

School of Human Evolution and Social Change

Undergraduate Research Apprenticeship

Research project or internship title:

Predictive modeling of isotope and abiotic variables for understanding human adaptations to environmental change

Academic discipline:

- Physical Anthropology
- Archaeology
- Sociocultural Anthropology
- Global Health
- Applied Math
- Bioarchaeology
- Museums
- Other: Hydrological and Climate Modeling/ GIS/ Remote Sensing

Project description:

The APU (Andean Paleomobility Unification) Project is a two-year examination of isotopic values and environmental conditions throughout the complex hydro-geological systems of the Andes. Baseline isotopic values of strontium and oxygen are being compiled for water, soils, flora, and fauna in the natural environment and from cultural features such as puquios (wells) to develop predictive models that will allow us to probabilistically assign archaeological skeletons or artifacts to likely places of origin. In addition to facilitating sample geolocation, the isotope data will be used in conjunction with climate and paleoclimate data to understand how prehistoric Andean societies adapted to periods of intense flood and drought cycles that may have impacted their water and food security.

The project has several components: 1) meta-analysis/ mapping all bioarchaeological and environmental isotope data in the region; 2) development and testing of a cloud-based mobile field data collection system through the QGIS Field App; 3) field data collection; 4) isotopic analysis in the ACL and Keck Labs; and 5) development of a password-protected website where users can upload their own data and download APU data and models. In year 1, we are focusing on plotting and analyzing the isotopic pilot data already collected, as well as meta-analysis and field data collection. This project is a collaboration between the Archaeological Chemistry Laboratory and PI Beth K. Scaffidi, pursuant to support from the National Science Foundation.

Student's duties:

The project needs 1-2 students with some experience in GIS or remote sensing to assist with data compilation, hydrological and ecosystem modeling, and geostatistical modeling. The APU project maintains raster and vector data on elevation and environmental variables in the Peruvian Andes, which now needs to be scaled up to include the entire range, at various spatial resolutions. The project has recently been granted access to 10,000 km² of high-resolution time-series RGB/ NIR data through the Planet's Research and Educational Program, and the apprentice will be assisting with data organization, procurement, and pre-processing of this and other new data sources. Students will also be plotting isotope data and x, y coordinates from publications within and beyond anthropological sources. They will also help with testing the field data collection app and gain some experience in preparing and analyzing isotope samples, if desired. Finally, there will be opportunities for presenting research results at conferences, assisting with peer-review journal submissions, and field data collection during the summer 2019 season.

Required qualifications or pre-requisites:

Students should have a working knowledge of GIS and/or Remote Sensing principles, either in QGIS, ESRI (ArcMap, etc.), ENVI or similar software packages, gained either through an introduction to GIS class or through intensive field or lab work. Beth Scaffidi has taught several Intro to GIS classes and will be training students on advanced methods, but students should know enough fundamentals of GIS/ RS to be able to work independently if needed.

Students should have a broad interest in understanding how societies adapt to challenging environments, and how changing climates can impact social structure, cultural practices, migration, and health. Students are encouraged to apply their own expertise and interests to the project, so students with prior coursework in hydrology, geosciences, biogeochemistry, climate change, ecology, global health, and computer-based modeling would be particularly well-suited to maximize the experience.

Project/internship location:

SHESC building, office 318/ Archaeological Chemistry Lab. After the assignments have been explained, apprentices can complete the work from other locations.

Hours per week or days and times needed:

5+ hours/week, at location of choosing. 1 Facetime or in-person meeting per week.

Project supervisor:

Beth K. Scaffidi

Supervising faculty:

Kelly Knudson

Contact information:

beth.scaffidi@asu.edu