

# What's in Your Building with Biology Kit



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Activities and Conversations about Synthetic Biology

June 21, 2016



# Hosts

- Kayla Berry, Museum of Science, Boston MA
- Ali Jackson, Sciencenter, Ithaca NY
- Christina Leavell, Science Museum of Minnesota, St. Paul MN
- David Sittenfeld, Museum of Science, Boston MA

# Presentation Overview

## Introduction to Building with Biology project

- Public Engagement
- Synthetic Biology
- Big Ideas

## What's in the Box?

- Hands-on activities
- Forum
- Passports

## Previous Events

- Pilot sites & Evaluation
- Examples
- Logistics

## More information

## Group Q & A, Discussion



# Public Engagement



## Project Goals:

- Multi-directional conversations between scientists and the public

## Target Audiences:

- Scientists and informal science educators, and the public

# Synthetic Biology

**Biologists** study life, specifically organisms and their relationship to their environment.

**Engineers** solve problems using science and math. They use an engineering design process, which is a series of steps towards solving a problem.

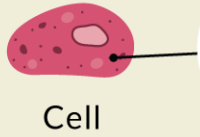
**Synthetic biologists** solve problems by applying engineering principles to biology

# Synthetic Biology

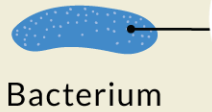
Researchers in this emerging field redesign existing organisms and make new ones.

Synthetic biology may provide solutions to problems in areas such as food security, healthcare, energy, and the environment.

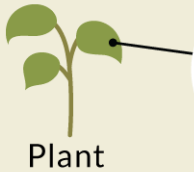
**GENETIC PART #1**



**GENETIC PART #2**



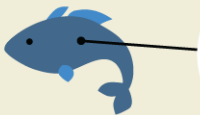
**GENETIC PART #3**



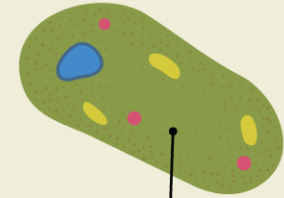
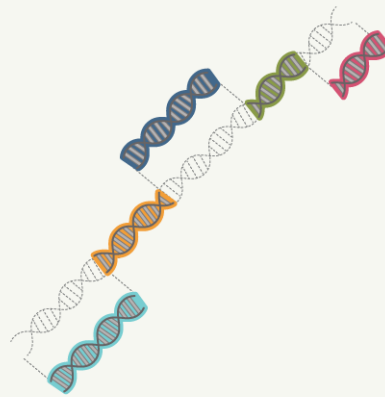
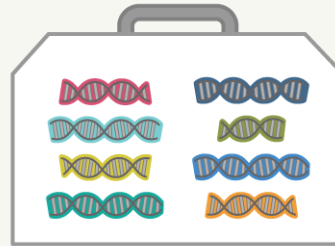
**GENETIC PART #4**



**GENETIC PART #5**



**TOOLKIT OF GENETIC PARTS**  
Standardized parts with known functions



**NEW OR MODIFIED LIVING ORGANISMS AND MATERIALS**

Include genetic parts from different organisms

# Big Ideas

Synthetic biology  
**builds biological  
systems**

Synthetic biology  
**generates new tools  
and knowledge**

Synthetic biology  
**benefits from  
many voices**

Synthetic biology  
**is interconnected  
with society**



# What's in the Kit?



# Bio Bistro



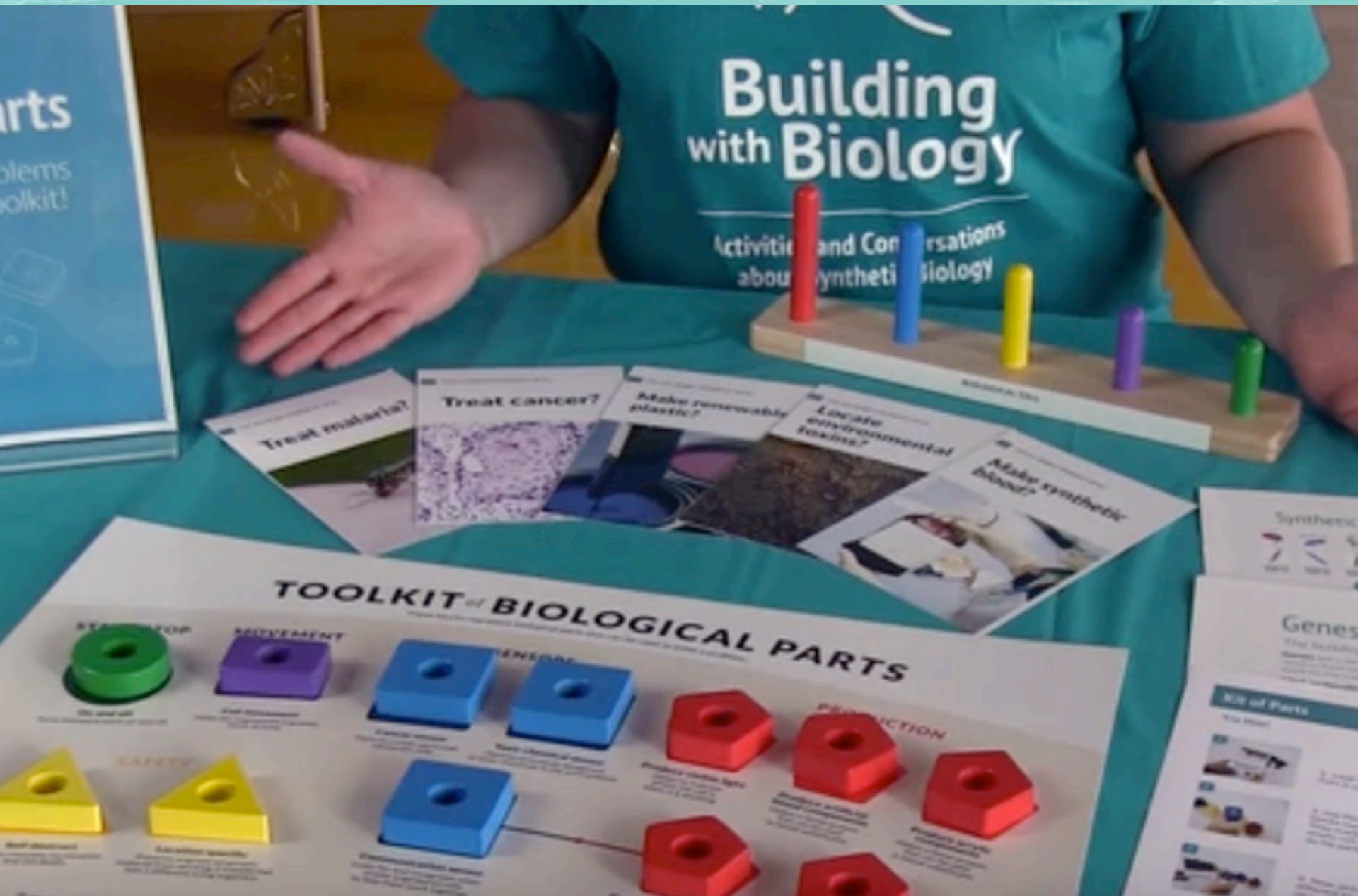
# Bio Bistro

Great group activity!

Very communal –everyone gets engaged



# Kit of Parts

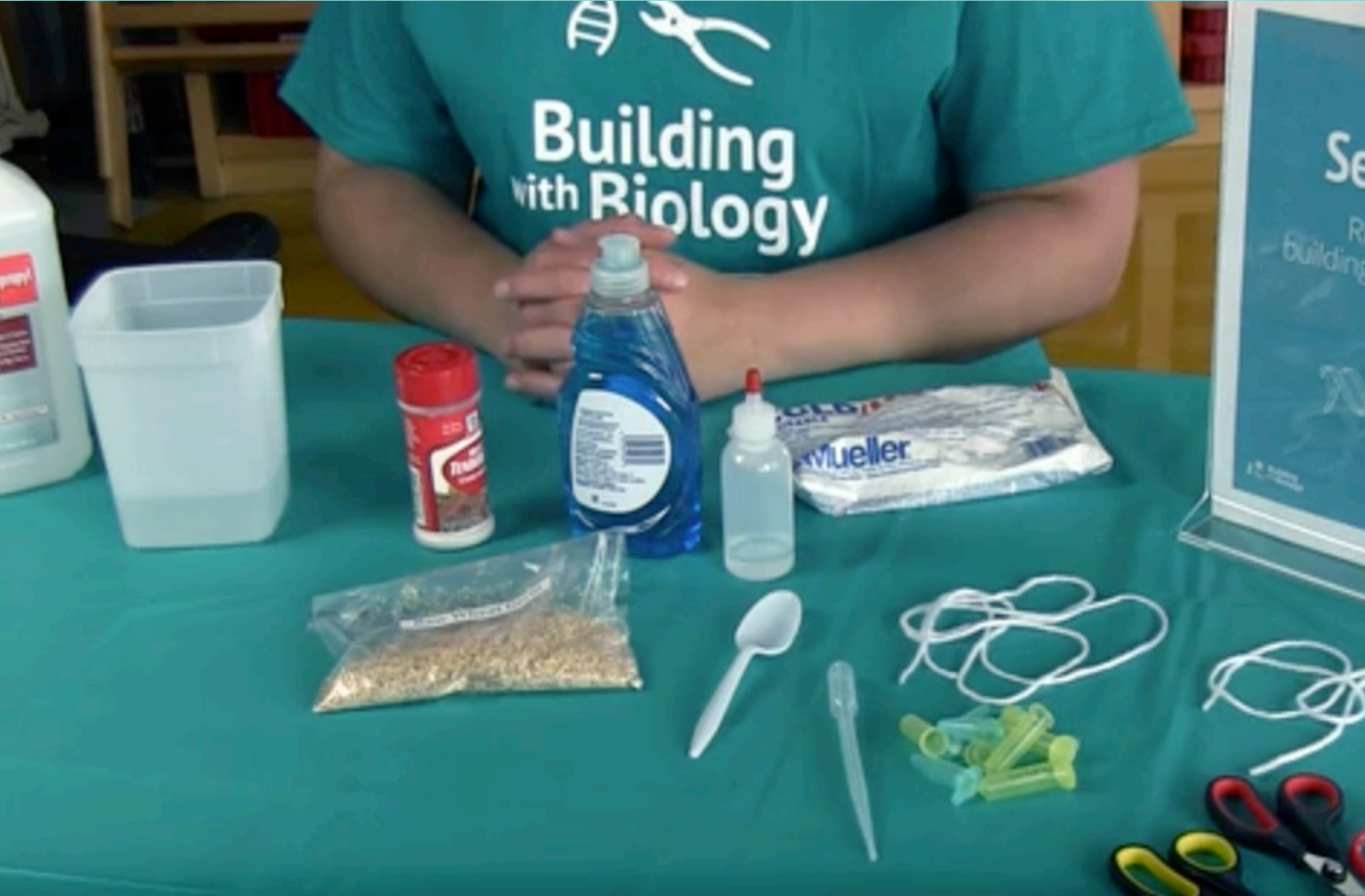


# Kit of Parts

Simple model – make sure public and scientists understand the shortcomings of this model



# See DNA



# See DNA

Advance prep necessary

Good entry point with fun take-away

Clean-up - do not clog your drains!!!



# Super Organisms





# Super Organisms

Steer clear of the super villains!

Unintended consequences

Super organisms  
are NOT like  
super heroes!



# Tech Tokens



# Tech Tokens

Many variations – group size, age, etc.

Just a few...

- Limit cards
- Different color tokens for role/character card than personal choices
- Tokens = Wages on role/character cards



# VirEx



# VirEx (“FedEx” ;-)

Really tailor info to audience!





## Hands-on activities



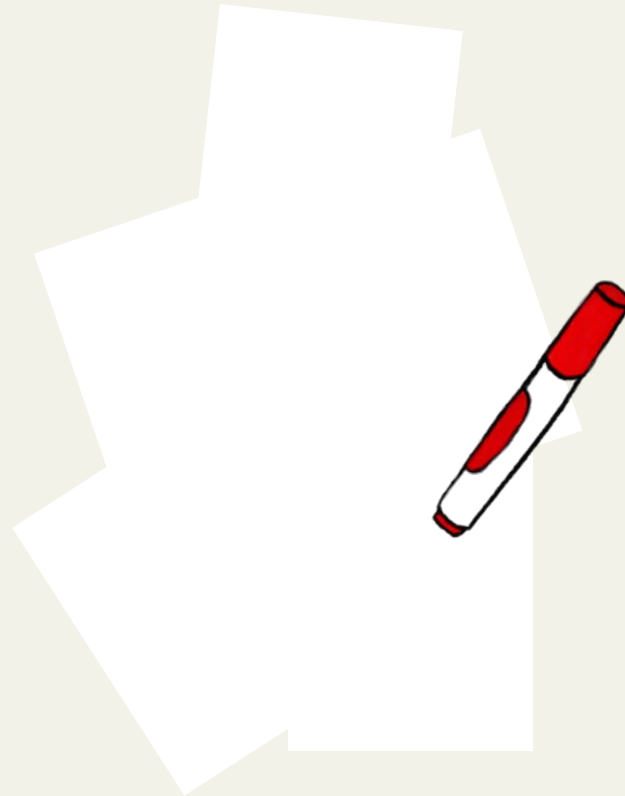
- Facilitated
- Shorter experiences + back-and-forth discussions

## Forums



- Longer conversations
- Focus on societal and ethical issues
- Science content + personal experiences and values

# Passports & Graffiti Wall





# Training & Orientation Materials



The focus of this project is to encourage scientists and volunteers to engage in conversations with visitors.

<https://vimeopro.com/nisenet/buildingwithbiology>



## Public understanding

### Demonstration

- Scientist/educator has knowledge and expertise to share
- Visitors discover phenomena and laws of nature
- The facilitator communicates facts
- Visitors ask questions and receive answers

## Public engagement

### Conversation

- Everyone has their own values and perspective to share
- Visitors form opinions and explore ideas
- The group considers facts and values
- Facilitators and visitors ask questions and receive responses

# Pilot Events – Summer 2015

Science Museum of Minnesota &  
University of Minnesota

Pacific Science Center &  
University of Washington

Museum of Science &  
MIT

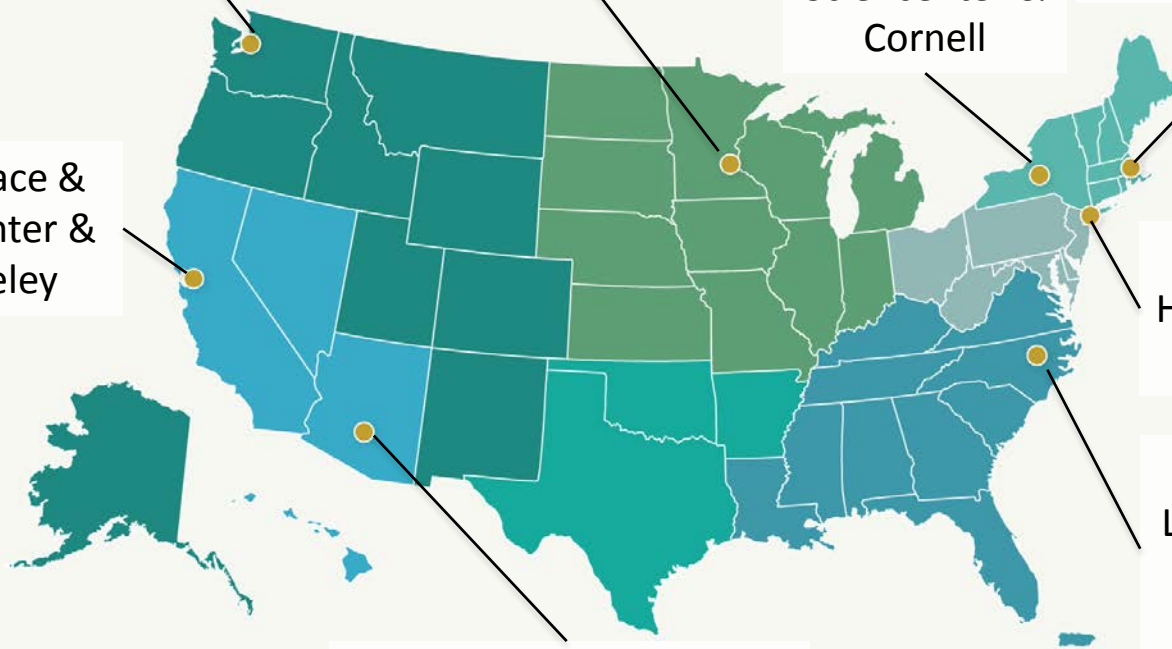
Sciencenter &  
Cornell

Chabot Space &  
Science Center &  
UC Berkeley

New York  
Hall of Science &  
GenSpace

Museum of  
Life and Science &  
North Carolina  
State University

Arizona Science Center &  
Arizona State University

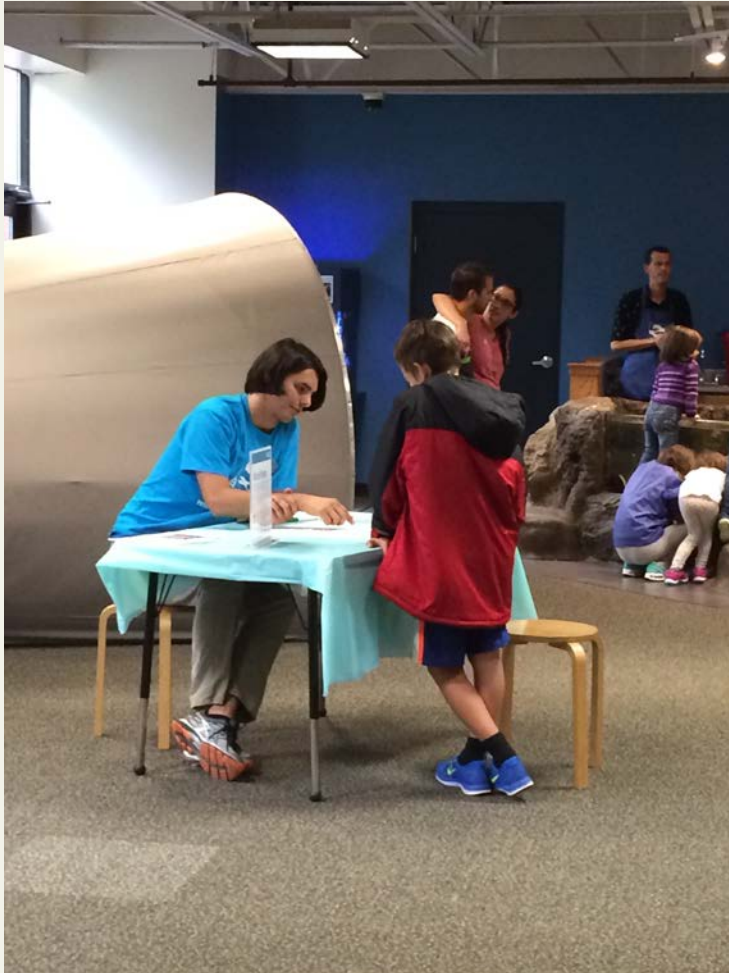


# Evaluation Findings from Pilot Year

During the pilot events, we conducted surveys and found that:

- Visitors enjoyed the events
- Participating in events increased visitors' interest in synthetic biology
- Volunteers increased their skills in engaging the public in science

# Sciencenter

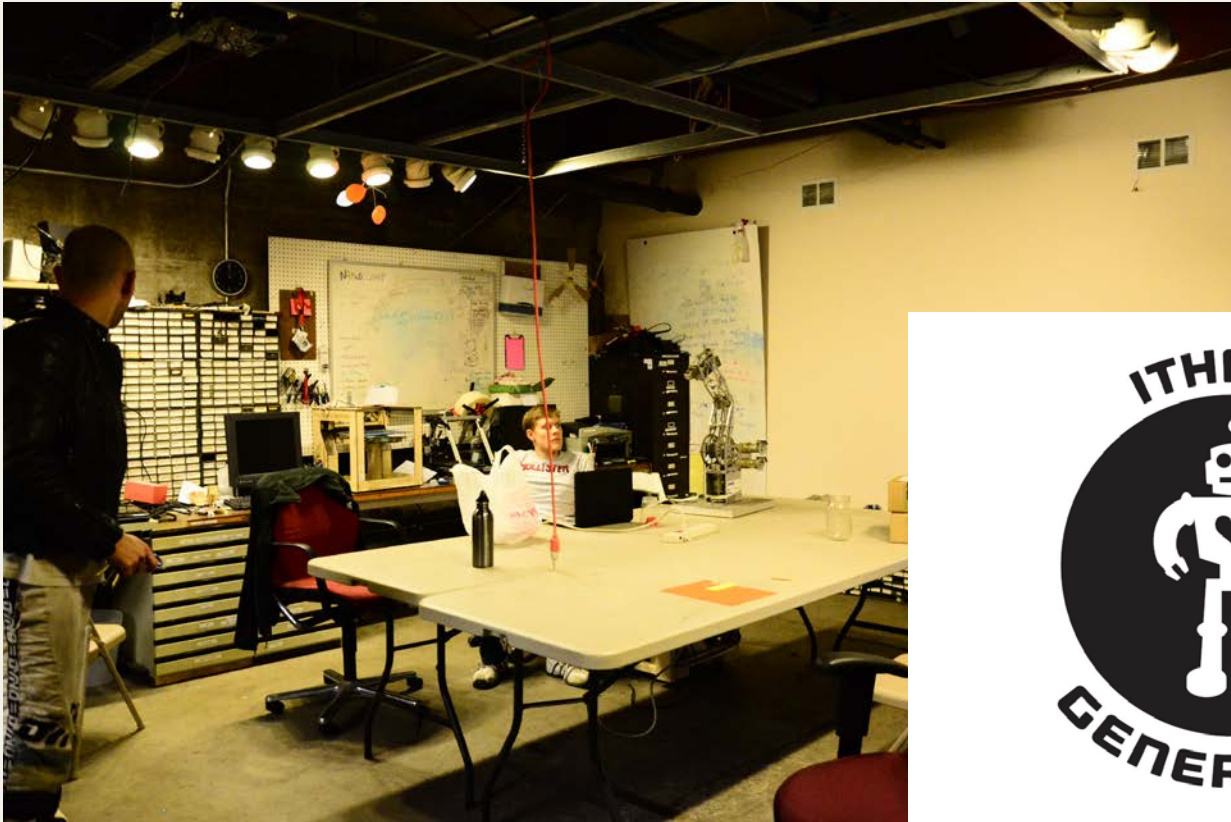


# Scientist Orientations



Building   
with Biology

# Forum





# Science Museum of Minnesota



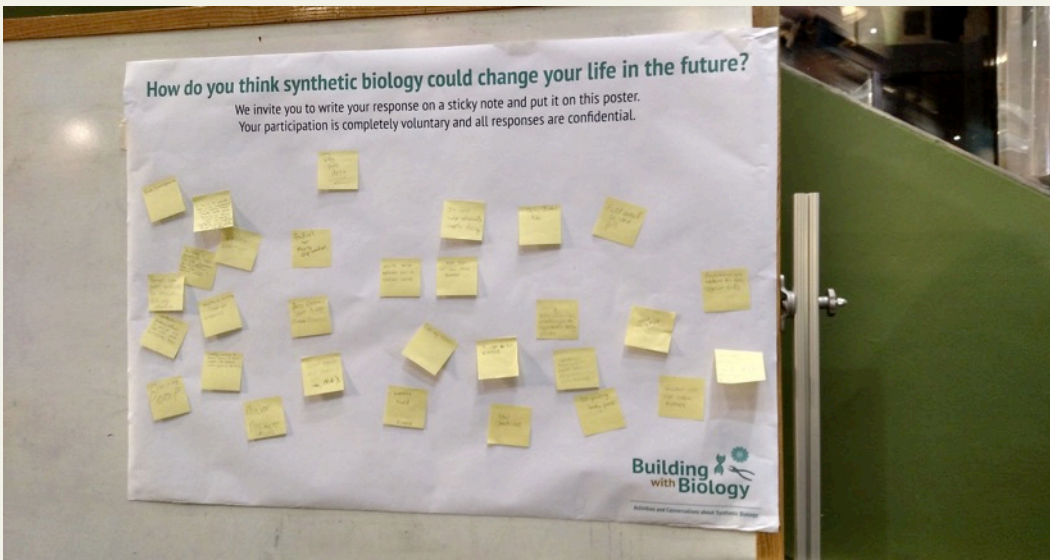
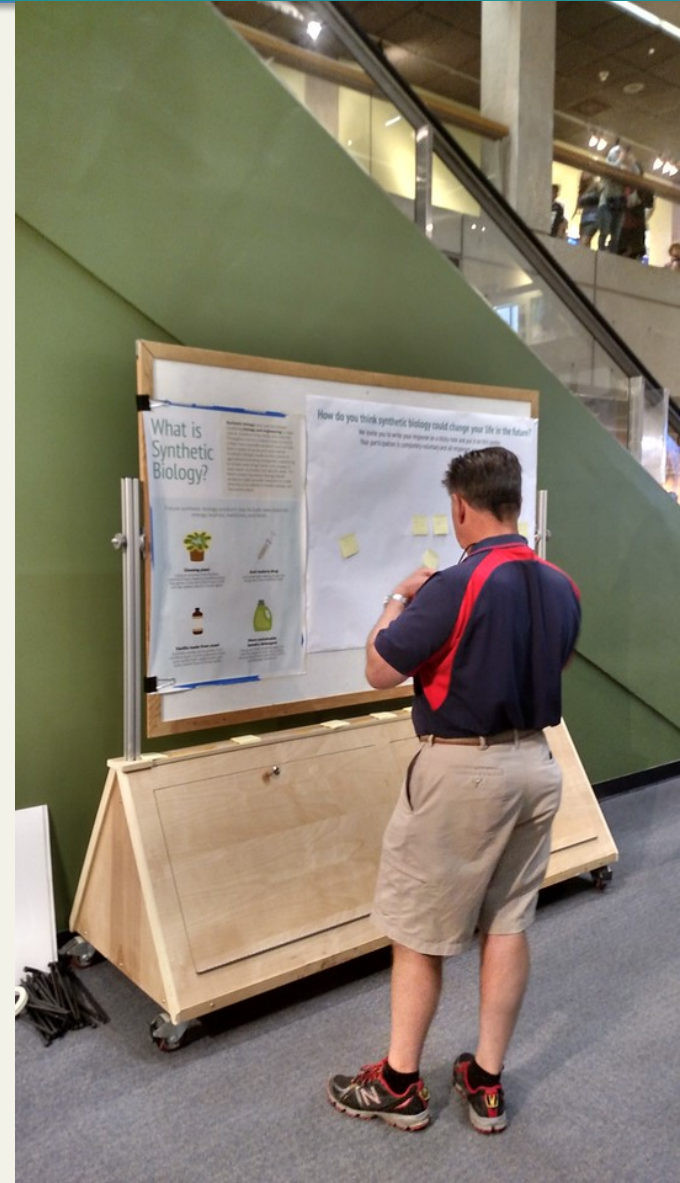
# Museum of Science



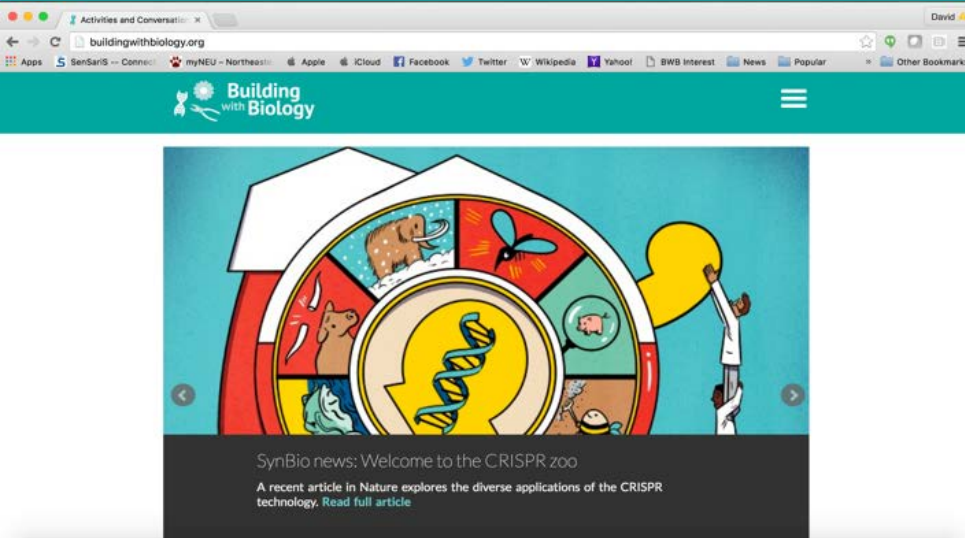
# Scientist Orientations



# Research and Evaluation



# Current Synbio Content



The screenshot shows the homepage of the website 'Building with Biology'. The browser's address bar displays 'buildingwithbiology.org'. The website's header features the logo and a navigation menu. The main content area includes a colorful illustration of a house with various biological icons inside, such as a DNA helix, a microscope, and a person. Below the illustration, the text reads: 'SynBio news: Welcome to the CRISPR zoo. A recent article in Nature explores the diverse applications of the CRISPR technology. Read full article'.



The screenshot shows a Science magazine article titled 'Fighting Lyme Disease in the Genes of Nantucket's Mice' by Amy Harmon, dated June 7, 2016. The article features a photograph of a white mouse being held in a gloved hand. The text below the photo reads: 'White-footed mice carry the pathogen that causes Lyme disease. An M.I.T. scientist is proposing to create mice that are genetically engineered to break the cycle of transmission. Your Ad-Hour/The New York Times'. Below the photo, there is a link: 'Can genetically engineered mice save Nantucket from the scourge of Lyme disease?'. To the right of the article, there is an advertisement for 'theTradeDesk' with a 'close' button and a disclaimer: 'This ad was based on your browsing activity. We are committed to providing you with transparency and control over the types of advertising you see.' Below the ad, there are links for 'Set Your Ad Preferences', 'The Trade Desk Privacy Policy', and 'Industry Resources: EU | US'. At the bottom of the ad, it says 'AdChoices by TRUSTe'.

## Scientists Turn Bacteria Into Living Hard Drives

Living organisms can store lines of code and pass them down to their progeny.



## Genome Editing: 7 Facts About a Revolutionary Technology

What everyone should know about cut-and-paste genetics

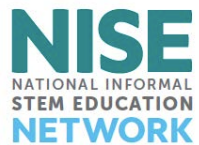
By Lucy Odling-Smee, Heidi Ledford, Sara Reardon, Nature magazine on November 30, 2015



# Thanks



We couldn't do this without you!



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