

SCIENTIFIC AMERICAN FRONTIERS PROGRAM #1406

"Coming Into America"

Airdate: July 20, 2004

Who Was Arlington Springs Woman?

Clovis: A Primer

Clovis First?

Were the First Americans Europeans?

By Land or By Sea

ALAN ALDA (NARRATION) People love to hang out by the water. And that's probably been true for a very long time. We're making a short hop across the fog-shrouded Santa Barbara Channel to the Channel Islands. We're heading for Santa Rosa Island - 80 square miles and almost uninhabited. We're also heading back into the past. The archaeologists we're with only half see today's rugged and inhospitable landscape. Instead they see it thousands of years ago, when Santa Rosa was cooler, wetter, forested, and occupied by people who were, of course, hanging out by the water. We're at Arlington Canyon -- home to Arlington Springs Woman, more than 13,000 years ago. Hers are the oldest securely dated human remains that have been found anywhere in North or South America. Arlington Springs Woman was discovered in a lucky accident more than 40 year ago. Her bones were just sticking out of the canyon wall, right at this spot.

JOHN JOHNSON Phil Orr was excavating a road back in 1959, and right below us he got in trouble. He got stuck in a spring.

ALAN ALDA (NARRATION) While figuring out what to do, Phil Orr -- who was curator of the Santa Barbara Natural History Museum - looked around and saw the bones. He knew they were old, just from their geological setting. At that time bones could not be dated directly, so instead he dated some nearby charcoal. It was old - 10,000 years.

JOHN JOHNSON There was a lot of questions, you know -- couldn't the bone have eroded into that location and some old charcoal eroded next to it, and therefore maybe the charcoal wasn't really the same age as the human bone. And so people never really quite accepted this association, and so this is what motivated us originally to go back and try to re-date the bone -- is to see if we could really find out how old that bone really was, and lo and behold it turned out to be even older than the charcoal date that Phil Orr originally found, by 3,000 years.

ALAN ALDA (NARRATION) Phil Orr brought the bones back to the museum, where they could wait for better dating techniques.

ALAN ALDA How long has it been since you had these bones dated?

JOHN JOHNSON We began this work about 1989. Well it's very tricky, especially when you're dating old bone. You have to do a lot of bone chemistry.

ALAN ALDA You really got this locked away, haven't you?

JOHN JOHNSON Yes.

ALAN ALDA (NARRATION) In the 1980s, ways were developed to radiocarbon date the collagen that's part of bone structure. John Johnson realized he had the perfect candidate in his vault, sitting in a block of earth.

ALAN ALDA So that's her bone, huh?

JOHN JOHNSON That's right. This is the end that's closest to the knee, the thighbone, heading towards the kneecap, going into the block of earth. And then you can see this groove here. This is where the rest of the femur lay originally. And we took a small sample of that and that's what we got the radiocarbon date on.

ALAN ALDA How long ago did she live?

JOHN JOHNSON About 13,200 to 13,500 years ago.

ALAN ALDA (NARRATION) The remains had always been called Arlington Springs Man, but detailed measurements of the scans turned her into a woman.

JOHN JOHNSON We can tell that she was a petite five foot high.

ALAN ALDA How do you know this isn't a child?

JOHN JOHNSON Well, see this line right here that's visible in the CAT scan, that's the fusion line between the shaft of the femur and the end of the femur, and the fact that these have grown together, and fused means that this person had quit growing. This is an adult.

ALAN ALDA (NARRATION) We know nothing about what she was doing on the island, but it makes sense that she was near the canyon for its water, and near the sea for its many good things to eat. Native people have exploited the bays and coves of the Channel Islands for thousands of years. In Arlington Canyon

you can see shell dumps eroding from the wall - ancient remains of meals of abalone, mussels and clams. A cave on a nearby island has recently been excavated.

JON ERLANDSON These are strands of cordage. They're made out of sea grass -- it's a marine grass -- and these are very unusual in the fact that they're about 9,000 years old. They represent the earliest basketry from the Pacific coast of North America. They're just a whole bunch of cutoffs, they're... people were mending nets, making cordage, probably making objects and then snipping off the ends. These are made from bird bone, and they're used for fishing. They would have had a string tied around, just off center of the middle of them, and then bait wrapped around that, and then once the fish swallowed it then you tugged on it, which toggled it, forced it to lodge in their throat or their stomach, and then you could reel them in. The layers in which they were found contained many, many fish bones. There were thousands of fish bones -- small fish from kelp beds and near shore habitats that could have come either from fishing from the shore or from boats.

ALAN ALDA (NARRATION) People have probably always lived off the sea here, but the discovery that they were out in the islands more than 13,000 years ago has caused archaeologists to shift nervously in their seats. We've always thought that around that date the first Americans - called Clovis people - were walking down from Alaska into the center of the continent. Clovis people were big game hunters. So who were these people going fishing off California? And how and when did they get here?

JON ERLANDSON I suggested a few years ago, almost tongue in cheek, rather reluctantly but in writing, that maybe Clovis came down the coast and then moved to the interior. This completely turns the traditional theory upside down. It's always been Clovis came into the heartland of the Americas and then spread from sea to shining sea. But you know, it's at least possible, it's worth thinking about, that perhaps Clovis originated on the coast and then moved in the other direction.

ALAN ALDA You grew up right here, right around here?

JON ERLANDSON Yes. Went to school right here, too.

ALAN ALDA And so you used to look out over there to the islands. Did you ever visit the islands?

JON ERLANDSON Just, er, not until I was seventeen or eighteen, I think. I sailed out there with some friends.

ALAN ALDA (NARRATION) In this program, we're going to meet many archaeologists who, like Jon Erlandson, are turning theories upside down. Collectively, they're now in the process of re-writing the history of the first Americans.

ALAN ALDA How would you describe how they made their way to this part of the world?

JON ERLANDSON Well you know, I think one of the things that's really interesting about archeology, and science in general, is that you'd think after a century of intensive scientific research we'd know the answer to some of these questions, but the fact is we don't.

ALAN ALDA (NARRATION) We do know Arlington Springs Woman must have had a boat, just to get to the island. But even that's quite a new idea.

JON ERLANDSON In the past, anthropological theory used to say that people's use of boats developed relatively recently. In the last few decades, and just the last few years, we've found evidence that people colonized Australia by boat at least 50,000 years ago, that people moved into island Melanesia in the Pacific, parts of it, as much as 25 - 30,000 years ago. These voyages probably required ocean going travel, sometimes multiple voyages of 100, 150 and even 200 kilometers. So the evidence today suggests that people had more sophisticated boats than we thought, and much earlier than we thought.

ALAN ALDA (NARRATION) The Smithsonian Institution, in Washington DC. I've come to meet one of the leading experts on the peopling of America. Dennis Stanford is also one of the principle advocates of new thinking in the field, as we'll find out. But first, I wanted to know about the Clovis people.

ALAN ALDA When did the world first start to think about Clovis?

DENNIS STANFORD Clovis was first brought to the attention of the Smithsonian, and I guess the rest of the world, when a gentleman out in Clovis, New Mexico by the name of Ridgeley Whiteman, who was an arrowhead collector, had sent a letter to the Smithsonian, where he describes what he had found...

RIDGELEY WHITEMAN VOICE Concerning Indian life, etcetera, does this organization buy arrowheads and instruments? I have a very fine collection of Indian relics from this part of the country. Yours respectfully, Ridgeley Whiteman.

ALAN ALDA (NARRATION) The collection included arrow or spear heads, known as Folsom points, that had recently been found along with remains of extinct Ice Age animals. That meant the objects were ancient. The Smithsonian didn't buy a

thing, but they did send an expedition out to New Mexico. There they uncovered the remains of extinct mammoths, along with a new kind of stone point they called Clovis. Clovis was underneath Folsom, with nothing deeper. So the idea began that Clovis people were the first on the land.

DENNIS STANFORD This is the first Clovis point., and it's bifacial, it's flaked on both sides, and the characteristic identifier is this flake that's taken right out of this area here. You see this nice big flat flake here?

ALAN ALDA Why was that taken out?

DENNIS STANFORD This is a hafting device, and then here's one on the other side. Here we go. That's what I want. OK this is what we call a foreshaft. This is a piece of ivory from a mammoth, and you see it's cut at a diagonal here -- that's hafted to a wooden spear -- OK, and then at the opposite end, you can see where they've carved it, there's a kind of little area here where it starts tapering down, and then it's rounded and blunt? And then you take this piece, and that is set onto that, and then you can twist it, and when you twist it, the torque sets it so it doesn't come out. And then your Clovis point, with the flute, fits in like that. And the beauty of it is, is that on impact, when you hit your animal, this comes out and if you're carrying a whole bag full of these, you can put on a new one and take another shot.

ALAN ALDA (NARRATION) The Clovis people had come up with a lethal weapon system for hunting the large animals - like mammoths, horses and bison - that were around towards the end of the last Ice Age, about 13,000 years ago. Many more Clovis sites were found, always - it was said - with nothing deeper or older. We'll come back to that later. The Clovis people made perfect first Americans - brave, inventive and successful. Above all their stone work showed not only consummate skill, but an aesthetic sense too. Many archaeologists who study stone age people try to get closer to their subjects by doing what they did.

DENNIS STANFORD What I'm trying to do is make this specimen as flat as possible, so I want to take this ridge off, and then I'll take off this high point, and this high point.

ALAN ALDA (NARRATION) This unfinished Clovis point, found in Idaho, shows how the blade was thinned by striking a succession of flakes from both faces. The flakes have to be just right, running straight across the blade to the mid point. If the flake turns, or goes across to the opposite edge, the blade's shape is ruined.

DENNIS STANFORD That did an outre passé that I didn't want. It turned and went down.

ALAN ALDA Do you find many unfinished points. People just abandoned them half way through?

DENNIS STANFORD Yeah. Broken them. Yeah. All of the mistakes I make, they make, at least in the samples I've seen. There, that's a nice one.

ALAN ALDA (NARRATION) We're working with obsidian, a volcanic glass prized by stone toolmakers ever since tool making began.

DENNIS STANFORD OK, turn it more this way.

ALAN ALDA Aha. Yes.

DENNIS STANFORD Beautiful. See, made it all the way across, right to the middle, which is where we want it.

ALAN ALDA Now I want to get this point?

DENNIS STANFORD Yeah, but now what...let's do, is just...

ALAN ALDA Oh right.

ALAN ALDA (NARRATION) This little stone age trick makes a solid edge to strike. It's called a platform.

DENNIS STANFORD Uh, oh. We came right down the middle.

ALAN ALDA So I guess they sort of invite me to go join another tribe now.

DENNIS STANFORD Sounded good. Perfecto. You're going to be a Clovis elephant hunter yet, before a five o'clock flight.

ALAN ALDA Oh, I missed it completely.

DENNIS STANFORD There we go.

ALAN ALDA How long do you think they'd spend making a point like this?

DENNIS STANFORD It would take me about an hour. And what I suspect happened is four or five men would get together. They'd sit there working on their stuff and shooting the bull, and talking about the good old days and have you heard about the folks that were down in Patagonia, and maybe we ought to go

down there and, you know... maybe we ought to go to Texas and check out their women. Push in...

ALAN ALDA I can't get it to do anything.

DENNIS STANFORD OK then, move to another spot.

ALAN ALDA (NARRATION) Several mistakes later our point was shrinking fast, but eventually we reached the pressure flaking stage, which creates the final edges.

DENNIS STANFORD That one crushed.

ALAN ALDA Did I do anything?

DENNIS STANFORD Yeah. All these little flakes down there, you did. OK, you see them?

ALAN ALDA Yeah. So this is starting to look like a Clovis point?

DENNIS STANFORD Yeah. You got this flake and that flake, and this big one and that big one, and now we're just trimming up the edges. OK, so what we're going to have to do here is trim up these edges, put a tip on it, and then bring the base in, and then flute it.

ALAN ALDA (NARRATION) Now the all-important flute.

ALAN ALDA What have I done? Look at all that that came off.

DENNIS STANFORD You fluted the hell out of it. Excuse me. Alright, now you hit it right on the platform, like you should have and it took the...

ALAN ALDA Took the point off.

DENNIS STANFORD Took the point off.

ALAN ALDA (NARRATION) Dennis cheated a bit, using a metal tool to quickly fashion a new tip.

DENNIS STANFORD But that's one heck of a fluted point, gang. Don't show them how thick it is.

ALAN ALDA (NARRATION) One more mistake and the thing would have practically disappeared. But with the obvious flute thinning its base, this would be recognized by any archaeologist as a Clovis point.

MICHAEL COLLINS Sit down, let me show you what some of this stuff looks like, Alan. This is kind of a pot-pourri of Clovis lithic artifacts.

ALAN ALDA (NARRATION) This is all from a Clovis site near Austin, Texas. Here are the Clovis points, with their characteristic thinned, fluted bases. And here are the expected mammoth remains - a lower jaw, with its massive teeth. But this site, along with many in recent years, has produced a wide variety of other animal remains.

MICHAEL COLLINS The single most common kind of animal to occur in Clovis sites, in today's sample, is turtles.

ALAN ALDA Turtles?

MICHAEL COLLINS Turtles.

ALAN ALDA You don't have to be much of a hunter to...

MICHAEL COLLINS That's right. In fact that's very likely something the women and children could go out and collect.

ALAN ALDA (NARRATION) The Clovis site that Mike Collins has exhaustively explored is called Gault. The people who lived here 13,000 years ago were very far from fast-moving big game hunters. They chose a place with many different resources within easy reach. Here's the rock outcrop where they got flint for tools. The valley floor has wood, nuts, berries and - yes, turtles.

MICHAEL COLLINS These are burr oaks, there's cottonwoods, willows, mulberries, elms, all these trees that have to have water. This is Buttermilk Creek that we're coming up on here. As you can see it's flowing, even though we're in a drought. Nice stream of water. Right in this area here it never dries up. We're beginning to mix in cactus -- higher and drier.

ALAN ALDA (NARRATION) A short walk up from the creek brings new resources. Mike Collins is a rancher, so he knows the land as intimately as the Clovis people must have.

MICHAEL COLLINS Your deer and turkeys are probably going to be easier to hunt up in this more open terrain up here. These cactus have an edible fruit on

them. The big what we call pads are edible. The mesquite beans are edible. Lots of things they can get up here, they're not going to get down in the valley floor.

ALAN ALDA (NARRATION) The 700,000 bits and pieces that Mike's group is now analyzing give one of the most comprehensive pictures we have of Clovis life. They used their tools for everything - cutting and scraping meat, bone and wood... Punching holes in hides... Slicing many different things.

MARILYN SHOBERG One of the most interesting ones is this tool, and if you take it in your hand and just hold it against the light and go back and forth, can you see that there's a really bright ribbon of polish along the edge of that tool?

ALAN ALDA Yes, yes. Now I see it.

MARILYN SHOBERG It almost looks like it's melted on there?

ALAN ALDA Yes.

ALAN ALDA (NARRATION) The polish is a giveaway for the simple activity of grass cutting.

MICHAEL COLLINS As I move it around here, my eye catches that sheen already, in just a few moments of cutting here. And that's identical to what we see on the prehistoric tools.

ALAN ALDA (NARRATION) Mike was using a replica blade, but here's the real thing. This discovery is a first for a Clovis site. The bright coating is the characteristic sign of silica from inside grass cells. Were the Gault people making baskets or rope? We don't know - nothing has survived. We wouldn't know if they gathered mulberries or mesquite beans, either. They did catch everything from bison to turtles, and overall Mike's conclusion is that these people were hunter-gatherers who exploited everything they possibly could. We can catch a glimpse of their lives beyond subsistence. Was this a weaving pattern? Is this a drawing of grass? Or maybe a map?

MICHAEL COLLINS This is artistic expression that has survived. These people may have painted themselves. They may have tattooed themselves...tattooed themselves -- look at this little thing. Can you see the tip on that?

ALAN ALDA Yes. Oh, yes, yeah, a little sharp thing.

MICHAEL COLLINS In cultures around the world today that tattoo themselves, this is exactly the sort of thing they use.

ALAN ALDA (NARRATION) Mike's view of Clovis is far from the classic, fast-moving big game hunters. Clovis sites appeared across the entire continent within the space of a few hundred years - but maybe it was Clovis ideas spreading, not the people themselves.

MICHAEL COLLINS When I look at the signature of Clovis closely, I see people who were exploiting diverse resources, in diverse habitats. I think it took them a long time to do that, and so I'm asking, Is it an alternative that we are only seeing the spread of a technology that, in part at least, was hopscotching from one existing culture to another?

ALAN ALDA That certainly could have happened. What evidence do you have that that's the way it happened?

MICHAEL COLLINS I don't have any. This is negative. What I'm saying is, How do we explain this stuff being so widespread, so quickly?

ALAN ALDA (NARRATION) That idea -- that Clovis were not the first people in the Americas -- has been reinforced by the discovery of a site in Chile.

JON ERLANDSON Monte Verde, down in Chile, has been widely accepted by many archaeologists. It's a thousand years or more older than Clovis, and it's way down in South America, and it's actually not far from the coast. If Clovis is first in North America, how did people get to Monte Verde 1,000 years earlier?

ALAN ALDA (NARRATION) Arguments have raged over Monte Verde for 20 years, but at the same time archaeologists have been busy turning theories upside down on the east coast of North America. It now seems that people were in the forests of the east long before Clovis times, or Monte Verde for that matter. In 1981 a local named John Topper stumbled across a few arrowheads in the woods near the Savannah River. Al Goodyear from the University of South Carolina has been working here ever since. He's found that he's following in ancient footsteps.

AL GOODYEAR Prehistoric peoples for thousands of years came to this hillside and gathered up some of this rock and broke it open. And this sharp material, this glass-like material, would form the basis of their stone tools.

ALAN ALDA (NARRATION) Al recruits volunteers to work at the Topper site for a couple of months every spring. Grain by grain they've revealed the history of the site as it was laid down over - how many thousand years? Ah, that's the question. They pick out anything that's a little bit unnatural looking, that might have been generated by people.

STEVE FORMAN The Clovis is sitting within this.

AL GOODYEAR OK.

ALAN ALDA (NARRATION) Steve Forman visits Topper regularly. He's an expert in an advanced technique that directly dates soil. In the wet eastern US, ancient bone, wood or charcoal rarely survive, so radiocarbon dating is not possible. In his first few years of digging, Al found a satisfying and predictable pattern.

AL GOODYEAR These represent artifacts that are from the last 13,000 years of occupation at the Topper site, starting with eighteenth century colonial bottle glass, Indian arrow points, going back through time...

ALAN ALDA (NARRATION) This was exactly the sequence Al had been taught in school, with the earliest people being, of course, Clovis.

AL GOODYEAR All the way back to, in this case, the base of a Clovis fluted point, which would be about 13,000 years. So we have accounted for the basic, textbook story of early human life in North America in the upper meter or so.

ALAN ALDA (NARRATION) At that point Al stopped excavating. But then Monte Verde came along, so he decided to take a look below the upper meter, in this layer of Ice Age river sand. He began the new dig in 1998, to get to the lower levels.

AL GOODYEAR We're going down to our deep pit excavation, where we first found the evidence of pre-Clovis stone tools, and they're excavating now on the old Ice Age terrace. This would be an example of the cluster of smashed chert pieces. You can see the sharp faces and the edges. We typically find these in piles, which is in a geological sense an unnatural situation to find them, especially since many of them have fracture faces. We have small flakes. These flakes are generated from this chert being smashed. Here's one with a little scraper type bevel, cut on the end. It could be used for scraping. And then we get something that's very typical of the pre-Clovis lithics here, something that we call a bend-break tool. And you see this sharp, triangular chisel-type working edge on it.

ALAN ALDA (NARRATION) The prize find was what they call the Topper Chopper. It has several worked edges, including this carefully trimmed scraper or knife... And a chopper part, worked on two faces. It's hard to argue, as critics do with primitive tools, that there's not a mind at work here.

AL GOODYEAR In order to move from nature, you have to have design. You know it's the idea of the watchmaker -- if you find a watch on the beach, you don't

think nature formed it. These are not in stream flows of enough force to gather these rocks or break them apart. The hillside gradient is too subdued for them to roll -- you could roll a wineglass down this hill and it wouldn't break. So you're beginning to run out of natural explanations for that.

ALAN ALDA (NARRATION) So how old are the Topper tools? The Ice Age sand they came from could be 20,000 or more years old. Steve Forman ran a series of dates on the layers above the Ice Age sand. The technique - called OSL - precisely measures the light energy stored in sand particles. Careful sampling procedures are critical. The result - 15,000 years old. The Ice Age sand below, where the early tools were found, must be older. So their date?

AL GOODYEAR It's well in excess of 15 or 16,000 years, because the 15,000 year old OSL date came from above all that.

ALAN ALDA (NARRATION) Our next stop is a vault at the Denver Museum. Steve Holen believes he can push the peopling of America back even earlier than Topper - with the aid of these pieces of mammoth bone. People were using the bones long before Clovis people hunted the animals, he says. Mammoths were large elephants that roamed the grasslands of North America for 100,000 years during the last Ice Age. They died out about 13,000 years ago, as the Ice Age ended. Steve is borrowing some wild animals at the Denver Zoo. Cow leg bones are the bait.

ALAN ALDA Here he comes.

ALAN ALDA (NARRATION) Steve's critics say his mammoth bones could have been broken naturally, so the idea here is to see what kind of damage large carnivores can do to bones.

ALAN ALDA Oh, I hear a bone cracking...

STEVE HOLEN Yes, yes I do. That one's chewing on some bone there.

ALAN ALDA (NARRATION) We gave the animals plenty of time.

ALAN ALDA The lions all work on the end of the bone.

STEVE HOLEN Right. Animals, carnivores, like dogs or any animal will start chewing on the end of the bone, where it's much thinner, and then they go in as far as they can until the bone is so thick that they can't break it any more. These bones were left in for several hours with the lions and, as you can see, on this bone there's really very little damage. They gnawed off a small piece of bone

right here, and what they basically did was chew off most of the meat and the gristle they could get off of these bones but really didn't do very much damage.

ALAN ALDA (NARRATION) Next, hyenas. They're bone specialists - probably the most powerful bone crunchers around today.

STEVE HOLEN These bones were eaten by the hyenas, and as we can see there's severe damage to this bone. Here they have completely chewed away the end of the bone and started getting down into the midshaft. When they get to this they really can't go any further, they cannot destroy this bone, they can't break it any further than this.

ALAN ALDA And how do you know there wasn't an animal alive then that could chew into the bones? I mean there were a lot of big animals then, right?

STEVE HOLEN There were a lot of big animals then. There was the plains lion, the lion that was much larger than the lions that we just looked at. And there was also the giant short-faced bear, which was a bear much larger than a grizzly bear. All of the paleontologists that have studied these animals say the giant short-faced bear cannot pick up a mammoth limb bone, a full, adult mammoth limb bone, and break it a mid shaft. The bone is just too heavy and thick.

ALAN ALDA These guys were a lot stronger than I am. They lived outdoors and everything.

STEVE HOLEN OK.

ALAN ALDA Now wait. Wait a minute. Here. Ow!

STEVE HOLEN OK. Now, let's do it the way that humans actually broke bones in the prehistoric period. OK.

ALAN ALDA Watch your hand.

STEVE HOLEN Now try to hit that bone right there. There you go. One more time. There. OK? Here is what we call a spiral fracture. This is a very typical pattern. It spirals around the bone, as opposed to going straight. You really did a job on that when you broke it.

ALAN ALDA I did a job on my hand. I cut my hand.

STEVE HOLEN Oh, no. Here we see the semi-circular notch where the impactor hit it.

ALAN ALDA Oh yes, yes.

STEVE HOLEN And then we get this negative cone of percussion, we call this. This is indicative, this is the diagnostic factor of percussion by a rock hitting a bone.

ALAN ALDA The force of the rock hitting spreads in a typical way?

STEVE HOLEN Spreads in a typical way, making a cone shape.

ALAN ALDA (NARRATION) This is how the mammoth bones were broken, says Steve. Only humans can create this kind of evidence.

STEVE HOLEN We're going to fit four pieces of this femur together to show an impact point. OK, something very heavy and hard hit this at a high rate of speed, causing these spiral fractures. Then, when we look at the impact point we see the semi-circular notch, giving you some idea of the diameter of the impactor. And then when we turn this piece up on edge, we can see this negative cone of percussion right here.

ALAN ALDA Oh yeah.

STEVE HOLEN This is the one -- if you would hold that -- that we produced earlier, and here we can see a negative cone of percussion like here, that looks just like this one.

ALAN ALDA (NARRATION) Steve's found the same pattern at 5 mammoth bone sites. One site, La Sena in Montana, is 18,000 years old.

ALAN ALDA Have people come up with alternative ways that you could get that pattern?

STEVE HOLEN There has been one suggestion, in actualistic studies in Africa around mass death sites, where a lot of elephants died around a drying up water hole, where you get a bone that's broken -- another bone laying on it and it gets trampled by an elephant, and you get a little notch.

ALAN ALDA The bone laying on top of it....

STEVE HOLEN Of another bone would cause...

ALAN ALDA Would have that, would concentrate the force the way a rock would.

STEVE HOLEN Right.

ALAN ALDA (NARRATION) But at La Sena, Steve found the lighter bones, like the ribs and vertebrae, intact. They were cracked during excavations, but had not been trampled.

STEVE HOLEN When you get trampling situations, the first bones that get broken are the ribs and the vertebrae, OK? So what we have at the La Sena site is just the opposite of what happens in Africa with trampling situations. The lighter bones are more intact, and the heavier bones are broken all to pieces. So that's why this cannot be trampling.

ALAN ALDA (NARRATION) One problem with the idea of people in America 18,000 years ago is that at that time the way in was blocked by ice. During the last Ice Age, ice took water from the oceans. With sea levels 300 feet lower, a huge land bridge opened up joining Siberia and Alaska. But ice also formed a 1,000-mile barrier clear across Canada. Above that barrier was the ancient landscape archaeologists call Beringia. We're in the Tanana River valley, in the center of Alaska, at what would have been the eastern edge of Beringia. On the bluff above the river is a site where people lived 14,000 years ago. It's called Broken Mammoth. One part of the idea that Clovis people were the first Americans has always been that they came through Alaska, then traveled south just as the Canadian ice sheets were breaking up. So for a long time archaeologists have looked for signs of Clovis people in Alaska. This site was discovered in 1989, by chance. The state archaeologist came to investigate.

CHUCK HOLMES They put the new road in and it trimmed off the edge of this little knoll that comes down to the river. So we scrambled up and took a look, like we're supposed to do. There were artifacts and bone coming out of the strata.

ALAN ALDA (NARRATION) Right away Chuck dug a small test pit. He found mammoth bone fragments and some charcoal that turned out to be about 13,000 years old. A promising site.

DAVID YESNER We knew right off it was old, it had well preserved bone, mammoth tusk fragments, artifacts, probably hearths because of all this charcoal that he found coming out. And so we just took kind of a gamble, we said, OK let's do it, let's get a big project, let's get a bunch of students up here and er, in 1990, and it was a gamble that paid off.

ALAN ALDA (NARRATION) The site yielded a variety of artifacts -- scrapers of various kinds... A mammoth ivory spear foreshaft... Bone tools... And at the lowest level, crude stone tools. These were older -- 14,000 years. It was the oldest site in Alaska - but no Clovis points. Then a little further down the valley another site was discovered. This turned out to be older still, by a few hundred years. The site yielded not Clovis points, but microblades and scrapers. These

are typical of Siberian and Russian sites going back more than 20,000 years. For Chuck Holmes this reinforces the idea that at that time the people in Alaska weren't really Americans.

CHUCK HOLMES Alaska was actually more a part of the old world, in Siberia. So I really don't see much connection at all between what's going on in Alaska and, say, Clovis and how that comes about and where it comes from. I do not see a connection of origins. I just don't have the data that shows me that.

ALAN ALDA (NARRATION) This is now a hot debate among archaeologists. Did Clovis people, or their predecessors, come through here, or did they come some other way? David Yesner insists his finds show a connection between Alaska and Clovis.

ALAN ALDA Are they Clovis, or what?

DAVID YESNER OK, I prefer, rather than referring to these people as pre-Clovis, as proto-Clovis.

ALAN ALDA Proto-Clovis. What's the difference?

DAVID YESNER Because pre-Clovis is a term that's been used to suggest people who are somehow different than Clovis, then preceded them. I think these are Clovis, but they're just earlier than the classic Clovis in the lower 48 states, in the areas to the south. They're 500 years earlier, but they are, if not directly ancestral then certainly an offshoot of those earliest people that became Clovis.

ALAN ALDA (NARRATION) David Yesner's "proto-Clovis" people had to come down through what's called the "ice-free corridor" just as the ice sheets retreated, and arrive in time to become Clovis people about 13,000 years ago.

ALAN ALDA It was free enough of ice, it was open enough...

DAVID YESNER To permit movement. Now I don't know how good an environment it was, but for me that suggests, OK it's possible at that point to have some people -- it's just the right time to get people from Broken Mammoth down to the south and perhaps become ancestral to Clovis.

ALAN ALDA (NARRATION) We're going to come back to that ice-free corridor, but first we'll see what Dennis Stanford at the Smithsonian has to say about an Alaska connection to Clovis people. Here's how Siberian people used their microblades. Using pitch or pine resin, they set them in a row along a bone or wooden holder. It made a good knife or spear point. But for Dennis Stanford,

microblade technology bears no relation to the bifacial spear point system that Clovis people used. He spent years in Alaska, but couldn't see Clovis' origins.

DENNIS STANFORD I can remember sitting on the banks of the western edge of Alaska looking off to Siberia and saying, If we could ever get to Siberia we will have the answer. And finally we got to Siberia, in the late eighties and early nineties, and we were able to look at all of the archeological collections in Siberian museums, and talk to the Russian archaeologists and go out and look at their sites. There wasn't any Clovis, and this began to bother me considerably.

ALAN ALDA (NARRATION) Now Dennis has a different idea, which is bothering other people considerably.

DENNIS STANFORD Alright, these are artifacts...

ALAN ALDA (NARRATION) He's developing a theory which says that Clovis people came from the other direction - not from Siberia, but from Europe, where they're called Solutreans.

DENNIS STANFORD These people made bifacial projectile points, like Clovis, and they're the only paleolithic people in Europe that did that.

ALAN ALDA (NARRATION) This is the base of a Solutrean projectile point. Dennis and his group noticed Solutrean points have clear thinning at the base.

DENNIS STANFORD As we looked at these, we began to see that some of them are actually, have little kind of flutes in them -- can you see that? ALA ALDA Yes.

DENNIS STANFORD So it's sort of incipient to this fluting -- and that these things really work nicely on these harpoons.

ALAN ALDA (NARRATION) Many Solutrean practices paralleled those of Clovis. They often made large blades like this - sometimes unfinished - which they'd store in caches, whether for ceremonial reasons, or as raw material stock, we don't know. Clovis people did the same - this is the Simon cache from Idaho. About a dozen Clovis caches have been found. And then there's the Clovis spear shaft wrench, made of mammoth bone. The first people to make these were the Solutreans.

DENNIS STANFORD There were so many shared traits, both technological and cultural, that we said that it has to be, but there's two major problems. One, the Solutrean material is 5,000 years older than Clovis, and there's the old Atlantic Ocean out there that the Titanic couldn't get across. Now, what about our cave men? Are they going to cross the Atlantic Ocean?

ALAN ALDA (NARRATION) Here's problem number one. The Solutrean culture - here in France and Spain - lasted from 20 to 16 thousand years ago. Clovis culture didn't begin until 13 and a half thousand years ago. Dennis says a site called Cactus Hill, in Virginia, holds the answer.

DENNIS STANFORD These are casts of the Cactus Hill material, and here we have these nice little projectile points, and do they remind you of something?

ALAN ALDA They're bifacial, right?

DENNIS STANFORD They're bifacial, they're basally thinned, and to us they look just like Solutrean.

ALAN ALDA (NARRATION) The bases of the two Cactus Hill points are thinned in exactly the same way as the base of the Solutrean point -- that's in the center here. Cactus Hill is a recently discovered, very old east coast site that - like Topper - is forcing new thinking.

DENNIS STANFORD What was even more exciting was the radiocarbon date. It came back about 18,000. So that's pushed Cactus Hill -- pre-Clovis -- back so it overlaps with Solutrean in time.

ALAN ALDA So you have stuff that looks Solutrean, and dates to the same time as the Solutrean technology.

DENNIS STANFORD Right.

ALAN ALDA So how come we're still talking about Clovis as being the oldest folks here?

DENNIS STANFORD I don't know.

ALAN ALDA (NARRATION) This fossil walrus jaw illustrates the next step in Dennis' argument. It was found in the Chesapeake, along with a projectile point of a type called Suwannee - found first in Florida. Suwannee points look Solutrean, but have never been dated. The walrus provides the key, says Dennis. Walrus are animals of the ice. The only time they could have come anywhere near the Chesapeake was during the height of the last Ice Age - and that was around 15 to 20 thousand years ago. That's when, and how, the Solutreans got here, says Dennis - they came along the edge of the ice. Of course, they'd need boats. We asked a Canadian expert in traditional boat designs to build us one. In Vancouver, British Columbia, Robert Morris builds what are called "skin-on-frame" boats.

ROBERT MORRIS You want to make sure that the thwart isn't resting on any lashings or abrading any lashings.

ALAN ALDA (NARRATION) The frame is fastened entirely with various kinds of bindings and lashings. He's using modern materials - like epoxy glue to fix this break - but he learned his traditional skills from the Inuit people of the Canadian north.

ROBERT MORRIS They would have used a blood or blood and fish hide glue. One of the elders was telling me that at a certain time of year dried seal blood is so sticky that if you're eating seal meat and you get a bit of dried blood stuck between your teeth, you actually have to hit the side of your jaw in order to break your teeth loose. It's like supertoffee.

ALAN ALDA (NARRATION) We don't know if these boats existed in Solutrean times. All we can say is these are very old techniques, used in many traditions all over the world. Imagine instead of nylon twine, twisted fibers from caribou back sinew. Imagine instead of sawn lumber, driftwood shaped with stone axes and scrapers. It's not so far-fetched that people could have been doing this for 20 or 30 thousand years, or longer. Now imagine bearded seal or split walrus hides, sewn together by the women of the group, then stretched over the frame. Well, all you've done is imagine what the Inupiat people of Alaska have done for many thousands of years. We're building a boat very similar to the skin-on-frame "umiaks" of Alaska's Arctic coast. They're tough, light and flexible. They carry heavy loads, and are ideal for use along the edge of the ice. Launch day for our umiak. We've asked a crew of scientists and archaeologists along for the maiden voyage.

ROBERT MORRIS OK let go.

ALAN ALDA (NARRATION) Robert's big concern is stability. Dumping a load of scientists into Vancouver harbor would not be the way to show how Solutreans reached America.

LIONEL JACKSON So where would you suggest I sit?

ROBERT MORRIS Why don't you sit in the middle. I've got the gunwale. Don't worry about going over. Get your hip right against the gunwale. You guys should be in the bow.

ALAN ALDA (NARRATION) The boat would capsize if Robert wasn't hanging on.

ROBERT MORRIS We're going to get some rocks over at this beach, to try and get the center of gravity of the boat lower.

ALAN ALDA (NARRATION) Robert adds ballast - about 200 pounds altogether.

ROBERT MORRIS So where do you think we should go? How about Asia? Do the return trip. Maybe a little backwater on the starboard side there. OK, forward all sides. It actually didn't have the stability that I thought it would have at first, but once it was ballasted it was amazing. Maybe we can go out a bit further. I love the way this boat is flexing. We were hitting swells out there and reflected waves and chop that 20 minutes earlier would have rolled the boat right over, and we were all just going, Wahoo!

JONATHAN DRIVER Particularly when we hit the large waves, I was worried at first, but it was amazing how stable it was.

ALAN ALDA (NARRATION) Our umiak proved to be a very capable boat - great for long distance travel, taking plenty of cargo.

RENEE HETHERINGTON I was thinking, Well where are the kids going to go? Where's the household goods? Where are they going to go? The boat as you can see has a lot of space in it, and it actually needed that extra weight to make it work properly.

ALAN ALDA (NARRATION) The edge of the ice is a surprisingly easy place to live and thrive. There's good hunting - for seals, walrus, even whales. Northern people have been doing this for a long time.

JONATHAN DRIVER Anybody who was capable of living in northern latitudes would certainly have had the technology available, both to hunt along the sea coast and also to build the kind of boats that we're talking about here. It's very likely that the, for example, the shelters for hunter-gathers in northern environments are going to be built out of skin, and so right there you've got the skin technology. You'd have skin technology for clothing as well, and this would be essential not only for surviving in cold climates, but also for building the kind of boats that we're looking at here.

ALAN ALDA (NARRATION) In fact long distance ocean travel near the ice makes sense for people coming into America both from Europe and Asia. They could have come during the Ice Age, reaching both coasts in time to settle all the early sites we know about. In contrast to ocean routes, it may be that the obvious land route into America, that archaeologists had always accepted, wasn't so easy. Our crew included a geologist who's an expert on the Canadian ice sheets, during the Ice Age

LIONEL JACKSON There were actually two ice sheets that covered North America. There was what we call the Laurentide ice sheet, and it extended up into the Arctic and down into the mid-continent area of the United States, off into Montana. And then there was another ice sheet that covered what we call the Cordillera -- the mountains extending from the Rocky Mountains on the east right over to the coast. The Cordilleran ice sheet got to its maximum extent after the Laurentide ice sheet had formed, so there were periods of time, maybe down to about 22,000 years, something like that, that some of the lowland major valleys, the north-south valleys in the Cordillera, were still open.

ALAN ALDA (NARRATION) So people could walk into America from Beringia before about 22,000 years ago. There's no evidence they did, but that would fit with Steve Holen's 18,000 year old mammoth bone sites in Montana and Nebraska. The corridor stayed closed for about the next 10,000 years.

LIONEL JACKSON Maybe down to about 12,000 years ago, the way south, east of the Cordillera, east of the Rocky Mountains, the Mackenzie Mountains and so on, was pretty well blocked by ice.

ALAN ALDA (NARRATION) This is another way the traditional view of Clovis could be wrong. Clovis people were here a thousand years before the land corridor was available. Of course they still could have come down the Pacific coast - stopping at Santa Rosa island - but it also fits with Dennis Stanford's view of where Clovis came from.

DENNIS STANFORD The ice free corridor didn't open up early enough for Clovis to get down, but by the time the Solutrean-related people worked around the glacial front it was opening up and they just worked right up through...

ALAN ALDA And it would have opened up from the south first, because it was warmer there.

DENNIS STANFORD Yes.

ALAN ALDA And then so that would be a path that people might take.

DENNIS STANFORD Absolutely.

ALAN ALDA And then once they had gone up there...

DENNIS STANFORD They ran into Asians that were already there, and these are the microblade using people.

ALAN ALDA (NARRATION) So now instead of the first Americans being one people, coming one way, at one date, we have a Pacific coastal route... A Beringian land route... And an Atlantic ice route. And we haven't even mentioned some of the direct ocean routes that people are starting to think about. It's a whole new world for the peopling of the New World.

DENNIS STANFORD OK, we've finally got rid of the ice-free corridor, the Clovis-first model, and let's think broadly, let's think about oceans being highways rather than barriers, and how does that affect the way humans migrated around the world, and it's going to change our views entirely.

ALAN ALDA What will it tell us about the rest of humanity, if you get it a little more clear what happened on this continent?

DENNIS STANFORD I think the key thing is that, if we're right, it shows how closely we're all related. And I like that.