**Arlington Springs - Discussion Topics**

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1. Why is Arlington Springs Important?

* Human bones were found deeply buried in a stratum dated to 13,000 years ago
* The site is the oldest yet discovered on the Channel Islands and in coastal California, dating to the end of the Pleistocene (Ice Age).
* The presence of people on an island indicates that they were using watercraft as a means of transportation at that early date.

1. Why is the use of watercraft significant at such an early date?

* The use of watercraft implies that coastal Paleoamericans were exploiting marine resources for food
* It has been argued that one of the earliest migration routes into the Americas was along the Pacific Coast south of the Bering land bridge. Watercraft would have been necessary to skirt around the glaciers that would have blocked progress on land.

1. How was the age of Arlington Man’s bones determined?

* Scientists used the technique of radiocarbon dating to determine the age of the bone.
* Radiocarbon dating is based upon the ratio of two isotopes of carbon, 12C and 14C. 14C is unstable and breaks down over time into 12C. There is a relatively constant amount of 14C in the atmosphere, so all living things maintain an amount of 14C in equilibrium with their environment. When an animal or plant dies, then the “clock begins ticking” with 14C beginning to degrade to 12C. This takes place over thousands of years. Thus, the ratio of 14C to 12C represents a measure of how old something was when it died.
* Bone possesses collagen which can be dated using radiocarbon dating; however, old bones also absorb organic compounds from plants, bacteria, etc. that are found in the surrounding sediments. So such contaminants must be removed using various purification techniques in a lab, in order to obtain a reliable date from bone collagen.
* In very ancient bones, collagen protein breaks down into its constituent amino acids.
* For Arlington Man, scientists had to determine that the trace amounts of amino acids were those that were from bone collagen and then just date that purified extract.
* Finally, archaeologists returned to the Arlington Springs site and dated charcoal from the sediments surrounding Arlington Man’s bones.
* These various studies yielded evidence for Arlington Man living about 13,000 years ago.

1. Why were scientists initially confused about whether Arlington Man was a man or woman?

* Only three leg bones remained, the rest apparently had eroded away as Arlington Canyon was formed.
* The diameter of the shaft of the femur (thigh bone) fell within the range usually associated with women. Men on the average have leg bones that are larger diameter than women.
* The head of the femur (the ball joint) was sent away to be assessed for radiocarbon-dating shortly after the bones were discovered in the early 1960s. Phil Orr had wisely recorded the diameter of the head of the femur before this was done. When his measurement was discovered among his writings, the diameter of the head of the femur indicated that the bone most likely was from a man.

1. What was the environment like during the Late Pleistocene in the Santa Barbara Channel region when humans first arrived?

* The sea level was much lower than it is today, approximately150 feet lower. Thus the shoreline was much further out to see than it is today.
* Because of lower sea level, the Northern Channel Islands were all connected together as one mega-island called Santarosae.
* Arlington Springs was an inland site on Santa Rosa Island.
* Ancient pollen records from sediments in Arlington Canyon and elsewhere show that a pine-cypress forest existed on Santarosae. There are small areas of pine forest on Santa Cruz and Santa Rosa islands, but native cypresses disappeared shortly before the end of the Pleistocene.
* Pygmy mammoths and a “giant” deer mouse were part of the land fauna on the island. Bones of the deer mouse were extremely abundant in the soil surrounding Arlington Man’s bones.

1. Did the first people to arrive on Santarosae hunt pygmy mammoths?

* Phil Orr, the archaeologist who discovered Arlington Man’s bones, believed that early Paleoamericans hunted the pygmy mammoths because he found areas of fire-reddened earth that he thought were roasting pits and he also discovered mammoth bones that had been charred by fires.
* More recent studies show that the fire reddened earth and the burned mammoth bones were the result of ancient wild fires on the island.
* However, the earliest date for humans at Arlington Springs of 13,000 years ago matches the most recent date obtained from mammoth bones. So mammoths seem to have gone extinct shortly after humans arrived on Santarosae, suggesting that the two events are related.
* There is abundant evidence from elsewhere in North America, that Paleoamericans were hunting full-sized Columbian mammoths 13,000 years ago. So it is probable that pygmy mammoths would have been hunted also once humans arrived on Santarosae.

1. Why were Arlington Man’s bones so deeply buried?

* When sea levels fall during ice ages, sediments are eroded away as the canyon downcuts to reach the lowered sea level.
* As sea levels rose at the end of the Pleistocene, the opposite phenomenon occurs. Sediments began to accumulate upstream in canyons that travel to the sea, burying the ground surface that existed 13,000 years ago, including Arlington Man’s bones.
* The sediment accumulation ceased when sea levels stabilized to their present levels sometime around 7,000 years ago.
* Once sea levels stabilize, then canyons can begin to downcut again. At Arlington Springs, this erosion is what eventually exposed Arlington Man’s bones 37 feet below the existing ground surface in the side wall of the canyon.

1. Why was it so important for Phil Orr to preserve the block of earth containing Arlington Man’s bones wrapped in a plaster jacket?

* At the time the bones were excavated in 1960, techniques were not yet available to obtain an accurate age from a small amount of surviving protein in ancient bone.
* Advances in analyzing bone chemistry and in using accelerator mass spectrometry to date small amounts of carbon made it possible in the 1990s for an accurate age to be determined.
* This is why maintaining collections in museums is important for future research, because new methods may be developed that will allow new scientific discoveries and insights to be obtained from artifacts and specimens were collected many years in the past.