# ARTIFACTS AND FEATURES
# ANCIENT CLIMATES

This article is one of an occasional series discussing matters archaeological, especially with reference to the Maturango Museum. Today I want to talk about ancient climates, since they affect our understanding of previous occupations of this area.

Obviously life requires water, a fact of which we in the desert are acutely aware. The Indian Wells Valley and the Coso region lie in a rain shadow created by the Sierra Nevada, so water supplies tend to be limited. However, there have been periods in the past when this area was much wetter than today, and others when it was much drier. These patterns would have had a significant impact on ancient inhabitants, and may again in the future.

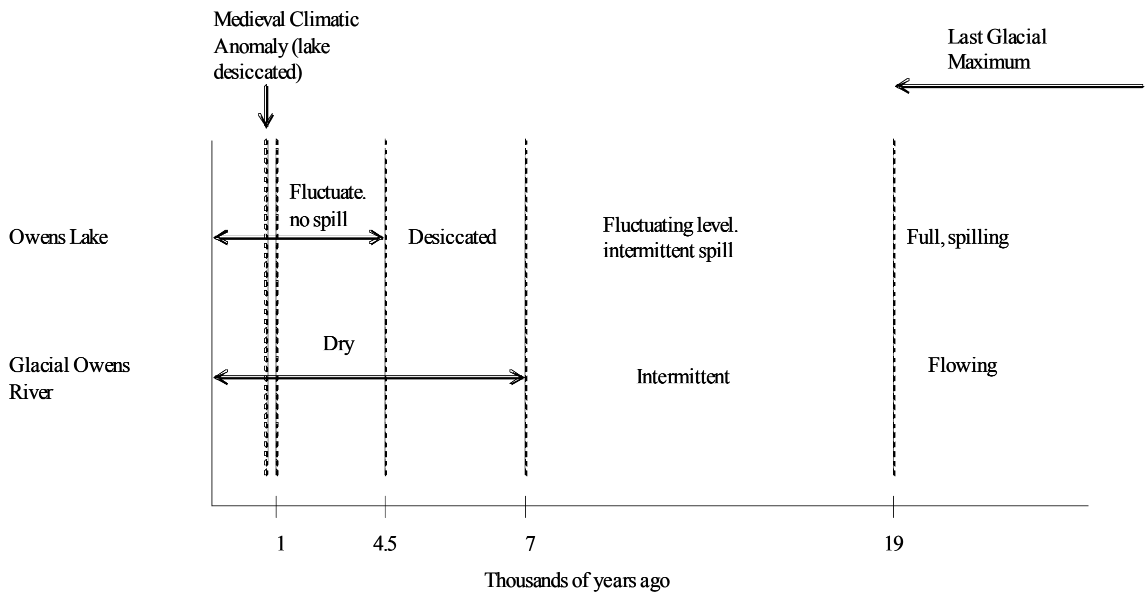
Since weather records only go back about 200 years, ancient climate must be studied by means of proxy data, phenomena which are indicators of past climate. Examples of frequently-used proxies are tree rings, pollen in wood rat middens, vegetation remains, faunal remains, sedimentation, evidence of erosion, and changes the concentration of the heavy isotope of oxygen ($^{18}O$). Proxy data can be used to reconstruct ancient lake levels, vegetation boundaries, and, in the case of tree rings, actual temperature and rainfall sequences.

The ancient lakes on the eastern side of the Sierra have received considerable study. Mono Lake has been extensively studied by Dr. Scott Stine of Cal State/Hayward, who has reconstructed lake levels back about 4,000 years based on a combination of sedimentation and radiocarbon dating of drowned tree stumps. He found a cycle of high and low stands, with a period raging between 200 and 400 years; the high stands probably correspond to periods of greater rainfall and lower evaporation rates (i.e. cooler temperatures). Significantly, he identified two ancient droughts in which the lake levels were below the current low stand caused by Los Angeles Department of Water and Power, probably indicating severe drought.

Searles Lake was studied by Dr. George Smith in the 1960's. Smith's primary interest was the Pleistocene, and he identified two times when Searles Lake spilled into Panamint Valley; both were during the last glacial maximum, around 20,000 years ago. More recently, Searles Lake was desiccated from 10,000 – 6,000 years age, but showed significant water level around 4,000 years ago.

Dr. Steven Bacon and colleagues have recently studied Owens Lake, and assembled an impressive set of multi-proxy data indicating lake levels. The accompanying figure shows their findings in a simplified form. Their data show that Owens Lake was full and spilled into the Glacial Owens River through Haiwee and Fossil Falls prior to about 19,000 years ago. This was the time when Fossil Falls was carved, and the Glacial Owens River flowed into China Lake. Pleistocene megafauna such as mammoths, horses, camels, and ground sloths lived in Indian Wells Valley at the time; you can see some of their bones in the Maturango Museum, and more bones can be found on the Chain Lake ranges. The vegetation was probably savannah-like at the time.

With the end of the last glacial maximum 19,000 years ago, Owens Lake ceased to spill into the Glacial Owens River; there may have been a short recurrence about 15,500 years ago, but that was probably the last. From 19,000 to 7,000 years ago the level




Owens Lake and the Glacial Owens River (after Bacon et al. 2006)

of Owens Lake fluctuated around a depth of 40 meters, with a few intervals when it was desiccated. In particular, the lake was dry around 12,000 years ago during the Younger Dryas cold interval. Subsequently, between 7,000 and 4,500years ago, Owens Lake was completely desiccated. Bacon and his colleagues were unable to find any evidence of shore-lines dating from this interval, indicating the lake was dry; this time corresponds to the hot, dry period, or "Altithermal", postulated by Dr. Ernst Antevs from geological evidence over 40 years ago. It is possible there were wetter intervals during this period, but they left no trace in Owens Valley.

The Altithermal ended some 4,500 years ago, and milder conditions returned, probably with more rainfall; Owens Lake partially refilled and achieved a high stand of about 20 meters, higher than the historic period but still far below the spill level. The lake level then gradually declined to its historic period high stand of 10 meters, with a desiccated episode around 1,000 years ago during the Medieval Climatic Anomaly.

From the perspective of archaeology and anthropology, this period of improved climate after the Altithermal but before the Medieval Climatic Anomaly seems to correspond to the time of maximum production of Coso petroglyphs. The climate was probably milder and wetter than today, and there were would have been more perennial water sources. Overall, the Coso region would have been an attractive place for hunter-gatherers to live.

From this brief review of the paleoclimatic record it is clear that significant climatic fluctuations have occurred in the past, for reasons which are still not fully understood by paleoclimatologists. The radiative output of the sun probably plays a part, as do the orbital dynamics of the earth, but the role played by other factors is less clear. In this context, it is interesting to note that the so-called Little Ice Age, a period of cold temperatures world-wide from about AD 1300 – 1850, corresponds to the astronomical

Maunder Minimum, during which the sun was apparently free of sunspots. The mechanism connecting the two phenomena is still debated.

Paleoclimatic reconstruction is a major area of research today, and even this brief summary suggests that there should be no surprise if climate change occurs, with or without human intervention. Reconstruction of ancient climates is valuable in archaeology, and also gives insights into the present.