

STRONTIUM ISOTOPE EVIDENCES

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Speaker- Narayan Prasad Agarwal.

1-Four outstanding multiple burials were discovered near Eulau, Germany. The 4,600-year-old graves contained groups of adults and children buried facing each other. Skeletal and artifactual evidence and the simultaneous interment of the individuals suggest the supposed families fell victim to a violent event. In a multidisciplinary approach, archaeological, anthropological, geochemical (radiogenic isotopes), and molecular genetics methods were applied to these unique burials. Using autosomal, mitochondrial, and Y-chromosomal markers, it was identified genetic kinship among the individuals. A direct child-parent relationship was detected in one burial, providing the oldest molecular genetic evidence of a nuclear family. **Strontium isotope analyses** point to different origins for males and children versus females. It tells insight into a Late Stone Age society, which appears to have been exogamous and patrilocal, and in which genetic kinship seems to be a focal point of social organization.

2-Cotton (*Gossypium* sp.), a plant of tropical and sub-tropical origin, appeared at several sites on the Arabian Peninsula at the end of the 1st mill. BCE -beginning of the 1st mill. CE. Its spread into this nonnative, arid environment is emblematic of the trade dynamics that took place at this pivotal point in human history. Due to its geographical location, the Arabian Peninsula is connected to both the Indian and African trading spheres, making it complex to reconstruct the trans-continental trajectories of plant diffusion into and across Arabia in Antiquity. Key questions remain pertaining to: provenance, i.e. are plant remains of local or imported origin and the precise timing of cotton arrival and spread. The ancient site of Mleiha, located in modern-day United Arab Emirates, is a rare and significant case where rich archaeobotanical remains dating to the Late Pre-Islamic period (2nd–3rd c. CE), including cotton seeds and fabrics, have been preserved in a burned-down fortified building. To better understand the initial trade & production of cotton in this region, strontium isotopes of leached, charred cotton remains are used as a powerful tracer and the results indicate that the earliest cotton finds did not originate from the Oman Peninsula, but were more likely sourced from further afield, with the north-western coast of India being an isotopically compatible provenance. Identifying the presence of such imported cotton textiles and seeds in southeastern Arabia is significant as it is representative of the early diffusion of the crop in the region, later to be grown extensively in local oases.

Some other strontium isotope evidences are as follows-

3-In **woolly mammoths** (*Mammuthus primigenius*) and their elephantine relatives (living and extinct), tusks preserve information about their habitats in an element called **strontium**, which

the tusks absorb from plants the animals eat. Ratios of **strontium isotopes** — versions of the element with different numbers of neutrons — vary between geographic locations, and incremental records of local isotope ratios in tusks can reveal where the animals were dining during different stages of their lives,

After splitting the tusk, the scientists collected about 400,000 individual data points on the concentrations of **strontium and other isotopes**, such as oxygen and nitrogen, taken from the center of the preserved "timeline" covering the animal's entire life span. The tip of the tusk represented the mammoth as a baby and juvenile, and the base of the tusk showed the last years of the mammoth's life.

4-Remains of twin fetuses & wealthy mom are found in Bronze Age urn. Where was she from?

Chemical analysis entailed looking at the different versions, or isotopes, or **strontium in the deceased's teeth and bones**. Different regions have different ratios of strontium isotopes, which people absorb in the water and food they consume. **These strontium isotopes** then end up in people's bones and teeth, allowing researchers to measure and compare them with strontium isotopes found in the environment. The vast majority of the individuals had local strontium signatures, especially the men and children. The elite woman, in contrast, was born elsewhere and moved to the region between the ages of 8 and 13. Furthermore, an analysis of her grave goods revealed that the bronze neck ring and gold ring were "prestige objects" similar to valuable items found in other burials and hoards in Central Europe. It is not improbable that the neck-ring and pins/needles were meant to symbolize a link with her native land, whereas the gold hair-ring (a gift?) embodied the new local identity she acquired by joining the new community at the highest rank. Another buried woman, who did not have any grave goods, had a **strontium signature** from elsewhere, possibly from Lake Balaton in western Hungary or central Slovenia, it was noted.

5-Where are the foreigners of the first international age?

The dead were usually buried in simple pit graves and often with ceramic vessels near their head.

The Bronze Age in the eastern Mediterranean has long been considered by researchers to have been the 'first international age,' especially the period from 1600-1200 BC, when powerful empires from Anatolia, Mesopotamia, and Egypt set up large networks of subordinate client kingdoms in the Near East. These empires fought, traded, and corresponded with one another, and ancient texts from the period reveal rich economic and social networks that enabled the movement of people and goods. A new study conducted by an interdisciplinary team of archaeologists, geneticists, and isotope experts, and investigated the movement of people in this period at a single regional center, a Bronze Age city-state called **Alalakh** in present-day southeastern Turkey. Their results indicate that the majority buried at Alalakh were raised locally and descended from people who lived in the region.

The team's goal was to see if the high levels of interregional connectivity evidenced by the architecture, texts, and artifacts found at the site during 20 years of excavations, sponsored by the Turkish Ministry of Culture and Tourism and Hatay Mustafa Kemal University, could be detected among the population buried at the city. To do so, they conducted **strontium and**

oxygen isotope analyses on tooth enamel, which can detect whether an individual grew up locally at Alalakh or moved there only during adulthood. The genetic data on the other hand can be used to determine where a person's recent ancestors came from. The isotope analysis identified several non-local individuals. However, their DNA showed an ancestry that was local to Alalakh and neighbouring regions. Either these individuals were short-distance migrants from the region or return migrants, people whose parents or grandparents originally came from Alalakh. Only one sampled individual, an adult woman, was not part of the local gene pool, instead showing ancestry that most closely matched groups in Central Asia. However, her isotopic signatures suggested a local upbringing. We expected the isotope analysis to show that this person immigrated to Alalakh, since her genetic data was so different from the rest of the population, so we were surprised to see that she was likely native to Alalakh. It could have been her parents or grandparents who made the move, instead. While different types of mobility were identified, including short-distance, long-distance, and return migration, there were no complete foreigners in the dataset. Most people were born and raised at Alalakh and also their ancestors came from the region. There are several ways to explain this. It is possible that far less long-distance migrants were living at Alalakh. Another possibility is that haven't found their graves, yet. Perhaps most individuals that came from far away were not buried directly at Alalakh, or in a way we cannot trace.