

Cal Poly Humboldt proposal '3D Digital Herbarium' to IMLS' National Leadership Grant Program

Introduction

In 2023, Cal Poly Humboldt Library developed the world's first 3D Digital Herbarium prototype (<https://hum.link/3DHerbarium>) with the goal of creating an immersive 3D web-based interface that inspires and improves botanical education to all ages, connecting botany students, faculty, citizen scientists, and community to learn about native plants in California. The Cal Poly Humboldt Library seeks support from the Institute of Museum and Library Services' National Leadership Program in the form of an Implementation Grant of \$249,130 to expand the codebase and enable libraries and museums to easily adapt the platform for any discipline from Archeology to Zoology. This project is aligned with IMLS Agency Goal 3: Advance Collections Stewardship and Access, and Program Goal 3: Improve the ability of libraries and archives to provide broad access to and use of information and collections, and Objective 3.3: Support the design and development of online library and archives services that meet user expectations for operating in an online environment. The 3D Digital Herbarium and 3D Exhibits4Learning are specifically designed to advance and share 3D photogrammetry methods, provide open source and hosted 3D exhibition tools tailored for engaged learning, and provide hosted and archival options for libraries. The IMLS Implementation award will enable the Cal Poly Humboldt Library to refine the 3D Herbarium and create a flexible platform called 3D Exhibits4Learning that can be easily adopted and adapted to any disciplinary 3D exhibit. Libraries, museums, and other cultural institutions will have the opportunity to host their own exhibits with the open-source software and instructions or leverage our shared hosted platform. In addition, IMLS support will enable the project team to develop and implement a digital archive plan, and to provide that service for partnering institutions in the shared resource.

Project Justification

Traditional herbariums are not very accessible and contain dried flattened specimens that lose their color and shape. Digitized herbariums are simply digitized photographs of the 2D specimen sheets. Due to their flat and complicated geometries, plants proved to be the most challenging specimens to scan and model in three dimensions in the exploratory work to date, which involved considerable photogrammetry and 3D modeling research. The 3D Digital Herbarium exhibitions offer augmented and virtual reality views, as well as an inspirational touchscreen kiosk experience that gives a very authentic look at the colors, characteristics, and structure of the plants.

This ground-breaking project serves as a very engaging learning environment on the web. It involves creating an open-source presentation tool that enables linking 3D models with annotations and integrating other resources using APIs, including services such as iNaturalist, among others. For the purpose of visualizing concepts, testing designs, and developing solutions, 3D modeling has emerged as a crucial skill and competency in many professions. Libraries play an important role in inspiring and encouraging learning 3D modeling techniques across all academic fields. In creating a 3D Digital Herbarium, we discovered how our research advancing photogrammetry and software development could advance botany education and created powerful collaboration with computer science and botany students. Cal Poly Humboldt has a strong botany program with a greenhouse and herbarium facilities. With support from IMLS, the Cal Poly Humboldt Library will expand the codebase of the 3D Digital Herbarium to serve as a 3D Exhibits4Learning, which adds features such as class assignment and citizen science roles for contributing 3D models and annotations. A hosted version that scales as a library cooperative framework will be provided to invite California State University Libraries, other libraries, museums, and pertinent cultural organizations to host and share their 3D exhibits. In addition, this project plans to test multiple disciplines to enhance the functionality to meet a variety of needs, from Archeology to Zoology.

Project Work Plan

Phase 1: Research. August 1 - September 2024

- a. Form Project Team with existing library personnel working on the project and invite disciplinary faculty and staff to participate. Cyril Oberlander, Library Dean, will serve as sponsor, a full-time Project Manager and Programmer will provide overall project management for the 3D Herbarium project, with support from other library personnel, including student assistants and interns.
- b. Project Team will research, outreach to and identify various disciplines interested in 3D Modeling and Exhibit Tool, academic programs at Cal Poly Humboldt and other CSU, and cultural organizations. Project Team will develop a multidisciplinary stakeholder group of academic college faculty, and library and museum representatives, to present mockups and models to gather their needed feedback for design and features of the 3D Exhibits4Learning.
- c. Project Team will develop mockups and prototype various disciplines 3D Exhibits use cases, provide sprint presentations and gather design feedback. Design and test various assignments using the exhibit tool as classroom activities and internships; document the workflows necessary to use photogrammetry to create and contribute to 3D Exhibits.

Phase 2: Software refinement and publish as open source. September 2024 - May 2025

- a. Process feedback from iterations of the various discipline 3D Exhibits into system requirements.
- b. Finalize conversion of Version 1 of the 3D Digital Herbarium to serve as a multidisciplinary framework for the 3D Exhibits Tool for Learning.
- c. Evaluate three archival models, so that contributing partners or locally hosted sites have effective options to store 3D models, and the hundreds of digital photographs that are required to build a 3D model.
- d. Project Team will work with the stakeholder group to prepare training documentation for publication.
- e. Publish documentation as open access for libraries and other organizations interested in using the 3D Exhibits4Learning. Release open-source software with documentation needed to implement.

Phase 3: Provide outreach and training for the 3D Exhibits4Learning. January - July 31, 2025

- a. Provide face to face and online workshops for implementing the 3D Exhibits4Learning either as hosted or local installation.
- b. Evaluate feedback and suggestions for version 1 release and answer questions about implementation and hosting.

Project Results

This project enables the 3D Project Team to research other disciplinary 3D exhibit needs and refine the software as a framework for any discipline to utilize for exhibits. This project will provide libraries and museums a powerful open-source 3D digital exhibit tool with training documentation in order to easily implement a 3D exhibit, as well as sharing a variety of photogrammetry methods, archival strategies, and even an opportunity to cooperatively exhibit on a hosted version. In addition, the 3D Project Team will author and submit an article for open access publication, and plan to provide a free online workshop for libraries and museums interested in implementing a 3D exhibit. Software will be released as Open-Source software.

Budget Summary

Total amount requested: \$249,130. By category: Salaries & Wages: \$80,400; Fringe Benefits: \$33,776; Supplies: \$3,000; Student Support: \$54,946; Indirect Costs: \$77,008. Students will be engaged in two distinct ways: 3D photogrammetry student assistants paid by wages, and Research Annotation Library Scholar Interns paid stipends.