinge fracture. A step fracture terminates in a right angle truncation and a hinge fracture terminates in a curved break. This step fracture takes a direct downward pressure with just enough outward pressure to detach the flake. I am speaking of pressure and I should, perhaps, refer to it as force until the technique of fluting a Folsom is more sharply defined. On this Folsom, they were able to control the blow, or the force, sufficiently to stop the flake at the distal end without letting the flake come forward to end in a hinge fracture. And some of these have been carried entirely thru to the distal end. The distal end of this artifact

is abraded apparently indicating support to withstand the force used to detach the channel flake. When applying force at the base, the angle between the base and the tip cannot vary more than one or two degrees in order to terminate the channel flake properly. Because of the preform being designed too flat, the channel flake spread on this one. It's unfortunate. Oh, here is one that shows no polished platform or none of the preparation that is uaually associated with the Folsom technique. This is the distal end of the channel flake for you can study the force lines and they indicate where the force was applied. This is also the distal end of the channel flake which, unfortunately, is not nearly as diagnostic as the proximal end. This shows a feathering out of the flake at the distal end to transmit the pressure from one end to the other. Marie is quite right in saying that these pieces here are preforms. They certainly are. I can see no evidence of the thermal change on any of the artifacts, but the smaller flakes do indicate heat treatment. This one is quite lusterous but not knowing the source of the raw material, it is difficult to determine whether it was altered. This one demonstrates the normal preparation of the Folsom showing the preparation and the grinding of this edge and the control the worker had in forcing the flake the length of the artifact. I'll turn it back to Dr. Bordes and Marie.

Bordes: Well. I have not much to say after what Don Crabtree said. He is the expert in making the Folsom, I am not. But, however, I agree with him that this is certainly a preform for some point. Here it is very interesting this piece because it shows that they were reposing on something when they were working. They made a special preparation and very probably there has been two flutings, you know. One on the other and none of them was too good.

Crabtree: Can You can determine how it was broken on the end there, Dr. Bordes, by studying the break there on that side? In the second fluting, I would say.

Bordes: I will say that there was a flaw in the flint and it gave a kind of , what is the word, rebound of the short wave and it went South.

Crabtree: This might account for the excess material on the tip. No doubt this was the tip and they left this thickness here for support which would help in the fluting. Notice even in the preform that they have left the tip thicker.

Bordes: Ya, ya. One of these channel flakes has been after worked into a tool. They made the small platform on this side and then very ~~poorly~~ probably, by pressure, they made it a sharper edge.

Wormington: Here is one that has the little graver tip too where it has been pointed.

Bordes: That I don't know. I would like to have a big glass to look at it. It could be.

Wormington: This may not be a good example, but we have dozens of them.

Bordes: But this could well be an accident. As for this kind of special scrapers with this point which here is almost a borer. I wonder if it is not something akin to the old joke about the curved gun to shoot around the corner. You scrape your skin like that, but sometime I tried the scrapers on fresh skin and sometimes there are little bits of flesh that you cannot get with this edge and then with that you can get it much better. And it's a kind of composite tool I think, rather than a special tool. Instead of being a scraper it is scraper plus another tool all the same. Like there are burin scrapers, burins or scraper, borers. This is a scraper - well, I don't know how to call it - beak or something like that. And that is really very interesting. But that is about all I have to say on this bit of material.

Wormington: Before we leave Folsom altogether, may we just have a look at these. I brought this simply because it is probably the most extraordinary example of fine flaking on a Folsom that I have seen. You might like to examine this. This is of some interest, I think, because something very characteristic of the Folsom is the removal of flakes on either side of the channel. I would be curious as to whether this was done after the fluting. I suspect that it was. And this is quite characteristic of the classic Folsom and among the knappers who were producing forgeries many of them are not on to this yet, and this is a great help.

Crabtree: This is a good observation. The Folsom is quite different than Dr. Byer's collection. Where the thinning and freeing of the channel flake is done prior to fluting one can easily see the intersecting flake scars. These diagonal scars at the base is the big difference between some of the Eastern

fluting techniques and the Western fluting techniques. These two little flakes are removed to leave a smoother surface to provide the flatness for hafting and they are generally removed after the fluting. This one is awfully flat. Because of the thinness and the flatness of the preform, it would have been disastrous to have tried to flute this for it needs a ridge to guide the flute. For it is the ridges that guide the flute and this one was left too flat. So he salvaged the point by not fluting the opposite side and removed just a single flute on the one side. The Lindenmeier site produces one of our finest examples of edge retouching and as far as I know it has not been exceeded at any other site. These retouch flakes are so tiny - just mentally calculate what type of tool was needed to remove these tiny flakes without leaving a crushed edge and each one required individual flake preparation. The worker moved from one side to the other on both sides. This is a fine example of lateral edge retouch showing great control. It is almost unbelievable. The spacing per inch and the amount of flakes removed in order to sharpen the edge of the tool is extraordinary. It seems like almost art for art's sake. A very refined technique.

Bordes: Well, I have some words to say about that. About this specially beautiful bit of work. It seems to me that this

point was broken not in the making but by utilization. It seems there would have been no point in making this fine retouch on a piece which is broken and so I think they did make it complete and you can see the first preparation here. There are flakes like that and the others are a little more ~~outward~~ abrupt. I think that this point was used and broken in utilization, not in preparation. What do you think of it, Don. Look you can see the two different sets of retouch.

Crabtree: Yes, the two different sets of retouch are very obvious on this side. This flake didn't go over as far as the retouch and you can see the shearing of the ends - such as this example. It is not as obvious in this particular piece here but, usually, you can see slight compression rings starting at the point of force. These compression lines are not present when the flake is feathered out and these have been feathered out very regularly on that side. By inspection of these rings with a glass, it can be determined if the retouch was before or after the fluting.

Bordes: But I don't see the point of making such a fine retouch on something broken.

Wormington These next four examples are also from the Blackwater Draw locality near Clovis, New Mexico but the upper horizon. This is more recent than Folsom. This is one of the Meserve, Dalton perhaps, and these are in the Scotts Bluff tradition though lacking the stemming. But it does seem a somewhat different type of flaking and I thought it might be interesting to compare this with the Folsom.

Crabtree: To compare them, we must start with the unfluted side. Two different techniques are demonstrated between the Scotts Bluff point and the Folsom. The Scotts Bluff has very deep, very sharp, well-defined retouch flakes. The flakes are not parallel sided because the worker did not take advantage of the ridges to guide the flake and there is an overlapping of flakes and no regularity as there is on the Folsom. The techniques are entirely different. It is difficult to determine the exact point of force when there is a folding over of the flakes like this. These have been feathered out and terminated at the end with a great deal of compression. These flakes show that the worker took a much heavier bite into the side to remove the flakes so that the edges would have enough strength to withstand the pressure and the flake would pop out right to the end. If they were pushing slowly, you would not have the well defined ridge in the center like we see here. As a thinning technique, they met the flakes in the middle. If this particular shaped point was fluted, it would produce a narrow channel and it would hold the narrowness to the tip - similar to the Clovis technique. The Folsom preforming preparation produces a much broader type of fluting flake because the worker leaves excess material down the median line to guide and broaden the flute

Bordes: Yes, yes.

Byers: May I say something before you move on. This first point that you picked up broken in the manufacture - excuse me, I can't see through the microphone - shows very clearly that this flake here is a lateral flake that ran and not a centrally placed flute flake. It shows the same preparation at the base that you find in some of the Eastern points and these - a typical if you want to call them Folsom - are the things that are typical of the Eastern fluted complex. And according to my observation, the discards from the fine stuff on the Plains is the equivalent of the fine stuff in the East.

Bordes: Well, to come back to this point. It seems that it was broken after the first fluting was done since the platform was reversed already. But you know, as it is, it is not in the middle, it is a lateral flake. I wonder if this is punch or pressure technique. It seems difficult for me to miss it so much. And I wonder if it could not be tried just by percussion.

Crabtree: It could be. This shows compression here that you wouldn't get with the pressure.

Bordes: And I did some experiments with fluting and I got some very often, you know, the fluting not ~~from~~ in the middle but just on one side because you can not be accurate enough with percussion as you are not as accurate as you are with pressure or punch technique. And so it could well be that this is an example of fluting by percussion.

Wormington: Shall we go on now. This mass of material is part of the Black Sport material from Wyoming where there has been

much controversy concerning it. It is all surface material. Some people just on the basis of typology attribute great antiquity to it. Kreiger regards it as Pre-projectile point, but we have absolutely no way of dating it. My feeling is that it could be of almost any age, perhaps relatively recent. These were some of the techniques that were used in this.

Bordes: This? That's a Levallois core, but not exactly.

Crabtree: The first one I picked up here is a peculiar type of flaking, but it seems to be distinctive amoung a certain group of people. These are thick, tabular flakes and this is because the worker did not follow the ridge but, instead, positioned his blows on behind the other. This is something slightly on the order of a side struck flake. The blow is struck well inside, or similar to the Levallois technique of moving inward to remove a heavy tabular piece. From the patination, the little projection here appears to have been reworked after this flake was removed. On this side scraper, the flakes were removed this way and then it was turned around and flakes removed from the opposite side. This is very characteristic of this flake technique - both from this side utilizing the ridge first then moving back inside again without following this single ridge in order to give the beveled edges on both sides of that particular flake. The others are really in Dr. Bordes' category. Here is another representative

style of this type. Another similar type of flaking technique. But quite a different technique was used on this one. This is moving back inside something like a Levallois flake. It seems characteristic of this technique to move one blow in back of the next one. The material is extremely fine-grained; one of the finest quartzites that I have seen. Here is another fine example of beautiful quartzites. Notice, again, that we have the same technique to provide these very thick heavy flakes for some purpose. For what, I don't know.

Bordes: There is here a lot of flakes which looks to have been made by the Mousterian or some kind of Levallois technique. I agree with what Don Crabtree says and this core is amusing because it looks at first like a good Levallois core, but it is something which is slightly different. It is the same idea but there has been, it seems, that either the flakes did hinge fracture, or ~~perhaps~~ in France we say it went on the other side, and that could be a Levallois core. Well, from here and in Africa, no question, it would be called a Levallois core. So the Levallois technique, after all, is known in the States. And this I wonder. This is made on a flake. And a kind of bifacial tool.

Bordes

I don't think that it is a core. I don't see any special preparation of any striking platform. It could be a first preparation of a Levallois core but I will rather call it a kind of denticulate with a thin back. That happens very often in Mousterian culture in France. Nice side scrapers. And, well, what is this tool? The one with the little borer. Ah, here, certainly there has been two different times of working. First a flake of this type and then somebody picked it up and made a small alternated borer with alternate retouch. Perhaps a thousand of years later, perhaps only ten years later. Sometimes the patination is very quick. But, anyway, it can be anything. Big blade, yea, in this quality. This shows a blade technique, one blade taken off. It looks quite different from the rest of it. Well, you can find this in flake culture you know. From time to time they made blades. In some Mousterians there is up to forty percent blades, you know. But, anyway, this is certainly not Mousterian this bifacial tool. Made by percussion I think - no question. There is another one I think. That is another thing. Also this is a kind of denticulation with a backed technique. That's a very common in some Mousterian. Perhaps for hafting, perhaps for just holding in the hand. Better, but that is quite common in some Mousterian. You know most of these tools you could lose in a Mousterian assemblage. I don't say, or mean, that it is Mousterian or it is very old. It can

be sometime in France some Neolithic looks very much when you take off the typical tools looks very much like Mousterian. So it can be any age. It can be very old; it can be young.

Bonneville/Bordes: What is the age?

Warmington: We don't know. This is a very controversial subject

Irwin: It's a quarry site, so I suspect there are quite a number of ages.

Warmington: Probable.

Irwin: It is a big quarry. That very fine grained cherts that outcrops in the Black Hills area.

Warmington: This is the sort of thing that is often perhaps erroneously classified as a burin. I would like to hear your comments on this.

Bordes: No. That is just an octagonal fracture, I think. It was a thick flake that took a part of the side of, well let see if it was taking it out , and it broke.

Warmington: That was my impression.

Bordes: But that can have been used afterwards as a burin or something else, you know. It can very well have been used after as a tool but technically it is not a burin.

Tixier: A broken scraper

Bordes: Oh, it's a broken anything. Yes

Tixier: Scraper.

Bordes: Yes, yes, But no I think the flake broke when they took it off and then they made a kind of retouch on one side and maybe a small borer on one side and on the other

it was pointed. Perhaps they used it as a burin but it is not technically a burin.

Irwin Williams: No it's right there, the yellow one.

Bordes: This is something dfferent, I think.

Wormington: Yea, this is something else. I brought this. This is unfortunately only a cast, but it does show the very fine oblique flaking that can be done on this quartzite. This is the same basic material from the same site. This is not as good an example of flaking but this shows what can be done with this particular material.

Start Reel 10(1)

Bordes: That's a very nice cast anyway. Beautiful transverse, oblique pressure.

Wormington: This is essentially the material from which it is made.

Bordes: Ya. That is not so good. Is that the same thing?

Wormington: No.

Irwin: That's something else? All right.

Wormington: That was of no importance. And these I brought just to show the sort of change of material thru time. The earlier people really made a great effort to get fine grained material. The later period people utilized just whatever was available. And this was just to show material change. If we go still later, however, into the sort of the protohistoric period, often we get a return to the fine grained materials. And there is a whole series of these very small end scrapers which are characteristic of a late period. I thought perhaps you might comment on these very small scrapers. Some of the late protohistoric sites that Leaner has been digging.

Bordes: Yes, they are very nice small end scrapers. They look a little like some Azilian

scrapers in France, but, however, on this one, you have this little point like in the Folsom type which seems to have gone a long, long way. And with a fine retouch.

Wormington: Yes.

Bordes: This also is retouch up on here. Spanish Solutrean-like they are. Some are Azalian like. How do you call it - covering this retouch which covers all the face is more Solutrean-like or Folsom-like than the upper Magdaleanean or Azalian. Never that in Magdalenian or Azalian. The outline yes. Mainly this one or this one. They are very small but we have as small as that in the Early Mezolithic or the Mezolithic.

Daugherty: Marie, may I ask a question? Do you find those hafted in the sites?

Wormington: No, there are no perishables available or no bone.

Daugherty: We find identical scrapers to these up in the plateau and we have found them hafted. And the method of hafting is to put them in a deer bone about this long that it isn't tapered in any way toward the scraper point. The things are set way in so that just a little rounded curve projects. I would guess that in some of those where it begins to flatten off either thru use or thru retouching in sharpening, because only the curve projects that it would get flatter and flatter as they sharpened it until there wasn't anything left. And you would get a change from a rounded to a fairly straight across type of scraper end.

Bordes: It could be. But are your scrapers which are hafted retouched on the dorsal face, also

Daugherty: All around.

Bordes: All around, yes, but on the dorsal face here is completely retouched on some of them, you see. Have you this kind of retouch?

on some of them, you see they Have you this kind of retouch.

Daugherty All the way around ~~to the~~

Bordes Around yes, like this one , but what I mean is it retouched covering all the dorsal face?

Daugherty: It varies. Some it goes clear up to the top and some are like that last one you had there with the flatter ~~flater~~ flake.

Bordes: Another question. Is there any trace of utilization on the flat side in your scrapers?

Daugherty Not much.

Bordes: Not much, no. No I wonder if this is this thing being hafted as you say, were used like that or like that, pushing

Daugherty These would almost have to be coming back toward you because they would have to be held direct.

Bordes: Like that you mean, working like that?

Daugherty They are set in such a round end with only this little bit sticking out you couldn't get any scraping action.

Bordes All right.

~~You couldn't get any scraping action.~~

Tixier ~~Tixier speaking~~. I think so, because in North Africa when end scrapers are burnished , you see, the burnishing begins here and often is covering on the upper face but never on the back face ~~biface~~. And I think that there are some scrapers , some hafted scrapers , in the Wiltonian of South Africa. Thumbnail ~~Some same~~ ones, I think.

Wheat: May I make a comment here? These particular kind of end scrapers are continued over a very long period of time. Byers has them in his Bullbrook stuff and, of course, they go all the way from Clovis on down.

Wormington: Here's another one from Lindenmeier that I brought to show earlier.

Wheat: And one of the characteristic ways of hafting these is to put them in an L-shaped haft. From historic times there are a number of these. They are made out of elk antler and they were hafted in such a way that they have to be pulled back. You couldn't possibly push them forward. They have to be pulled back.

Bordes: All right.

Wormington: Perhaps we might go on to something else. This is some of the Ohio material from the Sawmill site either late Paleo-Indian or very earl Archaic or Transitional. And this is sort of a flat retouch that Don has been concerned with. I brought this as an example of this particular type of very flat thin retouch flake.

Crabtree: The spacing of some of this retouch seems to be quite unique. Instead of using the ridge to guide the flake - other than on this one particular example of this Folsomoid shape - they used a technique of collateral flaking which did not involve using the ridge and, therefore, this allowed the flakes to spread. This shows fine control. Some of these examples show a rhythm of control of removing conchoidal flakes and you can see the tearing and overlapping of the individual flakes as they were removed. They have been spaced alternately between the bulbs on the opposite side to provide strength and also to thin the artifact. On this side, the worker got a hinge fracture so he couldn't possibly continue with this pattern. It shows the different examples of flaking techniques. This type of flaking seems characteristic to this type of material. This very thin one also has the collateral style flaking and you will notice the spacing of the flakes. One flake has been removed here and, in order to retain the strength of the material, he removed a flake on the opposite side which gives a sinuous edge. He apparently changed angles on this one side and directed the force from the tip towards the base. The flakes are not quite directed straight in on one side, but there are two different examples of flaking shown on the one artifact. The others show a certain uniformity of surface flaking with well spaced, well controlled, collateral flakes but still leaving a thickness down the median line apparently for strength. This artifact demonstrates one of the many types of serrations. The force on the

edge was downward from one side and turned around and the same technique used on the other side, on the edge. But the majority appear to have been made by percussion first with very little marginal pressure retouch. But this sort of edging shows the flakes were removed from the base to the tip, on one side of the artifact only. I think I should turn this over to Dr. Bordes now.

Wormington Well, I think that finishes it.

Bordes: Perhaps I will have something to say. Let me look at the tools. Most of this, I think can have been done by percussion; most of the tools here. But I wonder for some of these. This, for instance, I wonder if it is only percussion. It looks to me like a pressure flaking on this one specially.

Crabtree: Well controlled.

Bordes: And this one too. Ya, ya, ya. This tool seems to me to have been made or finished by pressure. But most of the others seems to have been just percussion. Ya, good percussion mainly with this material. This one also could very well be made only by percussion with perhaps some pressure to finish the end. And that with this big denticulation. I think it is rather pressure than percussion. It is too sharp and too hollow even with a very flat pebble it is very difficult to get that without breaking the tips, the points. Well, that is about all I have to say.

Tixier: Do you know, Miss Wormington, that exactly this type of tool does exist in the Eastern coast of the Mediterranean coast of Lebanon. Neolithic. Do you know?

Wormington: It's a type that is very wide spread in time and in space in North America too. I guess that finishes the North American material. I do have a few examples from El Jobo in Venezuela here that we might consider next. This is North American, perhaps we might just look at this. This so called Nebo Hill type and this is identified as a gouge. It is consistently associated with these points, Unfortunately we have no firm dates for them.

Bordes: Pressure. No. Not quite, not quite. Well this tool
B looks at first sight like a Campagnion tranchet but it is not. It's lacking the lateral blow here that would cut here and give a very sharp edge. That is something different technique only to get the same result. And this point is beautiful with this retouched tip very, very pointed. The one who did that was really mean.

Crabtree: This one appears to have been made by percussion and retouched on the ends. Notice how he guided his flake to save losing his tip. Directing the force from the tip to the base with very small flakes for the retouched edge. It appears to be by percussion for it is impossible to remove flakes of this size by pressure.

Bordes: I agree. I agree with Don, no question.

Wormington: Well that finishes the North American material then we can go on to this El Jobo material from Venezuela. These bifacially flaked objects occur in great quantities and a wide range of sizes Many are much larger than this. And these are also very

characteristic with this curved base and this ridge carenate.

Bordes: Well, this one is very strange. It looks like an elongated Mousterian slug but then you could call it a working slug, you know. That is very special and I have never seen anything like it except perhaps in some Campagnion tools but they are much cruder than that. Not so well worked. That's strange.

Wormington: A very characteristic form and I don't know of any other occurances of it outside El Jobo.

Bordes: Like that? Exactly like that slug. But this kind of a tool made on a convex flake can be found in some Campagnion in France. Whatever Campagnion is. Some say it is early Neolithic, others say it is just a facet of Neolithic.

Wormington: Does anyone else know of any New World occurances of this?

Irwin: I think Mueller-Beck has some material like that.

Wormington: From where?

Irwin: I couldn't exactly say from some of the sites that he worked in Columbia. But perhaps Bordes knows more about that.

Bordes: No, I don't know. I don't know.

Crabtree: Dr. Bordes, while you are examining these, would you say that instead of a blade technique being used that a side struck flake technique was used to form that edge? I don't know about function. However, with the abrading from this edge and having a curved outward surface, it

end of Reel 8(2)

would be difficult to determine a functional use for this artifact. It's a very difficult thing to analyze.

Bordes: Certainly this one was not made on a blade, but on a flake. A short flake with a big bulb or perhaps on a terminal flake. I don't know.

Crabtree: Is there any sign of abrasion on the ends? Could it have been hafted like the adz to be used like a pick which would give great strength.

Bordes: Well, there is some trace of use at the point but not very heavy. This side is more crushed but not very much. Strange thing. Yea, that's what I mean for this one. Could be a natural fracture. It could be that they took advantage of the ground fracture terminal fractures of this kind of material.

Wheat: I would like to postulate a potential use for this thing. If this were hafted on a shaft in such a manner that only the tip itself was fastened like this, this would produce a beautiful barbed hook for the taking of large fish or crocodiles, alligators or this sort of thing - something of fairly large, iguanas that might otherwise get off, so that an analysis of the wear pattern of the thing itself might indicate that it was hafted.

Reel 9(1)

Bordes: Something like the curvetron points in the Upper Paleolithic in France. That could well be, for big fishes.

Phil Smith: Marie, you might take a look at some tings which escaped Thompson from Kharga Oasis in Egypt in the so-called Neolithic. They have the inverted arch, concave, beveled flakes which are retouched. Somewhat remininscent of that of El Jobo although not precisely like those.

Wormington: Then this brings us to the El Inga material from Ecuador. This is material sent by Mayer-Oaks and Bell. As I am sure you are aware, the points that are found with this have a shape like a Fellscave Point but are almost invariably fluted. Mayer-Oaks and Bell are reluctant, for some reason, to use the term blade and do not wish to call these blades. And it certainly seems to me that they are blades. I would like comments on this. They have also identified some of these objects as burins, and I think that they would be very interested in your comments as to whether they are burins, and are they blades.

Bordes: There is no question that this is a blade. If that is not a blade, I don't know what a blade is.

Wormington: That's my feeling too.

Bordes: And you have a burin on this rigid blade, which is a preparation. And as for burins I can see at least two beautiful ones. Here is a nice burin on the concave truncation on this side. There is another burin on the convex truncation on the other side of the same tool. A double burin. This one except that it is in obsidian could belong in most of the Upper Paleolithic culture in France. This one also is a nice burin on a concave truncation. And they are all over. No. One is double, the other is single. That is also a burin on a fracture. That's also a type well known here. Let's see. That's just a blade. That is probably a burin spall, no question. I am not sure, but it can well be one, yes. Yes, that's one. Another burin on the concave truncation. This one is not so good, but it could well be. Yes, it is one also, that's a burin of obsidian and of obsidian it is not so easy to make burins. And once again it is not easy to make burins in flint. No, that's just a blade, I think.

Tixier: Looks like Scams cave.

Bordes: That probably is another one. Here is one broken. Broken but that was one double. That's a blade. Let me see. If you put them back again at the same time I take them off, I can do that way for a very long time. That's a bit of blade too. No. No. That's a blade, yes. And that. That's a burin spall. I think. A big burin spall.

Reel 9

Sonneville Bordes: What's this?

Bordes: Could be one, too.

Wormington: The dates are running about

Irwin: There are a variety of dates.

Wormington: Yes.

Irwin: We prefer the date of 6000 B.C.

Bordes: And what of the other dates? Younger?

Phil Smith: Younger. And older, the obsidian dates are older. They are around 11,000.

Bordes: That could be a burin spall. That is just an inverse truncation.

Tixier: Yes, and Senor Frey or Leakey

Bordes: Please don't speak of this man!

Tixier: I speak of Senor Frey and Leakey

Bordes: Next we'll speak of folklore. Yes I would say there are a lot of blades and a lot of burins in here. Would you care to comment. Yes, you are specialist of the Upper Paleolithic after all.

Sonneville Bordes: I am speaking for Cambier. For this little tool he is thinking it is prepared a little like the Noille burins because of this truncation and size.

Tixier: Because of the flatness of the flake only, I think.

Sonneville Bordes: Yes.

Tixier: But there is no notch. Oui.

Sonneville Bordes: Yes, but

Cambier & Tixier: (French) Reel 9

Bordes: There is a lot of burins.

Sonneville Bordes: Yes.

Bordes: This one, this burin spall, is interesting because it shows a lot of preparation of the flake, the blade, before taking off the burin spall. And this has very often been mistaken for a tool. This is not a tool. Just a technical preparation.

preparation of the flake the blade before taking off the burin spall. And this has very often has been mistaken for a tool. This is not a tool. Just a technical preparation.

.....

Because just suppose I take this blade and I want to make a burin on it. Well I made a truncation here. But if I leave this angle here, the burin will not go. I have to retouch, put it straight, like that, and then it is very easy to get the burin spall out and prepare a burin. And it will give you this kind of burin spall with retouch which has been supposed by many people to be special type of tool. But it's just a technical trick.

Sonneville Bordes: This as my husband said, it is just what you can put in the preparation.

Bordes: No question, they are burins.

Sonneville Bordes: It is quite well.

Tixier: It is the first time two such burins are found in the industry?

Wormington: The first that I know of.

Irwin Williams: I think either this afternoon or tomorrow, we will have a chance to look at some burins of quite different types but certainly burins from an industry possibly with the equivalent age in Mexico. Apparently burins of one type or another are very widely spread, but rather spottily distributed in the New World. We get them both with blades and without blades. Sometimes just made on flakes. I wonder if anyone would like to comment on possible methods of producing these kinds of blades.

Crabtree: Some percussion. This is quite typical of producing blades by percussion. You can see the compression and there was almost no preparation. They left them very thick but you still get a great deal of compression. If you'll notice the little undulating lines on these. They appear to be flat on the surface and the cores would probably be quite conical when they had finished. They apparently used fairly thin tabular pieces in order to get the thickness of the blade with these single ridges for there is no regularity of form, more indiscriminate percussion. Yet, for a certain purpose, they did desire, apparently, these thick blades. So they would have to have a quite narrow core in order to produce this particular type of tool.

Irving: I had occasion to look over Mayer-Oaks' surface collection of El Inga at one time. I looked thru a good portion of it, and I didn't see anything that reminded me of a blade core. Many, many burins have a great variety of shapes but nothing that I would call a blade core. Now, I am not sure how that scores with the identification of some of these as blades. Could many of them be, perhaps, burin spalls, or is this getting too technical.

Crabtree: This appears to be a very narrow tabular form of obsidian, and, therefore, the cores would have been utilized. I doubt very much whether a core would be found where one was accomplishing this type of a very thick blade. The one that Dr. Bordes has may be the last of the core. So you would go to the end of the thick tabular flake in order to remove a burin spall to get this thickness. From a cylindrical

or rectangular core, it wouldn't be possible to recognize anything that could be determined as a core to get this type of flake. It must be a fairly thick flake to serve as a core to make a blade of this thickness. So the thick tabular flake would have been utilized to produce these. So it would be hardly identifiable as a core when they had completed and utilized what material they had on hand. That would be my feeling of this type of a blade technique and it is certainly a blade technique that they did use.

Irving: That would seem to explain it. Thank you.

Bordes: There is no question that it is a blade technique. There is a preparation of the side of the core.

Crabtree: Yes.

Bordes: There is no question about it. But now perhaps they went on and on until the core was just finished and then made it into their burins.

Crabtree: Dr. Bordes, there seems to be no regularity of preparation on any of the ends of detaahing these. Just by percussion taking these and following these heavy ridges in order to guide this type and to get the thickness of flakes.

Bordes: It is not a very good blade technique they have, but it is a blade technique all right.

Wormington: This is Mayer-Oaks' surface material. I was reluctant to transport any excavated material. The plane might go down or something.

Sonneville Bordes: (French) Reel 9

Wormington: There are points with the shape of the Fellscave. Could someone get one of the Fellscave casts? But also fluted. And there are, I believe, a variety of side scrapers and, I think, some end scrapers but I have not seen the full assemblage.

Irwin: (French) Reel 9

Bordes: Ya, fishes.

Wormington: (French) Yes, but here these are Fellscave materials. These are unfluted in association with this we have the same shape, but fluted.

Bordes: This one is perhaps, I am not sure.

Wormington: Well, there is basal thinning on the Fellscave material but on the El Inga material there is real fluting.

Bordes: That's cast.

Crabtree: This point here is good for comparison. It demonstrates how, from a stemmed projectile point, the thinning was done on either side. However this shouldn't be confused with the El Inga material because the form is entirely wrong.

Wormington: That is the type of fluting though.

Crabtree: Well you would know better than I because I have never seen this material.

Wormington: Well, I guess that wraps it up.

Bordes: Who is presenting this material? Okay, let him speak and speak clearly.

IRWIN Collection (Hell Gap)

Irwin: The collection that is front of Bordes, Tixier and Crabtree is all from the site of Hell Gap. Earliest date on this site is 9000 B.C. The latest date on the horizon that is represented here is 8000 B.C. There are the later industries. I brought collections, not necessarily representative in terms of statistical counts. This collection is largely aimed around the formation of projectile points. You get in this corner, these are blanks. Now these tools and the collection, in general, is fairly representative of all we term Paleo-Indian, at least in the Plains area of the United States. I think many of the types correspond with those found in Eastern United States with which I am not very familiar. These end scrapers, which are statistically not too numerous, the side scrapers which are numerous. The technology - if I start on this end, you have these large cores and these cores resemble, in some small fashion, Levallois cores. But, if you consider them Levallois cores, they really aren't very classic. They removed large flakes which are also typologically Levallois flakes. I brought one here. There is a little faceting on the butt here. Notice that this platform is ground, before the removal. This is an extremely characteristic aspect of the Paleo-Indian technology. This flake is Levallois, but as I say, the technique, if you want to call it Levallois, is sloppy. The blades, in addition, which occur are not as good as the blades from the Clovis horizon. They also are sloppy, there are some here. And they were probably removed from cores such as this one that I had there. There's another core here. They would, as Don says, simply follow down, with the percussion stroke, down a ridge and they would retouch these blades into side scrapers and retouched blades. Also they like to produce large wide flakes which they could make into side scrapers and things. There are some tools on the end here which are rather interesting and characteristic of only one of the horizons. These, as I said, these horizons are mixed. This goes thru a number of so-called recognized Paleo-Indian groups even Scotts Bluff what used to be called Angostura, Agate Basin, Midland, Hell Gap, a complex called Alberta and the projectile points from these, some of them, are down in this corner. Now more interesting

than the projectile points somewhere are the beginning stages of these projectile points which you can see are up in this corner here. These are blanks from Agate Basin points that were broken in manufacture. Here this great long thing is a blank for an Eden point and it was an ambitous project. I think it belongs to Eden points, and the record is about nine and one-half inches. This would have been eleven if he, well presuming he had gone down maybe only ten, if he had peeled it down a little bit. We found the flakes which have been removed from this and we have been fitting them back together just to get an idea of the technology of it. One thing that is important and a great problem of the American typeologist is distinguishing between things which were cutting implements like knives. I brought two or three pieces which were probably knives, in this corner, and things which are blanks or unfinished points, such as this piece right here. This was probably going to be an Agate Basin point. It's a bad piece of stone; there is a hole in it here. This isn't very good. So, apparently, they just didn't finish it. Here are two of the complete points which would have been made from this form here. Here are other things which are commonly called knives, which were probably preforms. Here is a preform for one of these points here. You can see. Apparently, he broke it before he did the final touch. Again, this illustrates the progression of the technology. Up to this point it was almost all percussion. Some of the work from this point on was pressure. Now this point here is interesting from Don's point of view. This would have been an obliquely flaked point. They normally are. He was trying to turn his flakes here, and he kind of goofed. And he never got them quite around in the right angle. He got started on the wrong pattern and was never able to straighten out and also he broke it mid-stream. Here is an Eden point. This has a diamond shaped cross section. This also was broken in the manufacture. You can see the stage which is prior to the small edge retouch which characterizes most Eden points. Some of these things.

Bordes: That's quite normal. There, it has been heated.

Irwin: The scrapers are interesting because you have these generally rather short scrapers. They are also characteristic of everything from Lindenmeier down. You have the kind with a corner on it which is not quite one of these little spurs, but it ranges from something with no spurs, to something with distinct spurs which is probably functional. I am not quite sure about this particular one. There is one over here with a little spur. Often inside the little spur, although not in this one, you will have a little flaking where they apparently did some of the work on the plain face. And quite frequently you get a little notch lower down in the scraper. This tool here is also characteristic of Paleo-Indian. Apparently both East and West. Coe had one of these things. Quite frequently you not only get the single notch in here you get a double notch which make it like a strangled blade and frequently this is broken giving some of the people the mistaken idea of a drill. In fact, it really isn't. These little things here are so called graving tips. I think

that if Byers has any of the Bullbrook stuff here, he will find that the distance between these two little points is rather similar. I don't know precisely why it is true, also of Lindenmeier measuring the distance between these points. They seem to always run about the same length or the same width. I don't know why. Here is another so-called knife. You can see that it is nicely finished, it is not a blank for a point or anything. Here is a rather large end scraper. Large end scrapers are fairly rare in Paleo-Indian, although apparently not in the East. At least in the West they are fairly rare. Over here are the retouched blades and these things, which I think I showed earlier. I don't know what they really are. They are finished tools, they are not blanks. They are not material that they bring back from the quarry. Some show use and edge retouch. I guess that is a good summary, unless you have further questions. I can, if anyone wants to know, point out the exact type of each one of these points later on that might be of interest. Oh, notice this burin on this projectile point. I think that there are two possibilities, one is impact and quite frequently you get an impact fracture. I have not made an experiment, largely because I have neverhad enough points to do this, although I've used some Archaic things to drive into the wall to see what kind of fracture you get. But this one, I think, was actually pounded on the top and this burin was caused by this pounding, for as you see this was quite a bit of pressure on the edge. Maybe this is something similar to the Piece Esquiellee that Doug Byers has. But it's not yet. I that that pretty well summarizes the general collection. There are a couple of cores; these cores are typical. Some of the cores appear in larger quantities. One problem with Paleo-Indian sites, and this includes the Lindemmeier site, is that most of the work was done at the quarry which is often some distance from the site. We do not get very large cores in the quarry. You can see. In the site itself, the quarries which we have been trying to investigate, which are a little hard to investigate, are quite numerous and, I think, this is true of Lindenmeier. So we don't know really what most of the larger cores look like. You want to say something?

Bordes: Oh, well, I can try to say something. Well, that's a beautiful array of material you have here. With a lot of different kinds of points. I won't try to remember all the names. I can't. That is out of my horizon. But things which are interesting. This is a scraper of some kind and these big things. About that - you want to know what they are. Well, they can be tools by themselves. Kind of knives or Laurel Leaf. In France, we call them Laurel Leaf. But you know really, how you say, this is just unfinished stuff. Even if it was, it could have been used like that. I would rather say that this was the first stage of that. And that the definitive point should have been about this width and this length. So it could well be that this is derived from that. That being the first stage. Then this one was a largeone which is broken but also probably once finished would have been much smaller.

Irwin Williams: This material of ours from Hell Gap, we do get occasional piecesof this kind which have been finely retouched at the

edge. To presumably make a cutting edge which is why Henry thought they might be knives.

Irwin: Well, if you look at the edge here, there is quite a bit of retouch.

Bordes: That is not retouch. No, no, no. What do you mean? That is just some kind of roughing of the edge before striking new blows. That is not really some special retouch.

Irwin Williams: We do get, however, some rather large relatively well-finished points.

Bordes: I won't say they are not bigger or Laurel Leaf shape, but knives that is quite possible. But I speak of this one. This one strikes me as a stage in percussion of smaller things like that. And then the blades, oh well, they are blades, not very good. And they were always struck, as you say, from this kind of flat blade core which is more like the Levallois blade core than the Upper Paleolithic blade core but can give you perfectly good blades sometimes as long as that. And then your flakes here. Some are Levallois-like. Not very good Levallois, but they are. Oh, this one was burnt. That 's a typical fracture of heating. That is quite typical.

Tixier: Not heat treating but overheated.

Bordes: They tried to treat it andburnt it - it has happened. Yes, that's a nice side scraper. That's a nice flake from making and mixing like that. No question. Typical with this.

Irwin: Ground edge.

Bordes:= No, no. Not so much ground as this lip.

Irwin: Yes, it is prepared but also notice that this platform has been exposed.

Bordes: Oh, exposed! I am not sure. It can be exposed just like that. With some blows with something. That you could find in the Solutrean. I don't think there is anything very special about it. Lots of side scrapers. Nice ones, beautiful ones. Yea, this also. That's a kind of bifacial side scraper, perhaps. That is also nice.

end of Reel 10(1)
start Reel 12(1)

Irwin: That's rare.

Bordes: No, no, no.

Irwin: There is one maybe.

Bordes: No, no. Not here. It doesn't matter.

Irwin: It's rare, anyway.

Bordes: Could be. Side scraper on a blade, a retouched blade, as you like it. Not this one, but you have seen it. Ya, this is an end scraper on the notching. It's a kind of

composite scraper with convex and concave. Always small multiple borers like in the Lower Magdalenean. This one has a spine. That's one of these crazy ~~things~~ points.

Irwin: Dr. Bordes, look at this, called the cutting edge. This causes a lot of confusion. This has the same shape and generally calssified both as knives. This is probably an unfinished point, and this a cutting tool.

Bordes: Ya, ya, but you want to be optimistic and I wantedto make a point, you know.

Irwin: Sometimes we are stupid.

Bordes: Americans are all too optimistic. This one, you know, is a funny thing. It looks very much like La Quina bifacial scraper, small ones which are leaf-shaped with this big flat flake on one side. Of course, here there is some pressure retouch, that you would not find in a Quina scraper, but from this side it could very well come either from some La Quina culture or some Blatspetzen culture in Germany or from early Mousterian in Combe-Grenal.

Wormingtpn: Some are Hungarian material.

Bordes: Hungarian - not quite. Not quite. It's more, you know, like the Solutrean or most of thosethings - symmetrical. But this is not quite symmetrical. One side is just thin so you can hold it but there is no try to make it regular shape. That is only one edge which interested them. That's beautiful. A scraper with - not a knife, it is not cutting on the other edge, but it's rather abrupt retouch. What else. Oh, yes. You see it seems that the Americans were already infected with massproduction. They have a lot of blanks and blanks and blinkety blanks. That's a thing which does not happen in France either in the Solutrean. They either finished a tool or they broke it and threw it away. But very, very seldom we find blanks. That is half-finished tools.

Irwin: These are mostly broken, let me point qut.

Bordes: This one is broken, yes.

Irwin: We simply found both pieces.

Bordes: Yes, they are broken pieces.

Irwin: You can see, for instance, on this one they got to the stage where they hit this imperfection.

Bordes: No, but what I mean is that I have read in American publications that very often, in the earth, you find a cache of blanks and so on that, to my knowledge, has never been found in France that we know of.

Jelínek: I think it probably reflects a difference in social situation of the tribe.

Bordes: Could well be.

Irving: A concentration of wealth.

Bordes: You know there are two interesting differences. There is this blank business and there is your quarries different from camping site. In France, I don't know, I never have seen something that would qualify as a quarry site distant from an occupation site. And that's one of the big differences, I think, between the European and the American Paleolithic.

Irwin: They quite often are quite distinct. At the quarry site locally, for instance, you can turn over several hundred thousand flakes and never find a finished tool. If it is a finished tool it often is a very late finished tool from Teepee ~~Tepee~~ period Indians.

Bordes: Yea, but that is not the case with us. Well, that is about all I have to say for now. Probably, when Crabtree will have pointed out which to him is obvious perhaps I will say well, I agree, I agree, I agree.

Crabtree: This material certainly shows a wide array of manufacturing techniques. It starts in with the core with several different techniques in blade detachment and there are three different platform preparations here. Notice the very small platform at the top. It is not as large as a grain of wheat, yet they removed a flake of this size which shows a great deal of control and preparation to remove this much material. This shows another side of the edge. And we have these quartz flakes. These two quartz flakes show a polishing of the edge, but these three show a crushing of the flat platform and then here again they get away from the crushing. Here we have side struck flakes and we have the trimming flakes, as Dr. Bordes indicated. Here is one that is a little unique. Apparently they turned the flake up on one edge and they have utilized the ridge in order to give it this conformity and this seems to be not too uncommon. This flake has been left with a wide distal end apparently because they did not want a narrow portion in the center. But it makes a very ideal scraper having this edge which has been slightly retouched. Their thinning techniques are

very superb; their control of thinning where they took advantage of the step and the hinge fracture. This one shows a nice step fracture terminating it in the center by using the core tool method to do this remarkable thinning to bring the flakes in from the side to meet in the center. Starting to get a very thin blade like the Solutrean ~~sort of thing~~ Type and coming in on this side to meet in the center. This one is an example like the one I was trying to find this morning, but we couldn't find it - with beautiful Solutrean shoulder point techniques. This is a very typical technique used by Solutrean, however, their flaking was a little more direct without as much of the angle but the spacing seems to be same as the one Dr. Tixier showed me this morning. I'll go a little fast so that we can utilize our time well. They seem to be collateral flakes like Cynthia, Henry, and I were discussing of this type of spacing, using a complete flake rather than following ridges and yet keeping wonderful control on the edge. This one had apparently been retouched as a knife, particularly on the one side, all from one side to give it a cutting plane like this and then redulled again so we have lost a lot of the character of the edge, and it looks like a reutilized biface, or knife, or something like that. Evidence of heat treatment in this particular one. These are quite characteristic of the Lindenmeier site. The quartzites and the variety of materials show quite a range in diversification of utilization of materials. The flaking characteristics are very much the same. With the quartzite the flake characteristics are hardly identifiable because of the texture of the quartzite, the flakes lose many of their characteristic features, while they are fairly obvious in flint. You'll notice the sharp deep indentations all the way thru in most of the examples. This is because of the way they have set their tools - to get a deep enough flake so that they can pop in off and the flakes will feather out. Almost no hinge fractures in any of these particular pieces. This one is a superb example of this type of flaking, but by the nature of the material, there is almost no detail shown. It looks almost like it was ground and polished Turn it edge wise on the light and you still have this same character but a longer narrower flake. But they still don't appear to be a parallel flake type. They have very little slant. They are directed inward, towards the center. This specimen I didn't see earlier - tha one Henry said was broken in making. In spite of being broken the control of the quartzite is very wonderful. This quartzite shows a little different preparation. This side shows basal polishing of this edge, but the well defined bulbs ~~of this~~ show the last row of flakes that were detached. These flakes have a slight slant to prevent breaking the tip of the point. The flakes slanted toward the base. Point characteristics are not too obvious on this side, removal of flakes was backwards and inwards away from the tip on this particular point. The rest, I guess these are some of the Alberta style. These two at the top have little diagnostic value other than this one which was apparently shot, whether they missed somebody and hit a rock, I don't know, but it is evidently a projectile point. I'll turn it over to somebody else, I think. That's all I can say on the flint working other than it is beautiful array of many different types represented in this collection.

REEL 9

Wormington: What about this one?

Crabtree: It appears to be a percussion preform made from a tabular piece of stone instead of being made from a single blade. It s done by the core method from a tabular form of material and it is most certainly a preform, or it hasn't been refined. But the spacing and the regularity of the flakes indicates it is a preform. Note the spacing of these very wide inward flakes, and instead of using the ridge, each one is a separate flake and there is no utilizing of the ridge for a parallel flake. It might be interesting to note that the parallel flaking technique would have flakes with straight sides. These have rounded sides or, what would you say, a convexity.

Cynthia Irwin Williams: I wonder if you would like to comment just from a purely technological point of view, how do you think for the first thing, those blades would have been produced? By what techniques?

Bordes: That is not very easy to do. As Crabtree pointed out there seems to have been several different techniques, but you know the experiments I have just made these days show me that it is very difficult sometime to make a distinction between one technique and the other. For instance, this I would say would be rather with a wood billet than something else.

Irwin: Before this congress.

Bordes: But this morning I took off a beautiful blade with a punch technique. And I got exactly that. So

Could it be punch technique?

Bordes: Could be. One thing is definite; it is not stone struck.

Phil Smith: Right.

Bordes: That is a different thing. That is not stone struck.

Irwin: We comment on that as we find no hammerstones.

Never on an anvil.?

Bordes: no

Irwin: Anvils might be. no none of these are on anvils.

Bordes: I will tell you something, even in the cultures in France where we know a lot of stone struck stuff, very seldom we found the stone hammers.

FIND

Krwin: Yea, well I think we would have to examine the flakes plus the hammerstones.

Bordes: Very probably when the hammerstone broke or was just too worn out, they just throw it away like Mousterian or let us say Folsom.

Irwin: I might add, speaking of primitive psychology, from the gentleman who was trying this large biden point here, broke it, we found the flakes which fitted on it and he didn't throw it very far, so it indicated that he didn't feel in too bad a temper about having it break.

Bordes: How much far away was it?

Irwin: Oh, about six feet.

Bordes: Six feet - that 's always something you know. It could be related to the stone. It did not just fall. To hell with it, To Hell Gap with it.

Irwin Williams: That's whereit went.

Crabtree: Cynthia, I have been trying to replicate the character of Hell Gap but I'm missing it. I am getting closer, but it is still not characteristic of Hell Gap. The difference is in the wide flakes. Mine are a little narrower, but I am producing these deep bulbs in spacing so that I leave the little triangular portions at the top by spacing the flakes wider. I notice that with the Hell gap material sometimes the worker removed these little triangular portions and sometimes he didn't. Then they would alternate the flakes by removing the heavy side on the opposite side of the previous flake soar, but unless you have a model, it is hard to remember the exact detail of the edge character.

Bordes: How did you do it, Don?

Crabtree: Just with pressure, but I give it a thick bite with the tool so it pops fast so the flake will carry on through and feather out.

Bordes: Just pressure! Did it work right?

Crabtree: Yes. But it is a change in techniques for me. I had been working on bending flakes so I ruined everything for awhile by bending all flakes when I didn't want them to bend. It's very difficult to change from one technique to the other.

Bordes: It's already difficult to make one technique. Well, about this burin, you know. I don't think it is a natural break. I think that a projectile was broken and they tried or did a kind of burin blow there. Was it to make a burin or was it just because they wanted to take a small lamelle or something like that, I don't know. Technically, it can be called a burin. If it is only one in the whole culture - well.

Irwin: There are no burins except there are a minor tenth of one percent of burins on breaks which are probably accidental.

Bordes: Ah, you never can tell.

Epstein: To move it along here I think the result of at least this conversation you have taken all bifaces and broken them down into two catagories, and you are destroying American archaeology. They are either blanks, or they are finished products. I'm very much concerned as to how you can make this judgement so surely.

Irwin: If you are making a biface, it's either a blank or a finished product eventually or somewhere in between. Either it begins or it finishes.

Epstein: I wonder. I'm very much concerned about why I think, as Dr. Bordes would say this is probably a blank. In other words, there seems to be something going on over here as to a certain kind of judgement. As I understand it right now it seems to me that if it doesn't have fine pressure flaking, it is a blank.

Irwin: No.

Epstein: I ask for clarification on this.

Bordes: The thing is, it is not that the thing for which I think this seems unfinished is that first it looks unfinished. Nothing would be easier to get a straight edge here. Very easy. No trouble. It takes about two minutes and then on the other hand, you know, if there was only this, but you have things like this one which is much more - well, that is about all I get when I am making a Laurel Leaf and somebody disturbs me before I am finished and I put it somewhere to pick it up when I have time. That's about the shape it was and the size, and the weight is down, the amount of finishing of the edge and so on. Well, perhaps, after all, these blanks were finished as tools; I don't know. But when we call things scrapers after all we don't know if they weredoing any scraping. They were, perhaps, cutting, who can tell. Till some time machine is invented, we must try to study the thing by classifying them as well as we can and giving them names.

End of Reel 9(1)

Epstein: We have to give them functional names, Dr. Bordes.

Bordes: Oh, well, functional - No, God damn it - it doesn't matter. Call it a scraper, call it burin, call it Goldwater, it doesn't matter. You know when I speak of scraper, I have not in my head the idea of scraping, I have the idea of a flake with a retouched edge, you know. Let us see. Well, it so happens that you can scrape with it. But perhaps, after all, it was just made as a ceremonial knife for the presidential election for cutting that and it was both Democratic and Republican. I know that it is not the tendancy of the type of typeology that you are trying out, and I know it is easier to get into the life of political men ~~mean~~. I know it, for I know Science Fiction.

Epstein: I still am not satisfied. I do not feel that you have given me an answer here as to why I should think that this is just an intermediate step to something else as opposed to the finished product. Is there a ground projection, or is it just purely the sort of thing that I know deep down inside that this is not finished.

Reel 9(2)

REEL 9

Epstein: [illegible] just an intermediate step to something else as opposed to the finished product. Is there a ground projection, or is it just purely the sort of thing that I know deep down inside that this is not finished.

Bordes: No, that is not right. That is the state in which I leave something when I don't want to finish it now. That's all. That is the only reason I have, but it is at least another reason. On the other hand, you say to me that's a finished thing. Perhaps you are right, but give me your reasons.

Crabtree: May I help a little on this? I don't know if I can or not. But maybe, Gerry, instead of cutting sharp and fine lines between whether it shows pressure retouch or is a finished percussion tool, we should consider that, generally, a preform is roughly percussioned to the shape the worker wanted the finished artifact to be. This work could be done at the quarry to save transporting a lot of material to the campsite or workshop for final finishing. The design of a preform also shows that it is adaptable for further thinning and completion. Sometimes you can see, perhaps, some functional use on the edge or indications of a little retouching. This can help to decide if it is a preform or an actual tool. Like Dr. Bordes said, with a few blows, one could straighten this out, therefore, it appears to be incomplete. They, possibly, were in a hurry to bring in their material in this form and later on to finish it. Maybe this will help determine if it was a preform, or just very crude, roughed out blanks. Some are a little more finely finished at the quarry, so there is a slight variation in preforms, unless there are indications that perhaps did show function. Could be they used their preform for some purpose to show these scars.

Epstein: Fine. Now what I am concerned about here is that some of us may rush back here and start calling all bifaces, that aren't strictly on this level - blanks or preforms. Suppose then, we talk of these as thin oval bifaces with this kind of flaking on it. This kind of thinning flaking. Long pointed bifaces with this kind of flaking on it, and specify the flaking quite specifically.

Crabtree: Before one does that, Gerry, it would be well to very carefully check the edges to see whether this could be a digging tool. There is no purpose for a pressure retouch on a preform, and, certainly, we cannot call all pieces that don't have pressure retouch - preforms. There is quite a wide difference between the percussion technique for a preform and the percussion technique used to finish a tool. It may be finished as far as it will be finished by percussion and be a completed tool. Let's not use pressure retouching as a diagnostic trait to determine the difference between a preform and a tool. It may even have a functional retouch from rubbing one way or the other which would indicate the manner in which it was used. Close examination of a preform roughed out by percussion will show that it was left at a stage of final finishing by either pressure or percussion. Thin, oval bifaces usually are not designed for, and will not

permit, further thinning - only edge retouch for sharpening. One really needs an assemblage before final analysis may be made. I'm not saying this well.

Irwin: One other aspect of this problem is - I mean you excavate these sites where people have been fabricating these objects, and you quite often find both halves of an unfinished object whereas a projectile point - notice here that we have all bases - well, that's because they lost the tip while hunting. They took the shaft back and made another one. But with these blanks, they were in the midst of the fabrication and this is true of this point which you notice is not edge ground because it was not finished. It was broken before they finished it. Almost invariably a point that is finished is edge ground - this seemed to be one of the Paleo-Indian characteristics. This point also, which is not finished, is not edge ground.

Irwin Williams: In the same line, it may be interesting to note that among the workshop materials that we do get from Hellgap, we do find these rude fine-grained stones, very much like that grooved piece that Don had, for grinding the edges of projectile points or for grinding the platforms for further work.

Byers: May I take a piece of this. This large piece that Gerry was talking about particularly, as to whether this was finished or whether it isn't. There are enough ethnographic specimens that have been found with wrapping around them to make that a perfectly good semi-lunar cutting knife, which is widespread thru the New World with an edge no straighter than that, but very jagged because it had been chipped. And as far as this is concerned, we have a piece from Teotihuacan that isn't finished as well as that, but it is already hafted - has a handle. Looks like something that no one would pick up.

Bordes: Yes, that can well be, you know. That can well be. But, on the other hand, you know, you always have lazy people who did with what they had until the end rather than to work. It's as simple as that.

Byers: This is simply American informality.

Bordes: I really don't think so, you know. I don't think so. When you see the lots of pains it took these people when they really wanted to finish something. For instance - where is it? This and others and the bit of laurel leaf; this, this, and this, there is no question that it is finished. But this strikes me as something which is not quite finished - with, oh, about five minutes more of work and that's all.

Irwin: Well.

Bordes: You can cut with that. Of course you can cut with that. You can cut with almost anything. We can cut also with a crude flake without any retouching. You can haft also. Have you seen some of the things which have been hafted by people in the Pacific - Australians and so on. Any flake. But, anywhere, it is a flake.

REEL 9

Irwin: Well, one thing you get in this, is if you can find all of the production stages - that is, if you can go from this blank, so called, or from a bigger one you can go from something like this to something like this and to something that gets a little more finished like this - and to the final point. You'll notice the form is kept reasonably similar. With these things, I don't know.

Bordes: Well, you can -

Irwin: The thing is that these are - just to confuse the issue a little more - specific of one horizon which, unfortunately, does not include any of these. So, maybe they kept on sharpening these and chipping them until they became something like this. Maybe they started using this -

Bordes: No. I won't say that this is a preform for that. I will say that this could be a preform for that, which is a quite different shape.

Irwin: So we don't know. We would have to find one hafted, I think, to tell. But with something like this, there is no question, Gerry, that that isn't a tool.

Bordes: Yes, ~~I think~~ so. Except, do you really think that putting this as a long bifacial tool, with such and such type of scars and so on, will give you more information than to say no, he didn't finish the point.

I have another thing to ask Gerry.

Epstein: No. Yes, I do.

Bordes: I don't. I don't.

Epstein: No. What I am very much concerned about here is that - here Dr., I mean Mr. Crabtree - we'll have you elevated to Doctor status before the meeting is over.

Crabtree: Drop that point.

Epstein: Crabtree has certainly shown that we can get a tremendous amount of information out of this material by studying it extremely carefully. Much more carefully than we have ever done before.

Bordes: That's another thing.

Epstein: All right, but I think there should be one case here to distinguish between a judgement and a fact. And, when we call this a blank, and when you call any of these things blanks, you are making a kind of judgement which I think is very dangerous. And I would like here, at least, to say you scare the daylights out of me.

Bordes: Well, I want to say something about archaeologists passing judgement. After all, this passing of judgement is not archaeologists - it is catalogue. And I have seen too many dumb, bloody articles which are just

catalogues. So many points of such lengths and such matter and so on and so forth that go on and on and, in the end, you know what - nothing.

Irwin Williams: You call them laundry lists.

Jelinek: I would like to say something.

Bordes: Yes, go on. Shh'

Jelinek: Hello! What I would like to say is that I think part of this problem concerns the fact that you have done considerably more analysis with stone material over here; your typeology is worked out more clearly over here, and, in America, we are just beginning this kind of analysis. And I think that Epstein's emphasis on a more descriptive terminology reflects the fact that we need more description in looking at this material and keeping track of it at this particular stage of analysis in America. And later on, we are going to be able to work out a terminology that would help.

Bordes: I understand this quite well. I wouldn't say that what Epstein's saying is wrong, you know. But I would say that first when you speak of this tool in your first report, or in your general report, you say one Eden point. And then when you get into the technology of the making of the points at one particular site, you can go to any measurements and consideration of which facet if you like. That's something else. But I don't say we have something to win if each time you have to mention this point - you have to say, in your report, a bifacial tool much more longer than it is wide with such and such type of flaking, you know. That would be a convention.

Jelinek: I think that, initially, if you are describing an Eden site, that you need the measurements and statistics on each of these things and, once several of these sites can be analyzed, then we can go ahead and say, after that, well, we know now from our previous analysis, that this thing is probably an unfinished Eden point.

Bordes: Ya, Ya, ya.

Jelinek: The more material we get, we can do it.

Bordes: All right. You are right up to a point. And you are certainly right up to a point. But, on the other point, I am very much afraid that this will lead to some kind of work I have seen done this Summer in a certain shelter not very far from here with about 20 measurements to show that this was longer than it was wide. That's very dangerous up to a point, you know.

Jelinek: We don't have that much time.

Irwin: The point is that - that it is longer than it is wide, of course.

REEL 9

Irwin Williams: I wonder if either one of you would like to comment on the possibilities of some of these points being made on flakes rather than by reducing a bifa core technique or by reducing very large thick flakes. There are some that we find of which this Agate Basin is not a terribly good example - unfinished ones which do show fragments of striking platforms.

Irwin: I don't know about that one.

Bordes: I'm not quite sure.

Irwin Williams: This is not a particularly good one.

Bordes: It could be. It could be.

Irwin: Yes, you do get this certainly with Lindenmeier. We don't have enough to tell. In general, this end of the Paleo-Indian horizon was done from core, but, with Lindenmeier - and if Bordes sees the Lindenmeier collection and Don sees it - you will see that quite frequently you have the Folsom points made on a large flake - somewhat larger than that, actually, and there will be the bulbs of percussion - quite often ground, like this. And then, in addition, they put a little more grinding on it apparently for that support. The one example that Marie brought doesn't show that because it is a little bit later on in the thing. And, of course, then often they would break it. The Lindenmeier collection has a number of these. That's one of the differences in Folsom and this stuff.

Crabtree: This one is certainly suggestive of that sort of thing.

Tixier: I think here we can see bits of biface.

Bordes: Ya, I think so, I think so, yes.

Crabtree: Here is the natural face of the proximal end of the flake. That is good observation, Cynthia, that that is the flake and this could be from a flake and with a very flat platform and is quite unusual with this facet of the original portion of the natural surface.

Irwin Williams: This one, I might add, an unfinished point in mint condition without the grinding on the face.

Irwin: No grinding.

Irwin Williams: And it was found along with a couple of other unfinished points in a workshop area.

Bordes: I will tell - that in the Solutrean, anyway, many of the laurel leaves are made on big flakes because it is rather wasteful to begin on the core to make a laurel leaf and you have a lot of more work, but sometime when you find - how do you call it - slabs of material, then it is all right,

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You can go from a core like this one for instance, directly from a core technique, but to really make such a fine thing - taking a big lump of thing like that - it is a waste of time and work. And it is less easy.

Tixier: It's more easy on a flake.

Bordes: Right, it's more easy on a flake. This one could also be.

Tixier: Could be. Looks like made on a big flake. A symmetrical cross-section.

Bordes: I wonder. I wonder if this is not a little part of the original ~~face~~ surface.

Tixier: On the big flake there is no little waves like in the retouch pressure or retouched by percussion.

Bordes: Of course, you can start from this one on the very big flake, like we had before. I could make some kind of thing like that on one of the big flakes I have - I made.

Irwin: The material outcrops locally in tremendously large nodules, ~~10~~ ten to ~~15~~ fifteen times as large as the flint nodules as you have been working.

Bordes: Ah, yea.

Irwin: This was mined. They had a technological mining procedure. They were able to go after the beds of this type of chert.

Bordes: No question. They made big flakes first.

Crabtree: I wonder whether Cynthia perhaps meant with this one whether this was a blade technique, a small blade technique rather than a flake because there is no way that you can tell with a big tabular piece of stone.

Irwin Williams: Well, no I ~~did~~ didn't mean a flake as much as a blade but this is possible.

Irwin: You could get a point like that out of this blade.

Bordes: Ya, if the material was better.

Irwin: If it was a little better stuff.

Irwin Williams: The point is that we do have somewhat better examples that do look very much like blades. We do have points of this kind. In fact the other point found with the same one made apparently on a blade with one flat face, quite ~~[illegible]~~ more retouched.

Bordes: By Jove, that's not a typical scraper. Is that what they call a typical scraper?

Irwin: Would you not call that a little more of a little truncation on that.

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Bordes: Ah, no, that's not a truncation.

Irwin: Not steep enough.

Bordes: Not steep enough.

Irwin: I might add to point out one other thing that is interesting about this. You saw some artifacts of this material in the stuff Marie Wormington showed you. This is primitive treated at best apparently it occurs in North Dakota. I haven't been able to find the other location of it.

Bordes: But I have seen such material in Old World too. Same kind exactly.

Irwin: Ya, there may be more than one locality in America I don't know. I presume there are more.

Bordes: I mean in Europe ~~they~~ we have seen things like that same material.

Irwin: This particular batch comes from North Dakota, it occurs in Alberta, it occurs here, and it occurs down as far as Clovis, isn't there two or three places in Clovis?

Irwin Williams: Yes, there is.

Irwin: And they traded quite widely for it. It's interesting to notice that when we get artifacts of this material we rarely get blades. We have small sections or refinished tools.

Irwin Williams: We have perhaps seven or eight flakes of the same material but almost the same number of finished artifacts. Apparently was a desirable relatively widely traded material.

Bordes: That's also an end scraper. That's interesting. That's a scraper, all right. Retouch blade. Oh, yes.... Oh, yes, that is sloppy ~~working~~ work.

Irwin: Don, do you want to say anything more about heat treatment? for instance on this piece.

Crabtree: That one is the most obvious. It shows the original facet of this side prior to heat treatment. Others possibly indicate they were exposed near the surface which changed the color. It's quite obvious that that one was changed. Some of the finished ones are very indicative of treatment but, without the original surface for comparison - one cannot be sure. Unless you can find some of the original facets, it is hard to tell.

Irwin: Find out if we can see something.

~~Bordes~~ Irwin Williams: One of the factors ~~mitigating~~ mitigating against this is the fact that there is a very good quality of flint or chert available locally and there really wasn't the necessity for heat treating.

Irwin: This is some of the stuff then thatwas brough from up State.

Bordes: Very good. That's not bad at all. Not bad. Well, how many other collections have you to look at? You again.

Sonneville Bordes: But of course, me again.

Bordes: Okay..

Wormington: This is some of the Western material.

Bordes: Okay, all right. We have a limited time.

Wormington: Joe has some Folsom material from New Mexico.

Bordes: Okay, we have a limited time up here.

WHEAT Collection (Vanhorn)

Wheat: The material here is from three different sites. The earliest of which is the Folsom site near Vanhorn, Texas, and the Big Bend area. Actually, the site itself is a multi-performance site. All the material, so far, is from the surface, but there are several occupations of this from the Folsom site on up thru varieties of parallel-sided projectile points and so forth into an Archaic horizon and finally up into a late pottery horizon. From this site, I want to make a point of this, because from this site we have about three hundred of the little snub-nosed end scrapers and, normally, anywhere in the Plains one will say that these could be any age. At this particular site, I have pretty good reason to believe that they are all concerned with the Folsom horizon because I have something close to fifteen to eighteen thousand specimens from this area and I have no snub-nosed scrapers from any other site, anywhere in the area, until we get to this Folsom site. I won't say I have none, I have two actually from other sites. So these snub-nosed scrapers almost certainly belong to the Folsom horizon. Now the Folsom material, most of which I have brought here, I have selected out of a total collection because many of the pieces show the evidences of manufacture. There are a number of the pieces which were going from the stage which Marie showed this morning thru various steps of fluting. Many of them were actually broken in fluting. And I also have one or two odd-ball pieces which look like something they were practicing on - learning how to flute a point. As you can see, the original side ofthis has no particular significance but there is, neverthe less, a good form and a flute started. These are channel flakes and a number of small, what we would call, gravers there. But they are obviously little drills and so forth. Burin flake - this could belong to any horizon. Possible burin but not a very good one, if it is. And these projectile points - most of them are later in time. Notice that there is one here which

[illegible] has a burin on it. Yes, right here. Now this is an Archaic period point. Some of the others have been battered around. Shall we take this first and then, well I should mention this material down here. These cores and other bits of blades and so forth here, most of these are from the same site as the Folsom site or close to it. At least they are representative of the same type of material, hammerstone type of thing, which shows a secondary usage of a core and the double-ended scraper or side-scraper and some flakes and so on. These are all typical of the Vanhorn area and apparently are also typical of the Folsom horizon. This, of course, can only be finally established thru excavations there. So I'll turn it over now and then we can come back to these sites later on.

Crabtree: Dr. Wheat, which was the example that you would like to take first in this first group?

Joe Ben Wheat: The Folsom points and the ones which were broken in construction. Most of these down here.

Crabtree: This first one that I picked up is particularly interesting. We are just preparing to do fluting; one side by pressure and one side by percussion, with Dr. Bordes doing the percussion. I have a similar example on the shelf over there, it is the same sort of a preparation to support between the tip and the base as the flake is detached. And so he didn't bother to change the platform preparation from one side to the opposite side in order to remove a flute from this side. It's difficult to tell the type of breakage here between the base and the tip but, no doubt, there was a bit of flexing of the fluting flake and, therefore, the artifact broke. These basal portions do not appear to have been broken in manufacture but were apparently broken in the field.

Joe Ben Wheat: Yes.

Crabtree: However, there are several here that do indicate that they were broken in manufacture by the hinging off of the channel flake and this particular flake indicates it hinged off at the end of the fluting flake. This has been a problem of mine for years-to stop end snipping, and I find one must use a particular type of tip support to prevent this break. Several of these stubby small ones in these three groups show the fluting was done first without shearing the ends and then the retouching done afterwards showing a very distinctive overlap of retouch on the channel. The fluting removed the tip first, but it was then retouched to rejuvenate the point. Undoubtedly it was originally much longer. You can see the intersecting scars between the tip and the channel scar where the retouching was done on these short [illegible] Folsoms. This broken point is peculiar. No doubt it was broken by being stepped on. After it was broken it was reworked. There is no scar evidence on the edge of this side showing, in this particular case, that this Folsom was made on a blade. Whether this is characteristic with the whole group, I don't

know. This one from the flake scars of the outside surface, shows the flake was reutilized as some sort of a scraper certainly it was not intended to remove another flute. But, they had thinned this maybe for sharpening. It's a little unique, this sort of a thing. But it shows some sort of a reutilization of these tiny points similar to other specimens we saw. The direction of the functional scars show how the tool was used. As Dr. Tixier and Dr. Bordes will observe, all flakes scars are from one direction. A good example of a reutilization of a broken Folsom projectile point. This one shows a peculiar break. This side shows the flute splitting the platform because of a crushing of a cone. It apparently was fluted on one side and broken when fluting on the second side. But, this sharp edge may even indicate a sort of a burin break on his square ended piece. [illegible] quite obvious. We get this typical sort of a break from the collapsing of the platform. However, the fluting looks like it was successful, but the channel flake split. This one was not successful; it came off the edge as the second flute was removed and it collapsed either from being held and gripped too tightly due to the extreme thinness of this particular point. We can move on to these others. One cannot be sure of the preparation but it shows the general method is polishing the platform to give it sufficient strength to support the tool and the necessary forces to detach the flute. Unhappily, most of the specimens are the center sections of the channel flakes, which are not as diagnostic as the proximal ends. This shows a wide range of material was used. This one appears to be polished on the basal platform to withstand the pressure. There is a difference between grinding and polishing. Grinding lets the flake dislodge more easily while polishing gives the platform more edge strength to withstand the force needed to remove the flake. The base of a core that is ground has a much weaker surface then when it is polished. So there is quite a pronounced difference in a flake that is polished and one that is ground and abraided in order to free the flake. Grinding and polishing is usually done on a flat top surface. The grinding shows the platform of this flake while this one is rounded and polished. The difference between the two is apparent. With the cores I don't polish the platforms, but I do grind them. Apparently, almost a complete utilization of the core here, Dr. Bordes. I don't know whether there is anything distinctive left in the core. The flakes may show some character on that side. This appears to be a big side struck flake. A collateral flake with a hinge fracture at the distal end. It had to be struck from the side to produce this distinctive type of flake which is very adaptable for a big scraper. Not a Levallois ~~Levaccion~~ type of flake but the basal portion has a similar thickness that is comparable and shows a slight retouching of the platform. Yes, with a flat surface and a conical core.

Bordes: If it is a core, I am not so sure.

Joe Ben Wheat: We also get pulping planes in that area which look superficially like this and you have to examine the bottom to see where the wear on the surfaces are.

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Crabtree: Oh, Yes. I see. With this array all I can do is oh and ah. I have never seen anything as exquisite as this particular piece. It appears to have almost been ground out, but there is no mechanical way to produce this beauty. We know that it was preformed in several stages and probably several techniques were used to give it this final character of beautiful uniformity, feathering of the edges, and the edge character of spacing of the flakes and yet to leave the median ridges and edges straight. This is indeed one of the finest works of art that man has created and Joe Ben has an artifact that compares with painting, sculpture any of the fine arts.

Joe Ben Wheat: Did you notice that you are speaking before of retouch on the edge. Did you notice the retouch on that?

Crabtree: Extremely good! The type of material is similar to Sweetwater agate and the amount of labor that has gone into making this a beautiful artifact would make it almost a sin to use it as a projectile point.

Joe Ben Wheat: This appears to be another one of the big preforms. The base of one of the preforms such as Henry got at the Hell Gap.

Crabtree: It's very exquisite work and very distinctive. It shows a very distinctive technique.

Irwin: What site is that?

Joe Ben Wheat: This is the Claypool.

Crabtree: Dr. Bordes.

Bordes: Well this is Bordes speaking. First of all this Folsom material it looks as if the biggest state, no the second state, now has also the smallest Folsom, because there are some here which are really small. Anyway they are beautiful.

Joe Ben Wheat: Just a flake.

Bordes: Yes. As for other comments I won't say much. The scrapers are ordinary kind of scraper that we have already seen in other places, but here about the burin. This is a projectile point probably; I should say that it is a bifacially worked broken tool. Which seems to have had a burin blow from the break. I wonder if it would be interesting to experiment with points and see sometimes if the fracture break could not give us at times this burin blow. I am not sure, not at all. Just an idea, I throw into the air and let it hang. But there you have something and on two sides. Looks very much like some burins which have been done by Solutrean on broken Laurel Leaves, so it could well be burins after all. Well that is more a kind of a splintered point, basically. Or it could be just, no I don't think. It should have been something very hard to make that.

No, that's a little borer. I don't see others.

Joe Ben Wheat: What comments do you have on that one? That's one not on the breakage so much as the flaking itself.

Bordes: I leave that to Crabtree who is better than me on this [redacted] material[s].

Crabtree: It looks like a very fine pressure flaking and it shows an entirely different technique than any of these. In fact in this assemblage, this is quite a distinctive piece and the character shows a distinctive style of flaking. Is this common, Dr Wheat?

Joe Ben Wheat: ~~Is this common?~~ This is the only piece that I have like that from this site.

Crabtree: It seems unique.

Bordes: Ya, well, you know there is a lot, in fractures these burins or perhaps double burins, I don't know, but there is a lot. And this one is amusing. If it is a burin it has been made in the same way as Alaska burins that we have seen. Not on a true truncation but something which is almost bifacial retouch before that the burin blow. Well, about the other things, I have not much to say, there are nice [redacted], yes, here. Crabtree what do you think of this?, Is this big flake taken off by pressure do you think?

Crabtree: It appears to be unless it struck a rock at a diagonal angle it could have removed the flake by the percussion blow. But as it slid through it could have caught from the weight of the shaft and been given this sort of a flake scar.

Bordes: It could be

Joe Ben Wheat: This was actually in a buffalo.

Crabtree: Is that so. Had with striking the bone like that.

Bordes: [redacted]. Striking the bone or as I have seen when I was young practicing bow and arrow, my arrow touching the surface finding a rock and jumping again and going to bury itself in a tree. So it could be the blow as it went into the soil before getting into the buffalo.

Crabtree: It doesn't appear to be an intentional sort of thing that they were doing.

Bordes: No.

Joe Ben Wheat: No, its from hitting the bone, I am fairly sure. Did you notice this one? Look on the other side it's more obvious.

Bordes: Looks as if there has been two sets of retouch with a different aspect.

Joe Ben Wheat: This one has become partially patinated and since it is evidently the same type both before and after, it evidentally was found and picked up again somewhere and then reused, resharpened and reused.

Bordes: Looks like yes.

Crabtree: Notice the change in technique on here. I mean it's a random sort of thing like that, compared with the uniformity of this.

Bordes: Ya, that is good work in such a material.

Crabtree: Basalt is tough.

Bordes: But, that is very beautiful, but it is so regular that it becomes almost mechanical. I must say that that is a beautiful piece of work but, I must say that the general impression is less striking than some which are less beautifully made but more human.

Wheat: Hand made.

Irwin: It has a dramatic touch to it.

Bordes: No, it has a mechanical touch.

Joe Ben Wheat: Notice the range in size in points from one site. These are all from the same site. These would be considered blades, I presume, or are these simply elongated flakes.

Bordes: I am not sure, no I think that can be rather a flake.

Joe Ben Wheat: Yes, well that was my impression.

Bordes: A flake of first workings of bifacial things. Sometimes you have several blades like that. Well let's see here. That one here is very nice, very fine side scraper and it seems they were vicious enough to apply pressure flaking for making side scrapers, you know. They were certainly pressure people. That's another flake of making bifacial tools. That's the same thing. That is more like a blade. This one too, also. This one is certainly a blade. Ah, that has something on it, yes. That, you know, seems to be a kind of tool, because it is much too regular to have been just a preparation or a striking platform but anyway I don't see what they could have hoped to take from that. This is a little flake, I don't think. That here. Is this very common with your scrapers?

Joe Ben Wheat: Not common. You mean this removing of the bulb?

Bordes: No. Not removing of the bulb that not removing of the bulb you know. We find this often enough on end scrapers, not very often, but scraping edge - A regular scraping edge or utilization like that. I have done it by trying to polish a regular scraper like that, something like that. Well, this is a spall and not a core I think. Rather a kind of rough grade of tools. That's a kind of Levallois flake with a what I call scraper with flat face, but it can well be a knife. Because it give a sharp edge. These are cores which are not very good. This kind of Mousterian we call.

Tixier: ~~Tixier speaking.~~ I think that there are two sorts of gravers you see, ~~there is gravers a burin, gravers~~,

Bordes: Borers

Tixier: Gravers or borers,

Bordes: I don't like this word graver.

Tixier: Graver, borer.

Bordes: ?Borer if you like - but not graver.

Tixier: These borers with an abrupt retouch, you see, like this one, like this one, and others with beautiful semi-abrupt retouch, you see. It's quite different. Here is abrupt retouch and here is a semi-abrupt retouch. And here is a little bit of channel flake. I think these here, the back face of the blade and then the retouch of the edge and then the flaking out, flaking off of the channel flake. I think it's another preparation which makes me think that the Folsom points or fluted points were made on blade or on biface.

Crabtree: This ia the natural facet.

Tixier: This is the natural facet. It is a bulb flake, I think.

Crabtree: I mean the original large flake on that side.

Wheat: Oh yes, that's not a stem. They just didn't take out the center.

Tixier: And this is a very good burin spall with a retouch before striking off the spall perhaps coming from another burin. This is a burin but not very very good. Yes, it's one. Yes, it's good; it's good. It's on a little truncature.

Crabtree: Any further comments from you, Dr. Wheat?

Wheat: No.

Crabtree: Anyone else?

Alan Smith: Don, would you like to try that channeling now?

Crabtree: We can do that. It will take me just a few moments.

(Lapse in recording time)

Bordes: Fire away Cynthia.

IRWIN-WILLIAMS Collection (Anasazi)

Irwin Williams: We have here a collection of late pre-ceramic materials from the Southwest which are of interest principally because they very likely represent the antecedent to the Anasazi or Pueblo culture. I've got them arranged more or less chronologically, so that we have at the other side of the table here, the San Jose culture, as it has been called in New Mexico which probably has a date range around 1000 to around approximately 3000 B.C. The crude materials to the left, unimpressive as they are, seem to make up the most of these peoples chipped stone assemblage and I brought a representative collection primarily of the actual tools, scrapers, scraper planes, choppers, and things of this sort, and also some of the crude flaked tools which go along

with them Reel 9 (2) Some of the areas from which these were apparently struck when silicious material, relatively fine-grained sort, was available. And also some pieces made on this rather coarse basalt. Over to the right there are a series of projectile points from the same time period and these, of course, occur with a large number of grinding stones so these people's main concern was for seed grinding rather than for the production of gorgeous projectile points. The material closer to me here, apparently, represents the successors of the same groups and the same area, the development in projectile points, styles and development in chipping techniques. I think that it is quite obvious that there is considerable improvement in the kind of simple tools made in the late periods and there are apparently some blad-like objects of the same period. Now, right in front of me, there is a big collection of sharp looking flakes which do represent, I brought along just because they represent a workshop, small workshop area probably from one or two pieces of obsidian from this later period and this is they are just sort of representative of the kind of stuff that we were getting in the flint pit there. One man or so sitting there and chipping for an hour or so. They probably are somewhere in the 500 B.C. range approximately. Down at the bottom here, just to indicate what this stuff develops into of the basketmaker to the projectile point, and this is almost certainly what becomes of the culture ultimately. Now I don't think that I will go into the typeology anymore. That isn't our primary concern, so if either of you would like to comment on this why you might as well start.

Crabtree

Well, we'll start with the flake heritage and I'll start in the middle here. These are not even as good as those in our working pit. A lot of the flakes show that the distal end broke or collapsed from the shock which is, sometimes, characteristic of obsidian. They show almost no platform preparation and very little control of the flaking technique. This one indicates that they did take advantage of the ridge to thin their points. This is a nice thinning flake and probably one of the best examples os utilizing an existing platform, but they made no preparation. They show a lot of crushing and heavy cones. These flakes here indicate percussion work and show an extreme amount of compression. They lack a great deal of control and altogether this seems a very unusual array of workshop material. Some of the edges show a little use pattern. This flake indicates the direction from which the force was applied and it apparently collapsed in a flat flake rather than a burin style. Mainly they show very thick indiscriminate flaking. A variety of everything and not much in the way of technique. It's a little lower on the scare than what we find in our working pit here. It seems that they were wanting to produce, for some reason, a very heavy durable point. For what purpose I don't know. These are quite thick and have very little diagnostic evidence on the surface regarding flaking except for the extreme thickness. However, we find that they did appreciate good work. For here they have carried in this Clovis point from somewhere showing that they did admire nice work. Here is a flake showing some refinement - This shows a step-fracture for thinning . Serration of the edges is done from one side and then the other. They didn't use this too much for forming their point other than to produce the little projections on the side. Shows very little refinement - one single flake from this side and then a crushing in on the other side which is quite different. Here is an unusual piece of palm wood which is quite distinct in this array of fossil wood. I can't see on the far end of the table very well and I think Dr. Bordes can see them better and tell more about them. This is a little out of my category, so I will turn this over to Dr. Bordes.

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Bordes: Well, these tools which are just to my right, looks as though they could all pass for a medium grade of Mousterian. Almost all of these there are a kind of crude scraper, chopper, and better scrapers. Kind of thick-snoed scrapers or something like that. Bad cores. And here are chopping tools rather than choppers. Chopping tools worked on two edges, an occasional blade which is retouched on two sides, and that's an end scraper with very flat retouch, very, very flat. That's a bit of a bifacial tool and not very good. Scrapers, scrapers are everywhere. Lot of them. End and side scrapers, big flake. Oh, they hit a hard blow on this one. Not much else to say except that they seem to have done a lot of retouch on the flat face of this one too. This one also. Bit of bifacial tools, broken. This doesn't belong to this thing. Well, but scraper. Oh, I should say a flake with a badly faceted striking platform not too well defined on bifacial face by several scars and so on and then some retouch with step retouch from one side which is perhaps due to the nature of the material rather than the technique of the typology. That's all right but it takes five or six lines. I would call that, you know, La Quina scraper and I think that they are the same. As for this obsidian debitage, well, I am not too well today, but I think I could do better. It's not a very good job. Well, these poor people, they had no real culture yet.

Irwin Williams: Yes, they probably did.

Bordes: It is hard to explain. That's a pheasant culture. Pheasant culture, yes. Well, they didn't do much with obsidian And, for the points, they look not so bad considering the material. What's this, petrified wood?

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~~considering the material. What's this petrified wood?~~

Irwin Williams: Yea.

Bordes: Yes, that's hard to work. This is rather fancy but I wonder if it was very effective as a point. They did not know better, probably. What? Yes. Rather strange this one. All right, but that's a later one?

Irwin Williams: Yes, this is later. That's // basketmaker.

Bordes: Yea, that's better. Much better. Well if you want to be optimistic. They succeeded up to a point. And here, other end scrapers. Some side scrapers.

Irwin Williams: These are late.

Bordes: Ah, that. A kind of bifacially worked flake with longer retouch on one side and shorter on the other. But I would call it a bifacial scraper, which can be a knife, of course. That's something else? That's obsidian?

Irwin Williams: Yes, that's a kind of cloudy obsidian.

Bordes: That's nice material - this one. And that's what's that one?

Irwin Williams: Just more material from the same late series.

Bordes: Ah, that. What do you think of this? Is it not your State?

Crabtree: No, I don't believe it is. I rather think that this had been in a fire. Accidental or not there is no way of knowing.

Bordes: Same stuff.

Crabtree: Excuse me, Cynthia. This one right here appears to be also - more petrified wood.

Bordes: That's the same stuff, I ~~see~~ think. Some obsidian. Ah, ah! This one is backed. No question. Pocket knife, yes, no question. Small, but no question, this is the first one I have seen in all this American material. Yes.

Clare ~~Phil~~ Smith: What is it Prof. Bordes?

Bordes: Pocket knife. A pocket knife.

Irwin Williams: That is because ~~he was~~ they were a very backward people.

Tixier: ... abrupt retouch

Bordes: You are sure that it didn't drop from your pocket.

Irwin: (Williams) No, I'm sure, ~~I'm~~ sure.

Bordes: That's the first example of backing I have ever seen in American stuff. I don't say that they do not exist, but.

Irwin: I mean that's not preparation, that's just actual backing.

Bordes: No, no question. Not backing. Allright, ~~there~~ that is no preparation. That is not the side of a core. They took off the little blades and made this from here, you see. A little platform here but a lot from here. Now, that's an interesting tool.

Irwin: Are there many of those?

Irwin Williams: No, that's the only one. I brought it along because I thought it might be interesting.

Bordes: That was ingenous.

Crabtree: Dr. Bordes, I found one that redeems them slightly. This one right here. This one looks like they knew how to take off long blades. There is only one, but the percussion work is very good.

Bordes: Yes, yes, yes.

Irwin Williams: I would imagine that's intrusive.

Bordes: Ah, well, well, well don't fight them. They are your people, after all.

Phil Smith: What type is this?

Irwin Williams: Well, this is not necessarily that.

Tixier: What type is this does it go with these?

(Irwin Williams) Well, this does, but ~~not~~ necessarily that. I have never seen another quite as finely made as that one.

Tixier: Like upper Paleolithic.

Irwin Williams: And I would guess - a progression and degeneration. But we get this kind of thing.

Crabtree: Yes it appears to be.

Tixier: But on the other end, you see.

Crabtree: Yes a Little preparation. It's a shame they waste obsidian like this.

Irwin Williams: Well they didn't know what they were doing. It can be seen by the points that they turned out, or at least the tools. Well, these people's main interest was in grinding up either wild or agricultural materials. They have dozens and dozens of grinding stones for every projectile point. And hunting is apparently a very secondary kind of pursuit. With one interesting thing. You mentioned that you thought that perhaps these had been made because they needed a sturdy, heavy kind of point. Well, certainly the kind of game that these people were hunting doesn't necessitate this kind of thing. Primarily deer, and rabbits and this sort of thing.

Bordes: Rabbits, ah yea.

Irwin Williams: Rabbits.

Bordes: Rabbit's hide is hard. And you know, if you shoot a rabbit, you shoot downward, and so if you miss it, your point is ruined except if it is very strong.

Irwin Williams: In other words these people were also bad aims.

Bordes: Oh no. Try to shoot a rabbit with a bow and arrow. That's not so easy as it seems.

Irwin Williams: Well, this was probably with dart points, spear.

Bordes: Spears are even worst.

Irwin Williams: Well, I would assume that most of the, not all, but most of this has been done apparently by percussion.

REEL 1 ~~Start~~

Crabtree: It appears to be.

Bordes: All of that anyway.

Crabtree: With the exception of the little serrations on this side here, and some of this work here, but this is very simple to do with a tiny pebble. Or with extra piece of sharp flint you can do this. ~~They are even abraded.~~ The notches are even abraded.

Bordes: That's percussion here. Perhaps a little pressure, but they are not much farther on pressure flaking that I am, rather less.

Irwin Williams: Rather less.

Tixier: And their arrowheads are more beautiful in quartzite than obsidian.

Bordes: Ya. But you know, that it is easier to work quartzite than obsidian, except when you know. Oh, yes. Oh, yes. I would rather work this than obsidian.

Epstein: We agree, we agree.

Crabtree: It depend on the different techniques.

Bordes: On the technique you use and quality of the quartzite of course. No, no, no.

Crabtree: It looks almost like a blade whether it is accidental or not - there is not enough there to tell.

Irwin Williams: I wonder if you thought that might have been heated.

Crabtree: Yes, I'm sure it has. I'm sure it has.

Bordes: That's an important thing, you know.

Irwin Williams: Well, all right, we'll make it a little later.

Irwin (French) Tixier: Scars on obsidian - an end scraper.

Irwin Williams: The ancient mariner. Yes, it looks like it.

Irwin: Even that is characteristic.

Irwin Williams: Well, does anybody have any more comments or shall we move to another group of materials.

REEL 1 (STOP)

Bordes!

All right, let's move.

Epstein Collection - San Isidro

Epstein: The material on the table now consists of material from two sites in Mexico. The heavily patinated, tan-patinated material comes from San Isidro site which is an open site about ~~50~~ forty miles east of Monterey in Northeastern Mex. In the lowland section of that area. It's a very hot, dry region. And this site was discovered in 1960 and excavated in 1962 with very little results of excavation. The site seems to have been uncovered rather recently but how many times this last recent exposure represents in the history of the site, I do not know. But there are a whole series of fire hearths that seem to be in almost perfect condition, that is, there are circles of concentrations of rocks maybe ~~3~~ three feet in diameter and in and around the hearths are these heavy artifacts. Most of the artifacts are heavy percussion bifaces of this general kind. Some twice, sometimes three times, as large as the ones on the table, and they vary in size. Second in number are these pebble choppers which are unifaces on unifacial and bifacial and some of these weigh as much as four and five pounds. Going along with that, are such things as what we call in Texas, bifacial clear fork gouges of which this is representative. And throughout are whole series of what I think of as very heavy percussion flakes. Some of them have relatively straight platforms and some have rather faceted platforms. These flakes that I am bringing here are the smaller flakes. Some of the flakes are enormous, being of this kind. In terms of the faceted flakes, most of the flakes that are faceted are struck at the high point of the platform. Also, in this area, in this region of Mexico projectile points are the most common single artifact one can find. And yet at the San Isidro site Projectile points were very uncommon. We found a few, once, to lump these things together and called them something or other. We found ~~14~~ fourteen of these. And they were all within essentially a very small area of the site. We found ~~5~~ five of these, or things identical to this. Actually this is almost identical to

REEL 1

a specimen that MacNeish found from Tamaulipas called Lerma. Almost identical in terms of the photograph of his stuff and going along with something like this. These are some of the projectile points found. There is also some very recent projectile points found at the site. The material itself is a highly silicified limestone. Where is that clear fork gauge? And it consists of essentially black material, which is patinated, as you can see. There was no context in which this could be surely dated except that the material that we found in the survey was not like this. And recently, as a matter of fact, I am working on the site now, we stopped digging just to come up here. There is a site near Lenores on a second terrace, it is a two terrace arrangement, and this is the high terrace, the cave up in the high terrace is about seventy-five to eighty feet above the ground. There was a five foot cultural deposit lying on top of gravels in it and then because I had been to Combe Grinelle and seen Bordes' excavations, I decided to go through the gravel and there was about five to five and a half feet of gravel in the section of the cave that I dug through and this was lying under the gravel. And, so far, the kind of material found with that are the large flakes of this kind but, so far, none of the thinning flakes that one would find in making a biface such as this or something like this. We have abundant carbon fourteen sample on this material, but we won't have that run until about a week from now.

Bordes: That's a pity. I would like it though.

Epstein: In terms of typology one things that comes up at this site which does not come up here are these. The pebble tools, unifacial we have, but these things, which are pebbles largely that have been miserly unifacially worked, with just a little bit of bifacial working, do come up at this site, but do not show up at San Isidro. This material is known as Cue Vedal a[illegible]na, because it is very close to a zone of rock fall in that area. That's all.

Bordes: This material is very strange. And it seems from what Epstein says that they

are always small flakes. The biggest flakes not being there. Well, of course there were flakes which were struck rather hard but most of them not by stone but rather by a soft hammer. This is more the characteristic of wood on the first flake. This one perhaps, no I don't speak of this one. This one perhaps, but soft hammer anyway, not a very hard rock. This could be stone struck. It is difficult because patination is so heavy, but on the other hand this one does not seem stone struck. Seems they used it as some kind of stone hammer. This belongs to same.

Epstein: It's the same open site. That's all I can tell you.

Bordes: But you have not found it here. And these projectile points are rather surprising and I wonder if these two are not intrusive, I wonder. I don't know the material, the site, and so on.

Epstein: I wonder too.

Bordes: This one could be a burin. They seem rather much fresher, than the other as far as patination goes. Perhaps it is not the same material, I don't know if this is the same material as that. Looks like.

Epstein: On the patination, it is very difficult to tell. There is definitely a re-use of tools evident at this site. In other words, some tools will have been used, some bifaces have been used and then the new flakes on it, the patination is much less. Of course, patination can vary with the amount of exposure and it is difficult to tell looking at this open site which side has been exposed.

Bordes: Ye, yea, of course, but it seems rather strange that the four projectile points, all four of them, seem to be of the same material much less heavily patinated that the others. This one is a little bit. Not the same kind of patina, you know. This is, you know, I would say let's say it is worse in France on the plateau. I would say that this is Paleolithic and this is Neolithic. Of course the patina can be but I think that if you have enough material, as statistical as this of the different elements following patination could, perhaps, give you

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something interesting. It works here and on the plateaus. Of course, you will find on every patina some that are ~~[illegible]~~ bad and something like that which is not very patinated. I would be rather surprised if there was the same ~~preparation~~ patination in the two kinds. This looks very good, it doesn't mean much. Could be a peasant culture, you know. And this you say comes from below the gravels in the cave?

Epstein: Pardon me. Just one thing. This has a slight sheen to it because point one: when these were found they were heavily encrusted with limestone and when the finish of the limestone after it was through with acid was so ~~different~~ difficult that I decided, I just touched it up with oil. So there is a sheen to it because of an oil finish on it.

Bordes: Yes, yea, yea, It doesn't matter.

~~Epstein~~ Irving It also photographs better with oil.

Bordes: We have seen this. Yea. After all, not only ~~[illegible]~~ the Solutrean can do thinning but also the people with the chopper chopping tools. That looks very much like the old culture of Font Robert. I don't say it is. I don't say it is, but if you find a little like well, why not. Who can tell. That's really quite different. Even this one.

Epwtein: Try fluting on that or thinning and I was wondering whether Mr. Crabtree would think of that as fluting or thinning or what?

Crabtree: It's reminiscent of some of the very rudimentary Clovis sort of thinning with the step fractures. He pressed and then stopped, or attempted to stop without the flake going on through. He got a step fracture here. He was letting it go as far as the pressure would allow before he let it come outward. But this material appears to be comparatively soft and your observation of their utilizing a ridge for the impact is quite important. To concentrate the force of the blow up on this projection so that they can carry their cone on through

(duplication)

He got a step fracturing here. He was letting it go as far as the pressure would allow before he let it come outward. But this material appears to be comparatively soft and your observation of their utilizing a ridge for the impact, is quite important. To concentrate the force of the blow up on this projection so that they can carry their come on through. But because of the softness of the material these seem to be going inwards from the leading edge. Shows almost a shattering before that one. It demonstrates considerable toughness of material yet they have the ability to come up with a point such as that. It's quite amazing if this is all the same material.

Bordes: This is what I call in France a dihedral striking platform and it is very, very common one, but very peculiarly the point of impact is not just on the ridge, but just beside.

Epstein: What kind of a platform is it?

Bordes: Dihedral striking platform.

Epstein: Dialogue?

Irwin Williams: Dihedral.

Bordes: Dihedral.

Epstein: Now what is the Chapeau De Gendarme.?

Bordes: Chapeau De Gendarme, ah, something quite different. It would be. Have you a pencil somebody and a bit of paper? Here is a pencil and a bit of paper and the Chapeau De Gendarme would be. Oh, God damn this tool! It would be: A striking platform like that with small faceting, you know, with this shape. What you have here is a dihedral striking platform. And, generally, the point of impact is not just here, but here just beside. Because just try to strike exactly on the edge and you catch a ridge and, pop!

Tixier: I think that you have to make one. You have to make one.

Bordes: Yea, yea. It's not difficult. And here I would say is a striking point. Here

was a ridge and a striking point is just here, just beside. Why they use this kind I don't know, but perhaps this is just a flake taken off of one of these chopping tools or no bigger.

Epstein: I think.

Bordes: Well, here is tentative ~~indicative~~ of a convex striking platform. This material. Yea, yea, yea. That's a good one.

Tixier: That's a good one.

Bordes: It is not bad from what I have seen here.

Epstein: Interestingly enough, in the area where I am working there are apparently no burins.

Tixier: What kind of raw material? basalt or what

Epstein I think like basalt.

Phil Smith: There's one almost ~~a good~~ one.

Bordes: Yeah Almost, not quite, except ~~for the~~ to be a true Chapeau de Gendarme it should be a little like that. That's a convex striking platform. In the ~~valley~~ valley of Chapeau de Gendarme it is like that. No, no, no, they did not quite get to the Chapeau de Gendarme. That's a convex striking platform. The Chapeau de Gendarme is a variative of the convex striking platform which looks like the old hat in the old French Gendarmare. Yea, and this kind of tool, how you call it?

Epstein: We call it a clear fork gauge in Texas.

Bordes: Clear four?

Epstein: Clear fork, a gouge.

Bordes: A gouge - oh, yes.

Tixier: But, we call it in Egypt, an adz.

Bordes: Is this known in other cultures in America?

Epstein: Yes, it has a very wide distribution in the American Plains ~~largely~~ largely, but outside of the plains I think, the well stratified evidence in Texas indicates that this is associated with Plainview, so called Plainview points and ~~Sierra~~ Farmer when the evidence is well documented.

Bordes: Could be. Could well be that those belong to the same thing but it is rather surprising but anyway, nothing is impossible. That is very rough work, huh? I would not call that a projectile point. That's rather rough. This, this, I don't know what it is. Here's a kind of bad scraper. Chopping tool. Their best tools are chopping tools, by far. Oh, well. Have you seen anything like that in Siberia, Marie?

Wormington: Some of these big things and even larger than this are the sort of things that they call skreblo that you get at ~~Afontoba~~ AFONTOVA Gora. That's part of the tradition which is quite different from Malta and ~~[illegible]~~ Buret ~~[illegible]~~ and there is now a radio carbon date ~~[illegible]~~ somewhere in excess of 11,000 years for the lowest level of the ~~Afontoba~~ AFONTOVA Gora where you do get this general type of thing.

Bordes: Yea, that's a small ax.

Epstein: These large triangular things which is here about ~~2½~~ two and a half inches wide and maybe ~~5~~ five inches long. These have been found in Texas in dry caves hafted to a branch, in other words a branch about this large, which has been split in half and then tied at both ends.

Mam

Bordes: Yea, yea, I am not at all surprised.

Tixier: Hafted like this or like this?

Bordes: No, like that.

Epstein: This is the branch here. Yea, like this.

Tixier: An ax.

Bordes: Looks like. Rather a nice thing. Yea, strange. These Americans are crazy! No more comment?

Epstein: Do you have any more comment on this, Mr. Crabtree?

Crabtree: I haven't any at all. It is strange material.

Epstein: Well, here may I ask you one question? I think that I have seen points called

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Palasaides points in, who's the author of "The Old Cordilleran Culture"— Butler? I think he illustrates a point like that that he calls Palasaides.

Irwin Williams: Cascade.

Epstein: Cascade, I'm sorry. And it has a certain amount of serration in it and I was wondering if it is at all related.

Crabtree: This is unique. In getting away from this sort of pressure, which is very rare. I mean, I thought I had seen many, many points in the Northwest but we never see this type of diagonal flaking. Either they hold down the artifact and push away from the body or they are left handed men doing it this way. The Solutrean are straight in, straight in like this, but to turn it like this is strange. There are well-defined bulbs [illegible]e of pressure flaking, moving ahead instead of following the ridge and staggering their flakes exactly right, without the help of the ridges. A slight step fracture there on that side, but not a great deal of regularity. However, the direction of the flakes certainly indicates pressuring towards the tip rather than towards the base of the point. I'm not familiar with the Cascade points.

Bordes: Nothing more.

Crabtree: No, I wouldn't like to say anything about them.

Bordes: Any question?

Irwin Williams: Well, no except that I think the Cascade points generally have considerably more bipointed effect.

Wormington: You have same there.

[illegible]. I think [illegible] Dick has a Cascade point that you can use to compare it with

Irwin Williams: Oh, good - a Cascade.

Daugherty: This is coming closer to what we are talking about.

Irwin Williams: See, the point of balance is considerable farther up the widest point is

considerably farther up the point than the Cascade stuff. Here it is essentially at the base.

Bordes: Finished?

Irwin Williams: Well, the only other comment that I have is that I think that both Gerry's and, to a somewhat lesser extent, my stuff from the Southwest indicates at least the possibility, and in my case the probability, of the association of relatively well made points and these extraordinarily crude things. And, I think, it is interesting to think about the problem, anyway, of the many comments that have been made on our early cultures. ?The cultures that have no context, surface materials, etc. which are sometimes considered to be very early just on the basis of pure typology. The point is that it is perfectly possible for people to make stuff like this or like the Cochise, San Jose choppers and scrapers, planes, etc. and, at the same time, be producing perfectly functional bifacial projectile points for spears or whatever. That's all.

~~XXXXXXXXX~~ Daugherty Collection

Daugherty: Start Reel 13(2) Let's take these groups one at a time. Over at the left is the Lind Coulee material. It was found back in the 1950's and radio carbon dated, two runs, at 9500 and 8500. However, that was without heat treatment and I'm sure it is older than that. Geological studies have suggested that it is probably a couple of thousand years older than that. But we have, I didn't bring the whole assemblage, there are a lot of bone tools with this, long bone shafts like you find with Clovis, serrated bone points a variety of scrapers. There are flake scrapers as well as these heavy steep angle scrapers. Projectile points you'll notice are of considerable variety, different materials involved. There is one of these crescents, actually two were found. These have a very wide spread distribution throughout the Intermontane West and down into Mexico. I think that I'll stop at this point and let you look at those.

Bordes: What's the date did you say? What date?

Daugherty: The radiocarbon was 8500 B.P. and 9500 B.P.

Bordes: What?

Daugherty: Nine thousand five hundred.

Bordes: Yea, yea, yea.

Daugherty: And I think that it would be more likely between 10,000 and 11,000.

Bordes: O.K. Well that's certainly fine work on this one.

Crabtree: Very fine.

Bordes: Good material but fine work too. And that is a projectile point. This is a kind of bad carinate scraper, thick scraper. This is a thick scraper not much ~~cut to it~~ cutting edge, and that is a projectile point. This crescent is amusing. Looks a little less well made, unless big like Egyptian or Danish stuff, ~~that's~~ but smaller and not so well made.

Daugherty: There were larger points in the assemblage. We didn't find any larger complete points, but we found the stems on the order of this point but maybe three times as large as that.

Bordes: Don.

Crabtree: This one here is a little unique ~~in relation to these~~ when comparing these two points with apparently the same sort pressure technique. These two appear to be the same and this one no doubt, is the base of another point. They have basal grinding on them. Some of the flakes carry over the surface while this point shows a different technique used with the short flakes ending ~~of~~ on the ridge giving a different contour than this ~~unique~~ other point. This one appears to be of untreated material. This one appears to be treated material, which is a little unique. These flakes are spaced with the sides straight and ~~to be~~ are almost parallel. Well-controlled flakes. But they are of the very broad style with almost no indentation for the placement of the tool. This poses the question - how were these wide flakes detached without having a bulb of pressure. Normally, the tool would be set back away from the edge to produce this type of flake. So far, I haven't been able to replicate this technique. I'm working on it.

but I don't understand it yet.

Bordes: I wonder if this is not part of a much bigger flake.

Crabtree: Yes, I think so.

Bordes: Yes, it could be. It's a rather big one.

Crabtree: Let's see this bunch here.

Daugherty: There is a large form of bison found with these. The identification was just a large form they didn't find anything that was diagnostic to suggest that it was a non-existent type, but, on the other hand, it was extremely large for modern bison. This next group comes from MARMES ROCK SHELTER Marmes Rockshelter, a site that we have just finished excavating. We worked three years on this. There is a large collection of material, radiocarbon dates received so far run from 10,750 and right on up to modern times. This 10,750 date was not at the bottom of the deposits, there was three feet of material below that. So we have no idea yet how far it goes back beyond that but I would guess not too much earlier. The earliest points, interesting enough, are the stemmed points very markedly edged-ground and quite a variety of these. Then you come up to some lanceolat points certain lance forms like this with the distinctive basal notch. Then the so-called Cascade type come in about 8,000 years ago and this happens all over the plateau. It's not nearly as early as Butler originally suggested. About 5500 to 6000 years ago you get these large basalt side notched right in the midst of the altithermal when it is hot and dry and economic conditions apparently rather grim. The fine material changes almost exclusively to basalt and this form develops. After that when things improve you get this is a example of large corner notched points giving way to smaller corner notched points and finally I didn't bring any, some very tiny side-notched points, which are just about the beginning of the historic period. These large blades, five of them, were found with a infant burial about 7,000 years old. All right I'll stop.

Bordes: Done.

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Crabtree: These appear to be very well done. This basalt has extreme toughness and appears to be made by percussion. It's hard to say whether blade or core techniques was used with these particular ones. Apparently the flakes were removed from a big blade ~~from~~ showing -- nice meeting and thinning of the collateral flakes -- well controlled. Good edges here. No doubt a finished tool.

Daugherty: Do you think it's finished tools.

Crabtree: It appears to be, yes. They are nice straight sides. This basalt is very tough material, however, this one here may not have been basalt it looks like an overfired piece of the dark flint. Like it has been burned on the edge and it was starting to break down. Perhaps not, I don't know. It's hard to identify from one piece as to what the range of material was. ~~Basalt~~ Looks more like basalt to me material is very difficult to work. However, the variety and grade of ~~the~~ basalt is as variable almost as quartzite. And these show quite a refinement of using small flakes and slight retouches on the edge with nice pointing. Is there anything distinctive about the pointing? Notice how they are flaking these back from the tip to control the flaking ~~and not break the tip~~ and still retain the tip and not break the tip. The flakes start from the tip and are worked back on both sides of the point leaving a little projection at the tip. They are almost serrations.

Tifieri Crabtree: Basalt

Bordes: Heated, of course.

Crabtree: Oh, yes.

Bordes: No, question. Heated or burned.

Crabtree: This one appears to be a little more lusterous on this side but the color would certainly indicate it was burned, all right. However, the flaking surface is coarse, like untreated material, but burned. But it may have been burned accidentally or imbedded in the meat during cooking or something like that. Because it doesn't appear to have been heat-treated, yet this one from the older sites does appear to have been altered. This one shows a reverse again.

I mean there are several styles and changes in flaking technique on this particular one. The flakes go back at this angle and yet it shows a collateral style of flaking with a bending technique over the edge but still leaving the sharp ridge, which is quite different from this style of flaking on this point showing very fine, smaller retouching on the side. This thick one here looks like some pressure retouch after percussion on the side of that one. This one here looks like another piece of petrified wood that has been altered by heat, however, there are still no facets that remains on that side.

Daugherty: This last group over here. Since obsidian is quite rare in our sites up at Washington, I brought some from a site that has been excavated in Oregon. Very late material. It shows the technique that they were using. This site was occupied within the last ~~1000~~ thousand years. There was no clear way that it could be dated but it is late. But it is of obsidian material, exclusively.

Crabtree: Percussion with a slight retouch on the edge.

Bordes: ~~Something~~ Similar thing here.

Crabtree: Slightly diagonal but quite deep indentations of placement of the tools, fairly heavy bites on the edge. These and the same thing with the other one. There may be some difference in random flakes and smoothing. The notching and the flaking were done at the same time on this one. No doubt a very small pressure tool was used. Single flakes were removed from both sides in their notching. Apparently, the same technique with these single flakes.

Bordes: Serration is different I think.

Crabtree: Oh yes, it is. This serration is from both sides. This edge wasn't serrated, peculiar one side serration.

Daugherty: One final point. This is Hell Gap and how does the flaking of that compare to the flaking on the ~~Lindenmeier~~ LIND COULEE material?

Crabtree: Very different on this particular one. They are not nearly the same. Because here they have the flakes bending over the surface while here, the flakes

terminate right here, here, here, and here. And the flake scars are not nearly as well defined.

Borden. Yes!

Daugherty: How about that one? Still different, isn't it?

Crabtree: Still different, Still different from the edges of that one there. This one has quite an angular direction of flaking while this one shows the flakes were removed at right angles. This one has a slight angle in comparison with this one over here. But here, again, we have the reverse or back-hand type of flaking. This is my first experience in finding this back-handed flaking.

Daugherty: They held it behind their back.

Crabtree: They must have. Or they must have had some genes that brought on this left-handedness.

Daugherty: Any other questions about this? Well, do it.

Crabtree: Something interesting, Dick, is the dating of the heat-treatment somewhere around the time of 10,000 years. There is not a sufficient array of this material for positive evidence but it is quite interesting to note the occurrence of alteration even to the Clovis and Folsom; and, yet in Europe there is no evidence of alteration. I was so in hopes that with such a tremendous range of time here in Europe that we could find some particular horizon in one of these sites, which would indicate heat treatment and we would be able to follow its development, but it just wasn't here.

(Tape on Recording) Irwin Williams - Mesa Central

Irwin Williams: We have here a collection this morning from Central Mexico on the Mesa Central the highland plateau of central Mexico just north of Mexico City. This is material from two caves which covers probably the period of around 6500 B.C. to perhaps 1500 B.C. The material is typical, but not necessarily representative of the entire industry because I don't have still left ~~down in~~ out of Mexico, very much of the original collection -- just a few projectile points for casting and a few other artifacts. Well, in any case, they are arranged more or less chronologically, over here, the projectile points and over there, to their right

there is a relatively typical group of tools which would be typical of the early Pecalote or Hidalgo complex of perhaps 5000 or a little more B.C. This bunch of debitage on the right is again relatively typical of this period and I think, a pretty well developed small blade industry. In addition, not seen here, are a whole bunch of large blades made in approximately the same way but about twice the size, or more, of ~~these~~ those that we got here. There is a number of burins that I would very much appreciate any comments on as well as some forms and knives and things of this sort. So fire away.

Bordes: I will leave the projectile points to Crabtree and I look at the burins. Well this one is on a broken point or let's say a bifacial tool to please Gerry. And it seems, really, to be a true burin, not a result of an accidental fracture. This one is also, a projectile point broken and then there is a burin all right. This one is the best, by far. It's a burin on one end and an end scraper on the other, and it's really absolutely typical, no question. This one is, or was, a double or perhaps a triple burin, no question. This is just a broken piece of bifacial tool.

Irwin Williams: This is simply the kind of broken bifacial tool that they did convert into a burin.

Bordes: And that could well be also a burin. Not very, very good but obsidian does not take the burin blow easily. And that is amusing. It looks like a channel flake a little. They made a burin on it it seems because it is not only a fracture I don't think, there is a burin blow, all right on ~~the end~~ it.

Irwin Williams: The point of bringing these burins here, outside of just indicating the kind of material that we do get in Central Mexico for burins is that these are not a minor tool in this assemblage. There are more burins in these early levels than there are projectile points. They make up to 30% of the entire group of materials so that these are really a major tool. They aren't just

REEL 1 ~~(Side 1)~~

a minority piece, some of which could have been caused by chance.

Bordes: Oh, no some of them are ~~not~~ definitely not by chance. They can't. This tool it is quite impossible. Now I leave it to Crabtree.

Crabtree: This assemblage is quite a typical roughing out, preforming, assemblage. Some of these are well refined. ~~They~~ There seems to be a difference in preparation of the platforms. Some indicate the use of a billet on obsidian. Possibly they utilized the ridge to guide and make a series of flakes. Flakes were, no doubt, detached with considerable regularity. It does indicate that there has been a little extra platform preparation. However, these flakes are well controlled from the edge of the artifact. This does not look like a typical core tool. I mean, the flakes do not appear to have been detached from a core because when they are detached from a core there is a lot of regularity in this type of an edge, with a slight bending of the flake where it hangs onto the side of the billet. They were able to force these flakes clear across, using a small tool, while here it appears they may have used a stone percussion tool. When there is a great deal of shock, you lose the platform. There is also a shock pattern at the ends of these flakes where the flake was broken from the shock during striking and it leaves these lines or fissures. Notice the compression of the flakes. It appears to be the result of a blow by a hammerstone. The deep heavy scars and the bulb here on the top and the striations indicate the direction of force. There is a hinge fracture where the force was dissipated. Because the platform collapsed, they were not able to remove this flake. Back to this other group. The surface of the scars, with the exception of this one, and perhaps this one, have indications of being core tools or well-defined flakes. And this one most certainly is prepared in the same style as some of our pressure flakes, refining of the platform so that the flake is released easier. It does indicate the pressure technique of lifting the long flake off, but it is

difficult to tell their original length. Not having an assemblage, but just one flake, it is difficult to tell but it does show that they had the refinement of a pressure technique. The rest of these flakes required more than pressure and this one indicates a short of a percussion thinning flake, yet still following the outward ridge. Back to Gerry's problem. These are quite interesting preforms made by simple roughing out with the flake technique to avoid transporting a lot of material back to the campsite. There is no refinement in this preform and it is not a tool, but shows working just merely to remove surplus material. Another percussion type of a little preform that could be later shaped into an artifact. Now with this one, I don't know. Because you find many of these sort of thick objects that do not appear to be preforms but used as tools as they are. So to sharply define the difference between this tool and this tool is a little difficult because the edges on this one show they haven't created a platform to thin it down and make a better artifact. So this, no doubt, was the artifact itself. And the functional scars on this artifact indicate that it has been drug toward the person. Wouldn't you agree, Dr. Bordes?

Bordes: Yes, I think so.

Crabtree: This is not a preform, but looks like a sort of little gouging, digging tool because it has been abraded back from this edge and it is not designed particularly for a preform. Each artifact must be appraised and one must determine the difference between a tool and a preform. This, of course, is a little difficult. This one certainly looks like a preformed object with no retouching and has no apparent abrasion on the edges. This one was, no doubt, stepped on, for a direct downward blow will give you this type of break which appears to be accidental, for it shows a crushed area just in one spot.

End of Reel 1(1)

Bordes: Look at that.

Crabtree: This one shows beautiful refinement of pressure work. Very excellent. It also bring out something that we haven't seen here before. I thought all this type of flaking was done by

a left-handed man. But this shows that the worker was ambidexterous for it shows he changed directions of flaking. This shows a remarkable amount of control and the technique of feathering the flakes off on this side and this is a very beautiful artifact showing double diagonal flaking. This is very uncommon in most of the western United States. Is this common in Mexico, Cynthia? This kind of technique of diagonal flaking - making a Christmas tree pattern.

Irwin Williams: Not particularly common. It does occur on this projectile point type.

Crabtree: Reel 1 (2) Well, that is a superb example of double diagonal flaking. This one appears to be the same technique. Both slanting in that direction.

Bordes: Do you think, Crabtree, that this could indicate that the man could use his two hands, because I think when I am doing pressure, I would have no trouble doing this kind of retouch.

Crabtree: Yes, it could. But it is very difficult to control the angle with the tolerance of having this flake and this flake meet. I mean the degree of angle just can't be measured. It is to perfection. So, can you calculate the angle going this way backhand, and turning and turning and turning it around and going this way and retaining exactly the same angle. However, the last series of flakes on this side were done from the tip back toward the base. Starting from the tip and flaking back toward the base in a back-hand sort of technique. But the changes of angles, even considering the contour of the artifact itself, require a great deal of skill to keep this very constant angle. I mean it is like setting up a machine to calculate in which direction you are going to have two points meet. For instance, if you are going to drill a hole in a bead, you have to balance the hole on the other side so that the holes on both sides will meet perfectly in the center and this is similar to what they have accomplished here. It is certainly a very beautiful piece of work. This could be done by a right-handed man by reversing the platforms and changing the direction of the flakes, or it would be done by one who is ambidexterous.

Reel 1

~~Crabtree~~

Irwin Williams: Could you comment on how that would be produced?

Crabtree: This looks like it is made strictly by percussion. Just by dragging the tools on the edge you can get this sort of character. They are random flakes on the side. Its doesn't appear to have any pressure there on it. This one has a peculiar technique of being retouched again after the initial flaking with a slight basal thinning and polishing at the base, which is a little unique with this type of hafting. This is apparently an example of gathering someone else's artifact, or blade, and retouching it again at some different date. And here is another one which certainly looks like some of the Eastern U.S. fluted points. However, there is a slight basal thinning on this one and as the artifact broke it hinged back in the other direction. But with this basal grinding it certainly is very characteristic of some of the work of earlier types. These have a uniformity—these over here. This is a type of point we see in Southern Nevada. They have changed directions of flaking. This type of roughed-out material with no regularity indicates that they have used pressure, then removed the ridges. This ridge, that ridge, and so on following through on the ridges until they get a better contour of the artifact, prior to the final retouch. As far as they were concerned, the tool was functional and was, probably, just as good as a tool as the other one.

Irwin Williams: There is an interesting little platform at the base of this one.

Crabtree: Oh, yes, there is.

Irwin Williams: Some of them apparently were made on flakes or blades.

Crabtree: You can see a little of the original flake, showing the scars coming from a direction other than the original flake scar. But these little thick tools, like this sort of thing here. Sometimes, they appear to be quite refined, however, this one is heavily keeled on one side and fairly flat on the other; while there is regularity with this one with no attempt at thinning. Apparently they wanted a very strong point for some purpose, whether projectile or what. I'm sure I don't know. This one up here--this long stemmed point. This is rather interesting. It is random pressure flaked but done with this technique to get the form and there is no continuity or regularity with this one. Let's see. Did I miss some of them?

Irwin Williams: Oh, here's a serrated one you might comment on.

Crabtree: The serrations have been made just by crushing the edges. They did not use the ~~do their~~ serrating flakes technique at the same time as the surface flaking when forming the point. It appears that they just crushed in the edge--just flicked it over by pressure with a rodent tooth or something like that. We might check that--the angle of this one here. This is another back-hand. Two more back-hands. At this meeting we have seen more evidence of left-handed people than I have ever seen in my life. This worker didn't have a right hand. But this would almost be an ambidexterous man, flaking in both directions.

Bordes: Could be. I think that if I am good enough some day to make this kind of retouch that it will be very easy for me to make this kind of thing-just changing hands.

Crabtree: This one appears to be a utilized core. That's the balance of it. This doesn't show a great deal other than detaching flakes for making small projectile points. Was there anything that we missed over here or weren't you ready for them? I'm all through.

Reel 1

Irwin Williams: No that comes later.

Epstein: One question for Mr. Crabtree: Would you show us or explain to us in more detail exactly what you mean when you say this could be made by dragging the point?

Crabtree: What I had in mind, Gerry, was this artifact here. It shows removal of some small flakes in through here. What I mean by dragging is taking the billet and pulling it across the edge, which would square up the point. This can be done instead of leaving these projections like an unfinished article. If you have these bulbs and irregularity on a preform, they may later be used as platforms, and then again, they may have used these as tools just as they are if they wanted an agricultural tool for digging or something like that. It may have been of no importance. We have called dragging several different things such as referring to it as "shearing". Then we will have another word for shearing. This may be confusing, using terms that mean the same thing. But, I think, Dr. Bordes understands. When we dragged these billets by hammerstones across the edge it gives this sort of a character on the edge.

Bordes: Small flakes. Shocks. Something very regular. Looks like pressure

Crabtree: This is something very interesting.

Irwin Williams: Now what tool did you think might have been used to produce these?

Crabtree: It appears to be almost one of pressure. Very careful placement of the pressure tool and following the ridge very carefully. The end is quite distinctive of the type of the Valley of Mexico. The ends have the same characters that I get when producing these long prismatic flakes.

Reel 1

~~Sidwell~~

Irwin Williams: Most of the impulsively produced blades you get a little later have a distinct character of this little overhang which is very often not removed and a very heavy bulb, even heavier than that.

Crabtree: Is that so?

Irwin Williams: I don't have any with me, unfortunately, but they look much like what you have been producing.

Crabtree: This is the only one that I found that was quite distinctive in this array here.

Irwin Williams: It might be something ancestral, very easily. Ordinarily we don't get them coming in until the very late pre-ceramic or very early ceramic.

Crabtree: This is quite an interesting incomplete sort of thing, having the character of almost a side-struck flake and leaving the original cortex and almost finishing it by pressure.

Trier: Crabtree, we spoke about this flint and I think that it is an unfinished one, you see.

Crabtree: Yes.

Irwin Williams:" Well, I have no objection to it being unfinished one way or another. However, it was part of a burial outfit that was buried with a woman. And I wouldn't be surprised if, in this case, the thing was just a mint condition artifact, which could have been hafted by that back end there. Very often this is the case of hafting like this. Because, as I say, this and a long bone awl were crossed at her side ready to go, I suppose, to be used in the after world.

Reel 1

[redacted]

Crabtree: That's quite unique.

Irwin Williams: I never found another one. There's one at El Arbillo in the somewhat later Classic.

Crabtree: The thing is, generally, the preforming is done by percussion methods, but this appears to have a great deal of pressure retouch like that they were doing the whole thing with pressure rather than percussion which is a little different and unique.

Bordes: They seem to have a little trouble here taking this off, and they did not bother to go on. And, probably, it didn't matter to them. But you see this kind of thing we meet, well, often enough in some bifacial type of side scraper which looks more or less like a German BLATTSPITZEN [redacted] in the North of France in the Ethna [redacted] Valley where you have some bifacial tools, FOLIATE tools and with this kind of flat thing left probably to hold it better or things like that. And perhaps the man wanted to make a projectile point and then said " well, after all, it can make a very good knife".

Byers: May I ask one question? Don, did you say that the Lerma point is a preform or is it finished?

Crabtree: It appears to be a finished point. It's just not adaptable for anything else other than just what it is. I mean there is just no angle left for thinning this down or for changing the character or shape of the artifact. It's a finished artifact, whatever it is. It's not a preform. That was the thing, Doug, to determine the difference between a preform and this sort of thing.

Reel 1

~~Side 2~~

Bordes: You know what you have to do. You have to make things like that and when you have made one or two of them then no questions asked.

(Laughter)

Epstein: All right, I will make one.

Bordes: No, not one but many.

Irwin Williams: All right, well, I haven't any more questions. Does anyone else have any questions on the obsidian lot, otherwise we can move to this other material.

Bordes: Yes. Let's go to the other material. end of Reel 13(2)

Irwin Williams Collection (Vaequillo)

Irwin Williams: We are going to go to a collection of casts of material from somewhat farther south in Mexico. These are from the Vaequillo [redacted] archaeological zone south of Puebla, Mexico, and they are of considerable interest in that they occur in detached association in non-rolled material with a rather large extinct fauna characterized primarily by mammoth, camel, horse, mastadon, an extinct four-horned antelope tetrameryx, and a wide variety of other extinct animals. Now I have them arranged in essentially what I believe to be their chronological order, from above left in sort of a reverse S to lower right. So that the latest material here is that just in front of Dr. Bordes.

Bordes: The oldest is here?

Irwin Williams: Well, this is the oldest, these two are probably the oldest collection here, yes. These first three plaques were found directly statigraphically one above the other. This is from a separate site which we don't have directly dated in relation

to the others and so it is probably of approximately the age of this little collection of flaked points here. I might add that all of the little flaked points, with the exception of this one, have occurred in direct association with the bones of, well, camel and mastadon, in these cases. This one was found with a horse kill among the horse ribs. This was among a bunch of horse bones, but not probably a kill. So any comment you have on this material will be extremely welcomed. Oh, this material here down on the lower right was with a mastadon kill. This, for whatever it is worth, scraper or whatever, point or whatever, was among the mastadon ribs. The other material was scattered in among the butchered bones. So, as I say, any comments you may have I would be most appreciative of, and the more detailed comments I can have on these the better.

Bordes: I am very much impressed to see tools which have been found in direct association with mastadon. The more because, here, in Europe, the mastadon are very, very old. I know that they are not so old in America, but nevertheless you know, mastadon that is something else. Mammoth were used to it, mastadon. Let's see these flakes one by one.

Irwin Williams: This is probably just a flake, possibly used on one side.

Bordes: Let's see. A flake which had been detached by probably a wood billet or soft billet. That could be a burin of the same crazy kind as in Alaska, you know, with this pointed tip. Could well be, could well be a kind of burin, you know.

Irwin Williams: Well, this was directly under the one side of the mastadon pelvis.

Reel 1

~~Bordes~~

Bordes: I don't know what they wanted to do with a mastadon pelvis and a burin. This, if this is a point, it is a rather crude one. If this is a scraper, it is not a very good one either. But there is certainly some trace of utilization. That's slightly retouched looks like a bad end scraper.

~~Fisher~~ ~~Bordes~~: Could be an end scraper. - typical and scraper.

Bordes: You know they were rather brave to attack a mastadon with such tools. And that is also a flake with a dihedral platform. ~~Perhaps~~ Perhaps you could call it convex with a small flake here. It's rather difficult to tell but probably struck with a wooden or a soft hammer. Some retouch on the concave edge, not much. And there is also here, a little bit of retouch. That's not much, you know. It seems that these people have used anything that they had in their hands at the time they found the mastadon because did they kill it or did they find it dead. That's the question?

Irwin Williams: If this is a point, they may have killed it, if not we don't have much of a conversation.

Bordes: Well, that's a rather small point for rather a big animal.

Irwin Williams: But these are smaller.

Bordes: Yes, but they are better. This is something else again.

Irwin Williams: These people were apparently accustomed to split ~~the~~ for the mastadon mandibles for one reason or another, and this was found imbedded in one of the mandibles just below the teeth row. We took it out in block.

Bordes: That's a completely typical tool. You know that's the kind of thing, yes what we call ~~backed burinaleer~~ backed-burin alles--graduating big, which gives you an edge, a cutting edge like that which is very strong, you know. With that you can cut like that, you see. Like a burin but a different technique. This this could be a point. Oh, ya, probably is--is some kind of point but can be also some kind of scraper. Difficult to tell with this America stuff.

Reel 1

~~[illegible]~~

[Irwin] Williams: My impression is that it might be the point end of one of these others.

Bordes: Ah, that's interesting also. That's just a pointed flake but they made a kind of stem, a little bit like a ~~Consobert~~ Font Robert--a bad ~~Courobert~~ Font Robert, but if it had been found in ~~Perigordian~~ Perigordian culture in France we would call it a very bad ~~Consobert~~ Font Robert or at least a ~~pitttgrated point~~ ~~point~~ ~~pic ou grattoir (pick-like-scraper)~~ pedonculated point.

Irwin Williams: I wonder if you will notice here. The platform, apparently, has been faceted before striking off this long flake.

Bordes: Very slightly, ~~you know~~.... It can be just rubbing the hammer here to prepare a little bit of platform. And it seems to have been struck also with a rather soft hammer, with this lip. But anyway, this hammer was not very wide for it was struck as I do for the blade, you know, vertically, because over there you have a good bulb. ~~It looks like a Levallois point.~~

Tixier: It looks like a Levallois point, almost.

Bordes: And this is the most interesting of all, because there is one question. It is certainly a point but was it hafted like that or like that? Looks very much like some transverse arrowheads we get in the ~~Neolithic~~ Mesolithic and Neolithic in our home.

Irwin Williams: Well, perhaps it will help in that its position was point first under a camel rib.

Bordes: Under a camel rib, You know, that's all right but from which side of the camel did it get in.

Irwin Williams: South.

Bordes: And the hole can get pretty deep. Even in the camel.

Irwin Williams: True, true.

Bordes: In a way that's interesting, you know. Because it shows that oh, ya, I would like you to find others like that.

Irwin Williams: So would I. This doesn't show particularly unless you point it out, but the entire base of this, all the way around on both faces, and the side, was polished, ground, for one reason or another. Apparently not I would guess to do with the flaking technique, but to do with its ability to be hafted.

Bordes: That could be. Anyways that's a kind of point made with small retouch. And these people didn't seem to bother much about retouching their points.

Irwin Williams: No, there is no bifacial retouch in these lower levels at all.

Bordes: There is a kind of bifacial retouch.

Tixier: A little curving - very short.

Irwin Williams: Edge trimming, yea.

Bordes: Now we get to that. That's different. That's a good projectile point, broken, or knife, you know - this bit.

Irwin Williams: That's just a fragment of a biface.

Bordes: That-that's a fragment of something bifacial. Something bifacial.

Tixier, Bordes, Piece of a projectile point I don't think so.

Tixier: Maybe something of a projectile point?

Bordes: Could be, I don't know. This is a nice one. Seems percussion made, rather than pressure. And that-that's a strange thing. It, difficult, the casts are good but not a good point.

Irwin Williams: That wasn't a very good piece to start with.

Bordes: What?

Irwin Williams: That wasn't a very good piece to start with.

Bordes: No. I can see that the material is bad material and the retouch is not very easily seen on it. That I don't know what it is. It can be anything.

~~Sylvia~~: It looks like a drill or a borer.

Bordes: Looks more like a bad drill than anything else. Ah, here, ah, ya. Here is a bifacial tool. It is certainly not a projectile point. Probably a knife, with a basal end untouched, notched, very outward. And it seems that here either, they made a burin out of it or they tried to get small blades. Who can tell? It's difficult with such things. You know, since I have seen the Japanese stuff, where they began by making a kind of thick laurel leaf and then they break it one way and then they do all this work to get small blades like that. Well, of course, you say they are Japanese, and Japanese are always pigheaded. I wonder when I see something like that if it is a tool or if it is a core. You know, you never can tell. That is not too good. That is a faceted striking platform with a little overhang but anyway it was not done with a stone. You never get this overhang with a stone. But it was a hammer which was medium hard, not too soft.

Irwin Williams: This apparently has had some sort of gouge or leading edge maybe.

Bordes: Oh, ya, a kind of scraper anything, you know. Scraper is a good word because it does not mean much. It has a very wide acceptance. That's a very nice projectile point. I don't think that this is fluting. It could be the

surface
~~line~~ of the flake and it went into something hard. And that is certainly probably not a burin. I think rather it went against something hard, camel skin, perhaps, I don't know. What was with it?

Irwin Williams: The horse and camel.

Bordes: Horse and camel. Ah! Hard enough But no, it went probably against a bone or a stone or something like that. Ah, that's another thing. That's a small flake with platform which has nothing special some facet of that. And it is difficult to tell what was tried with this one. Could be stone could be something else. But an interesting thing is a very outward truncation ~~on~~ to the right of the burin and very, very, outward by small retouch, no work here. It is not a borer. It seems that the truncation was a one. Nothing else. I don't know, perhaps it was two.

Irwin Williams: No, a concave scraper.

Bordes: It's not a scraper, it's too outward. It has something to do with camel hunting. I don't know. Other comments from other people?

Crabtree: I would assume that the casts are replicas, as near as possible to the color of the original material.

Irwin Williams: Approximately.

Crabtree: And, no doubt, it is chert and flinty material. This is something I wonder about. In Mexico there is an abundance of obsidian and yet these points are of nothing but flints and cherts. It seems characteristic of many of Ancient Man's sites that he wouldn't touch obsidian when it was right in the Valley floor below. I'm speaking of my experience with obsidian in Southern Idaho. For some reason they seemed to desire these flints and cherts and yet we I think Dr. Bordes has made all of the comments necessary have a lot of obsidian there. But this group proves that they had some well-controlled, well-defined flakes. There is one little flake here showing

a hinge fracture. This shows a little specialized retouch, spacing of ~~of spacing~~. I mean, there is not enough of these to show any uniformity, but it indicates that it was used scraper-wise in that area. But these three show the position of seating the pressure tool each time rather than indicating percussion or function. This side indicates a bifacial flaking, such as Dr. Bordes explained. This one also shows a bifacial retouching. This one appears to have been [redacted] on the tip like it may have been one of the gravets or a little engraver. That is all I have to say on this.

Irwin Williams: Do you have any suggestions how the retouch on these later points, well this particular later point, would have been done?

Crabtree: This appears to have been done by pressure on this side. However, the technique is not too refined. You can see the little step-fractures where he hasn't applied sufficient pressure and this character is not common with the percussion technique. He has undercut and left fairly heavy deep bulbs on the edge which produces quite a sharp edge. This is, of course, bifacially done. It is quite heavily [redacted] on this side. This [redacted] appears to be the tip of the tool. And, again we have these left-handed rascals. There is a slight retouch here on the edge of this one, indicating it may be a reworked artifact. There is not much showing here, but it appears pressure was applied away from the tip and back in again on the opposite side. This one here, however, is in reverse. I mean the flakes are directed away from the tip which is difficult to accomplish without snipping off the tip. He took very wide flakes clear across the surface. The normal reaction when pushing down this much is to get a shearing of the flake because you must keep your pressure away from the tip. But with this specimen, he reversed it and applied pressure towards the tip. He may have carried his finger out in this manner and used it as a sort of support for the tip. This gives

good support without losing the tip. This certainly does appear to be pressure work on this particular point. I'm glad you brought that one up. Don't you think, Dr. Bordes?

Bordes: Ah, yes. no question.

Irwin Williams: Well, do either of you have any comment on the kind of tool that would have been used to produce this rather large flat retouch or chipping on the biface here?

Crabtree: It appears to be done with a billet, horn, wood. Something like that.

Bordes: Something like that, yes.

Jelinek: I have a question for Tixier or Bordes. How similar is that small stemmed point to an ~~Aurian~~ ateriano point.

Bordes: To an ~~Aterian~~ ATERIAN point.

Jelinek: To an ~~Aterian~~ ATERIAN point.

Bordes: No, it is not. Not the same technique.

Jelinek: What would the distinction be?

Tixier: The distinction is at first the stem is narrower and well shouldered, you see. It's very well shouldered in an ~~Aterian~~ ATERIAN point. On one side, yes. Here it is something like an ~~Aterian~~ ATERIAN point, but here, no.

Crabtree: This is just a comment to Cynthia. With the Paleo-Indian artifacts, we find occurences of the back-handed technique and, yet, in the recent material, we see none of this. An apparently distinctive technique was used by Paleo man at your site. It appears on ~~the~~ two retouches that we find in Solutrean ~~sites~~ we find only two but yet they are distinctive and different while the rest of the specimens show very regular and very uniform flaking. Whenever this type of retouching was done they applied pressure in the direction of the tip and away from the base.

Irving: Mr. Crabtree, in view of the fact of your earlier observation of the hand-holding the piece being flaked does most of the work, do you suppose it is

possible that they have here a tradition of holding the piece being worked in the right hand and holding the tool in the left? This done by right-handed men.

Crabtree: This, I think, Dr. Bordes should know. He is ambidexterous and he can work either right or left handed and can change angles from one direction to the other. Right-handed persons have their strength in the right arm and that is where you actually need it. If a right-handed person were doing this with his left hand he couldn't free hand-hold it. So he must, therefore, hold the artifact against a log or some part of the body. Right-handed persons will naturally thrust and pull inward toward the body when applying pressure. But to push away from the body, one lacks control of flaking. It is normal for a right-handed person to pull something towards himself very carefully and very gradually, if you understand what I mean. I mean to exert pressure toward the tip of the point and away from the body is not the normal thing for a right-handed person. Therefore, I assume the worker was either left-handed or ambidexterous. Another thing - the accuracy needed for flake removal requires seating the tool each time pressure is applied, and this back-handed method would make seating more difficult. This would also be rather tiring for a right-handed person. Because of the mechanics of flint, it is more likely to break the artifact when pressing toward the tip rather than toward the base of the point - or toward the body. This back-handed technique takes greater control for shaping points, yet with this particular one, they were applying pressure in the direction of the tip rather than into the body of the artifact. Now, no matter whether percussion or pressure is used, we have to keep the blow towards the center of the artifact, otherwise, we'll break it. I mean it will break in the middle or at one end or the other. Well, the same thing is applicable to

pressure work. If a person has been using the right hand for pressure, I just don't feel that he can alternate and use the left-hand for pressure with any degree of control. It's just like writing right-handed or left-handed. And these scars are just as identifiable as penmanship, almost. You'll have certain styles, whether it be Palmer Method or printing. When one develops these rhythms and the muscles develop for a right-handed technique, it is very, very difficult to change over. It would require much practice and many hours for me to change from one style to another. For instance, last night I was trying to change techniques and do a Hell Gap style of flaking. I haven't mastered it as yet. Dr. Bordes was making a true replica of a Solutrean and he feathered out the flakes with fairly deep bulbs. The way he applies his tool and affixes it to the edge of the piece of flint determines the popping off and the feathering out of the flakes. So I tried to use his technique to show a little of the ripple flaking. Bust my flakes would go clear across and take off the other side of the artifact. I mean, I just couldn't get the feel of it. These are the things that are distinctive with pressure retouching, probably more than percussion. However, I think that at some later date, and I think Dr. Bordes will agree, that certain percussion techniques are going to be as identifiable as well - when further work has been done and more collections studied.

Bordes: Oh yes, yes.

Crabtree: Not from one group, because we have millions of people whose techniques we are trying to identify. And, there may be almost as many techniques as there is with handwriting. Maybe we can get a character analysis here from some of the stone work.

Bordes: Well, any other comment on this collection?

Byers: I think it's very interesting that Don Crabtree has picked up this concentration

of left-handedness with this early material. The preliminary indications from Tetohuachan which is only about 40 miles away, Cynthia?

Irwin Williams: About 60, I believe.

Byers: Is that the population there is all very inbred and this concentration of left-handedness may coincide with an inbred population.

Crabtree: This ambidexterous or left-handed work is quite a rarity. Extremely unusual. It is one of the first fine examples I have ever seen showing this precision and control. I think this is a classic in demonstrating this particular type of technique. I haven't anything in my collection of replicas that compares with that. I thought if we were showing different techniques that something in this essay on the table would demonstrate many different techniques. But most certainly not with the accuracy and precision shown in the making of that particular artifact.

Wheat: Don, I have one question. I was wondering, Don, almost all pressure flaking that I have ever done or that I have ever seen done has been done against the palm and consequently on the force side of the blade from the chipper. Have you ever attempted to do flaking on the top side of the blade and if so what kind of control do you get on that?

Crabtree: Well, to answer your question Joe Ben, when I tried flaking from the top side of the artifact, I used a popping motion up and out from the edge. I do use that technique mainly in platform preparation. But to do an alternate opposite work on the top even to take off a right angle edge, it's much easier for me to reverse sides of the artifact rather than work back-handed. However, you would hold the preform a little differently in the hand, if you were going to flake in this back-handed manner, from the top side. For instance, hold the point like this and work backwards such as that. The fingers must hold the artifact, so they

are in the way when the flakes are removed toward the fingers. When using this method, one must flake by placing the tool on the underside of the leading edge, pressing upward and toward the tips of the fingers. The flakes, if you are successful in using this method, will go into the tips of the fingers. If a pad is used, it will prevent the flakes from terminating and we will end up with step-fractures and it will not have the character shown on these pieces. Well, this would be easier to demonstrate. I'll be careful, Cynthia. It is difficult to correct an angle when working on the top side. Now, if we would use this technique on the top side and have a leather pad to protect the fingers, we can catch the removed flakes between the pad and the artifact and we'll end up with little tiny step fractures on the ends of the flakes without termination. We must hold the tool underneath the leading edge in order to get the flakes to feather. So to hold the artifact with the surface exposed, the tool will waver and we can't get this type of a snap which was, no doubt, used to terminate these flakes. For it takes a fairly heavy bite on the edge to pop them out from the edge upward. Notice the extreme sharpness of the edge of this artifact. No crushing of this edge, but very very well done and the angle of the flakes is quite consistent. It may be possible that they devised some sort of method of holding the stem in this way and following thru and they could have developed precision in flaking this way. It is not necessarily maybe a left-handed technique but it is a different flaking technique and one that goes from the base to the tip on both sides and it is a holding method that is foreign to a right-handed person. Maybe some day we'll know more about this. The angle here is very good to keep a good straight edge, but they didn't do it that way. With this one they did it only on this side here, because you can see the overlapping of the series of flakes and it demonstrated they only did it from one side

rather than an alternate opposite. Otherwise, we get a sinuous effect on the edge, not the same thing.

Tixier: Yes, yes, yes - here also on the other face there is no bulb. That is quite different in direction.

Bordes: Well.

Tixier: This was the last series, [illegible]. But it's quite different [illegible]......

Crabtree: But this technique to have appeared between 3500 and 5000 B.C! This refinement is quite different and it seems like it is an original. It doesn't show up very many places maybe other than in this particular geographical area. It is quite an uncommon technique and very distinctive and perhaps could be traced much easier than some of the random flaking which doesn't show refinement. This sort of thing just shows mainly [illegible] trimming the rough surfaces off without any regularity.

Alan Smith: Prof. Bordes. We have three other tables to look at. Before you we have Phil Smiths material. Then we have Msgr. Cambier's material. And then finally Don Crabtree has laid out a sample of artifacts of different techniques.

Bordes: All right.

Phil Smith: These collections are all from upper region a place called [illegible] far from Aswan. There are 5 collections here - 5 industries and they represent the Egyptian equivalent of the Upper Paleolithic. They were found on a silt plain on and below the surface and I'll describe each of them in very brief detail and roughly the order in which they come. The oldest dates apparently to about 16,000 B.C. That's the one on my left and the youngest to about roughly 10,000 B.C. at the end of the Pleistocene. This is an industry which is curious because it hasn't been known in Egypt before. It seems to have been found recently in the Wadi Halfa area of the Sudan by the New Mexico and Colorado groups. There, I think, they called it the Halfan

Industry. It's made using the Levallois technique. The micro Levallois technique of small prepared cores very often with the ~~chapeau de gendarme~~ Chapeau de Gendarme striking platform effect, which I mentioned yesterday to Gerry Epstein. Associated with this rather archaic technique are polished bone needles, awls, and very well developed grinding stones, as well as burins and end scrapers. Should we talk about this one first and then I'll go on to the others later.

Bordes: As you like. I think here that most of the speaking will be made by Tixier who knows African material much better than I do. However, there are certain Upper Paleolithic similarities. But for this first culture, I would like to point out this small nest of some of these Levallois cores which made flakes which were no bigger than a nail and one can wonder what could be the use of such flakes. Sometimes, in the Mousterian, we find very small but never as small as that. About this size is the smallest I know in France. Now to Tixier.

Tixier: They are very, very little such Levallois cores in North Africa particularly in Upper Arterian. Arterian of North Africa there is most flakes of Arterian are the Levallois technique and they are very, very little cores like this. But the thing is striking me, I think it is the first time it was found, the Levallois techniques, with needles and bones and worked bones and it is very very interesting. And there is a question. Do you think, Philip Smith, these men are like in North Africa with suppose Neanthethral men or almost like them?

Phil Smith: We have no clue at all. No skeleton material were found with it.

Irwin: I have a comment. We found a jaw, Homo Sapiens, associated with this sort of thing.

Tixier: I would think so. Yes. I would think so.

Irwin: This jaw ~~with a bit of core~~ has been reported.

Phil Smith: Perhaps the unusual feature about these Levallois cores is that they are faceted at the bottom. And I don't know whether that was done to form the bottom of the flake or whether it was used as a technique for resting the core in order to strike it off. In other words to give it some firmness at the base.

Bordes: For such a small flake I don't think that it was necessary to rest the core on something because you can strike it very well in your hand.

Tixier: (In French) to Philip Smith

~~Bordes~~ Phil Smith: So we finish with this one now and go to the next one, which was found at the base of a stratified site in a silt base, [redacted] this is the lower industry in a stratified site which had two industries. This is the upper industry. This seems to date about 13,000 B.C. and as you can see it is a highly microlithic industry. A large number of retouched backed bladelets, blades and a good number of micro burins. There is also a fair number of true burins of various types on truncature, dihedral on breaks so on such as this. Cores are all small and usually ~~unusually~~ the materials are made in exotic materials that come from the bed of the Nile. Agate, chalcedony and various others fossilized wood several other things.

That's a ticklish point. I had been calling it the Silcellant ~~(Silcellian)~~ [redacted]. from Java, Silcella [redacted] where it is found. Tixier and I have just about decided that it is probably an Eastern relative of the Northern African Ibero Maurusien which is better known in ~~as~~ Tunisia and Algeria.

~~Bordes~~ Tixier: I'm quite sure. ~~It could be.~~

Bordes: It could be.

Phil Smith: Perhaps you can comment on this.

Tixier: I'm quite sure because there are tools which are very characteristic of Ibero-Maurusien and which are, like this one, little bladelets. Little backed

bladlets with their striking off a micro-burin, a little one. We call this "Piquant-Triede" in France and in North Africa. And, in France, Point Oblique. Vignard said Point Oblique. It has two names but, I think Piquant Triede is better. And this is a very characteristic kind of technique in Ibero-Maurusien. Usually, removing the flaking of micro burin is the preparation of truncation or geometric microlith but here it is not a preparation, it is a finishing tool to be more pointed, more sharp, you see. And there is also what I call Ouchtate retouch, because of Ouchtata in Tunisia. It 's a very, very little retouch, very short one - sometimes a little abrupt but often a semi-abrupt, sometimes needle you see and it is a very, very characteristic retouch of the Ibero Maurusien. And this retouch very often begins near the bulb without striking offthe striking platform near the bulb and it becomes very narrow and very thin and disappeared before the distal end of the bladelet. Excuse me for my bad English. It is very difficult for me. It is very, very difficult for me. And also there it seems that the statistical balance of this complex is very near, it is very close, is very like North Africa ones from Iberia, Tunisia and Moracco. I'm sure. (French)

Phil Smith: He says that they are not the brothers of the Ibero-Maurusiens, they are the first cousins. Two little things I'll point out. There are very few true microliths on the acute triangles, trapezes and half circles and segments of circles. But they are very rare in spite of the fact that the site was screened.

Bordes: I would hesitate to call this segment a circle.

Tixier: Because of its size.

Bordes: Just barely, if it is round. Barely. It's more like a true convex truncation.

Tixier: Yes, when the bulb is not removed, there is no pressure, no segment. But when there is no bulb and no striking platform and retouch all along here. This one is retouched a little bit of the bulb.

Phil Smith: Perhaps you can mention the Points de La Mouillah.

Tixier: The Points de La Mouillah, oh yes there are many things about this. Here is, you see, not a good one but a bladelet. A little bladelet, thin one but backed with the retouch. And, then with the removing of the micro-burin and these I call these Points de La Mouillah. It's very important because it's a characteristic tool and we can easily gain experience from Points de La Mouillah. I made a very good number of points. It's very easy.

Bordes: What else?

Phil Smith: The other thing is that all the nuclei recovered are very small. In fact, there is nothing much which is as large as these from which undoubtedly they were struck in the first place. In other words, they have all been worked down to very small proportions.

Bordes: There is an amusing thing. That this micro-burin of this culture is bigger than the Levallois core of the older culture.

Crabtree: They do show a great deal of refinement in their core technique of removing blades. This thick blade was removed from the core, but it also took off the flake scars from the removal of additional burin flakes, but they do show a great refinement. The thermal treatment is very evident in this array of material. Particularly this one shows the change of texture and has the color change, which is very nice. Also the distal end shows the original facet prior to heating and substantiates the altering.

end of Reel 1(2)

REEL 15 [redacted]

Phil Smith: Do you find something like this around Wadi Holfa, Henry?

Irwin: This industry is very curious, we have an industry, or we have two industries which have these little pieces that have arched back like this, but as far as I know, at least with the stuff that I worked with, we lacked micro burin technique. Except some which are perhaps very rare, you know, one tenth of one percent. With that industry over there, we get two forms of that industry and one form has little lamella dou and there is a date which Wehdorf has gotten and I expect our date will be the same of 17,000 years.

Irwin (In French) translation of above.

Bordes: All right. - why not.

Phil Smith: Curious Burin - backed

Bordes: Not quite. It's not quite a SACRED burin but it is an interesting burin. On one side a fracture and on the other side a kind of careful retouch in two direction. That's amusing.

Phil Smith: All right. Anything else about this industry?

Crabtree: There is one thing that I might [redacted] add about this material. This point is so obviously heat treated. Even though there are no facets remaining, it is obvious. This type of agate, which is called in the old country onyx and used for cameos, contains little tiny quartz crystals and, therefore, is quite irregular. And the surface is extremely coarse prior to heat treatment. You can see the color change from sardonyx to carnelian and this specimen is apparently from the pebble culture. Another thing is the uniformity of termination of these little flakes and bladelets. As they were removed, they do come right out to the end with very slight curves on the end. This little core shows a slight platform preparation, making a facet to control the termination and regularity of the flakes making this uniformity.

Phil Smith: Do you think that [redacted] heat effect could have been produced by a solar action?

REEL 15 ([redacted] 20)

Crabtree: I don't think so, because if it had been solar action, it would have changed the whole surface. The color changes make this quite unlikely. This is certainly not a natural stone, unless the heat would develop up to 350 degrees which is unlikely. I believe Cynthia pointed out, that this is when this change takes place. I doubt very much if solar heat, even over a prolonged period of time, could ever develop heat to this degree and cause this crystalline change to take place. The uniformity in the texture of these smoothed stones certainly indicates they are treated by man.

Phil Smith: There is one last point. As Tixier remarked the other evening, that all the points here are retouched on the left side.

Tixier: Ah, that's very important. Very important. Characteristic of these La Mouillah points. I don't know of one La Mouillah point on the right edge. They are all, all, all, all, on the left edge.

Bordes: [redacted]

Phil Smith: The next level, given the name of Sobeckian, comes from the upper level of the same site. Several carbon dates around 12,000 B.C. and a very rich fauna associated with it, but the industry is very monotonous. It's always made on that gray or tan colored chert without exception. Virtually all of the artifacts are long [redacted] slightly retouched blades or bladelets, really nibbled bladelets, but there is a small proportion of burins, such as the odd-ball that you can see here and a few end scrapers. One of the curious features about the cores is that you have the nucleus quasi, as they call it in North Africa. Unfoftunately I didn't bring along a good example with me. So, back where you have the core being struck this way from that side and they turn the core over and do it at right angles. But most of the nuclei are more or less very, very steep striking platforms. Not always, but usually.

Bordes: Not always. There is one thing which strikes me about this core, you know.

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Bordes: For this one a truncation of the striking platform and here too. And this seems not to be worked with pressure but with percussion and percussion with a soft hammer and a very careful percussion that just takes the edge a kind of glancing blow, you know. And takes off very thin blades with a small bulb but on the other hand some of them are quite different. This one on this side has a plane striking platform which could have been struck like that. But, on the other hand, it seems to have a preparation that could be for punch technique or perhaps pressure technique because look at some of these very small blades. This, for instance, is certainly the kind of wood struck stuff. But look at this one, and there are others like this one, here with this very small bulb and I wonder if this is not either punched with a very thin sharp punch or pressure. I don't know.

Crabtree: Well defined. Very excellent. Certainly uniform. From the control it appears that they used a fairly slender, tabular sort of a core for their initial work, in order to get this depth with this narrowness to establish these ridges and make a continuity. [redacted] These well defined ridges would take a fairly narrow core in order to produce these. These are extremely flat with almost no compression lines. You'll notice that they do terminate sharply at the ends without any overhang coming in from underneath the cores.

Irwin: Do you get loma crest, Phil?

Phil Smith: No. Well, yes I do but not enough. This Ouchtata retouch, as Tixier mentioned a few minutes ago, is present on a good number of these also. Just what this industry represents is a bit hard to say now, but Mr. Tixier and I are having a slight argument about this. He prefers to call it a kind of Ibero Maurusien - Nile Valley Ibero Maurusien. I don't see quite eye-to-eye with him on this.

Tixier: There are four kinds.

Cambier: (In French)

Phil Smith: There are no micro burins at all in this industry and not a single geometric. It's entirely different from the previous one.

Bordes: Looks like.

Irwin: Does this occur locally, Phil?

Phil Smith: It seems to yes. You get it in the limestone deposits.

Bordes Tixier Cambier: (In French)

Bordes: An odd kind of Capsien.

Irwin: Looks pretty much like that bunch from ——

Phil Smith: Yes, it does, yes it does.

Tixier (In French)

Phil Smith: O.K. Now one question. Do you feel that this is a burin flat? This one here. Double burin flat.

Bordes: Could well be. There is a nice burin on the percussion here and there could be two, yes, yes, yes. Could well be, yes. Probably a triple burin. All right.

Phil Smith: We have finished with that one I think. This came from what was more or less a surface site. It seems to date to the late Pleistocene but, so far, I don't have any definite radiocarbon date for it. This industry was identified or found by Vignard about forty years ago at Kom Ombo he called it the aurignacian

when he got around to publishing it about ten years ago, because of its typological resemblance to the European aurignacian. There is no question but that it does resemble the aurignacian in some ways although I won't call it aurignacian publicly. Well, the fact that I found some engraved Venuses on the cliffs just above this made the situation even worse as far as Messr. VIGNARD was concerned. Now he is all in favor of direct migration up the Nile Valley from Rubisere. There are knobby cores almost no blades cores, true blade cores. Some have been reworked into steep scrapers of kinds, almost carenated ones. There is a huge proportion of scrapers of all kinds in this industry about 50% steep, some carenated on the end of blades, end of flakes, and also some side scrapers. Plus these retouch blades, lamelle triangle almost, which do resemble some of those found in the Antelian the so-called Aurignacian of Palestine.

Bordes: Why so called?

Phil Smith: We'll talk about that later. We have been arguing about that for five years. There are very few burins, no microliths, no micro burin technique, and, at the present time, the whole thing hangs in the air. As far as I know, it hasn't been found elsewhere in the Nile Valley up to the present time. I think it's final Pleistocene around probably, according to its geological context, probably around 10,000 or 11,000 B.C. But I have to wait until I get a couple of hearth charcoal samples run before I'll be certain of that. Tixier do you have any comments?

Tixier: No Comments.

Bordes: The only thing that I can say is that I have seen, last Spring, some of the material from what is the name already, the big site in Lebanon, Zoroque. And some of the real Zoroque not only the aurignacian-like tools but exactly the one of the aurignacian. So, perhaps it has no genetic connection with the aurignacian but it is a little difficult to

call it another name. You know, because, if so, we can go very far and say that the horse of North American wasn't a horse because they were in North America. You know, not only when you say some special feature all right, but no more or not much more than you could find between two, for instance, aurignacians of France and one of Germany. It's even much closer to the aurignacian of France ~~and~~ ther the Focollere ~~[illegible]~~ for instance and the same ~~[illegible]~~ PROPORTION of tools.....which is exactly aurignacian. So there is a problem of this Near East Aurignacian between quartz, if you like, but you know that old story about Shakespeare. Next one I think perhaps.

Phil Smith: The next one represents the ~~Sevillian~~ SEBILLIAN industry which ~~Vonnir~~ VIGNARD found at ~~Columbo~~ Kon Ombo about ~~[illegible]~~ forty years ago. Yes, the whole thing. This is the middle ~~Sevillian~~ SEBILLIAN, most of this is the late ~~Sevillian which is more micro lithic~~ SEBILLIAN where it became more microlithic. Unfortunately, I forgot to bring along some cores or some nuclei for the Middle ~~Sevillian~~ SEBILLIAN but some of these here give a fairly good idea. It's a industry which starts out very much in the Levallois tradition, and then gradually loses it although though it never quite disappears. At the very beginning, and there are very few of the early sites known, it seems to be hardly distinquishable from a Mousterian, Mousteroid type of industry. At the end which comes at the end of the Pleistocene and the beginning of the ~~[illegible]~~ HOLOCENE it's truly ~~micro lithic~~ microlithic using the micro burin technique. They made a great many geometrics and blades, but still a small proportion of the Levallois core. In some respects, in fact, it's kind of a second cousin to this industry I described at first. But typologically it is quite different, technologically it's somewhat the same. Typologically it is completely different. There are absolutely no burins found in the ~~Sevillian~~ SEBILLIAN, only micro burins as far as my experience at ~~Columbo~~ Kon Ombo went. The most distinquishing thing about the ~~Sevillian~~ SEBILLIAN, of course, is the fact that these triangular and trapazoidal flakes, which are common throughout, and the fact that the bulb is almost always removed and this curious U shape curving truncation.

This is a "Bordafact," not an artifact. He made it last Summer for me. You can tell how he makes it.

Bordes: Oh, well, that's not difficult at all. You take a flake, a Levallois flake if you have one in your hand, if not, a flake which is not specially like a Levallois. You make a truncation to give the shape, and then you put it on a stone and you make a second truncation taking off the burin, and that's very easily done, ~~easy to do~~, you know?

Phil Smith: Here's a kind core which is Levallois core which is found quite often in the Middle ~~Sevillian~~ SEBILLIAN and even in the Late. And this core is more like those found in the Early ~~Sevillian~~ SEBILLIAN. In the Early ~~Sevillian~~ SEBILLIAN most of the artifacts are done in basalt and diorite, as ~~Vignard~~ VIGNARD observed. In the Middle and Late they tend to swing more and more to flint.

Bordes: This is a discoidal core, not a Levallois core.

.....

Phil Smith: No, it's not a Levallois core, but you can find those in the Early to Middle. Towards the end there are quite a number of backed bladelets present: triangles, trapezes, scalenes, virtually every geometric form that one can think of. And in one very late ~~Sevillian~~ SEBILLIAN site I found these three artifacts which ~~Vignard~~ VIGNARD hadn't reported. They seemed to be in place, and they are really slugs, limaces, ~~climas~~, with what might be, it's hard to say, I think, it's percussion retouch.

Bordes: Oh, ya, ya, ya. Micro flakes. You know what there is. It this a break, oh no, if this is not a break of the tool after completion, it is not struck. For typologically to be a true slug, you have to have retouch all around. This one would be better, not the shape / but the type. And this, what is the matter with this?

Phil Smith: That's a small version.

Tixier: So called... Pièce à Languette

Phil Smith: Double concave scraper rather spoke-shaped. Very large number of these. Not

this one, but quite a few of the Sevillian points. They are not retouched except that the bulbs are left. I don't see one at the moment. This comes close to being it. They are left in their natural state after being struck, usually, from the Levallois cores.

Irwin: Phil, do you get a lot of micro burins with this?

Phil Smith: Quite a few yes. They tend to be heavier than those.

Irwin: Little ones, Do you get little ones?

Phil Smith: No, they are not as small because all the bladelets in the Sevillian are rather thick. You don't get any very small micro burins such as this. This is more typical, although it comes from a different industry. This is more typical of the Sevillian micro burins.

Irwin: But you don't get any of these little ones? Less retouch.

Phil Smith: No. They didn't have a very delicate bladelet technique.

Irwin: You got a little blade .

Phil Smith: Yes, you do but they apparently they didn't. I found no micro-burins

Irwin: They didn't do it by a micro burin technique.

Tixier: Proximal ones or distal ones?

Phil Smith: Both.

Bordes: Well, we have still two tables, at least, to examine in a very short day and very short time so it could be, could be, could be.

Phil Smith: O.K. well.

(Lapse in recording time)

Bordes: It is the name of the site of the Solutrean but not the type site. You have this white flint from Solutrea. And then you have here some casts of some very good points, which are probably the most magnificent Solutrean points ever made by man. These are two American tools coming from a collection which is very, very rich in beautiful tools with, what a pity, more emphasis on the price than to the rest than on the origin, from which this is Illinois, which is rather big. And this one is Kentucky. And here you have tools and things that

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is from Solutrean. This is a very, very Solutrean which comes from upper level Solutrean Paleolithic. And that is what could pass for a Solutrean point a face-plane but it is much later since it comes from a chalcolithic [redacted] level. You can see here, many these magnificent points. These are casts, of course, and the tools are much more magnificent than that, and which are very, very long, rather wide, and very, very thin, and they seem, however, mainly to have been made even so by percussion. Either indirect percussion or only percussion by somebody who really did know his business. I can't tell and I would like Mr. Crabtree to comment on this. That was a cache and there were about eighteen or twenty pieces like that. All magnificent.

Crabtree: There are many mechanical problems involved in doing this type of work. You'll notice the size of the detached flakes - the amount of stone removed in relation to the edge - strictly a mechanical and physical problem. The angle is very critical and it must be at right angle to the artifact. It must not veer a degree, otherwise it will break the artifact. Yet when this much area is being removed, it is hard to prevent the edge from crushing because of the shock to the ends. Because if there is the slightest tap on one end the other end flies off as a hinge. But the trick must be to somehow dampen the shock and, apparently, to use some sort of a bipolar technique to get this feathering out. However, some flakes do appear to have met on the opposite side as a thinning technique and apparently were made on a very large blade or on a core. But the placement and the regularity by which the flakes are staggered, in order to remove the stone in between each of the flakes on the opposite side, and they are almost full flakes without a great deal of overlapping. They haven't used the next ridge to guide their flakes, but have used the flat surface and regularly spaced them. Therefore the flakes are conchoidal rather than parallel. There may have been a slight amount of

pressure retouching done on the marginal edges. However, if you'll notice they didn't take off these projections left from previous flake removal, but utilized, the strength of the material to remove the flakes on the opposite side. Therefore, they didn't pull out a half-moon portion with the bulb of force. But they have resorted to every possible mechanical law in order to produce an artifact such as this. They are truly magnificent pieces of workmanship. There appears to be a uniformity of manufacture of straightness and regularity of these artifacts that would suggest the use of indirect percussion. They most certainly have been ceremonial objects. But for slicing elephants, you could take an awfully big slice.

Bordes: Well, this is many levels of the Solutrean. Where the flint was not too good on the edge. And so it is not as beautiful as in other Solutrean sites, but it is interesting to see the wide range of variation between the most elaborate ones which are sometimes not bad at all, like this one for instance, and this one, and some things which can be, how you call it, preforms. Could also be heavy tools. This I wonder if it was ever intended to make a Solutrean Laurel Leaf. I don't think so. There are also, you know, that there are a kind of small hand axes in the Solutrean and this is probably one of these small hand axes and not at all a preparation for a Laurel Leaf. We have also the same problem that you have got in the States. Here is an interesting one, which will also remind you of things we have seen, that's a piece on which they gave a burin blow. There is another one here. The question is—is this really to make a burin or is it to make a kind of stem? That's another question. This one, no question, it is certainly a burin blow. We have a lot of burins made on broken Laurel Leafs. I have seen another one; I don't know where. And that is a point which is different. In that case, in that case, it could be a burin blow, but it could be also something—a shock. And that would be interesting

because it will show that these relatively big things could be projectile points too. Not only knives, as some people have said. That's a thing that has happened to them, you know, flaking it and they took too much of a bite in the flint and bang, it broke on the side. And there were some here which are interesting with a stem, some not very well.

Cambier: Question in French.

Bordes: No, no, no, that is certainly Solutrean. In Perigeou - well these are some in Laurel Leaf and as ans. And also one of the characteristics of Solutrean of this site is that very often they made things which were just worked a little bit and left a big unifacial. This one with the exception of the stem; it's not even unifacial. Just a little one almost. Ah, here, that's interesting! What do you think of this one, Crabtree? Do you think that is pressure work here?

Crabtree: There are two indications of pressure work here. This one appears to be of pressure work and yet the normal Solutrean has a square termination of the flake with a series of flakes removed. I mean, the principle of working flint in Solutrean blades is spacing each flake so they are separate and away from each other. It is most certainly this sort of wide flake and the narrowness at the proximal end of the flake leaving both sharpness and regularity. This is no doubt, pressure retouch on the marginal edges showing quite a little refinement.

Bordes: And here, they did not bother to take this off. They could. They could. That could have been done, just holding it a little here and oblique blow on there, the same technique to get rid of square edge. It could have been done by pressure, by percussion, but it did not seem to bother them enough, and so they kept it like that.

Cambier: Question in French.

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Bordes: Ah yea. In the Upper level Solutrean you have this [redacted] one is certainly pressure work I think, and made very often flat. One face is not retouched, almost none. And here on this one it seems to be the preparation of a platform for pressure flaking, which is not very often seen in the Solutrean, this preparation.

Crabtree: No, this is different from what they did.

Bordes: It was removed or it was not done, you know. Here, for instance, it does not seem, it seems that the bulb is there, all right, and they did not seem to have prepared any platform for pressure on this one, you see.

Crabtree: A sharpening. But he was bending the flakes across which was not distinctive with the normal Solutrean. This is a little variation from what we saw at the museum yesterday. This particular technique is showing up. They are following the ridges; overlapping; double overlapping, following the ridges and are able to carry their flakes longer and up over the surface which shows a little change in technique between those in the museum and this.

Bordes: Ya, ya - between the burins and this. Yea, yea, that's an end scraper on it.

Tixier: Don Crabtree, here there is a little polished edge. Do you think it is after or before flaking? Utilization or preparation?

Crabtree: This appears to be utilization. As for the projections, they are turned down the wrong way for a polished platform to serve any purpose for pressure flaking and seem to be utilization, [redacted].

Tixier: Yes, I think, so.

Bordes: And this, this chalcolithic tool. It is quite something different, you know? It's a blunt edge.

Discussion in French.

Crabtree: This shows a slight amount of platform preparation on this edge in taking these flakes along here, very regularly spaced, very nicely done. He couldn't

have carried them any further because he had an indentation in the original flake. It is also interesting to see the straightening of the flake by removing the two curved ends. A little different style.

Bordes: Yea, Phelps much later. Ya.

Daugherty: Is that Solutrean?

Crabtree: I can't tell from that. I just am not familiar enough with these stones. There seems a slight difference, but I am not sure.

Bordes: Yea, it looks a little. Perhaps.

Phil Smith: One of the things which might account for the relatively scarcity of finely retouched pieces of Solutrean is the fact that it is just about the only important open air Solutrean site known. And very possibly it was a seasonal encampment rather than a place where they lived for longer periods. This might account for lesser interest.

Bordes: Ah, yea. You could say. Look, that's a Laurel Leaf and here probably on that side, I don't know if it has been done, oh no, it's done from this platform, you know. The leaving of the ridge here. It's not exactly fluting. Very close to it.

Crabtree: Some fluting technique.

Bordes: Very close to it. With this preparation of platform, no question. If it was smack in the middle.

Crabtree: If it was right in the middle. There we would have it.

Bordes: That's very interesting. Oh, no, no. That's much better, because what poor man called fluting is just, ah, I have no blade here.

Bambier — (In French)

Bordes: Ya, ya. This one is a damn good one you know. With this preparation.

Tixier: Do you think it is intentional?

Crabtree: Excuse me, one other thing. You are wondering how to remove the long flakes, and this has a curve here. Once this flake had stepped off, there was no

way to get any further. So he followed all the way through, till he hit this ridge, which would guide his flake showing the flake coming clear across, then he could go all the way across the top of the artifact. But it is just a matter of mechanics.

Bordes: Ya, ya, and probably there was also a slight changing of angles. The angles was much like that and not so flat.

Crabtree: He had a little ridge to guide the flake right over the surface.

Bordes: Yea, yea, yea.

Crabtree: He could keep going with long flakes.

Bordes: This one is interesting you know. No question, they prepared the platform and they took this off.

Crabtree: Right.

Phil Smith (In French)

Bordes: This kind of fluting I very often do to get rid of the ridge.

Tixier: I think it is a broken Laurel Leaf.

Bordes: What?

Tixier: It's a broken Laurel Leaf, I think.

Bordes: No, no. I don't think it's broken

Tixier: Is it not broken?

Bordes: Yea.

Tixier: Before flaking?

Bordes: I think it is a.... they made this with a broken flake as I take very often when I began to make a Laurel Leaf. Work this. I don't think it's a broken piece. No, I don't. No, no, no, no.

Bordes Tixier → (Discussion in French) (lengths)

Epstein: May I ask a question of Mr. Crabtree? As I understand your description of the flaking technique done on these large Laurel Leaves, you point out that they

did not utilize the other adjoining flake but went on beyond it. Or, in other words, they did not use the flake scar here but went much farther.

Crabtree: Very true.

Epstein: Now I don't know whether I understand you correctly or not, is there an advantage to this, as you see it?

Crabtree: Yes, to attain this extreme thinness, one must space the flakes so that there is material left between them. Then this material can be utilized each time to provide strength to detach the flake from the opposite side. Therefore, there will be a little material in this area for a platform. Then, when the flakes are detached, they will meet in the center wf to thin down the artifact. A type of thinning flake.

Epstein: Then, in other words, it's the nature of the material which almost demands a technique of this kind or something related to it. Is this correct?

Crabtree: Well, by spacing the flakes so they do not follow the ridge of the previous flake scar, the flake will expand and result in a broader flake to assist in the thinning. It is just a matter of stresses and strains in this material. As the worker progresses, he must retain enough material to withstand this amount of shock on the edge. So by spacing the flakes further ahead one can provide a platform and then do the opposite side to get the thinness. One can do a flat side without this technique, but to thin the opposite side, you must retain enough material for a platform. By leaving this amount of material, it assists sufficiently to take off the flakes on the far side. As you see, the flakes are staggered. So by spacing the flakes in this manner, one gains a little additional strength in order to detach the flake on the opposite side.

Epstein: Mr. Crabtree, then do you see in some of the very thin bifaces of Hopewell. Do you see the same technique? I don't remember from when we discussed it the last time.

Crabtree: There appears to be a similarity in the techniques, however, they didn't get as thin an artifact. However, between these two points, had he not trimmed off the material, he could possibly have removed a very/ heavy big flake by using the edge strength to withstand the shock.

Epstein: But these, of course, are not quite as thin as these.

Crabtree: No. This type of thinning hasn't the regularity. These flakes are fairly regular on this side but he hasn't taken advantage of the material in between. Here he has used it to a degree but not to the degree of uniformity of these Solutrean tools.

Epstein: If you were doing something like this, would you prefer, since this technique of staggering flakes demands a fair amount of precision, would you prefer to do this with percussion?

Crab tree: Oh yes. I think percussion is the only method for removing large flakes. But it is strictly a problem of mechanics of flintworking, Gerry. I feel there must be some sort of support for the artifact to remove these large flakes and it would also confine the shock to a restricted area. If it is held loosely, the ends are going to fly off and you will lose the artifact. But you must have this either covered with clay, as Dr. Bordes mentioned, to dampen the shock or you may remove small flakes as you go along the edge. Because when it is unsupported, the shock is dissipated into the artifact creating stresses which will fracture the artifact. And when you thin down to this degree, the shock is terrific.

Bordes: Yes, but you have to be very careful to work on something not too hard. Probably four or five layers of leather or something like that.

Crabtree: Some wood perhaps.

Bordes: Some wood, better than wood - it could be hard.

Epstein: Suppose one were to just dig a hole in the ground and put a rock underneath say a couple of inches, three inches in the ground, and then just put dirt or sand in and cover that and then place his biface edgewise into the dirt. Could that accomplish that effect?

Bordes: I don't know.

Crabtree: I don't know, Gerry.

Bordes: I don't know, but I don't think so.

Crabtree: I don't think sand would offer sufficient support and as you strike outward you would still get flexing, even in sand. You need to use sort of a bipolar technique but not get a bipolar flake. You must just miss opposing forces in order for the flake to terminate similar to the Clovis fluting in order to get the flakes to feather out and yet keep control and confine the force in one small area. Because the flakes do radiate out and would most certainly cause a break.