CENTER FOR ANCIENT MIDDLE EASTERN LANDSCAPES

MEHRNOUSH SOROUSH

Building on last year's exploratory workshops, the Center for Ancient Middle Eastern Landscapes (CAMEL) dedicated more resources in 2024–25 to our AI-Assisted Archaeological Remains Detection (A3RD) project, which aims to develop an open-source, artificial intelligence (AI)–based geospatial remote-sensing platform specifically designed to detect archaeological features on satellite imagery (for more information, see https://camelab.uchicago.edu/project/a3rd/). We focused our efforts on strengthening campus partnerships, expanding our collaboration with other institutions, and seeking funding to advance our project. These activities included deepening our partnership with the University of Chicago's Research and Computing Center (RCC); in addition to our long-term collaborator, Parmanand Sinha, new RCC staff members became involved in our work, assisting with grant applications in particular. We also launched an exciting collaboration with the university's Data Science Institute (DSI), welcoming to our core team DSI professor Nicholas Ross, who directs the University of Chicago's Data Science Clinic.

We applied for several internal and external grants to fund our ongoing research and to support the implementation of our ideas. As CAMEL director, I received a faculty grant from the University of Chicago's International Institute of Research in Paris to hold a weeklong workshop/hackathon at its John W. Boyer Center. On March 16–23, 2025, we worked closely with previous external collaborators Rémi Cresson, a remote-sensing engineer from France's National Research Institute for Agriculture, Food, and the Environment (INRAE), and Emad Khazraee, vice president of data science and AI at Xometry, as well as with new partners Andrew Wilson, professor of the archaeology of the Roman Empire at the University of Oxford and principal investigator of Oxford's Endangered Archaeology in the Middle East & North Africa (EAMENA) project, and Bijan Rouhani, EAMENA senior researcher and project manager. We introduced our project design concept and workflows to the EAMENA team, and together we tested a multicollaborator, Amazon Web Services–run cloud environment in which all participants independently tested our proof of concept. Finally, after receiving feedback on extensive documentation developed by the CAMEL A3RD team, we designed our platform architecture and prepared a roadmap for the subsequent phases (figs. 1–2).

In spring 2025, CAMEL partnered with ISAC's newly launched Data Research Center (DRC) in applying for a grant for an ISAC-led AI project. Our joint proposal, "New Frontiers in AI-Driven Knowledge Discovery of Human-Environment Interaction, History, Language, and Material Culture," submitted in June, was one of three preproposals from the university's Division of the Arts & Humanities advanced to the full-proposal stage. This proposal, which consumed much of the CAMEL team's time and resources in spring 2025, resulted in an ambitious and exciting plan that positions ISAC (CAMEL and the DRC) as a hub for cross-campus collaboration on *longue durée* human-environment history by deploying AI and other computational methodologies. Our proposal-development workshops included interested potential collaborators from many units and departments, including the Committee on Geography, Environment, and Urbanization; the RCC, Urban Theory Lab, DSI, and Center for Spatial Data Science; and the Departments of Art History and Geophysical Sciences.

Figure 1. CAMEL team and collaborators, with the John W. Boyer Center in the background. From left to right: Caglayan Bal, Jiayue Wang, Remi Cresson (INRAE), Mehrnoush Soroush, Dominik Lukas, Yuwei Zhou, Emad Khazraee (Xometry), Parmanand Sinha (RCC). Not pictured: Andrew Wilson and Bijan Rouhani (University of Oxford and EAMENA).

Figure 2. Workshop participants assessing the results of automated-detection tests. Standing: Andrew Wilson (University of Oxford and EAMENA).

During 2024–25, CAMEL also began a major initiative to digitize historical U-2 reconnaissance aerial photographs acquired by the United States in the 1950s and 1960s, now declassified and stored at the National Archives and Records Administration (NARA) in College Park, Maryland. Although the U-2 collection is smaller than the better-known CORONA and HEXAGON archives, the collection's combination of early temporal coverage and high special resolution (0.5 m/pixel) makes it a valuable resource for archaeological research. Digitizing U-2 images is laborious and complex; it requires multiple trips to NARA to work with custom equipment during limited business hours. Although a few scholars have acquired images from the archive for their personal use, public access to it remains constrained. CAMEL's goal is to digitize and assess the U-2 imagery and, ultimately, to make our digitized images available to researchers (fig. 3). While previous acquisition efforts focused on Egypt, the Levant, and Mesopotamia, this year we began acquiring images of flights over Iran, which have never been systematically obtained. For this project, we explored using a different method than that used in previous efforts—namely, taking a slower but more selective approach using large-frame negative scanners.

In addition to these larger projects, several contract and collaborative research projects have been pursued and are near competition—most importantly, a pilot research project between CAMEL and scholars at the University of California, Berkeley, and in the University of Chicago's Department of Geophysical Sciences that investigates a new, noninvasive method for mapping deeply buried archaeological features. In 2024–25, we also welcomed three CAMEL scholars in residence as part of our early-career scholar support and mentorship program: Kate Rose (PhD Harvard, 2024), who investigates settlement patterns in North Sudan using the remote-sensing technologies of light detection and ranging, or LiDAR, and thermal imagery; Safa Mahmoudian (research scholar, Vienna University), who has a project on the early Islamic gardens of Samarra; and Henry Bacha (PhD student in anthropology, University of Chicago), who is working on landscapes of camelid movement in the Andes. These individuals bring an exciting range of new topics into CAMEL's community conversations through their research questions and brown-bag presentations.

Figure 3. Comparison of the resolution of historical images of the Sasanian fortress complex in the city of Kerman, Iran, on (a) U-2 aerial imagery, 1480 mission (1958); (b) CORONA satellite imagery, KH-4A mission (1970); and (c) HEXAGON, KH-9 mission (1984).

As always, I am indebted to the talent, dedication, and motivation of CAMEL's research staff and collaborators. The A3RD project included research assistants Dominik Lukas, Yuwei Zhou, Jiayue Wang, and Caglayan Bal.

Ruijie Yao spearheaded the U-2 digitization project. Harrison Morin supported and supervised multiple contract and collaborative projects, including the building of a remote-sensing database for northern Oman and standardizing our cartographic production. Ruijie Yao and Julian McCoy worked on the Oman remote-sensing project. Olivia Fiser continued the laborious work of organizing our map archives. And last but not least, CAMEL supervisor Dominik Lukas has been an indispensable contributor to the lab's successful operation by supporting me in coordinating and supervising all projects.

I would like to extend my gratitude to all of CAMEL's friends and supporters. Special thanks go to ISAC's administration for funding and invaluable administrative support, including ISAC director Tim Harrison, Sheheryar Hasnain, Marianna Capeles, and Matt Perley, as well as to Foy Scalf, whose masterful leadership of ISAC's Integrated Database Project and related software maintenance and improvement is crucial for our success. Write to CAMEL at camel@uchicago.edu or to me at mehrnoush@uchicago.edu if you would like to receive our newsletter, if you wonder whether CAMEL can support your research needs, if you need help organizing your spatial data or producing publication maps, or if you are interested in collaborating with us or funding one of our many projects. We love to hear from our community.