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# Bridging Dimensions: A Robotic Art Project

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# Bridging Dimensions

A Robotic Art Project





# **Bridging Dimensions**

**Samantha Miller**

Advisor: Professor Fernando Orellana

*unraveled*


2019 Union College Senior Art Exhibition

Crowell and West Galleries

Feigenbaum Center for Visual Arts

807 Union Street

Schenectady, NY 12308



***WELL THE UNIVERSE IS  
SHAPED EXACTLY LIKE THE  
EARTH. IF YOU GO STRAIGHT  
LONG ENOUGH YOU'LL END  
UP WHERE YOU WERE.***

**Modest Mouse | 3rd Planet**



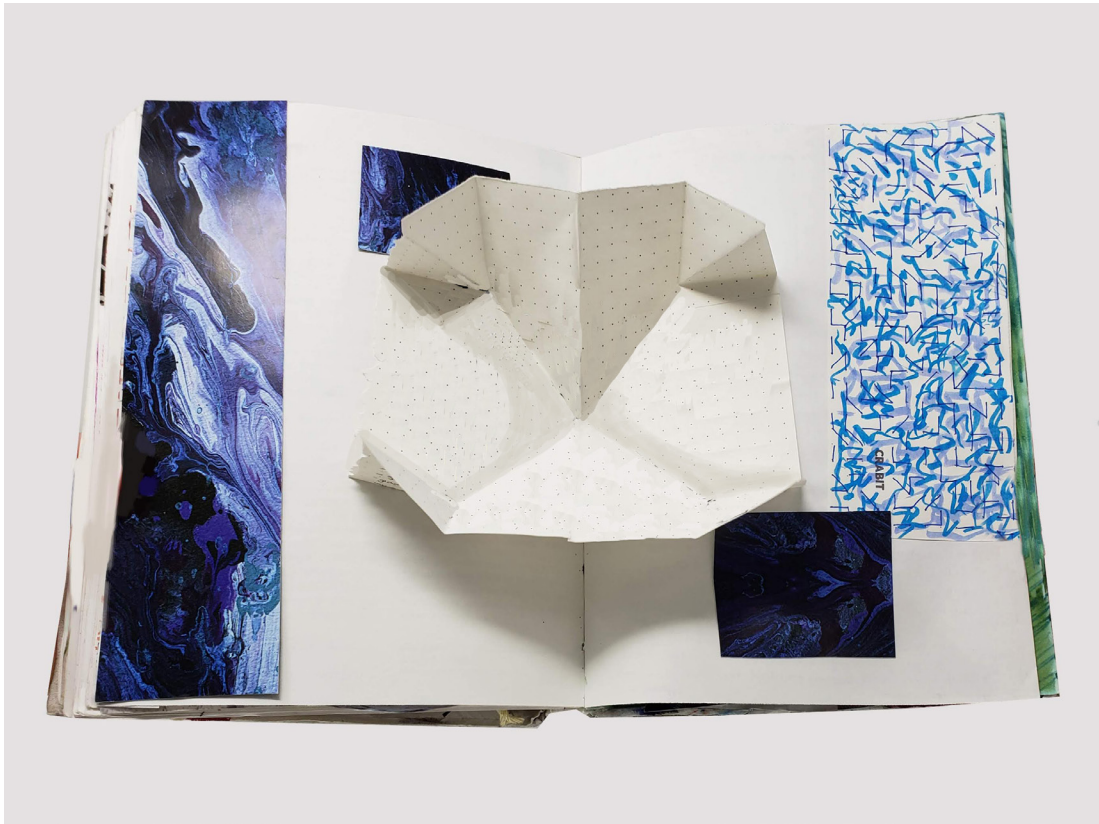


## Part I: Genesis

From the beginning, I understood that I wanted my thesis project to present an innovative combination of robotics and fine art. How I would go about this I did not know until I discovered my inspiration - the turkish map fold. Unique and dynamic, I viewed the fold as simultaneously architectural and illustrative. It was an opportunity to relate my two dimensional work with my interest in architecture.

What I especially loved about the fold was its motion. Opening and closing provided the visual an entirely new dimension. My idea was to remove the map fold from bookmaking—where it has been traditionally used in art—and give it a life independent of human interaction. By designing a mechanism to open and close the work, I saw a way to give the medium a new environment and utilize a variety of skill sets.

Without realizing it, from the moment I saw the turkish map fold, I invested myself deeply in the project. I encountered my idea relatively early, far before I ever truly began working on the project. This was the first time I let a project idea sit and ruminate for so long. This contributed to my deep investment in the final result. From my perspective, I saw this thesis project as a way to display ambition in my work. I desperately wanted to present something people had never seen before and showcase my abilities in both traditional and contemporary art forms. In my undergraduate career I have always tried to remain quiet about my work, letting it speak for itself. With my thesis, I wanted it to sing for itself - to be a beautiful summation and marriage of my work in engineering, contemporary art forms, and traditional art forms. With all of this subconsciously hanging over my work, I began.



A early sketchbook spread using a turkish map fold



## Part II: Theoretical Designing

As the fall of my senior year approached, I considered how to design the mechanism to move the turkish map fold. Being a visual learner, I decided to animate the fold's motion. Through this, I understood the motion was dictated by how the opposing pentagon faces changed in pitch. I imagined a mechanism with two arms rotating opposite each other, attached to the faces of the fold (Figure 1). In this design I also included support legs which would attach to the base with a slider. This idea was prototyped in cardboard and laser cut 1/4" wood. With these initial tests, I began using a gear and servo motor to facilitate the rotation. After these tests I was able to see the supportive leg was unnecessary, and instead created friction. This would bring me to the final simplified mechanism design (Figure 2) and early phases of box cover designs. While I considered exposing the mechanism, I preferred a wooden box cover to contrast the mechanised process and declutter the visual. At the end of my first term of work, I finalized the mechanism design and began to clarify the final project's organization and operation. Originally, my idea had been to emphasize the architectural nature of the fold by presenting them at around five feet tall. But as I realized I would not be able to achieve this easily, as the fold began to droop under its own weight beyond twenty inches tall. Recognizing I would not be able to achieve this size without dedicating my project entirely to one large fold, I moved on from this idea. Instead through a group critique, I began to see the possibilities of a series of turkish map fold mechanisms operating as an assemblage.

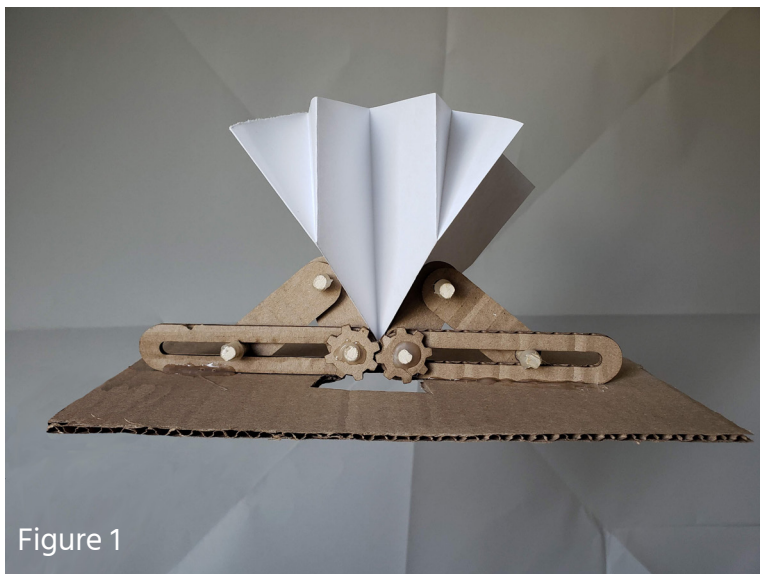
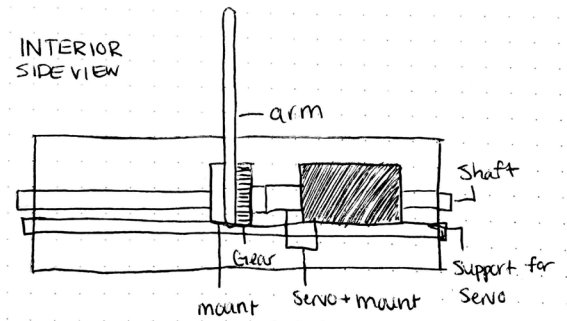
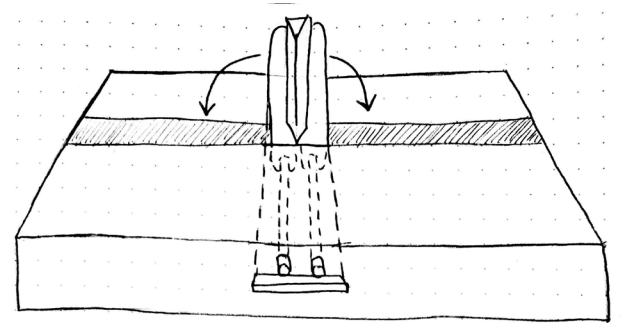
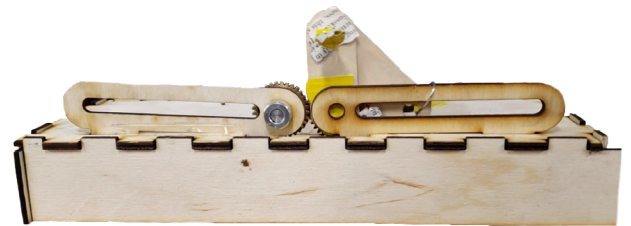


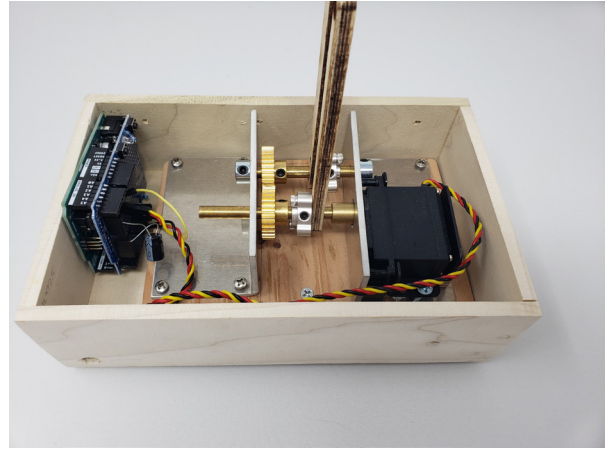
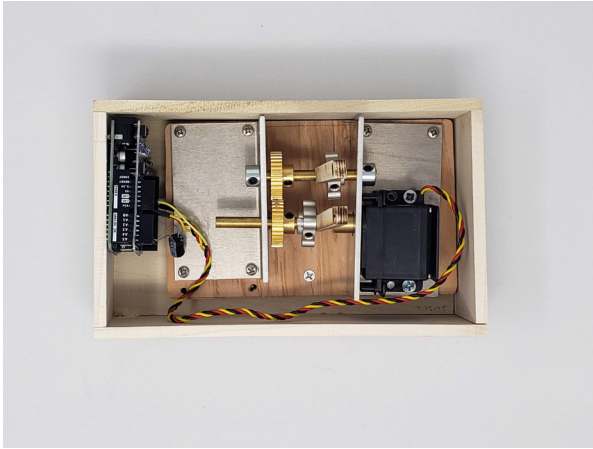
Figure 1

Figure 2



### **Part III: Clarifying the Design**

Despite having the mechanism designed, I still needed to create a support system for the mechanism to live within. For this aspect I designed a bracket out of aluminum to support the rods along which the gears rotated, causing the arms to move. This bracket was first planned in Cinema4D, then designed in Adobe Illustrator and waterjet cut out of aluminum. Three iterations of this bracket were developed before the final condensed design was configured. After mounting the brackets and mechanism to a board, it was stored in a poplar wood box, along with an arduino to drive the servo. With this design I was able to facilitate the automated movement of the turkish map fold I desired while maintaining a clean and organic visual appearance.

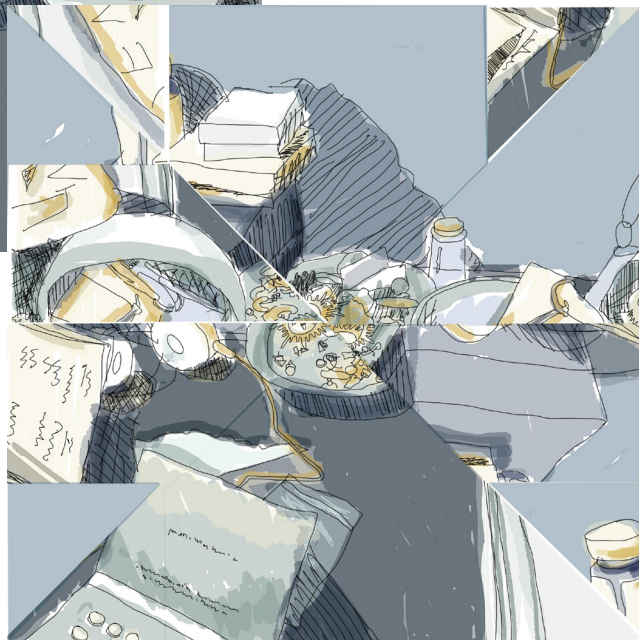


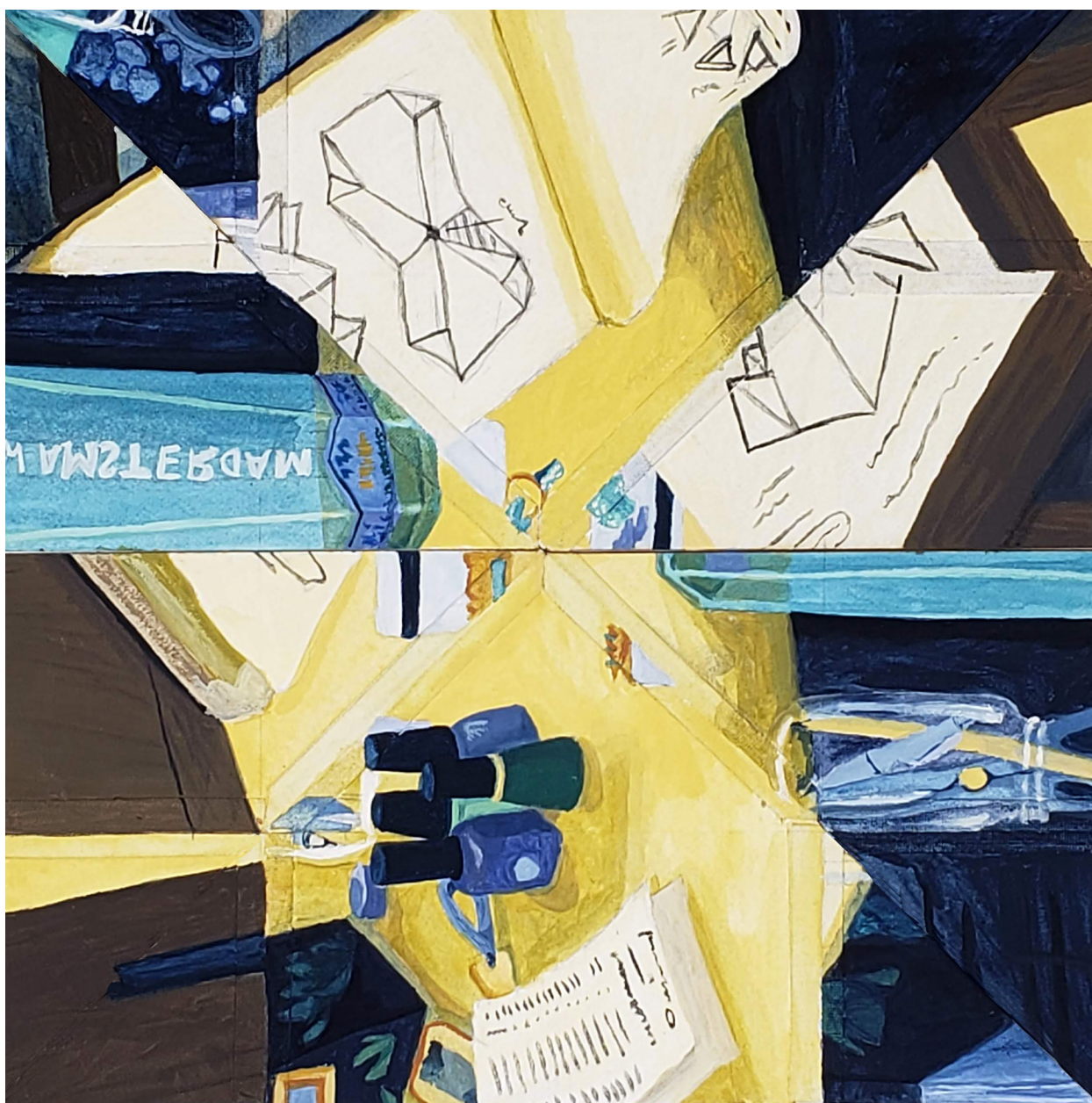


## Part IV: Deconstruction and Reconstruction

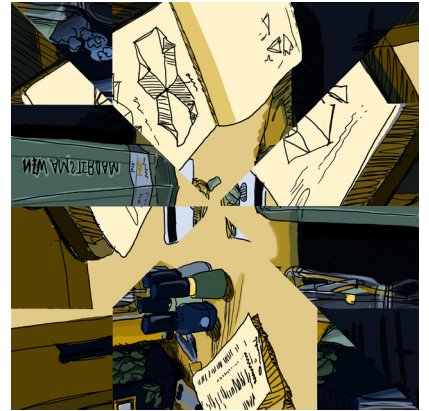
For the visuals, I began with a vague idea I first floated with my advisor: a parallel universe. A recent fascination with the multiverse and parallel universes came from a prevalence of this subject matter in the pop culture I consumed (The Flash, Stranger Things, Coraline, The Twilight Zone, Community, Rick and Morty). In particular, I was drawn to the idea of a world that is almost identical to the one we know but changed only slightly to transform it into an unfamiliar landscape. After discussing this idea with Professor Laini Nemett I discovered what I wanted to portray was the uncanny. To begin clarifying my plan, I looked to artists for inspiration: Matt Bollinger, Susan Lichtman, Erica Lee Sears, Jenna Barton, William Harnett, and Matt Saunders. I found three central themes linking their work: an eerie mood, a sense of familiarity, and a controlled color palette.

After a period of overthinking, I took a still life shot of my dresser and manipulated it in Adobe® Photoshop® to employ the desired themes. I digitally sketched out a simplified version of the scene using a controlled yellow-green-blue color palette. Then I used the turkish map fold shapes and faces to reorganize the image in a kaleidoscope- esque manner. This would provide a new perspective to the scene, particularly a defamiliarized view. With this, I developed my process: I brought still life images from my everyday life into Adobe® Photoshop® to be illustrated in a simplified manner, and reorganized. Using these as a reference, the final paintings were free hand sketched on bristol board map folds and painted using acrylic gouache. Traditional painting was an important aspect of this project to me in order to achieve a sense of familiarity in the visuals. This also allowed me to integrate my experience with and appreciation for traditional painting, despite my preference for digital planning. Seven paintings were created with a gradually transforming color palette. Through an increase and eventual decreases in vibrance, I sought to portray a sense of cyclical life and death, referencing the metamorphic quality of the turkish map folds movement.





Another Tired Eve. Acrylic Gouache. 2019.



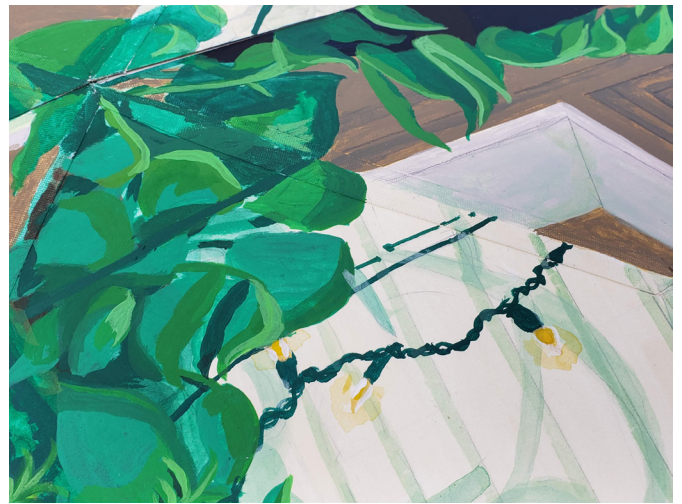
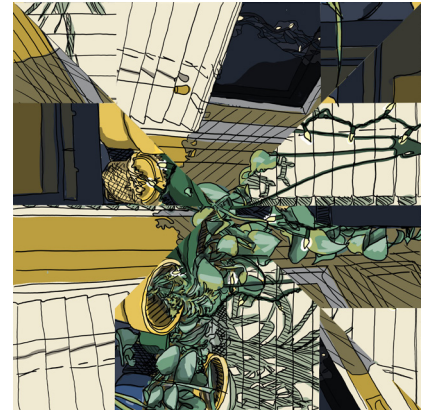


Communal Venial Sins. Acrylic Gouache. 2019.



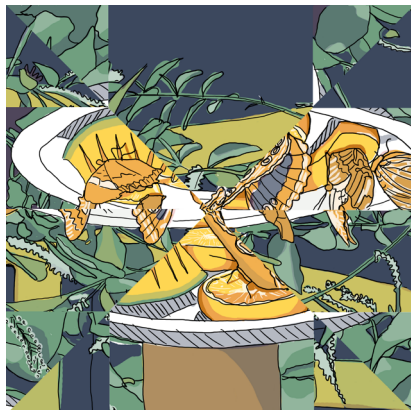


Cast. Acrylic Gouache. 2019.





Metamorphose. Acrylic Gouache. 2019.



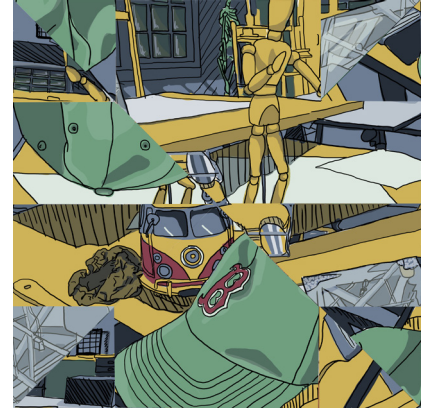


Soaking in Sun. Acrylic Gouache. 2019.



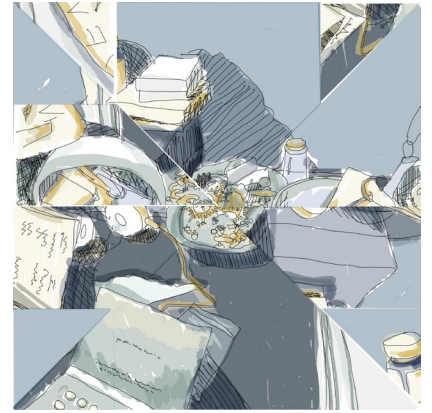


Posed. Acrylic Gouache. 2019.





Adorned. Acrylic Gouache. 2019.





## Part V: Culmination

The final stage of my project was the installation. A rushed yet also tedious process, I was presented endless new problems to address. But the work was edifying in both a technical and theoretical manner. For organizing my pieces on the wall, I hoped to formulate a layout reflecting the form of the turkish map fold and subject matter painted. I selected the constellation scorpio as a formatting guide. While I originally only used the constellation format as a technical design tool, Professor Laini Nemett highlighted to me how this represented the celestial and otherworldly ideas informing my paintings. Once the pieces were formatted, I integrated the wires as an element of the installation, paralleling the planes of the map folds. Next, the mechanisms' code was uploaded to the arduinos. This, along with a poplar wooden box cover for the power sources, completed the installation.

Having had time to breathe and reflect on my project, the most resounding conclusion I have come to is that the project never ends. Robotic art requires constant upkeep and each mechanism took on a life of its own that needed attention. I was required to bounce between facets and sometimes stretch myself between project demands. Nonetheless, I thoroughly enjoyed how my project challenged me to problem solve and think deeply about every aspect. I am pleased with what I produced and I am excited for how I might integrate this work and experience into future work.





Thank you to Professor Fernando Orellana for his guidance and mentorship. Thank you to Professor Laini Nemmett for her honest and motivating input. Thank you to Paul Tompkins, Rob Harlan, and Abby Golodik for helping bring this project to life. And finally, thank you the Union College Student Research Grants for funding and support.

