

The Archaeological Sciences Centre @ IIT Gandhinagar: Exploring the Evolution of Majestic Civilizations



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“Archaeology is not only the handmaid of history; it is also the conservator of art.” — Robert Bulwer-Lytton, 1st Earl of Lytton, English statesman, Conservative politician, and poet



Deriving its roots from the Greek word *archaeo* which means ancient or primitive, archaeology is the study of cultures of the past by examining the remains of buildings and objects, as described by the *Oxford Dictionary*, but also flora and fauna (like grains, pollen and bone remains) as well as any evidence of natural phenomena (from earthquakes to diversion of rivers) found in the ground. Almost all the eminent scholars of this field across the globe state that **there is more to Archaeological Sciences than what meets the eye**. This branch of study is not just about digging up ancient ruins and skeletons; with its ramifications in history, epigraphy, arts, literature, social studies, craft traditions and ancient technologies, archaeology is focused in the humanities on the one hand, while on the other hand, its explorations into palaeoenvironments, archaeobotany, archaeozoology, archaeometallurgy, petrology, archaeogenetics, and extensive utilization of cutting-

edge research techniques from fields of material science, chemistry, civil engineering and remote sensing, point towards its eminently scientific nature.

Indian archaeology has been lagging behind in the scientific exploitation of excavated sites and artifacts. Realizing the potential of modern scientific aids in this field, the *Archaeological Sciences Centre (ASC)* was established at IIT Gandhinagar (Gujarat, India) in December 2012 with the aim to pursue archaeology in multidisciplinary and interdisciplinary perspectives.

This Centre follows a research-oriented approach to bridge the gap between archaeologists and the scientific community in the present times, so as to understand the past of humankind and serve our future in a better manner.



Extensively promoting the concept of *open lab system*, ASC utilizes lab facilities such as field emission scanning electron microscopy, X-ray diffraction technique, mass spectrometry, ground penetrating radar and 3-D terrestrial laser scanner from various

disciplines of the Institute (*Material Sciences, Civil Engineering, etc.*) and conducts in-depth research and testing of various archaeological sites and excavated materials. This Centre also analyzes samples using the equipment available at other institutes like the *Physical Research Laboratory (PRL)* in Ahmedabad, Gujarat. In collaboration with the *Discipline of Earth Sciences* at IITGN, ASC has set up a *Ceramic Petrology Laboratory* which is crucial in examining the ceramic samples to acquire an estimate about the provenance and manufacturing techniques and hence help in developing a database for the same.

A distinguished faculty and zealous post doctoral fellows form the strong framework of this Centre. They have managed to attract many leading archaeologists and scholars from around the world to deliver lectures on a **wide diversity of topics** in several national and international conferences, summits and workshops, some of them being *Applications of Remote Sensing to Archaeology* (2014), *Archaeometallurgy and Archaeology* (2014), *History and Archaeology of Ancient India* (2015), *History, Science & Technology of Stone Beads* (2015), *Dialogue of Civilizations, jointly organized by* (2017), *Elemental Analysis with ICP-MS and Isotopic Analyses with MC-ICP-MS and TIMS* (2018) and *History, Science and Technology of Ancient Indian Glass IIT Gandhinagar* (January 2019). Focused on the areas of transnational heritage, proto-historical to pre-medieval Indian history, metallurgy through the ages, ethnographic analysis of the 5000-year old Gujarati stone-bead craftsmanship and the Indus civilization, several of these events were conducted by ASC in collaboration with government and non-profit organizations like the *National Geographic Society* and *Archaeological Survey of India (ASI)*. ASC's faculty members and post doctoral fellows have so far published four single-author books, two edited books, nine book chapters, sixteen papers in renowned journals and some miscellaneous writings.

The Centre has signed two *Memorandums of Understanding* with ASI for **national and global joint-projects** and programmes. It also has tie-ups with PRL, Ahmedabad, *Tata Institute of Fundamental Research (TIFR)*, Mumbai, many leading archaeologists in India and abroad, and the archaeology departments in *MS University, Baroda*, and *Deccan College, Pune*, for their guidance, expertise and research. Furthermore, ASC has international collaborations with *Field Museum of Natural History* (Chicago, USA) and *Oklahoma University* (Oklahoma, USA) for investigations into the source materials of glass manufacturing in ancient India. These partnerships have been very rewarding, as they not only give visibility and recognition to the Centre, but also **enhance awareness** about issues of great importance to the archaeological community.



Apart from these external associations, ASC also has several intramural alliances with many disciplines of IITGN which include **multidisciplinary investigations** in terms of bead-drilling technology, ceramics, water management system and town-planning, at the Harappan site of *Dholavira (Rann of Kutch, Gujarat)*, morpho-dynamics of *Markanda Valley (Himachal Pradesh)* using chronology and sediment provenance of fluvial terraces near Harappa sites with the Discipline of Earth Sciences. The Centre also has proposals sanctioned by the *Department of Science and Technology (DST)* and ASI on 3-D laser scanning with applications to the fingerprinting of antiquities with the *Discipline of Electrical Engineering*, investigating the impact of sea level fluctuations, climate change or tectonic activity on the decline of Dholavira and conducting a multi-sensor 3-D drone survey of Dholavira with the Disciplines of Earth Sciences & *Civil Engineering*.

Many interesting elective courses and projects for the UG, PG and PhD students of diverse education-streams are offered by the Centre as a part of the regular course-curriculum. However, the Centre aims to expand the scope of its courses and hopes to include archaeological PG and PhD degree-programmes in future.

Recounting an interesting experience, *Prof. Michel Danino (visiting professor in Humanities and coordinator of ASC)* said, “A few years ago we had two MTech students from Civil Engineering who were doing their final project at Dholavira, testing some areas with *Ground Penetrating Radar (GPR)*. Initially hesitant, they got excited as the project progressed in the course of several visits to the site and eventually published an excellent paper in *Current Science*. The best outcome was that one of them, *Silky Agrawal*, became quite an expert in GPR and launched her own startup, which has been doing quite well, I believe. This small incident goes to show how the fascinating field of archaeology can lead to completely different yet successful paths and is a good

example of how **the study of our past heritage can open up new avenues in the present and the future!**"

The discipline of Archaeological Sciences, which is quite advanced in the West, is just at its initial phase in India, hence there is a dire need to build it up for the betterment of our future generations and ASC at IITGN is an effort in this direction.

"Monuments and archaeological pieces serve as testimonies of man's greatness and establish a dialogue between civilizations showing the extent to which human beings are linked." — Vincente Fox, 55th President of Mexico



(This is the third article of the series about the 7 interdisciplinary centres @ IIT Gandhinagar. The second article can be found [here](#) and the fourth article is available [here](#).)

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