A Teachers Guide for:

Exploring the World’s Last Frontier: The Peopling of the Americas
1. Introduction

This video starts with the question “Why study our ancestors?” For many it is an exercise of finding out who they are? where they come from? Defining themselves by their ancestors, their ancestral home, and understanding how they came to be. For archaeologists the answer is more complex. Archaeologists study not just human objects from the past but human decisions in the past, and what it means to be human. How did our ancestors deal with difficulties, how they survived and when they triumphed over adversity, and where they may have failed. Archaeologists study the past to help us understand where we all came from, that all humans share a common ancestry, how we got to be where we are, and what the future might hold for humanity, these questions can help us to understand our shared past, and look to a bright future.

This video is specific to one archaeological field, the study of the peopling of the Americas. At some point prior to the end of the last ice age, according to current scientific evidence, the Western Hemisphere was teeming with life. Mammoths, lions, giant sloths, and armadillos roamed the continent but there were no people. Then, suddenly, that changed, and a long process began of people and animals entering (and leaving) the Americas. Finding evidence of the very first modern human to set foot here is an impossible task. Archaeologists are more interested in the process that brought humans here and the changes that resulted.

This story is told through our understanding of the Gault Archaeological Site, located about 40 miles north of Austin, Texas. The site is a large multi-component manufacturing site set into a unique environment on the edge of the Edwards Plateau. There is evidence for at least 23 archaeological cultures at the site from recent Late Prehistoric (~1000 years ago) to some of the earliest evidence for people in Texas (over ~16,000 years ago).
2. Outline of the segments of “Exploring the World’s Last Frontier: The Peopling of the Americas”

(DVD marker 00:00) I. Introduction

The video starts with the question “why study the past?” This question gets to the heart of what archaeology is and why it’s important. Archaeology is the study of past (and present) human cultures through their material artifacts and environmental data. This information is used to reconstruct patterns of human behavior in order to understand why and how human cultures change. Understanding more about these broad patterns can help us model and prepare for future changes.

The study of past cultural history and heritage gives color and meaning to our own lives as well as a sense of perspective – Where do I fit in? Human curiosity also plays a role. We are hardwired to be curious, to want to fill in our histories. Archaeology can also bring to light the lives of those who didn’t make this history books – the bulk of the population ignored by accounts of great changes and events.

(DVD marker 2:38) II. The Gault Site and a Paradigm Shift

The Gault School of Archaeological Research (GSAR), a nonprofit dedicated to research and education regarding the Earliest peoples in the Americas, was founded by archaeologists working at the Gault Archaeological Site. The Gault site is a Texas State Antiquities Landmark and on the National Register of Historic Places. It is currently owned by the Archaeological Conservancy, a nonprofit that protects over 500 archaeological sites in the U.S. and maintained by the GSAR.

People have been coming to this area for a long time. Gault is located in an ecotone, an area in which different plant communities’ transition into one another, and is located close to the Blackland Prairie, the Balcones Canyonlands, the Lampasas Cut Plains and the Edwards Plateau proper. In addition, the Buttermilk Creek Valley is an environment different from all.

Figure 2. Ecoregions of Texas with Gault Site marked with black star. Adapted from Gould 1975 Texas Plants A Checklist and Ecological Summary
those around it. This proximity to so many resources makes it a safe and easy place to practice broad spectrum (they ate everything) hunting and gathering.

The site is on the edge of the Edwards Plateau, 37,000 square miles of ancient seabed that is now porous limestone. One half of all the springs in Texas are found on the Edwards Plateau including the 15 largest springs in Texas. Four major river systems begin on the Edwards (Colorado, Guadalupe, Nueces and Rio Grande). In short, this is one of the largest sources of water in Texas and people, animals and plants need water.

When the Edwards limestone was being formed in the Early Cretaceous (100 to 150 million years ago) another type of rock began to form from the accretion of silica on the seafloor. Today we call this rock chert or flint and it is one of the finest materials you can make stone tools out of. It is stronger than most steels and breaks in a predictable fashion (a Hertzian cone) with razor sharp edges. The Edwards Plateau is one of the largest sources of chert in North America and we find tools and debris made of Edwards chert up to 1,500 miles away. Technically the Texas variety is all chert but many call it flint (a type of chert formed in chalk) which harkens back to the days when England was one of the largest producers of “gunflints”, the small piece of stone used to strike a spark in flintlock rifles and muskets.

The sheer quantity alone of tools and debris from the Gault Site mark it as a very important site both in the past and for present scientific value. The GSAR excavated an estimated 3% of the site and recovered 2.6 million artifacts. The majority of these artifacts are what archaeologists call “debitage” or the debris left over from making tools. Debitage can tell us a lot about the decisions that different cultures made when making their tools as each would have taught their children the “right way” to make things.

There are twenty-two cultures that an archaeologist might expect to find on a Central Texas site and the Gault Site has all twenty-two. The earliest named culture, Clovis, is represented by at least 600,000 artifacts – one of the largest assemblages of Clovis-age
materials from a culture found from Canada to Venezuela. In addition, researchers found more than 150,000 artifacts from a previously unknown and unnamed culture several thousand years earlier than Clovis. This has been called the Gault Assemblage.

The story we all learned as children and which, unfortunately, is still being taught in many places today is based on a very old observation. In 1590 a Jesuit priest named Jose de Acosta wrote a book about his 15 years in the New World (The Moral and Natural History of the Indies). In his book Acosta said that the people he’d seen seemed rather primitive and, since they were human, and his religious training told him all humans were related, he reasoned they must have walked to the New World somehow. Over the years we refined that into the now-familiar story:

13,500 years ago, there were these half-naked folks in Siberia chasing mammoth. We nearly always portray them as half naked though the Northern Hemisphere was even colder at that time than today and also tend to picture them as somewhat ape-like (hunched over and hairy) though they were all modern human beings – *Homo sapiens sapiens* – just like us. The story goes on to have them cross a “land bridge” to Alaska and then make their way 2,000 miles through the great glaciers that existed in the last ice age in an “ice-free corridor”. Once clear of the ice they spread out through the Americas killing everything they come across until 36 genera of large animals become extinct (and even 10 genera of birds).

The problem with this hypothesis (a hypothesis is an “testable idea based on observations” in science while a theory is a “tested, well-substantiated explanation”) is that there has never been any archaeological or geological proof that this is what happened. There didn’t seem to be any cultural continuity between Siberia and North America.

In 1975 a student in Chile was shown a large bone that a rancher had found. The bone turned out to be that of a gomphothere (a large elephant-like mammal) and came from a site now called Monte Verde near Puerto Montt, Chile. Subsequent excavations found
structures and tools from a human settlement dating to at least 14,800 years or 1,000 years before people had supposedly walked here. Other sites were found in North America with dates older than 13,500 years ago – Meadowcroft Rockshelter (PA), Cactus Hill (VA), Paisley Caves (OR), and the Hebior & Shaefer mammoth sites (WI). It became apparent that the story we had been telling for many years did not fit the data.

(DVD marker 7:52) III. Alternate Routes of Migration

If the archaeological evidence shows us that early humans did walk here 13,500 years ago we have to ask – How did they get here? The scientific process is for researchers to come up with ideas, called hypotheses, and then we test these. Contrary to what most people think scientists do not try to “prove” ideas – this could easily be done by picking out only the data that supports your idea. Instead we try to “falsify” the idea, look for ways to prove it wrong. After a great deal of time, ideas that we have been unable to falsify become theories. We call them theories (rather than facts) because there is always more to learn about theories (think about the “Theory of Gravity”).

What we do currently know about the spread of humans throughout the world places some restrictions on these ideas. Modern humans (Homo sapiens) developed in Africa around 300,000–200,000 years ago and dispersed through Asia and Europe around 70,000 years ago. The two most viable routes to the New World would be across either the northern Atlantic or Pacific.

The argument for colonization via the Pacific coast has been called the Coastal Migration Model, Pacific Coast Migration or, more recently, the Kelp Highway Hypothesis. Starting in 1979 an archaeologist named Knut Fladmark argued against the idea of an ice-free corridor and proposed that people had come along the coast in boats. Later refined by researchers such as John Erlandson and Darryl Fedje the idea is that the rich coastal ecosystems would provide lots of resources for people making their way along the coast.

Figure 6. Location of Meadowcroft, Gault, and Monte Verde. Showing Ice sheet coverage 10,000 years ago.
in boats. At first the prevailing idea was that the Cordilleran glacier blocked access to many places by coming directly down into the Pacific. But finds of early human remains (On Your Knees Cave 10,300 years old), Pleistocene bears and even hearth remains from Triquet Island, British Columbia (13,000-14,000 years old) indicate that not only did unglaciated land exist but that it was utilized by people and animals. This was bolstered by the evidence of human boat use to colonize Australia (at least 50,000 years ago) and early use of resources from Kozushima Island in Southern Japan.

A small handful of early human remains generally from the west indicate that at least some of the early peoples in the Americas shared ancestry with people in Siberia. The oldest of these (Anzick, Hoya Negro, Buhl, Peñon Woman III) date to between 12,000-13,000 years ago which may be significant since they may be 5,000-10,000 years younger than the first arrivals. It is also important to note that, while we have sites older than Clovis in the east, there have yet to be any finds of preserved skeletal material.

The route across the Atlantic, or more properly along the Atlantic ice sheet, would have been a similar distance and started in what is now France and Spain. This hypothesis has been named the Solutrean hypothesis after the culture that thrived in that part of the world 22,000-17,000 years ago. This hypothesis was first proposed in the 1970’s and got more recent attention after publications by Dennis Stanford (Smithsonian) and Bruce Bradley (U. of Exeter). In a book, Across Atlantic Ice, they compared stone and bone tool technologies, the environment, incised stone art and some archaeological features that seemed very close, perhaps ancestral, to Clovis technology. Clovis tool technology seems to have developed around 13,500 years ago in the American SE. They also looked at individual archaeological finds that looked very similar to technologies found on the other side of the Atlantic. Finally, they looked at the question – Could it have been done? – and went on to show that the edge of the Atlantic Ice Sheet was just as productive as the Pacific Coast.

Both hypotheses have their critics. Some argue that since we haven’t ever found watercraft that old they didn’t exist even though it can be proved otherwise. Others that there is no evidence for people adapting to the use of maritime resources. The lack of significant DNA from this period hasn’t stopped people from using that data to reject one or the other. The Solutrean hypothesis has even been rejected as “racist” because it implies that “Europeans” colonized the New World – this in spite of the fact that the people currently in Europe are not the descendants of the Solutreans nor did the genetic trait for white exist yet (it’s about 9,000 years old).
Hypotheses are for testing and much more work needs to be done so we have enough data start talking about the process of the peopling of the Americas. And it is a PROCESS and not an EVENT. There is substantial evidence for multiple migrations and movement in both directions, especially in Siberia. While the existence of two major hypotheses seems to indicate an either/or choice that is rarely the case with complex human cultures.

(DVD marker 9:27) IV. Analyzing the Assemblage

Archaeologists are like detectives, trying to reconstruct stories from the past based on the clues that they find just as modern forensic archaeologists work with police departments to solve crimes. Generally, the further you reach back in time the fewer clues you have to work with. Mother Nature is pretty unforgiving in destroying first the more fragile organic things – baskets, mats, clothing, wooden artifacts – followed by things made of bone (including human beings). It is a rare site that preserves artifacts made of fragile materials. Researchers looking at the peopling of the Americas generally only have two things to work with, stone tools and the geology of a site.

Analysis of archaeological data can tell us a lot about how past peoples adapted to change, local environments, and some of the priorities that were important to their culture. It can be a window to past decision making. To get to that point, however, takes a long time. As noted in the video, the average day for an archaeologist is not in the field digging but in the lab trying to find out what everything they recovered means.

One way is by careful analysis of stone, and the rarer find, bone tools. Examining the technology of both the finished product and the debris from making it can tell us how a particular culture thought tools should be properly made. Examination under high powered microscopes can tell us how it was used and on what materials. We can tell the difference between wood and bone working, meat cutting, hide working, dry and wet grass cutting which gives us clues as to the other tools and materials they used and possessed. A bone needle (or even the stone tool used to make a bone needle) tells us that they had clothing and perhaps bags or packs made of leather, for instance. We can find pollen and phytoliths, the remains of ancient plants that can tell us something about the paleoenvironment and their diet. Sometimes we even find blood cells that we can use to determine what animals they were hunting and cutting up.

Experimental archaeology (recreating past technologies) can give us more hints. Archaeologists use flintknapping, stone tool manufacture, to try to replicate the debris that we find from making a particular tool. That tells you that you are making similar decisions in the manufacturing process. Some archaeologists make and use tools to see
how efficient they are in skinning and animal or cutting down a tree, how long it takes, how often do you need to resharpen your tools and other questions like these.

Refitting stone artifacts is another analysis technique that takes a great deal of time and patience. It is like trying to put together a puzzle from pieces of many different puzzles mixed together without a picture of the final product and the certainty of many pieces having been taken away. Done well it can give you a tremendous amount of information. At one site, Les Maîtreaux (France), archaeologists were able to refit 60,000 pieces of debitage in such a way that you could see that there were three flintknappers and one was just learning!

Though the results of archaeological work often get put into history books and the profession is regarded as one of the Humanities the work of archaeology is science-based. As Dr. Collins points out in the video, archaeologists borrow techniques, methods and theories from lots of other disciplines. X-ray Florescence (XRF) is given as one example. A portable XRF unit can tell you the chemical elements in any substance down to parts per million. If we need to get more precise we use Laser Ablation Inductively Coupled Plasma Mass Spectrometry (with the awkward abbreviation of LA-ICP-MS). This can tell you the elements to parts per billion.

Another use of mass spectrometry has been Zooarchaeological Mass Spectrometry or ZooMS. This technique allows us to laser small fragment of bone, read the spectrum of elements from the smoke and often the signature can be assigned to a single species. Even small fragments of bone can now tell us what people in the past were hunting and eating.

Geographic Information Systems (GIS) are just one of the many computer analysis tools widely used by archaeologists today. GIS is a way of ordering geographically lots of different kinds of data which can give you new insights into the materials. There are many other examples of modern scientific tools being used in archaeology from physics (where we get most of our dating techniques like Carbon-14, Optically Stimulated Luminescence or Paleomagnetism) to drones (now often used with False-Color Imaging and LIDAR).

(DVD marker 14:41) V. Rules of Evidence

Like all sciences archaeology follows a set of rules that are mutually agreed on by others in the field. When we are discussing a new hypothesis what you must first determine is this set of rules that, when followed, would allow your colleagues to agree with your findings. In the case of the earliest cultures in the Americas those rules are as follows.
1. The artifacts you find must be of unmistakable human origin. You must be able to demonstrate that only humans could have made or used the materials in question.

2. You need excellent context. In other words, you need to be able to show that those artifacts were made by humans, deposited (or simply dropped) by humans and have remained in that spot ever since.

3. Lastly, you need excellent dates, preferably from more than one source and utilizing more than one method that shows your materials are as old as you claim.

As Dr. Lemke goes on to say, it is also all about patterns. Most sciences demand that an experiment be replicable to be accepted. The archaeological equivalent of that is repeatable. If you find one red frog in the woods, you cannot possibly say “all frogs are red.” Cultures are about human behavioral patterns and you need to be able to show that it is repeated to be a pattern.

The best way to get this evidence and meet the rules established by your peers is collaboration – working with those researchers who are interested in the same questions as yourself even if they don’t share the same ideas. More people looking for data in more places are more likely to get results. To this end, the GSAR has sponsored conferences for those interested in the Peopling of the Americas, the internet has greatly expanded our horizons enabling us to correspond quickly with researchers in other parts of the globe. It also allows us to trade papers, photographs and now even 3D models that other researchers can use to compare to their own findings.

It is possible that we are beginning to see patterns in the data. The Video talks briefly about 4 such patterns that we think we are seeing in North America. There is, however, not nearly enough information as yet to say anything definitively. These are hypotheses that we can further test. The GSAR is interested in the peopling of the Americas not just the peopling of Texas. To that end we work on projects throughout the hemisphere some sponsored by the GSAR and some in coordination with like-minded researchers. We do look at a large number of potential sites in Texas every year hoping to find artifacts and data similar to Gault (Patterns!).

Figure 8: GSAR members and volunteers in the lab and field.
VI. The Mission

The vision of the GSAR is to “Foster community-based research and education to expand our understanding of the earliest peoples in the western hemisphere and promote awareness of research and conservation efforts.” Fundamental to this mission is the idea of passing on what we know to both our colleagues doing similar work but also to the general public. In other words, education is one of the most important components of archaeology.

One way we reach the public is through tours and educational programs at the Gault Archaeological Site. The site is now owned by The Archaeological Conservancy, a nonprofit that protects over 500 archaeological sites nationwide. The Gault School administers and maintains it for the Conservancy and has built trails, signs and other infrastructure at the site to make it a center for archaeological education.

Hands-on education is another way of reaching the public. Archaeology is at heart an apprenticeship discipline with experience in the lab and field tremendously important for understanding the goals of the discipline. The GSAR offers volunteer opportunities in both the lab and field. Students of archaeology need this experience to advance in their profession and, for other volunteers, the ability to immerse yourself in the work is a learning experience unlike any other. Some work for a day or two because “They’ve always wanted to try it” and some get hooked and volunteer long term or even head back to school to learn more.

Archaeologists are interested in human behavior, how humans made decisions in the past, as part of an effort supported by other disciplines to model human behavior in the future. How are people going to act in the face of crises and decisions? Our work on the earliest peoples in the Americas may give us both a glimpse of our past heritage and insight into what the future may bring.

To Learn More:

Contact the Gault School of Archaeological Research: PO Box 81563 Austin, TX 78708 512-232-4912 or cwernecke@gaultschool.org

Check out the GSAR’s website: www.gaultschool.org

Schedule a visit to the Gault Archaeological Site 40 miles north of Austin (more information is available on the website, school tours are free)

Schedule a school visit by archaeologists from the GSAR – staff is available for presentations and demonstrations on a wide variety of topics.
Teachers Guide Glossary terms

Anzick/ Hoya Negro - human remains currently there are only about 13 known fragmentary human skeletons older than 10,000 years in the Americas - most of them from the west. The Anzick child (CO) has been determined to be about 12,800 years old while Hoya Negro (also known as Naia) is 12,000 years old.

Balcones Canyonlands - a subregion of and on the southeastern boundary of the Edwards Plateau. Highly dissected by the erosion of springs, streams and rivers it is characterized by a diverse deciduous woodland.

Blackland Prairie - a temperate grassland ecoregion stretching from the northern Texas border to San Antonio that was shaped by wildfires and bison.

Carbon 14 Dating - a method of determining the age of an object utilizing the half-life of a radioactive isotope of carbon taken in by living things.

Cactus Hill - an archaeological site in southeastern Virginia containing both Clovis and older deposits that date to 16,000-20,000 years ago.

chef/ftint - a finely crystalline form of the mineral silica, a rock that is durable and breaks with very sharp edges. Also called flint, jasper, and chalcedony.

Clovis - a complex of paleoindian cultural traits (not a people) in North America dating to around 13,500 years ago as defined at the site of Blackwater Draw near Clovis, NM.

Coastal Migration Model - an hypothesis involving the early migration of people from Asia along the Pacific Coast utilizing marine and coastal resources.

Cordilleran glacier - An ice sheet covering 1.5 million square miles of the western U.S., Canada and Alaska from the Mountains to the sea. Up to one mile thick it existed in various forms from about 2.6 million years ago until about 12,000 years ago.

Cretaceous - a geological period from 166 million years ago to 66 million years ago. An International Commission assigns chronological names to Eons/Eras/Periods/Epochs and Ages in descending order of magnitude (see attached chart).

Culture - broadly defined as everything that humans do that is learned rather than inherited. In archaeology often defined as assemblages of artifacts and traits found restricted in area and time.

Debitage - the debris from the manufacture of stone tools.

Ecotone - the transition area between two differing plant and animal communities.

Edwards Plateau - the southernmost unit of the Great Plains made up primarily of well-drained limestones with poor soils covering much of 40 counties in west-central Texas.

Extinction events - a widespread and rapid decrease in biodiversity. There were six major events in the past and current evidence puts us in the middle of the sixth.
False Color Imagery - imagery using parts of both the visible and non-visible parts of the electromagnetic spectrum.

Flintknapping - what we now call stone tool manufacture, the name derives from the English cottage industry of manufacturing gun flints.

Gault Assemblage - the human-made materials from the Gault site dating from 16,000-21,000 years old.

Genus/genera - singular/plural biological classification below "Order" and above "Species, i.e. for the Columbian Mammoth - Proboscidea (order) - Mammutthus (genus) - columbi (species)

Gompothere - an ancient elephant-like animal (though a separate extinct genus) found at a number of early paleoinindian sites in South and Central America.

gunflint - the small piece of chert (flint is a subtype) that was used in a flintlock rifle to strike a spark.

Hebior - a Columbian mammoth found in SE Wisconsin. This is the most complete skeleton ever found (about 85%) with butchering marks and it dates to 14,500 years ago.

Hertzian cone - the cone produced when force is applied to a brittle solid radiating from the point of impact (like a stone through a windshield).

Homo sapiens sapiens - modern human beings. There are still discussions as to whether Neanderthal is a subspecies of homo sapiens or that there are no subspecies - simply H. sapiens starting around 350,000 years ago.

Hypothesis - a proposed explanation as a starting point for further investigation, an "idea" in science.

Ice free corridor - the hypothesis regarding a 2,000-mile-long gap between the Laurentide and Cordilleran glaciers, roughly the modern Mackenzie River valley in Canada today.

Jose de Acosta - a Jesuit priest who wrote a book in 1590, the Natural and Moral History of the Indies, about his 15 years in the New World and speculating about the origins of humans in the Americas.

Les Maitreaux - a Solutrean culture (22,000-17,000 years ago) lithic workshop where researchers have refitted more than 22,000 fragments

Lampasas Cut Plains - a region often considered to be a northern extension of the Edwards Plateau consisting of numerous valleys scored into the limestone.

Land bridge - an inadequate term for the continent of Beringia, the 1,600-mile-wide land mass exposed between Alaska and Siberia when the sea was more than 200 feet lower.

LIDAR - short for Light Detecting and Ranging, uses a pulsed laser to measure distances - a major advantage is the ability to filter out reflections from vegetation.

Mammoth - an extinct genus in the same family as elephants consisting of 11 species from the Columbian and Wooly mammoths to the Pygmy mammoth.

Mastodon - (Mammut americanum) an extinct elephant species that looked much like the wooly mammoth. Mastodons lived in woodlands and were up to 10 feet tall.
Meadowcroft Rockshelter - an archaeological site in SW Pennsylvania with evidence of human habitation over the last 19,000 years.

Monte Verde - an archaeological site SW of Puerto Montt, Chile with definitive human occupation dating to at least 18,500 years ago including the remains of dwellings.

OSL - Optically Stimulated Luminescence, a method for getting dates from quartz and feldspar in soils that looks at their last exposure to the sun.

Paisley Caves - an archaeological site in Western Oregon with evidence, including human coprolites, of habitation 14,300 years ago.

Paleoindian - a period representing the first peopling of the Americas to the advent of Archaic foraging (about 9,000 years ago). Today it is known that there is not much separating the lifestyles of the cultures in these two periods.

Paleomagnetism - a scientific method of examining the magnetic polarization (frozen at the moment they were heated) of burnt rock and clay. It can tell you the temperatures reached as well as potentially used for dating as the magnetic pole shifts over time.

paradigm shift - a scientific fundamental change in our underlying assumptions about a problem.

Phytoliths - a microscopic mineral particle formed within a plant as it takes in water and silica, often lasts long after the plant.

Pleistocene - a geological period beginning 2.588 million years ago and ending 10,000 years ago meaning “most recent” (as opposed to the current Holocene or “entirely recent” period).

Pollen - the male microgametophytes of seed plants, individual pollen cells can last centuries in the proper environment.

Schaefer - 80% of a butchered mammoth skeleton from an archaeological site in SE Wisconsin dating to around 14,500 years ago.

Solutrean Hypothesis - the hypothesis that the Solutrean culture of SW Europe and the Clovis culture in the New World share many similarities that could be indicative of contact or migration.

Theory - In modern science, the term "theory" refers to scientific theories, a well-confirmed type of explanation of nature, made in a way consistent with scientific method, and fulfilling the criteria required by modern science.