CALIT2 Visualization Projects at UC Riverside

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Hi Gillian,

Hope you're well! Sorry I've been out of touch the past couple of months, I've been trying to wrap my head around this whole place. There have been some interesting collaborations at UCR centered around 3D visualization of Mayan archaeological sites in Mexico. I was very happy to find that UCR is already an important hub for this kind of work, and is already working closely with members of the Cultural Heritage Engineering Initiative (CHEI) group based in San Diego's CALIT2 office. We visited SD a couple weeks back to discuss ongoing collaborations.

I'd love to share some details about these people and their projects, please don't distribute images externally. All of these individuals are Archaeology Professors in the Anthropology department here at UCR. We're very strangely specialized, in that we have 4 different professors all engaged in Mayan archaeology in Mexico. They usually try to break it up to be more global, so this concentration on one area and a specific set of 3D technologies is unique and I think it offers some larger opportunities for partnership and shared infrastructure.

Travis Stanton - Professor of Anthropology

> **Chichen Itza** -Travis has already been working with members of CALIT2's CHEI group for several years. Pre-pandemic they'd collaborated on a massive photogrammetry project, taking over 130,000 photos of this important UNESCO site to document every instance of iconography at the site. That collaboration resulted in this book, as 3D models were used to create simplified tracings so that Karl Taube (another UCR professor and famed Mayan hieroglyph specialist) could translate hundreds of glyphs. There are plans to continue this work, further documenting the site, visiting museums to 3D scan related artifacts and place them back in their original contexts. Working with CHEI, Travis is planning to write a grant to build these models into a single cohesive 3D archaeological atlas. We're beggining to model such an atlas with this building at Chichen called Caracol (the observatory). We even be able to simulate the utility of certain archetectural features in observing the stars (see image below left, interactive 3D LiDAR of Caracol with starmap behind). The end goals are to provide a public facing immersive environment, aswell as a means for Karl to easily annotate all of the iconography in situ.
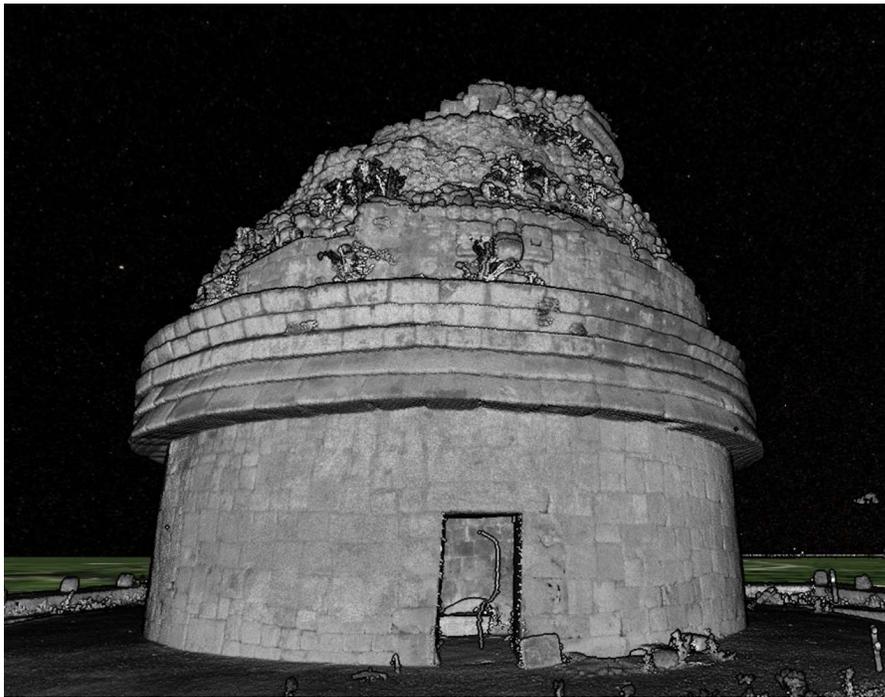
Mayan Train and Yucatan LiDAR - Travis has access to HUGE swaths of aerial LiDAR across
the Yucatan. He uses this data to identify and classify archaeological features beneath thick
jungle. Originally his work had focused on estimating demographics by mapping
settlements, but now he's in a weird place with this big development project building a train
around the Yucatan coast. This Train threatens a lot of important archaeological sites. Travis
and a small team of expert volunteersrecieve survey data days ahead of bulldozers, and
have to quickly process and tag potential archaeological features to be mapped and
evaluated by field staff. Images left to right: the extent of one 2017 LiDAR survey covering
almost 450km^2 , Raw LiDAR classified with trees, the same area processed to highlight
subtle features in the topography.
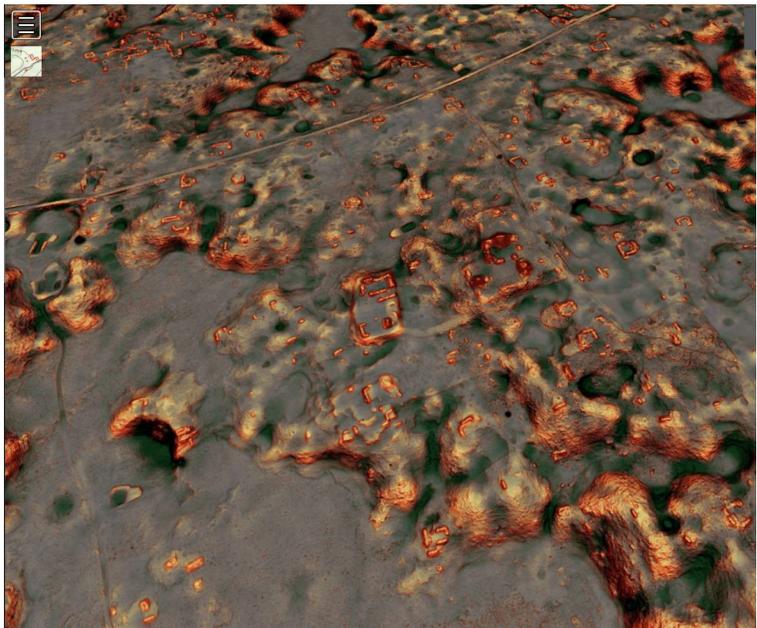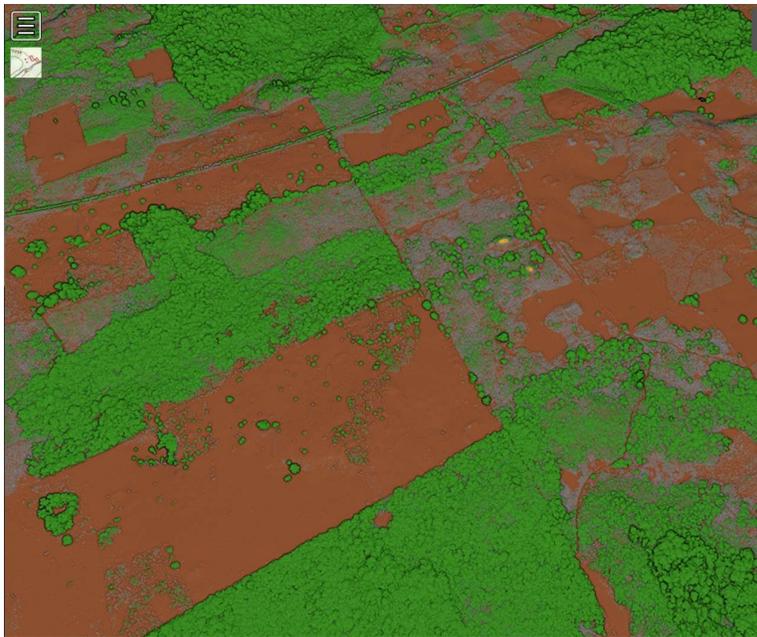
[Nawa Sugiyama](#) - Professor of Anthropology

Nawa specializes in zoological archaeology, performing isotope analysis on animal remains found across a number of Mayan sites, tracing the trade of animals, domestication, and use in rituals. She has her hands in dozens of different analyses outside of animals. She's very well connected, one of a very small and elite cohort of archaeologists coming out of Harvard, with close ties to the Smithsionian. Nawa is closely involved win high tech excavations in some of the most culturally important Mexican archaeological sites, including Teotihuacan and Templo Mayor (buried beneath the very center of Mexico city). These sites boast 30 years of legacy survey data and media which we're beginning to assemble a single corpus. Her collaborators are presently involved in 3D documentation and reconstruction of buildings at Teotihuacan. Below, some images of the Pyramid of the Feathered Serpent at Teotihuacan.
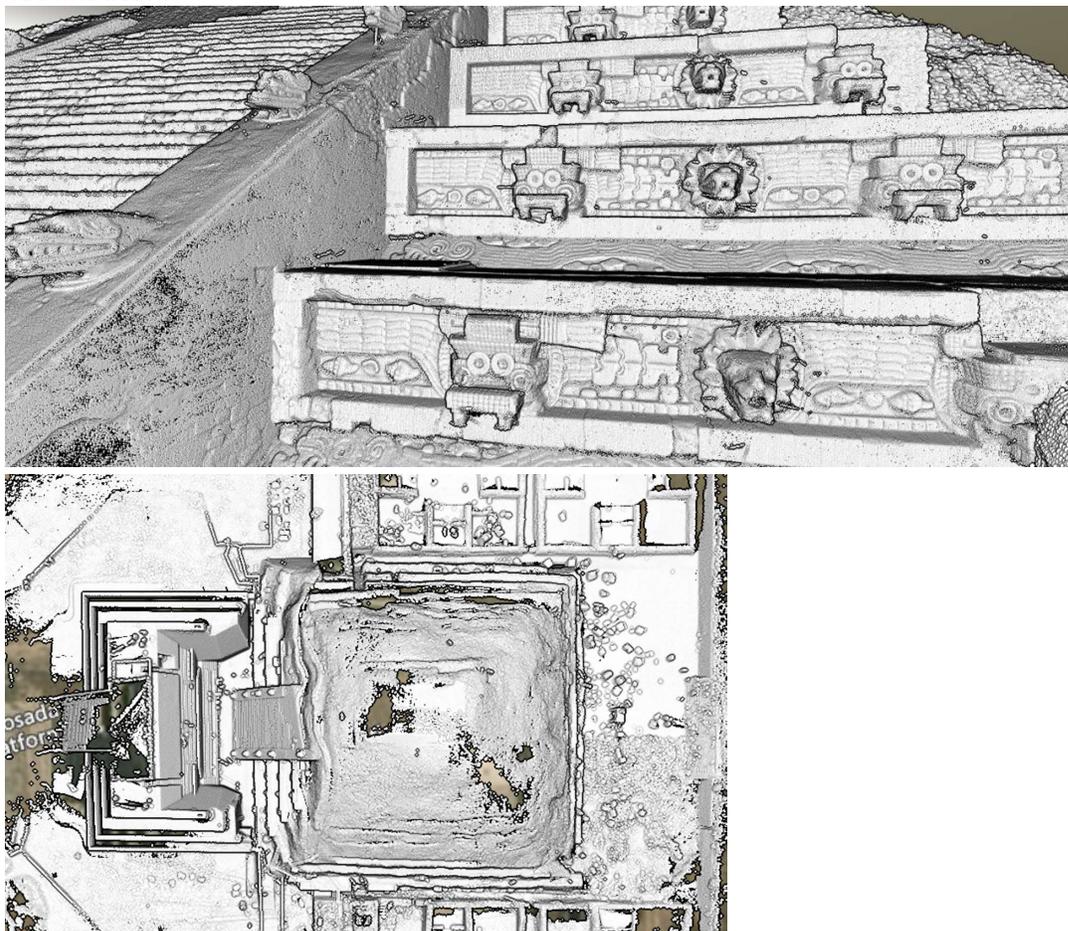
[Kenichiro Tsukamoto](#) - Associate Professor of Anthropology

Kenichiro is a very well reviewed teaching professor at UCR, and Assosciate professor of Anthropology, with an ongoing adjunct affiliation at Meiji University in Japan (which means his dept gets some great discounts on heavy isotope analysis). He specializes in Mayan political studies and works at a site called El Palmar. Kenichiro is doing 3D documention at every scale. Site-wide aerial lidar, individual buildings, individual burials, artifacts. In his last field season he captured over 40 different burial layers via photogrammetry. The needs for compute and data storage are getting out of hand, and growing exponentially year by year. Images below left to right: burials accross the site (40 models), one burial with offerings (plates/pots/flasks), a high resolution 3D scan of the small jade tobacco flask, circled in the previous image.

All of these researcher's can benefit from access to cloud compute and storage to help perform their analyses and collaborate with external research and government partners. I think these projects are going to result in some really impactful research and highly visual/interactive media that could easily communicate the scope and vision of CALIT2 her at Riverside. CHEI is hoping to bring all of these researchers together and the head of the Mexican Government's archaeological authority at CALIT2 San Diego this fall, to explore new partnerships.

I really love the way archaeology brings together so many different types of media, data, and analysis, with engaging narratives wrapped in an air of ancient mystery. Whatever systems we figure out to visualize and archive the range of outputs from these archaeological projects will probably translate to everyone else doing 3D documentation in field work. I think it's a really interesting opportunity to engage our faculty and graduate students who already employ these kinds of data in computer science/engineering, the geosciences, and agriculture. I'd like to start thinking about developing some graduate level seminars on 3D visualization in partnership with Calit2 and the Library for Winter or Spring 2023.

I'd appreciate your thoughts, I'm very happy to help support your mission however I can.