

# Biohealth Learning Lab and Makerspace for the Community

Abbey Thompson<sup>1</sup>, Caitlin Nealon<sup>2</sup>, James Wong<sup>2</sup>, Barry Starr<sup>1</sup>, Jeff Hayward<sup>3</sup>, Michael Cherry<sup>1</sup>, Anja Scholze<sup>2</sup>

<sup>1</sup>Stanford University Department of Genetics, <sup>2</sup>The Tech Museum of Innovation, <sup>3</sup>People, Places & Design Research

## Introduction

Biology has become a powerful and revolutionary technology, uniquely poised to transform and propel innovation. The skills, tools, and implications of using biological systems to design solutions to global challenges, however, are still largely foreign and inaccessible to the general public. Industries of today and tomorrow need creative, independent problem solvers, yet early biology education is often still very didactic and memorization heavy. We need new ways to inspire and equip young people from diverse backgrounds to meaningfully participate in the landscape of modern biology.

## Space Concept

An experimental museum space that explores the squishy intersection of biology, design, technology, and making to empower everyone to use biological systems as creative, problem-solving mediums.



## Core Approaches



### Making

The act of creating with tools and materials to produce shareable artifacts



### Tinkering

A playful way to approach and solve problems with direct experience, discovery, and experimentation



### Design Challenge Learning

Using the design process to create and iterate on innovative solutions to a challenge

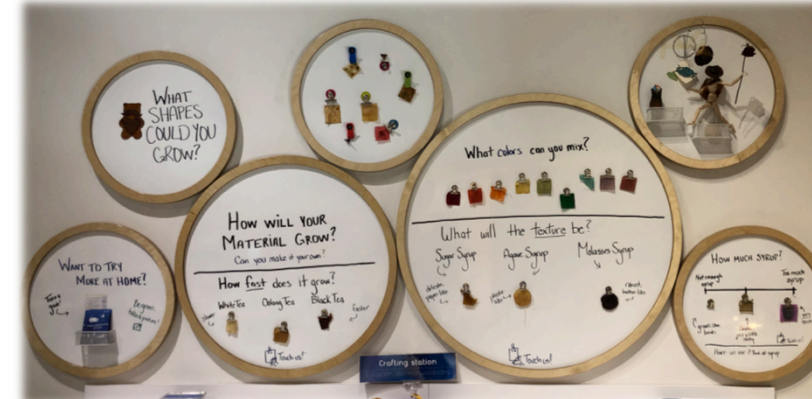
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## Activities in development: Making with Microbes

**Summary:** Visitors collaborate with tiny living organisms to design, mix, and grow a biomaterial. They decide the final look and feel by choosing what to feed the microbes. After leaving their culture to grow, participants work with already grown biomaterial from previous visitors to embed textures and craft something to take home.



1. Intro



2. Design + Mix



3. Grow + Texture



4. Craft



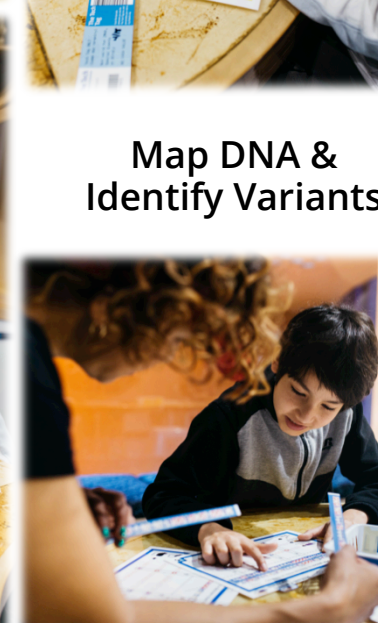
**Semi Permanent Programs:** Complex experiences that are facilitated on a daily basis by museum staff. They require custom infrastructure and installation and are run in guided sessions of ~30 minutes.

## Activities in development: Ancient DNA

**Summary:** Visitors reconstruct the stories behind ancient remains, including people like Ötzi the Iceman, or animals like Arzhan the horse. Using DNA sequences, visitors discover what they looked like, what they ate, diseases they may have had, and more. Visitors piece together their lives, share what they discover, and draw the story.



Map DNA & Identify Variants



Share Results

**Pop up activities:** Activities that require less infrastructure, are ~15 minutes long, and are designed to work in varied locations. They are run by graduate students.



Draw

## Experience Goals

- Enable everyone to experiment, create, and problem solve using biology
- Provide opportunities for hands-on engagement with novel lab tools, ideas, and organisms
- Support curiosity-driven exploration and tinkering with biological systems
- Foster confidence and STEM identity through a combination of fun and authentic science
- Inspire and excite participants about the future possibilities of biotechnology

## Summative Evaluation: Bio Inks

### Approach

- Ages 10-12 in family groups (n=101)
- Post-visit questionnaire



### Findings: Appeal

- 53% gave a 9 or 10 for 'interesting/fun' (equal boys/girls)
- Children liked the extraction station best

“ It lets you play with materials and explore  
I like squishing things  
It was fun using the tools

### Findings: Comprehension

- 72% perceived it as 'easy to understand what to do'
- 85% understood that they were working with materials that are alive or come from living things
- 74% knew that bio ink came from bacteria or agar

### Findings: Attitudes About Science

- The bio-tinkering model resonated well with children:
  - The top two descriptors chosen were: 'creative thinking' and 'doing actual science'
  - Descriptions of why the extraction station was liked best mentioned the challenge as much as the fun

“ It was fun to figure out what materials to use  
We were not told how to do it we had to experiment  
It was challenging and required thinking and logic  
They let us do it by ourselves without telling us

### Findings: Science Identity

- 36% selected 'makes me think I could be a scientist'
- 89% of children indicated that their interest in science had increased by doing this activity (greatest for girls)

“ It combined experimenting and art  
I felt more like a scientist with gloves and chemicals and it was actually fun  
It's fun to figure out how things work  
It made me realize the use of science  
I thought science was not like this experiments. I like mixing stuff to create new stuff