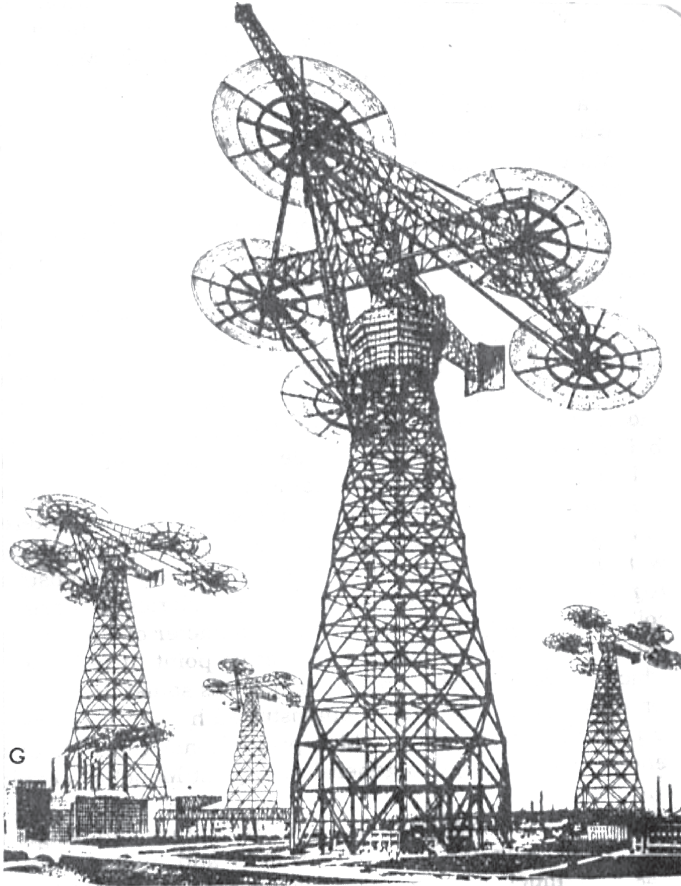


Introduction



This document is intended to chronicle the course of my recent independent study on windmills. Although the independent study has always been referred to as the “windmill independent study;” it is important to note that it covered a broad scope of material.

The independent study explored both the technical aspect of windmills, as well as their **symbolic value**, and **the alternate life that they quietly inspire**. The images found in the following pages are taken from a notebook I kept during the course of the study.

Technical Research

KEY CONCEPTS AND QUESTIONS

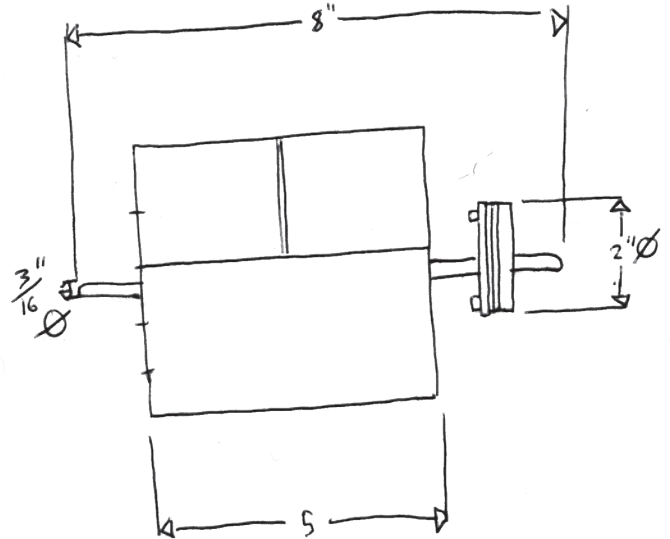
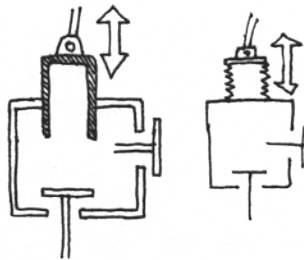
- Move from centralized utility to decentralized.
- URBAN HOMESTEADING / SWEAT EQUITY

(READING WINDMILL POWER FOR CITY PEOPLE)



THE MORE BLADES A WINDMILL HAS, THE LOWER THE RPM, AND THE HIGHER THE TORQUE,
LESS BLADES THE HIGHER THE RPM.

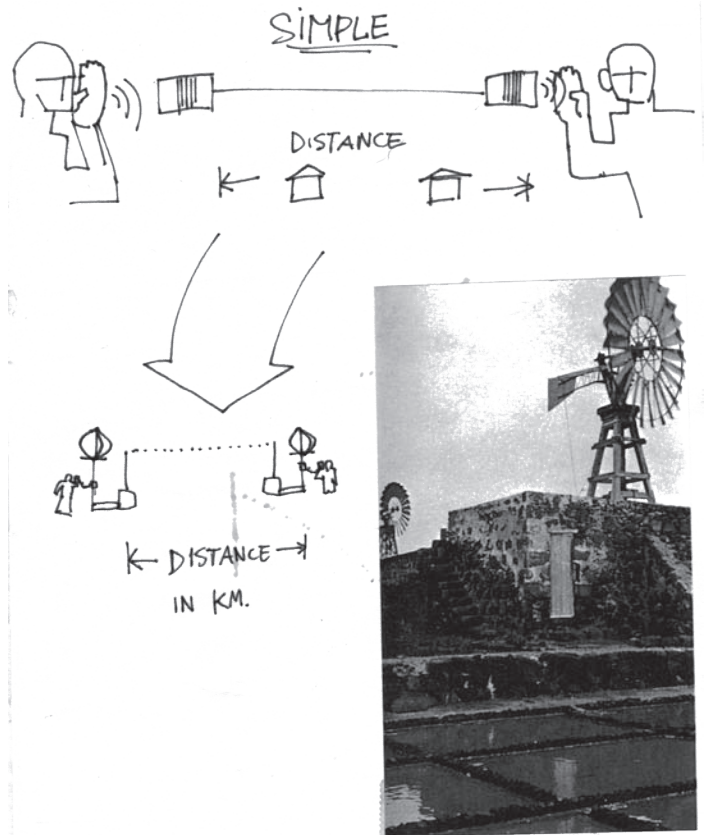
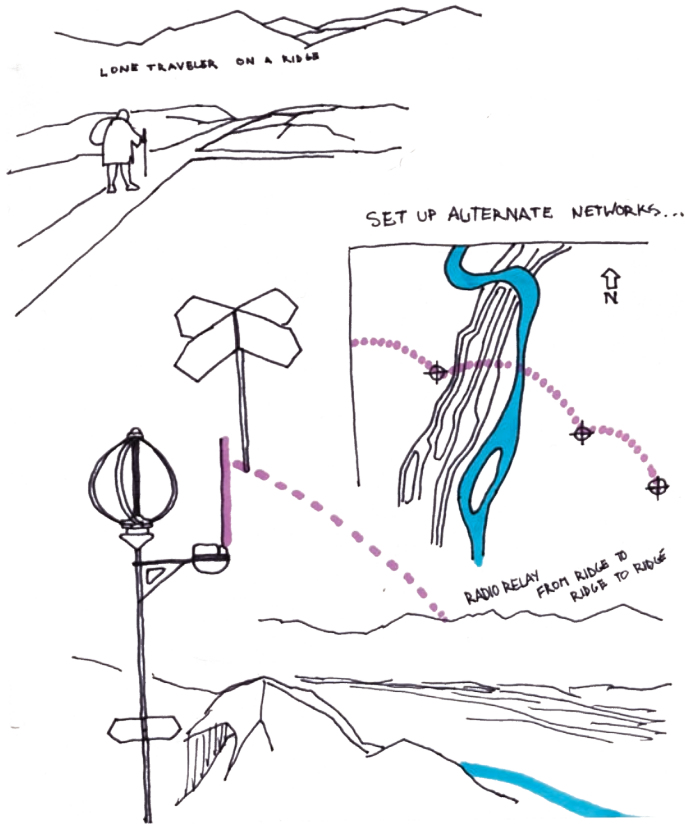
TWO BLADED MILLS TEND TO JERK AS THEY TURN INTO THE WIND



I began the Independent study by briefly researching windmills in their different forms and uses. I learned about the differences between vertical and horizontal windmills. Both kinds have their advantages and disadvantages. Within those two categories there are many subdivisions of forms and hybridizations. For example, in the realm of

vertical axis windmills, there are Savonius rotors and Darrieus rotors. Savonius rotors are self-starting while Darrieus rotors are not. These two types are often combined to take advantage of both types of rotors. This was also a stage where I built a small model of a Savonius rotor. Above is a drawing for my model.

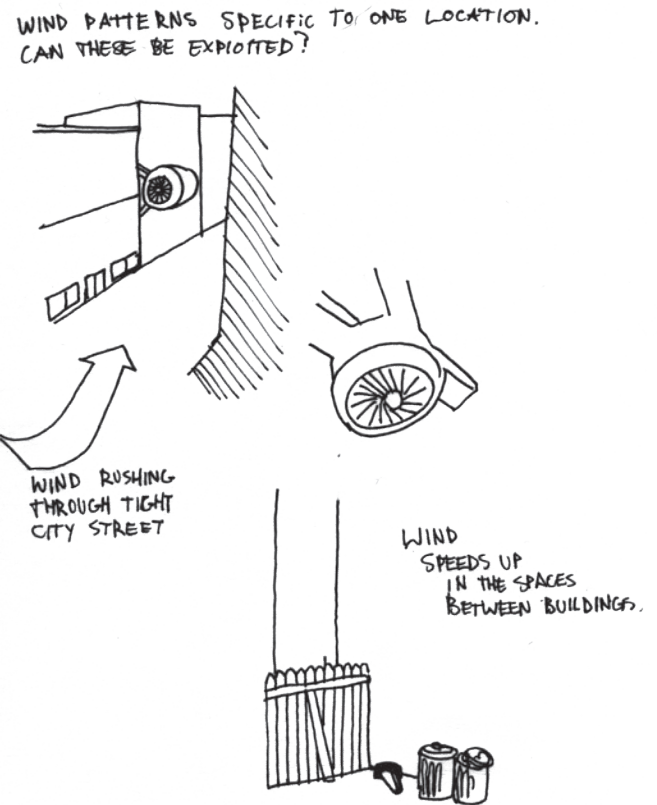
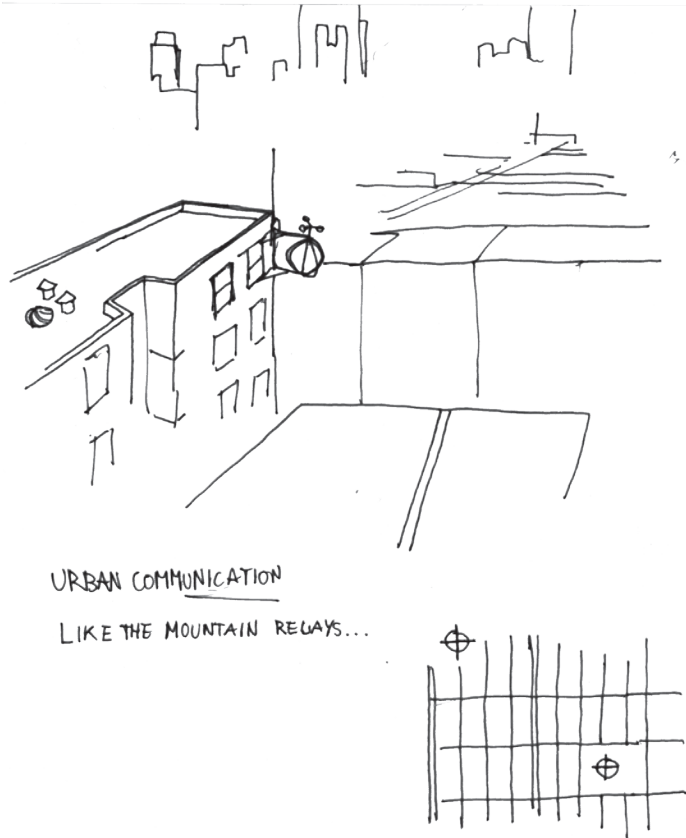
Reideation



While working on my first windmill model, I was also creating scenarios. I was trying to imagine uses for the windmill outside of the standard use of generating electricity. These two scenarios are focus on **independence** and **exploration**. For me, the idea of a single

windmill being used to bring water or energy, to a single isolated location is much more powerful than the thought of windmill farms. Windmills symbolized **a means to disengage** from what we know, and reengage with something completely different.

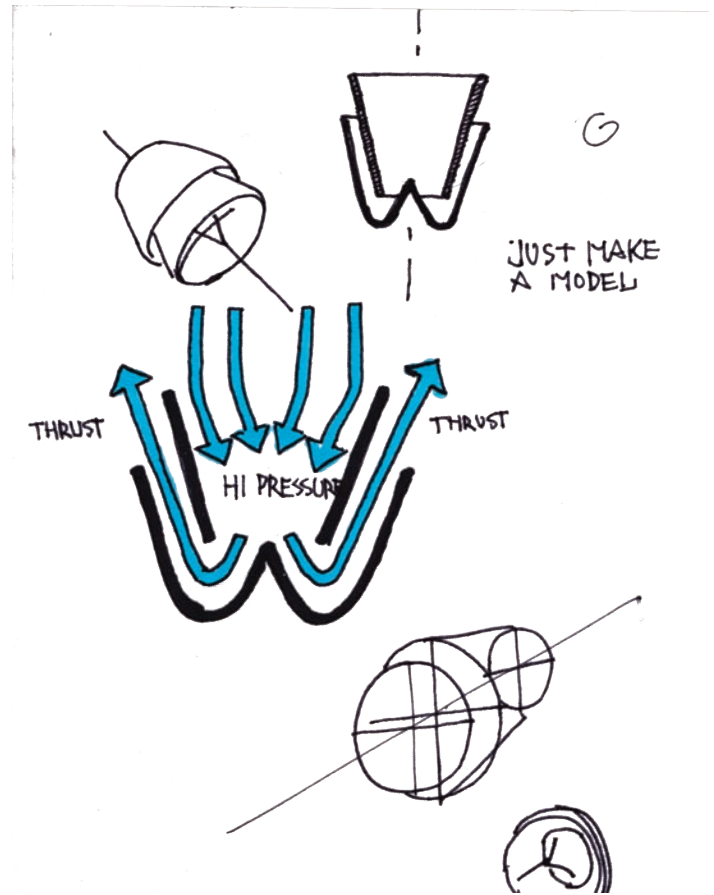
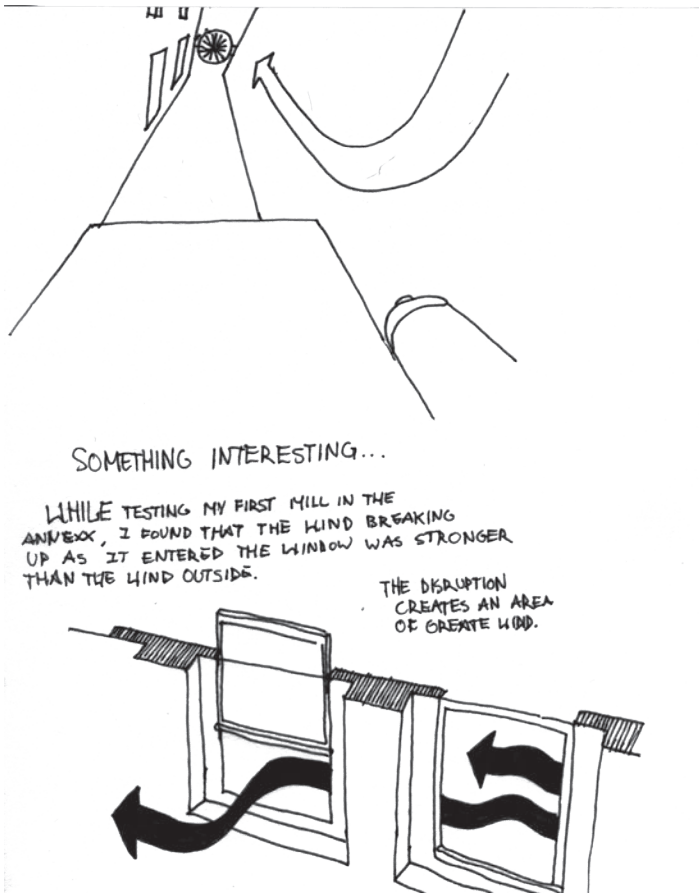
Urban Possibilities



As a current resident of Philadelphia, I tried to develop ideas that could be applied to city life and the city landscape. While the city is perhaps not the best place for lone windmills pumping water, for example, the city is still an opportunity for **inspiring individuality**

and **personal independence**. While working with my windmill model, I thought about opportunities around building mounted structures.

Discoveries and New Considerations



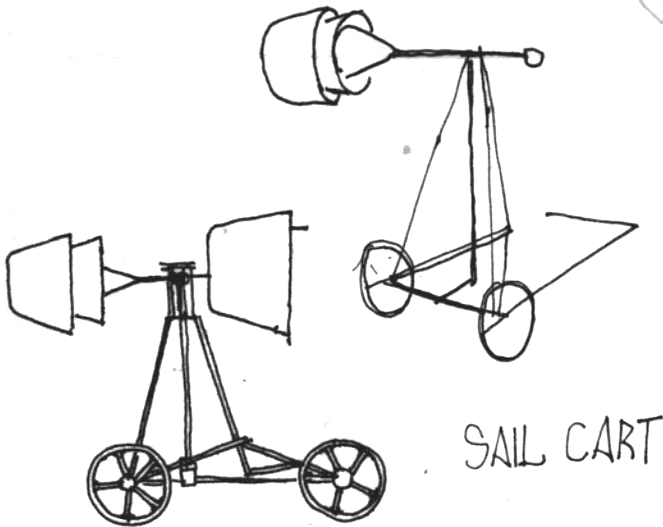
The small scale model of a Savonius rotor lead to the discover of an interesting interaction between windows and the wind. It seemed that as the wind broke on the windows, eddies of current rushed indoors and formed "sweet spots" which were ideal

for the windmill. Working with and studying different rotor types encouraged me to also try and develop some of my own. Above is an example of a "jet engine" type that I thought of.

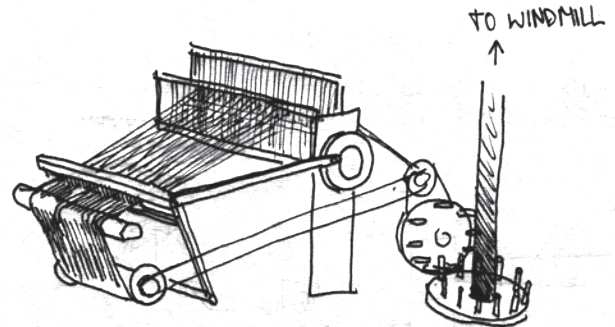
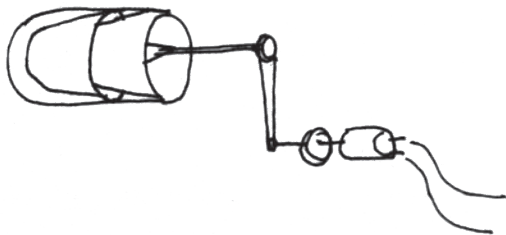
Alternate functions

IMPLEMENTATION OF EXISTING ARTIFICIAL SYSTEMS TO PRODUCE OBJECTS THAT FULLY DEPART FROM THAT SYSTEM.

MAN RAISING SHEEP



SAIL CART

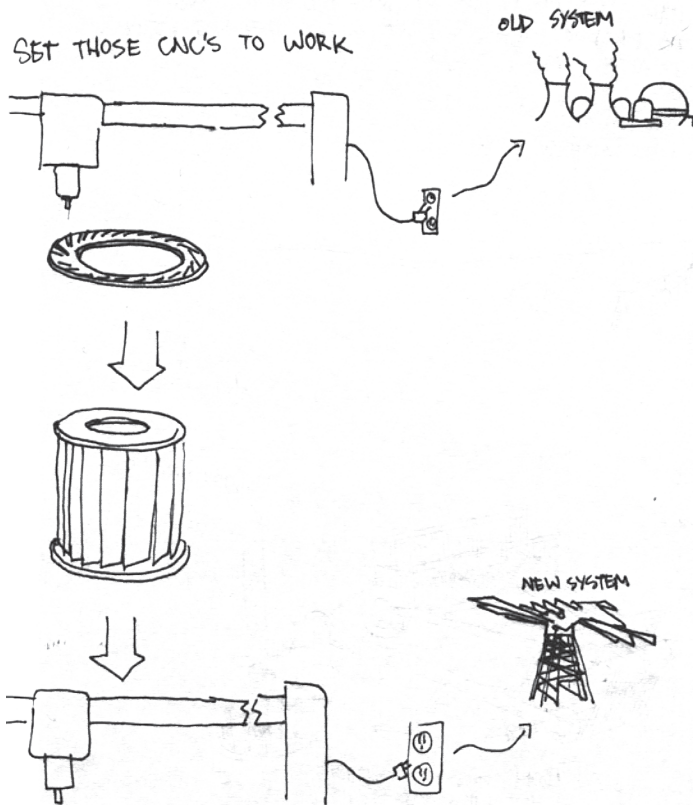


LOOM PRODUCES TEXTILE WHEN WIND BLOWS. NO OPERATOR.

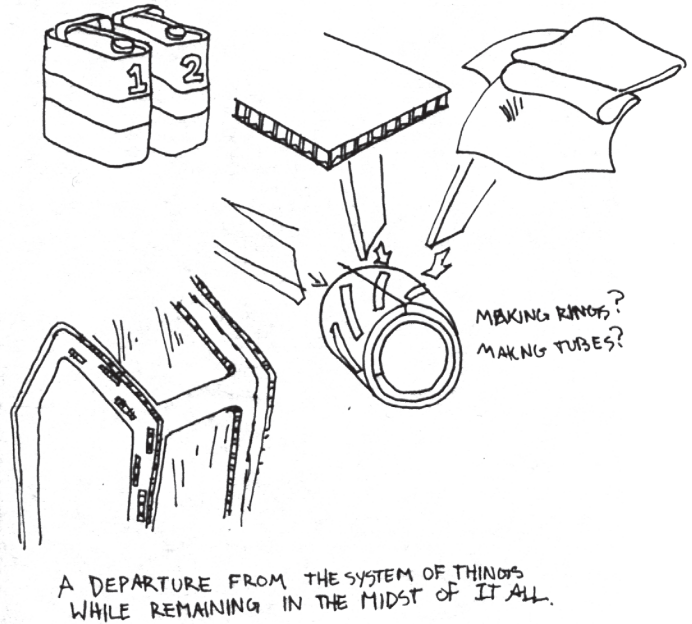
My scenario development continued with creating uses and situations further outside the normal scope of windmills. The first seen here is a windmill driven buggy. The second is a concept for a wind powered loom. The second concept is intended to not only suggest that wind can be used to create

textiles, but also that ideas of production itself can shift. Currently production is tied to the demand of human beings. In this scenario, production occurs only when the wind blows. Windmills imply a system that can't produce like our current systems can, but maybe can **give freely** instead.

Material Lightness



DISENCHANTED WITH THE WORLD AND ARMED WITH EPOXY, HONEYCOMB CARDBOARD, AND FABRIC, A MAN LEAVES IT ALL BEHIND TO BUILD HIMSELF A NEW WORLD.

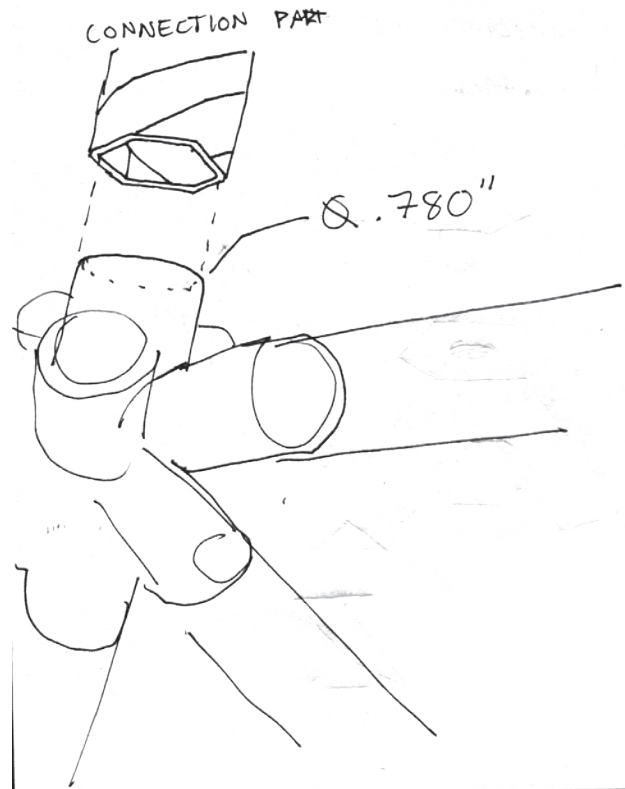
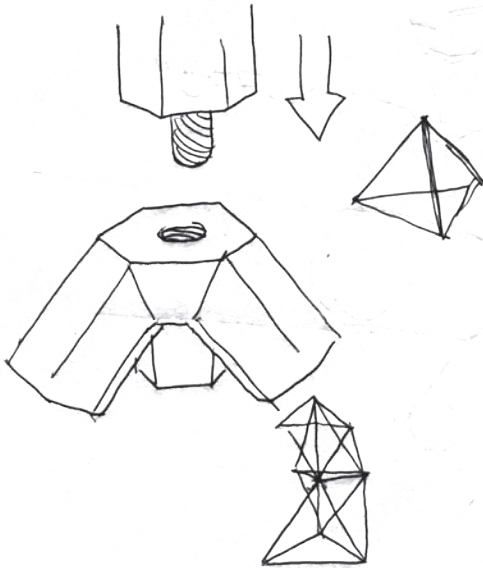


My focus turned from scenarios for a time, and I reoriented my work towards materials. During my research I found that many people were making windmills of their own. They were using every thing from aluminum to resin reinforced honeycomb paper, to

cut up 55 gallon drums. Besides implying new uses, I think windmills also imply a different approach to materials. This approach emphasizes **lightness**. I began working with resin/ acrylic reinforced paper to form light weight structures.

Building System

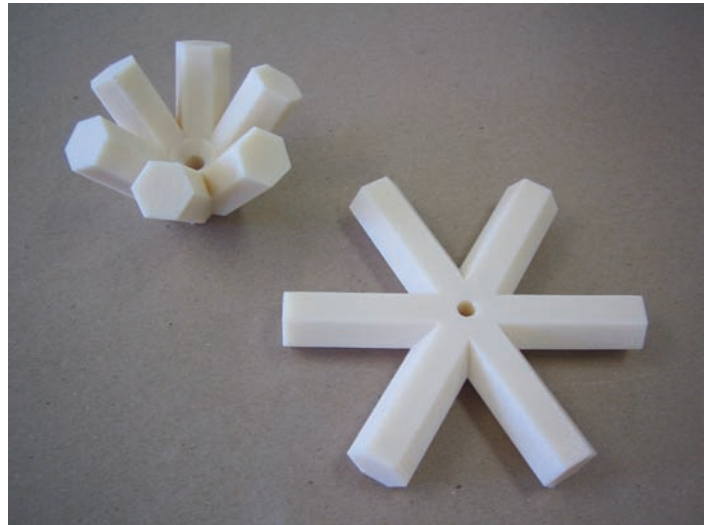
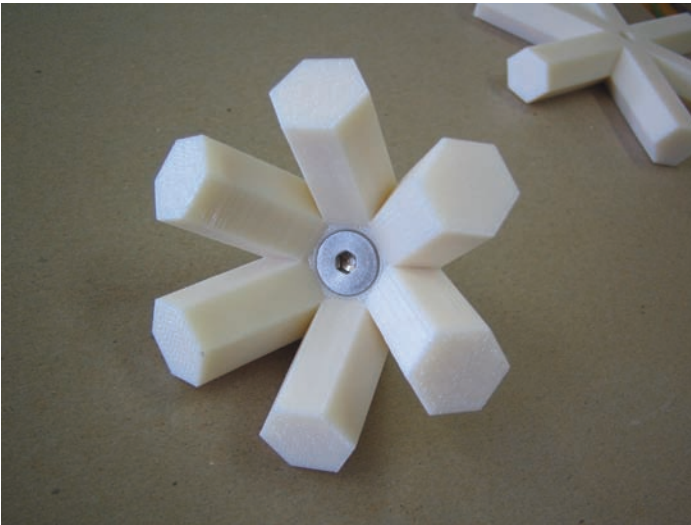
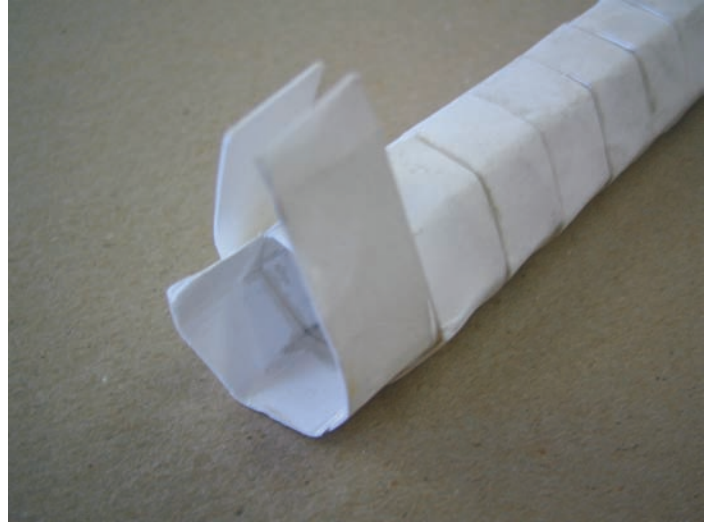
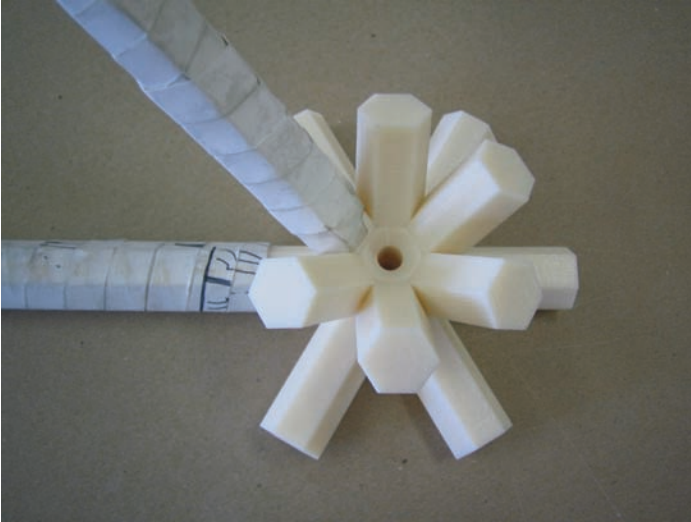
- To Do
- other stuff on last page
 - Model connector for tubes
Get printed.
 - start making tubes.



While working with paper and resin, I discovered that I could make paper tubes made up of 3 wound layers. The direction of each winding opposed the one beneath it to make a cross grain effect. I decided that this would be a good initial material to create

a building system with. I began with the tetrahedral form the base unit for my system. The drawings on this page show my initial ideas of how this could work.

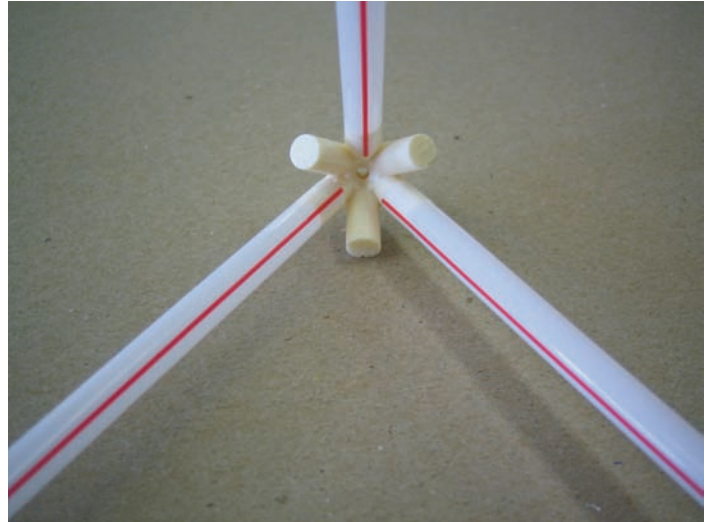
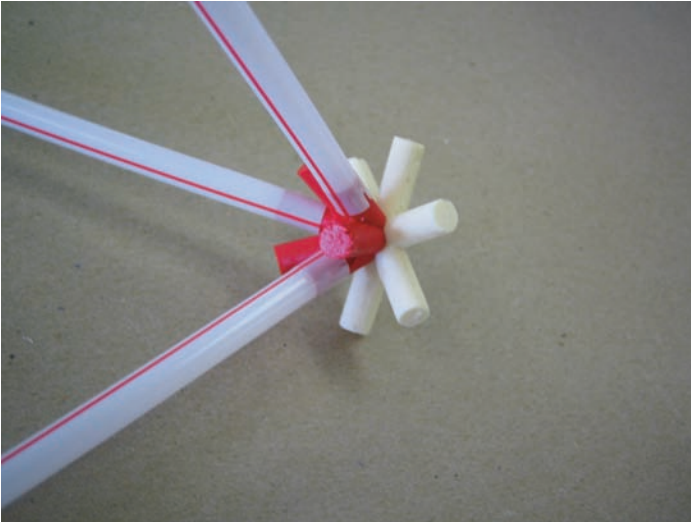
Full Scale System



Pictured here are full scale examples of the system components. The paper tubes form the spars in the system, while the white connectors are the nodes. The paper tube

sleeves over the different protrusions of the node to form the necessary angles of a tetrahedral system.

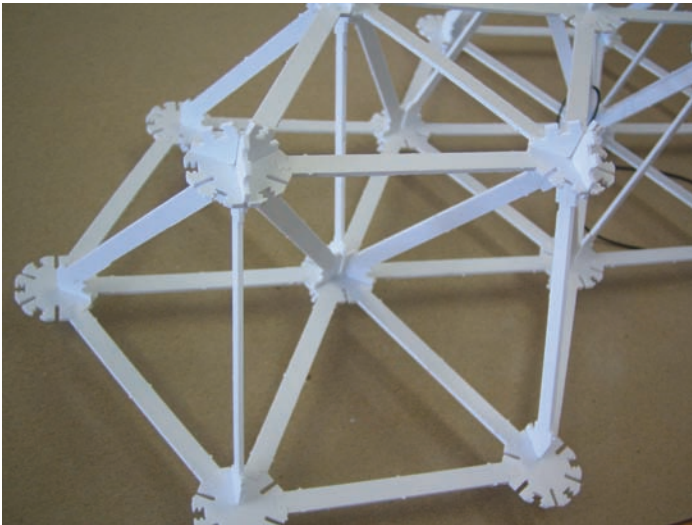
Small Scale System



This is a scale version of the system that was used to create models and explore different configurations. The scale version works the same way as the full scale version. In the

scale version, the spars were represented by straws. The nodes were adjusted to fit the inside diameter of the straws in order to preserve the action of the real system.

Flat Pack System



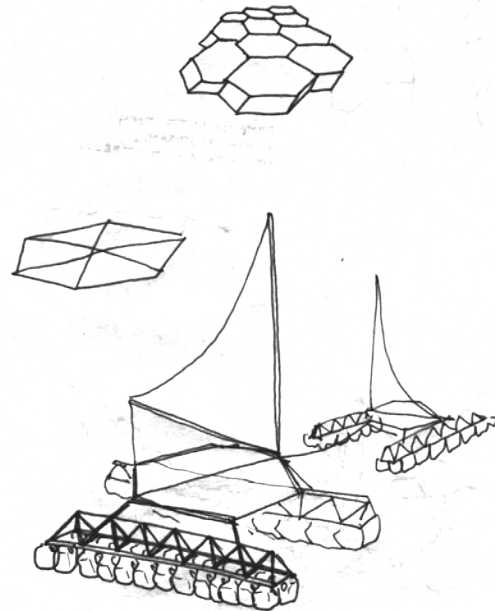
While designing the building system made of paper tubes, I was also designing a second system. This system is cut from sheet stock and uses no hardware. It forms the same tetrahedral structure. The spars press fit into the nodes and are held in place by teeth.

These connections were inspired by the way fan blades are mounted to the hub of a wind turbine.

A New Lifestyle



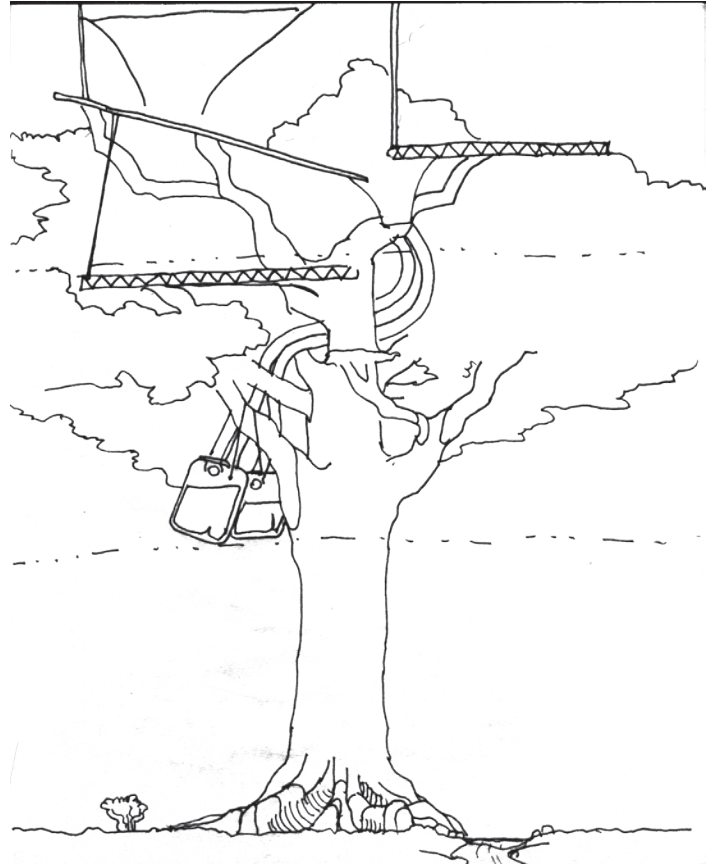
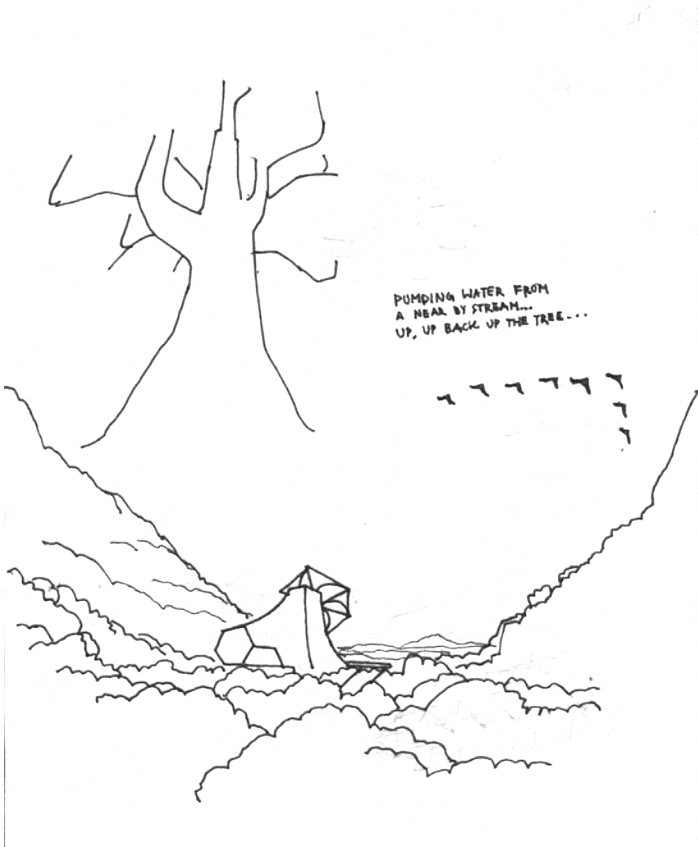
Pictures to
print and past-
Honeycomb AL
AL polyhedron



Windmills imply a willingness for adaptation. Light materials and the building system are expressions of this. After exploring the building system, I started to form more scenarios dealing with lightness, adaptation, and symbiosis. The first drawing depicts a

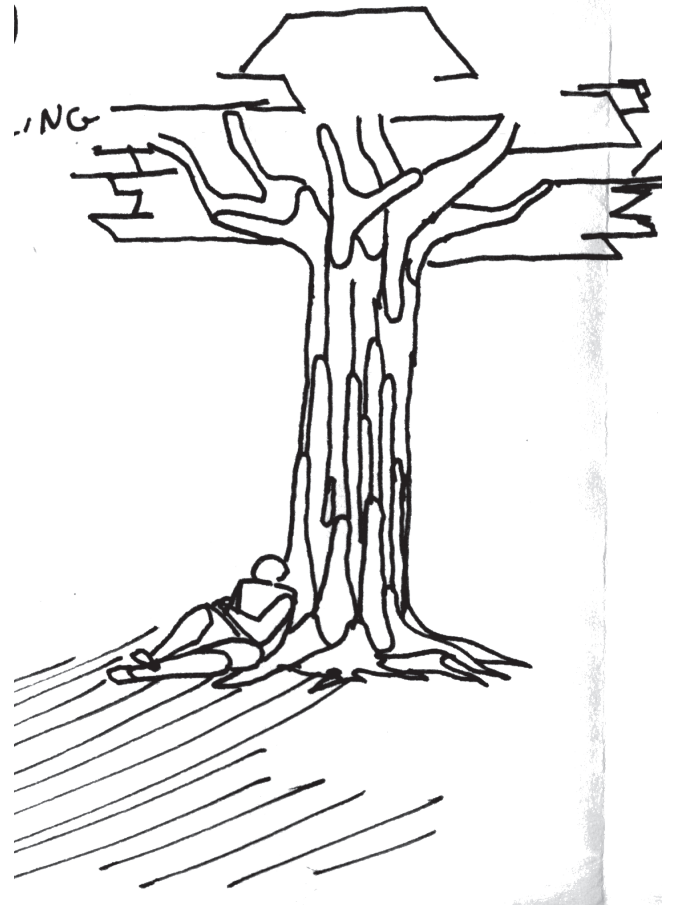
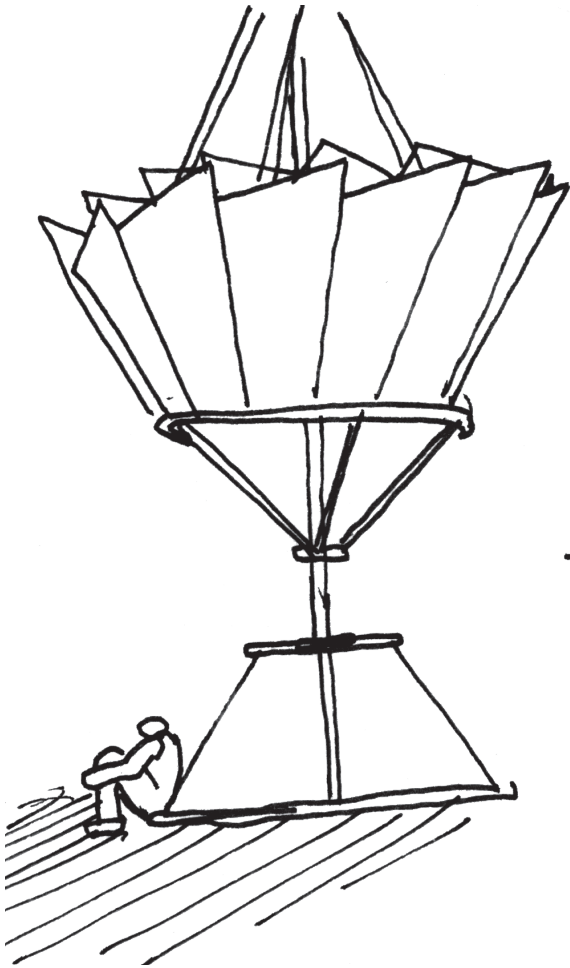
dwelling that is hanging off the side of an old fire tower. The second drawing shows a small water craft that uses old milk jugs for flotation.

A New Lifestyle



At this point, hopefully the association between tree houses and windmills is not an unexpected one.

Conclusion



From all of this exploration, one aspect has stood out the strongest. The Windmill is a device that can potentially give without taking. Not only that, it suggests a possible lifestyle that does the same. It seems the greatest conclusion this independent study

lead to was a question. **As a tool making species, can humans create objects that only give, in very much the same way that a tree or the sun only give?** A windmill is not necessarily the solution to this challenge, it may be just one of many related answers.