



SOCIETY OF PHYSICS STUDENTS

An organization of the American Institute of Physics

SPS Chapter Research Award Interim Report

Project Proposal Title	The Naked Eye Observatory
Name of School	Ithaca College
SPS Chapter Number	3183
Total Amount Requested	\$2,000

Abstract

Ithaca College has been trying to create a naked eye observatory on campus for years. The structure would drastically improve campus involvement in physics and astronomy. Our SPS chapter aims to provide the research and models necessary to begin this project.

Proposal Statement

Overview of Proposed Project

Throughout the process of this research, we want to ask ourselves: What sort of non-electronic astronomical instruments can we create that the public will understand and be able to interact with? The thought comes up, when the physics department sees low attendance (compared to the student population) at our open telescope nights, that there are two main reason that people do not attend these: 1. They are to infrequent, and often conflicting personal schedules. 2. Only one person can look through the telescope at a time, so the wait is long to see one thing. These responses are the reason we would like to build this naked eye observatory. It would encourage public astronomy to the Ithaca College community, as well as give the physics students a chance to leave a mark on our campus history. Specifically, this research project aims to create the blueprints, with which, this project can be started. Our goals are: To create accurate and detailed models of each naked eye observatory instrument, and to create an overall structural model of the whole observatory with accurate measurements and angles scaled down to be 3D printed for the campus project proposal team to use. This is a fantastic opportunity for our SPS chapter to create one of very few naked eye observatories in the nation. This will not only provide for national recognition of our students and college, but also national recognition for SPS for helping fund this incredible project.

Background for Proposed Project

Naked eye observatories have existed for a very long time. Stonehenge is most likely one of the first naked eye observatories followed by structures by the Aztecs, Mayans, and Mississippi river valley civilizations. A naked eye observatory today is a set of obelisks aligned with celestial bodies so that certain simple measurements can be made during various times of day, in different months and years. Measurements such as time of day, moon cycle, day of the year, season, tide pattern, planetary alignment etc. can be made with these instruments. Each obelisk also has a plaque on it detailing how to use the instrument on top of it. Before the full structure can be built, someone needs to make the necessary measurements and design the layout of the naked eye observatory. This is where our research comes in. We will be the ones to create the foundation for a college-wide effort to build this observatory.

Expected Results

We expect to 3D print accurate and detailed models of each individual instrument. These models will be exactly to scale of the real models we plan to implement. We also expect to 3D print a full-scale model of the whole observatory. This can go with a college proposal team for the project to supplement research information. We also plan to showcase our models by attaching them to wooden structures and lining them up in the location we are planning to build the observatory. This will allow the office of the president of Ithaca College to get a closer look into what the final product will look like.

Description of Proposed Research - Methods, Design, and Procedures

We want to figure out what instruments we can build and how to arrange them. We will do this by creating a model of the area that the observatory will be built, and simulating the sun, moon, and other celestial bodies so we can appropriately align each instrument. We also want to experiment with different alignments of the observatory to make sure that the final product will work for years to come. Many of our models will be 3D printed using our extensive 3D printing lab (we have over 15 3D printers at our disposal), and our full-size demo will be built using our woodshop on campus. Each confirmed and completed instrument will be added to the overall model, which will be eventually printed out and put on display.

Plan for Carrying Out Proposed Project

Many members of SPS will be assisting on this project, but main contributors will include those who work in the astronomy and astrophysics labs. We have 3 active members that have already been theorizing this with a faculty member for the past year who will provide expertise on the subject, and we have many students who do research in the 3D printing lab and woodshop that can assist us with expertise in those areas. The bulk of the research will be carried out in our 3D printing lab, faculty member in charge of the project's office, and physics student room. There are a few faculty in the physics department who have been working on this project for years now, and they would be more than willing to help us complete this research project to continue to push the overall project forward. They can provide a range of resources from equipment to space to expertise.

Project Timeline

1. Obtain all previous work on this project including, but not limited to: Models, research, ideas, prototypes.
2. Compile useful previous materials and begin research on instruments. – **Finish by end Jan 2018**
3. Complete computer models of instruments and continue researching new instruments
4. Begin 3D printing completed computer models and begin researching alignment – **Finish by end Feb 2018**
5. Finish 3D printing instruments and continue researching alignment.
6. Begin modelling and printing aligned overall model. – **Finish by end Mar 2018**
7. Finish printing overall model, begin compiling materials for demo
8. Run demo for the Office of the President, and hand over completed overall model to college proposal team – **Finish by end Apr 2018**

Budget Justification

For this research project, three reels of MakerBot PLA filament will be needed to create a 3-D printed scale model of the naked-eye observatory. The 3-D printing will be completed using Ithaca College's MakerBot printers. Eight standing structures will serve as models for the columns that would constitute the real observatory. The necessary materials for each structure are six twelve-foot-long wooden 2x4's, one bottle of wood glue, and approximately twenty-five of each screws, bolts, and washers. Construction equipment including drills and saws will be provided by Ithaca College. Wooden panels will be fastened atop these structures, which will serve as a surface for the apparatuses that allow for specific viewing of the sky based on astronomical research. These apparatuses will be 3-D printed with another twelve reels of MakerBot PLA filament. Each structure will need to be secured in place with two sandbags and five feet of rope.

Bibliography

- Price estimations received from Home Depot
- Information about Naked Eye Observatory gathered from Ithaca College Physics Professor Dr. Matthew Price
- 3D printer information and filament projections gathered from Benjamin Bouricius, IC3D LAB employee