

# Isotopes, Archaeology, climate and Sustainability of Human civilization

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Globally, more so in India, the boundary between Archaeology and Mythology is often blurred. Normally as a subject Archaeology is also kept outside the domain of Geosciences. In reality the time domain of archaeology corresponds to Pleistocene and Holocene epochs. With the technological advancements, the connections between human evolution, culture and climate change are being deeply probed. New techniques in chronology, stable and radiogenic isotope tracing of processes are providing information that are not only fascinating but also have relevance to ongoing climate change and future of current human epoch 'Anthropocene'. The talk will principally focus on few case studies of application of stable isotope tracers in studying archaeological events and processes and how the lessons from past can help us in building a sustainable planet.

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## Few relevant references

- Bryant J D, Koch PL, Froelich PN, Showers WJ, Genna BJ (1996) Oxygen isotope partitioning between phosphate and carbonate in mammalian apatite, *Geochim Cosmochim Acta* 60 5145–5148.
- Madella M, Fuller DQ (2006) Palaeoecology and the Harappan Civilisation of South Asia: a reconsideration, *Quat. Sc. Rev.* 25:1283–1301
- Weber, S, Kashyap, A, Harriman, D (2010) Does size matter: the role and significance of cereal grains in the Indus civilization, *Archaeol. Anthropol. Sc.* 2: 35-43.
- Schug GR et al. (2013) Infection Disease and Biosocial Processes at the End of the Indus Civilization, *PLoS ONE* 8(12): e84814
- Dixit Y, Hodell, DA and Petrie CA (2014) Abrupt weakening of the summer monsoon in northwest India ~4100 yr ago, *Geology* 42:339-342.
- Sarkar, Anindya, Deshpande Mukherjee, A, Bera, MK, Juyal, N, et al. (2016), Oxygen isotope in archaeological bioapatites from India: Implications to climate change and decline of Bronze Age Harappan civilization, *Scientific Reports (Nature)*, DOI: 10.1038/srep26555,
- Sengupta, T et al., (2019) Did the Harappan settlement of Dholavira (India) collapse during the onset of Meghalayan stage drought? *Jour. Quat. Sc.*, DOI: 10.1002/jqs.3178