

GIY: The Living Leather Project

Emily Takara

Nest Makerspace BioDesign Team
Cupertino, CA 95014
USA

nestmakerspace.weebly.com/
takaraemily@gmail.com

Trisha Sathish

Nest Makerspace BioDesign Team
Cupertino, CA 95014
USA

nestmakerspace.weebly.com/
reachtrishas@gmail.com

Anne Hu

Nest Makerspace BioDesign Team
Cupertino, CA 95014
USA

nestmakerspace.weebly.com/
anneHuBiodesign@gmail.com

ABSTRACT

We would like to share our journey exploring bio design, specifically our experiments with making and growing kombucha bio leather in our garage makerspace team. Our grow-it-yourself (GIY) explorations in kombucha leather are the foundations for a future biodesign challenge, in which we plan to propose a biodesign tinkering kit for children. We believe that exploring biomaterials in youth education in a playful way is important because using approachable methods, such as tinkering and hands-on activities, can introduce children to new ideas and technologies. We believe that this is a fun and simple method to introduce sustainable design conversation in youth curriculum. As part of our mission to educate children, we hope to conduct youth workshops at our local nature park, McClellan Ranch Preserve in Cupertino, California and in East San Jose, California. Currently, we are growing a bacterial cellulose with kombucha cultures and are exploring uses and possibilities of this biomaterial. We will be presenting various methods of growing and drying kombucha leather, as well as several projects and crafts that can be created with this bio material, such as small lanterns and integration as skins with 3D printed objects. In this journey we have been mentored by educator Corinne Takara. We kicked off our explorations with the guidance of Anja Scholze and Caitlin Nealon of the Tech Museum's BioDesign Studio.

Keywords

biodesign; makerspace; design challenge; biotinkering; sustainability design; kombucha leather; assembly design; biomaterial; GIY; circular design

2. PROJECT DESCRIPTION

2.1 Project Overview

The Kombucha Leather Project is an exploration in growing kombucha leather (symbiotic cultures of bacteria and yeast, or scobys) and finding creative makerspace applications for this bacterial cellulose, a sustainable maker material. While crafting using our kombucha leather, we are searching for sustainable uses of the leather as a toy in order to introduce kids to bioengineering and making. We are delving into biomaterials because we are entering the Biodesign Challenge (<http://biodesignchallenge.org/>) as a high school team. We think it is important to begin to explore growing our own materials in makerspaces as we start thinking about a more sustainable future and innovative answers to environmental questions. Our explorations (<https://nestmakerspace.weebly.com/bio-challenge-team.html>) center on growing and making with bacterial cellulose and exploring its shape, texture, and color in a playful, crafty way. Our projects include making lanterns and combining 3D printed frames skinned with kombucha leather that snap with LEGOS. Our first step in exploring the material was creating a light-up kombucha ornament (<https://nestmakerspace.weebly.com/kombucha-light-ornament.html>) made with pregrown leather. The ornaments were made with eight circle shaped units glued together and wired up with an LED. The second part was to design 3D printed wing frames upon which to grow skins of kombucha bacterial cellulose. All of our kombucha projects explore creating structures using units. We are experimenting growing our own cultures of kombucha using simple and accessible ingredients and materials (<https://docs.google.com/document/d/1CIjz7mHbLi3h3FyZ7qp0DkWItoRSc6MWOamFETeTN3A/edit?usp=sharing>).



Image 1. Assembled kombucha lantern



Image 2. Decorated light-up lantern

Image 3. Customized kombucha culture batches



Image 4. Our customized lanterns

Image 5. 3D printed wing being lowered into kombucha culture

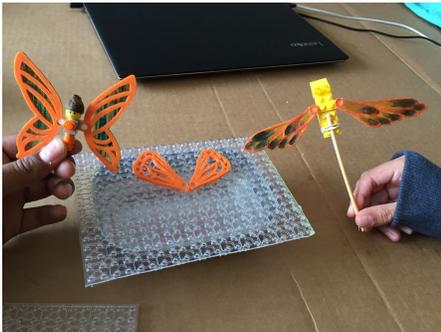


Image 6. Lego and kombucha leather blending

Image 7. Coloring kombucha leather

Image 9. Textured dried kombucha skins

2.2 Lessons Learned

While we have not yet completed the project, we have already begun to explore how the material itself and the process can be implemented in youth education in a friendly way. Knowing that biodesign is still a new concept, we believe that introducing such concepts should be done in a playful way. We have learned to look creatively at the process and materials. For example, when we created our first kombucha cultures we decorated the mason jars, which allows the child to customize the process and think of their project as a living pet-like creature. Since we learned that the material takes a long time to grow (two to four weeks), we decided to include the bacterial cellulose growing process as a part of the project journey. We also discovered that, in order to enrich the learning process, it is important to stagger the growth times so that the participant or student gets engaged in the material itself before they start the growing of the kombucha leather. Through our experiments, we have discovered that it is beneficial to grow the kombucha in small batches to be able to experiment and explore the material in an efficient way.

3. BIOS

All three girls will be members of the panel.

Emily Takara is a freshman at Pinewood Upper Campus in Los Altos, California. She likes to draw, run, and craft. Her interest in the Biodesign Challenge comes from her love of exploring science and design. Emily enjoys making with others and has worked at Makerfaire and Mini Makerfaire booths as well as at community pop-up maker events for the past five years. She has been a finalist and a two time Junior National Winner in the NASA sponsored Future Engineers Design Challenge. In 2018, she was a National Teen Finalist in the Future Engineer Design Challenge. She is a recipient of a Kurt Giessler Foundation Ambition Grant.

Trisha Sathish is a freshman at Monta Vista High School in Cupertino, California and has been making for as long as she can remember. In her free time, she loves to read, paint, and dance. Her recent interest of integrating biology with artistic aspects is what caused her to get involved with the Biodesign Challenge. She has been 3D print designing since 2014 and has worked at a Makerfaire booth with her local art school. She has also been a National Finalist in the Junior Strand and a National Semifinalist in the Teen Strand of Future Engineer Design Challenge. She is a recipient of a Kurt Giessler Foundation Ambition Grant.

Anne Hu is a sophomore at Fremont High School in Sunnyvale, California. She plays basketball and is a captain for her school's varsity softball team. She loves to create art through drawing, photography and crafting. Her photography was selected by National Geographic for display in the Vice President's house in 2015. Her interest in the Biodesign Challenge stems from her passions for science and learning. She has been designing and 3D printing since 2014. She was selected to represent her school at a Google IO conference.