JACOBS INSTITUTE FOR DESIGN INNOVATION

COLLEGE OF ENGINEERING, UC BERKELEY

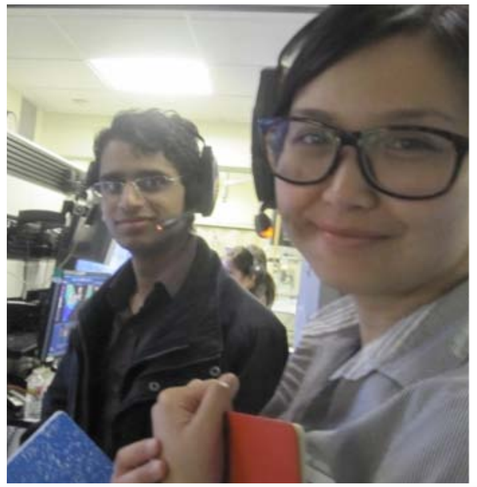

Make:

JACOBS INSTITUTE FOR DESIGN INNOVATION

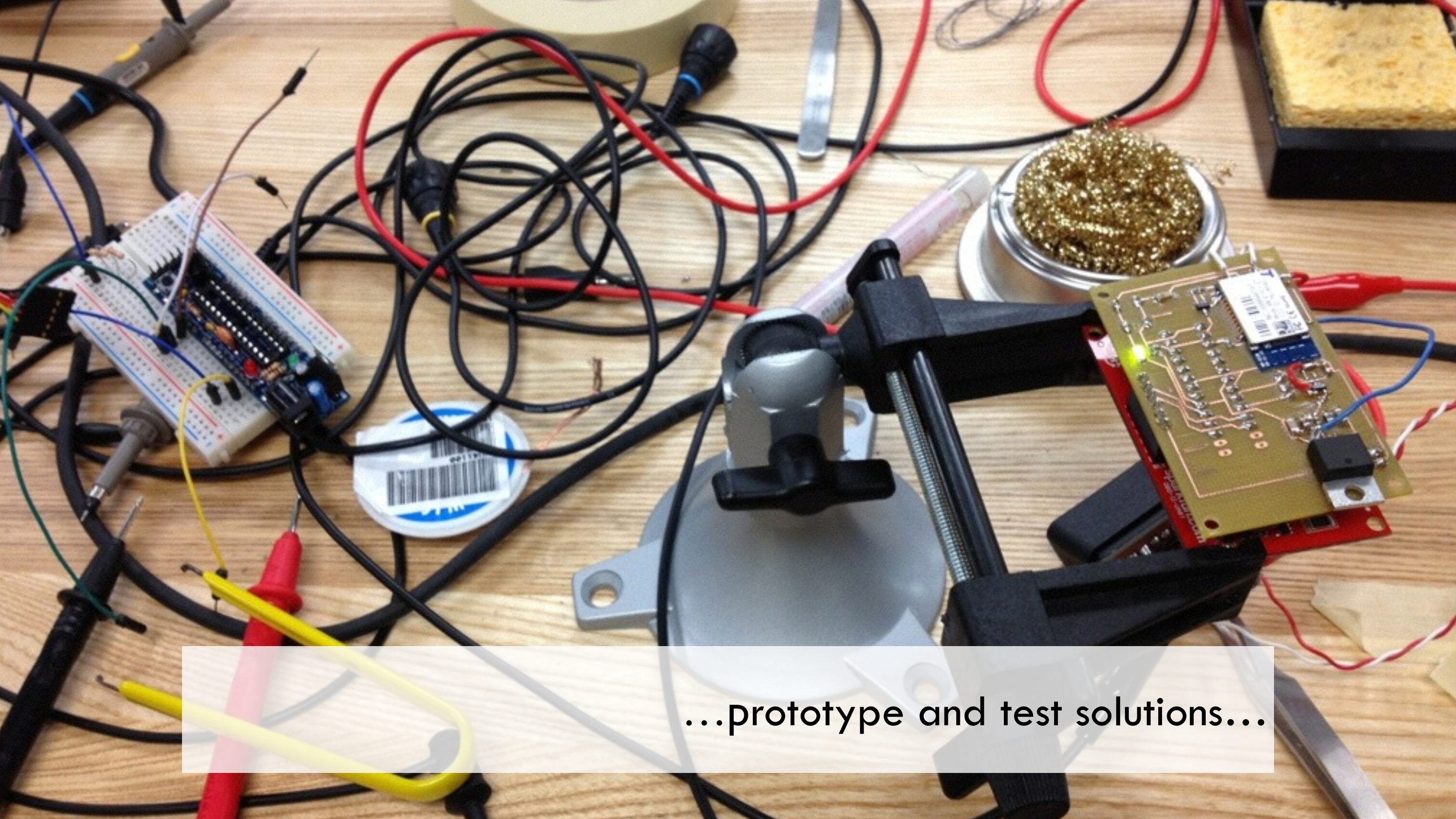
The Jacobs Institute for Design Innovation supports students in…


… learning the design process that lets them tackle “wicked problems”…





…. understanding & defining unmet needs
in the world around them….



…prototype and test solutions…

… through a wide variety of spaces in which to design, innovate, & make.

THE VISION

"Today, it is not enough to provide our future engineering leaders with **technical skills**. They must also learn to work in **interdisciplinary teams**, how to iterate **designs rapidly**, how to manufacture **sustainably**, how to combine **art and engineering**, and how to address **global** markets... to create our future."

Paul Jacobs
EECS '84, '86 '89

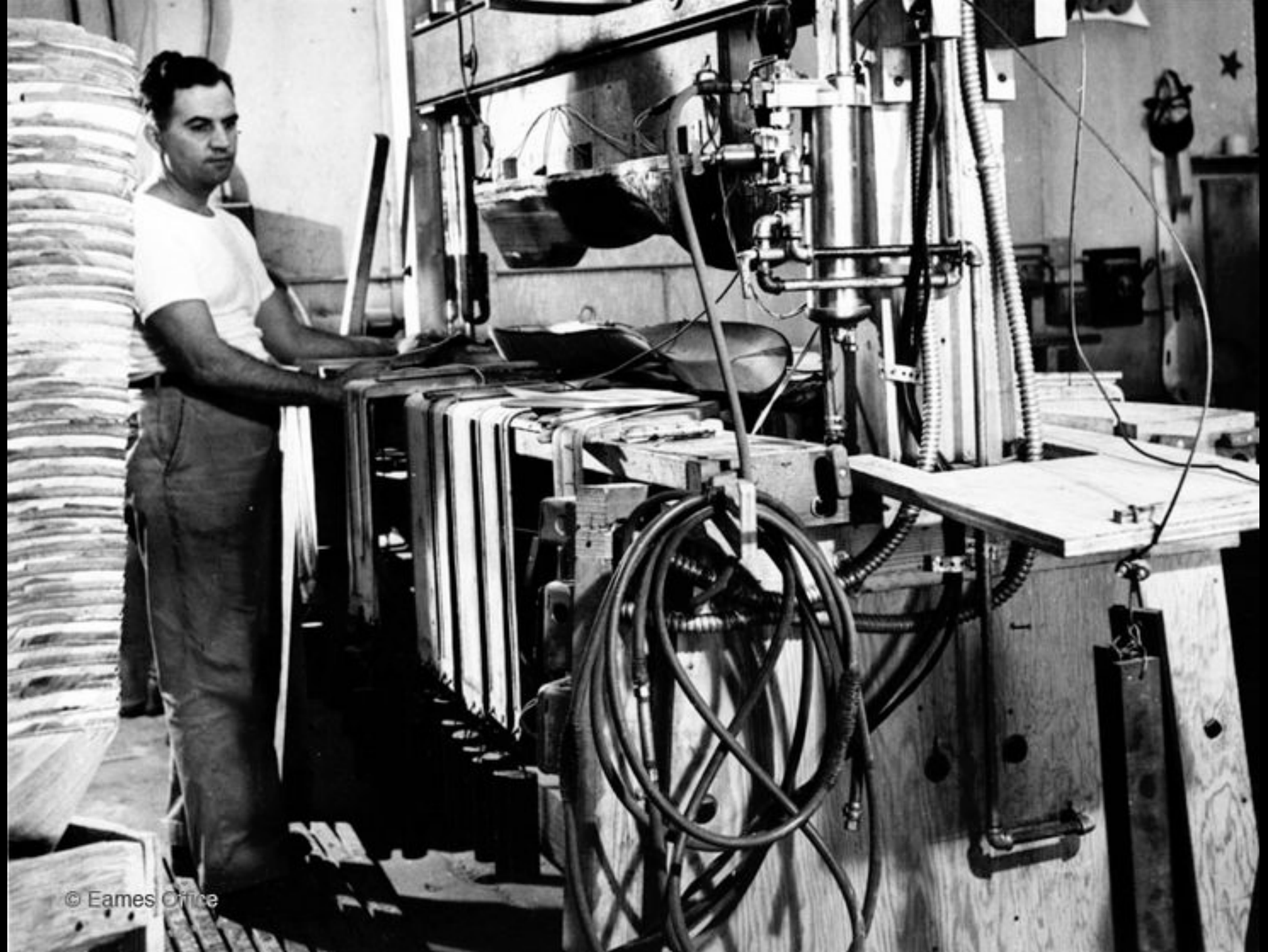
Paul Jacobs, Bill Clinton, Shankar Sastry (R to L)
Clinton Global Initiative
Chicago, IL | June 2013

DESIGNED IN CALIFORNIA

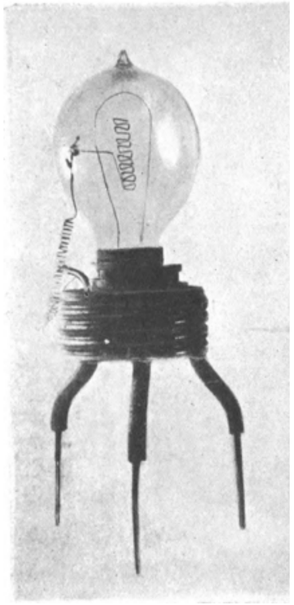
Eames: Materials + Aesthetics

Image:
Library of Congress

Image:
HiveModern

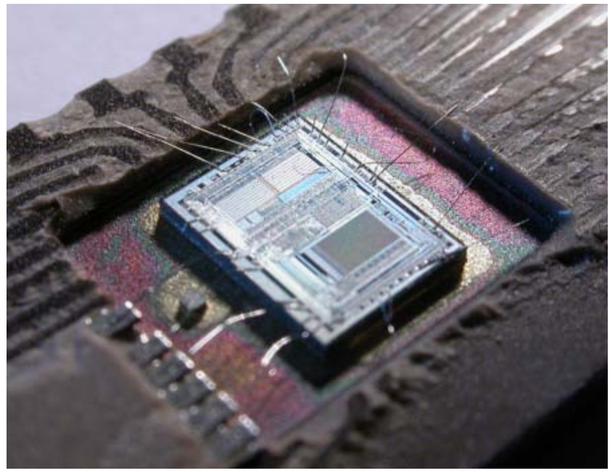

© Eames Office

Wozniak+Jobs: From Electronics to User Experience



Vacuum Tube
(Fleming 1904)

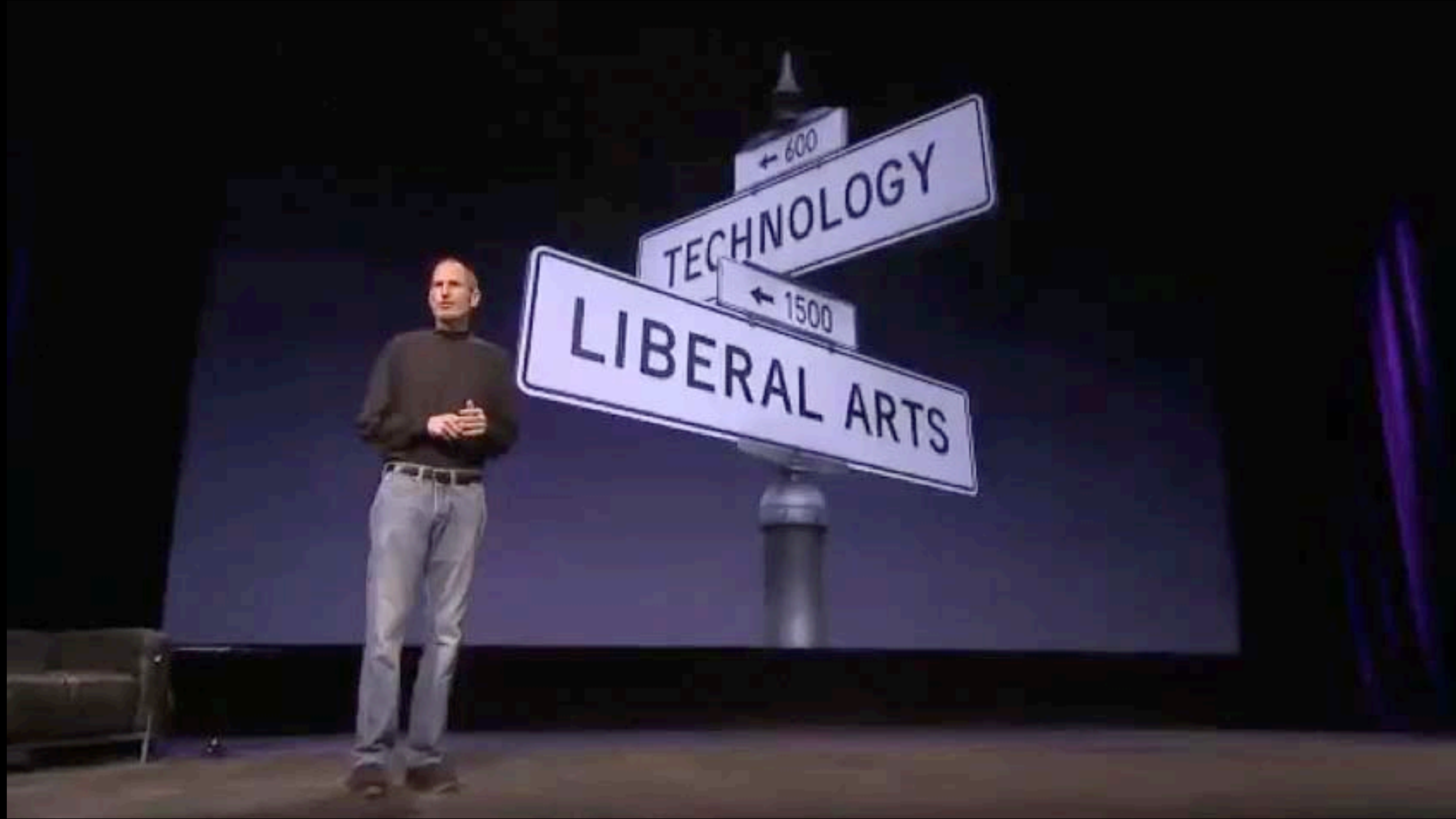
Transistor
(Bardeen, Bratten, Shockley 1947)



Integrated Circuit
(Kilby 1958)

Apple 1 - 1976

Apple Macintosh - 1984

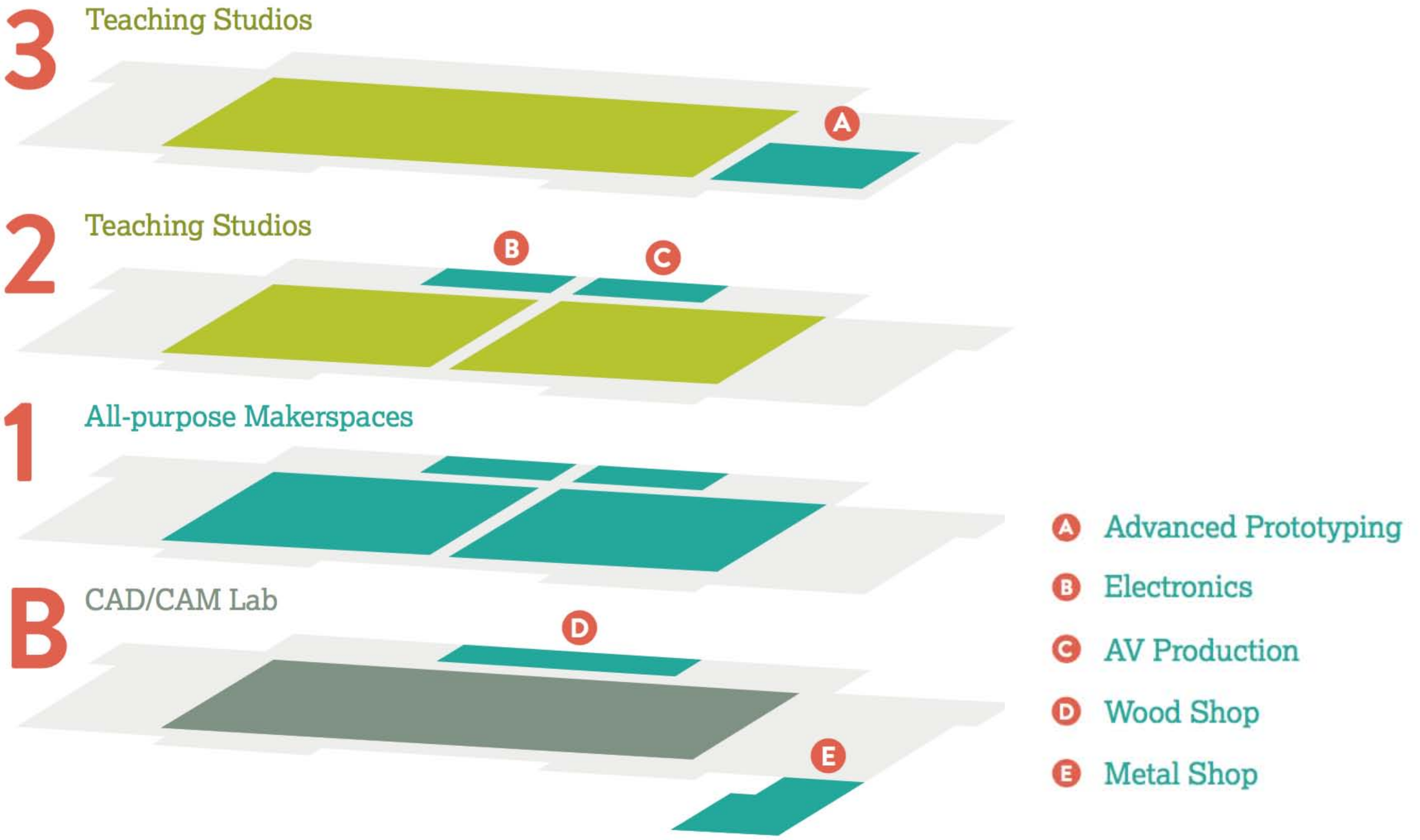

600
TECHNOLOGY
1500
LIBERAL ARTS

JACOBS HALL

PRECURSORS

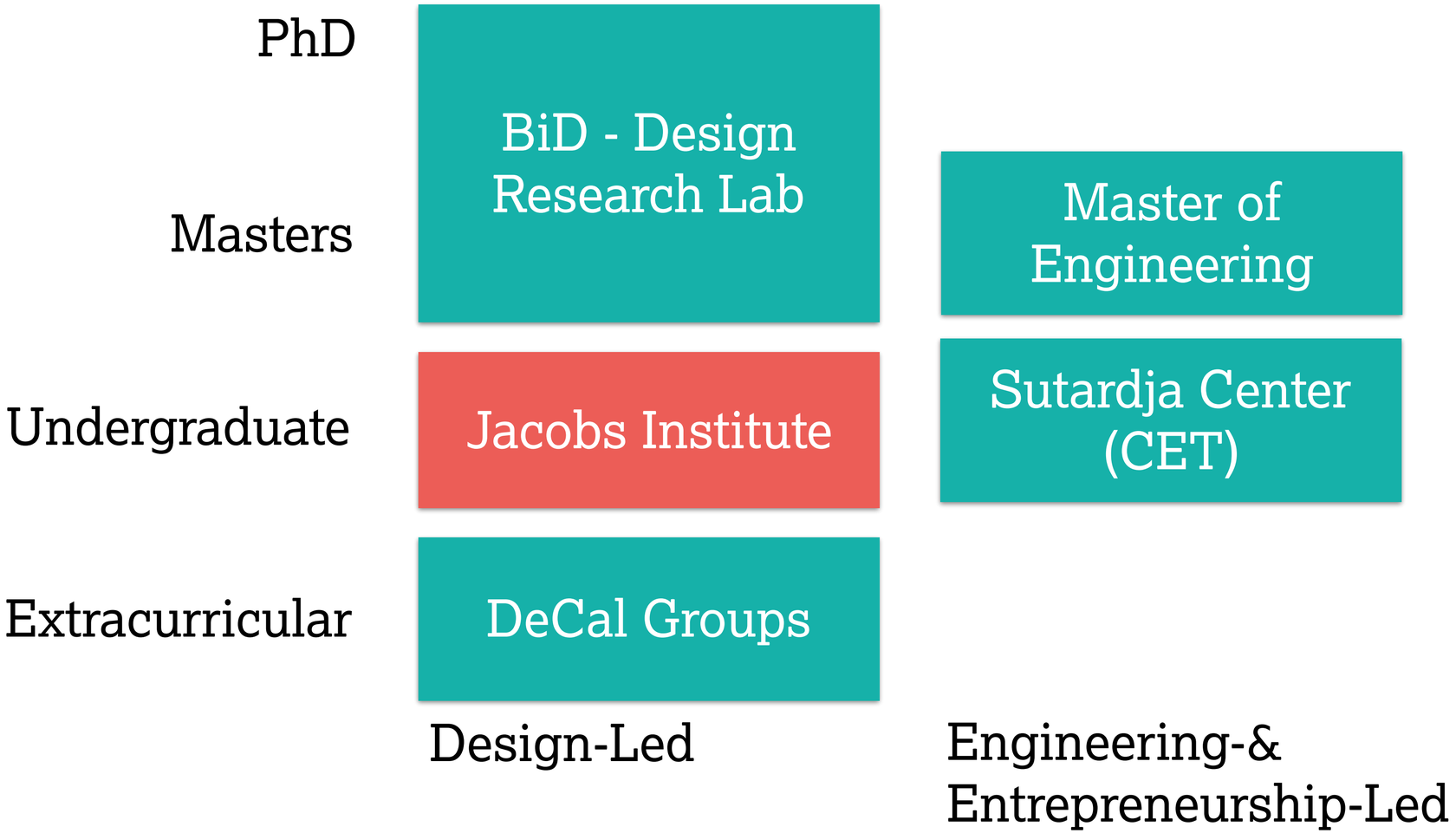
CAL DESIGN LAB 2010

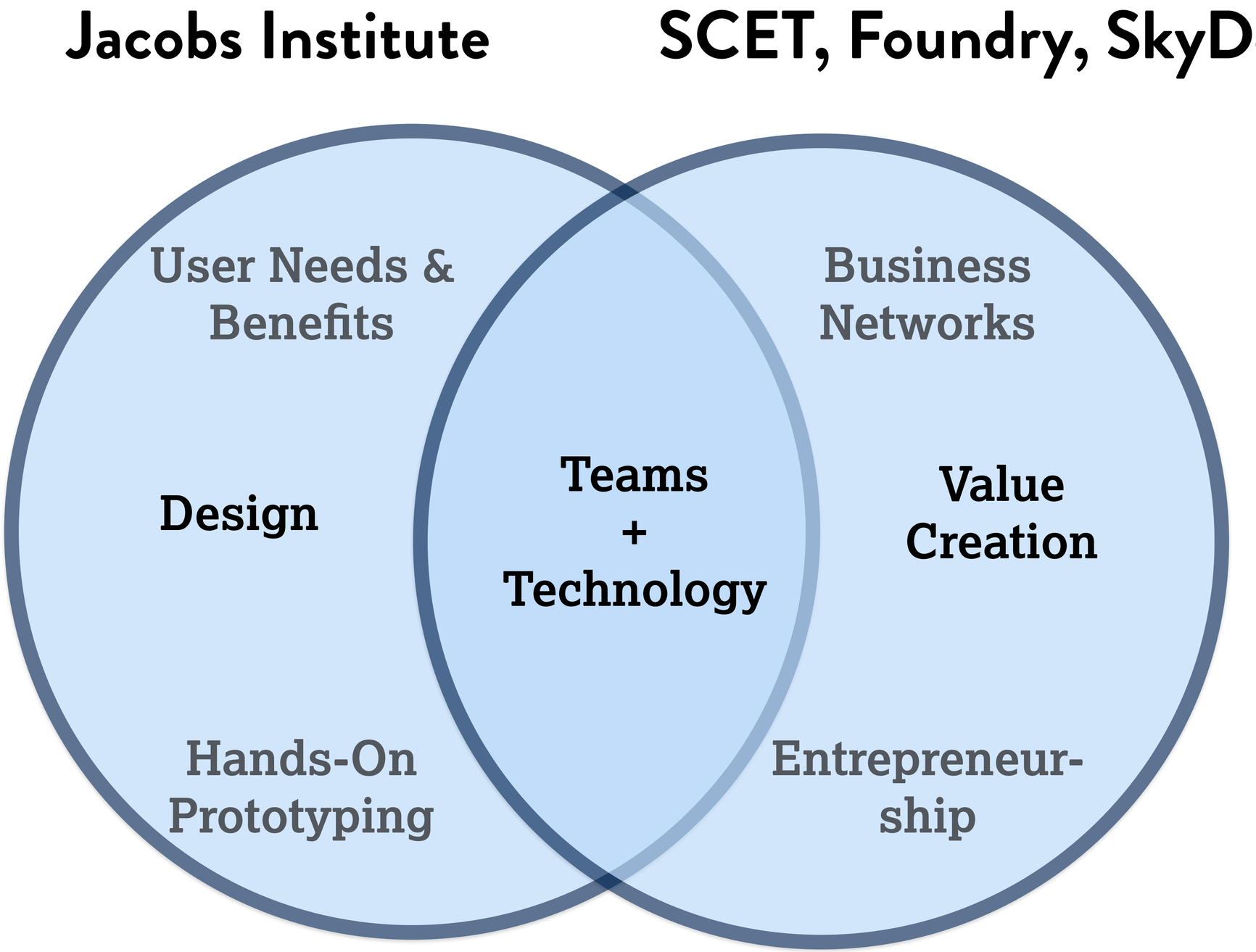
CITRIS INVENTION LAB

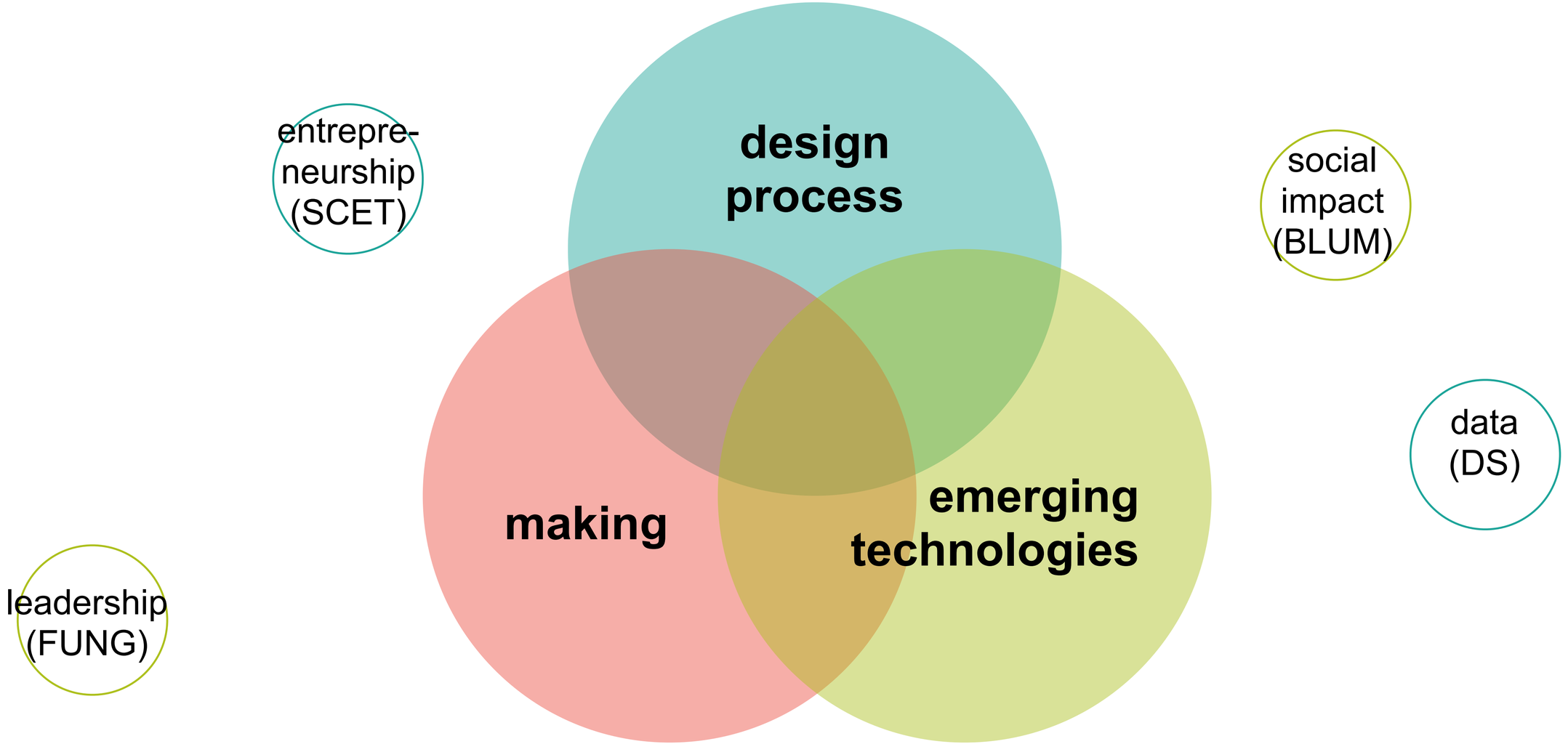

3
Teaching Studios
A
2
Teaching Studios
B
C
1
All-purpose Makerspaces
B
CAD/CAM Lab
D
E
A Advanced Prototyping
B Electronics
C AV Production
D Wood Shop
E Metal Shop


EXIT
COLORADO

DESIGN IN THE COLLEGE OF ENGINEERING




Jacobs Institute
SCET, Foundry, SkyDeck
User Needs & Benefits
Design
Hands-On Prototyping
Teams + Technology
Business Networks
Value Creation
Entrepreneur-ship


entrepre-
neurship
(SCET)
design
process
social
impact
(BLUM)
making
emerging
technologies
data
(DS)
leadership
(FUNG)

THE 21ST CENTURY WORKSHOP

DESIGN SOFTWARE + DIGITAL FABRICATION TOOLS + PROGRAMMABLE ELECTRONICS

PROGRAMS

PER SEMESTER:

10+

departments

20+

courses

1200+

students enrolled

CORE FACULTY & LECTURERS

ALICE AGOGINO

SARA BECKMAN

JOHN CANNY

AMY HERR

BJÖRN HARTMANN

HAYDEN TAYLOR

DENNIS LIEU

SCOTT MOURA

IKHLAQ SIDHU

ERIC PAULOS

MICHAEL SHILOH

JAMES PIERCE

ROB HENNIGAR

CHRIS MYERS

PAUL WRIGHT

TECHNICAL STAFF

JOEY GOTTBRATH

STACY JO SCOTT

MATT WOLPE

GARY GIN

CHRIS PARSELL

KENT WILSON

STUDENT SUPERVISORS

SHOTA OKUI

Student Supervisor

Shota loves basketball. But when he's not refining his graceful three-point shot, he likes to fill his free time working with wood, metal, and software. Talk to him if you're working on an innovative project.

JOSHUA MOULEDOUX

Student Supervisor

Joshua works with laser-cutters, electronics lab, and 3D printers, and he has experience in CNC subtractive machining. In his free time, he loves doing parkour, building random projects, and watching Netflix.

TIFFANY CHEUNG

Student Supervisor

Tiffany loves hearing about ongoing projects at Jacobs Hall, as well as completing DIY projects herself. Her favorite project from DES INV 22 was her LED nameplate and drawing machine. Talk to her about anything!

ADAM CASTIEL

Student Supervisor

Adam is a mechanical engineering student. Apart from this, he enjoys playing tennis, mountain biking, and getting way too excited about cars.

ALICE CHIN

Student Supervisor

Alice is a second-year intended computer science major. When she's not studying, you can find her playing tennis, sleeping, or looking for her next project to create at Jacobs.

CHARLENE SHONG

Student Supervisor

Charlene is a mechanical engineering major, interested in UAVs, robotics, and the maker culture. She enjoys playing PC games, working on DIY projects, and laser-cutting and 3D printing at Jacobs Hall.

MELISSA SU

Student Supervisor

Melissa holds the record for most spools of PLA used. She loves to (re)design functional and aesthetic projects. Her goal is to be proficient in all equipment at Jacobs Hall.

JOSHUA YUAN

Student Supervisor

Joshua is studying computer science. You can find him playing ultimate frisbee or spending lots of time at Jacobs Hall as a student supervisor and laser-cutter trainer.

NICOLE KIM

Storytelling Assistant

Nicole is a third-year urban studies student. She loves taking photos, recording music, and eating ridiculous amounts of ice cream. When she's not working on creative projects, she's often coming up with ideas of what to make next.

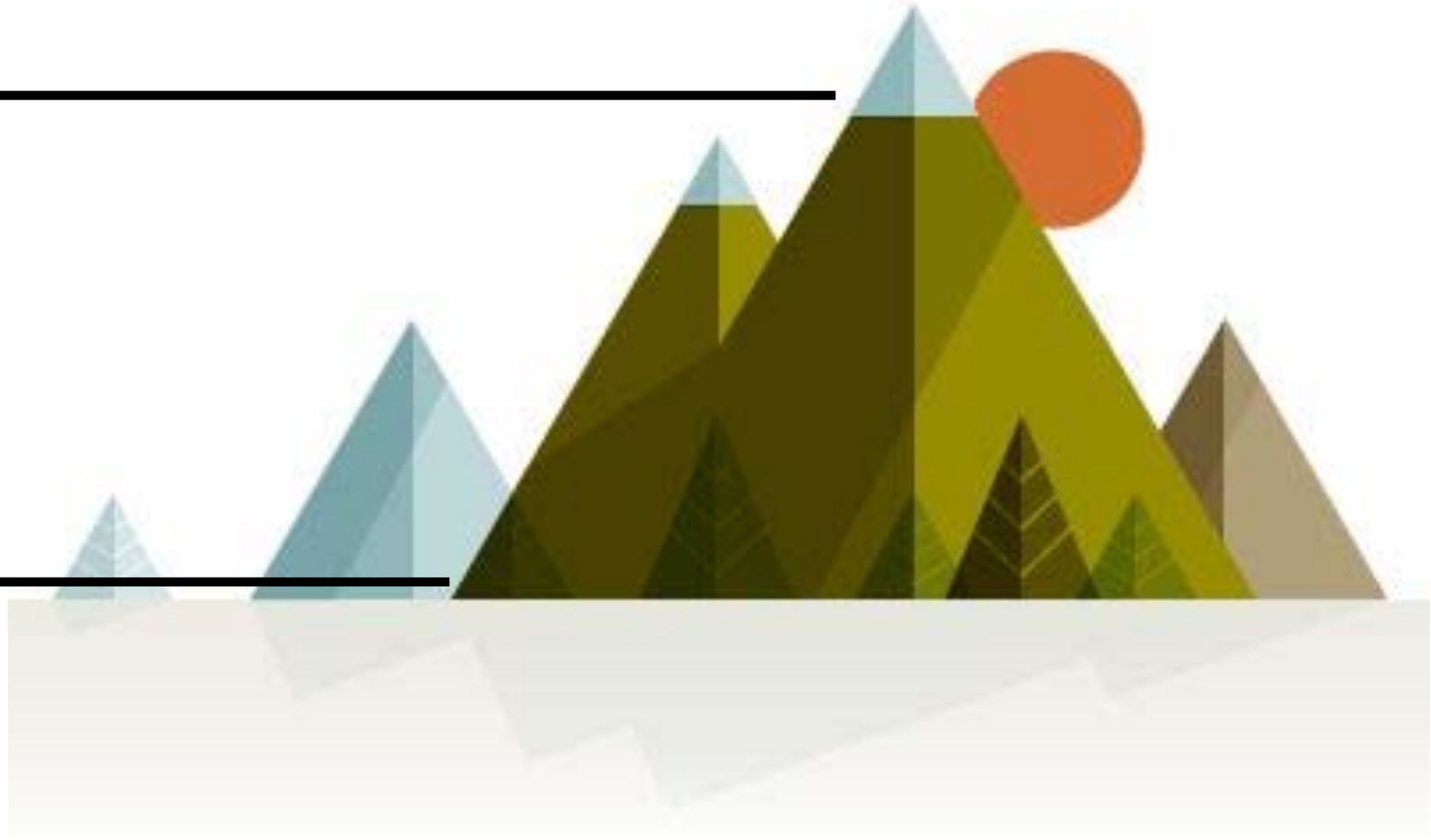
DAPREE DOYLE

Storytelling Assistant

Dapree enjoys making videos. In his free time, you can find him adventuring in the hills, listening to music, or finding something random to make a video about. If you want a project to come to life in a video, let him know!

PEAK:
EXPERTISE

BASE CAMP:
EXPOSURE



PROGRAMS & ACTIVITIES

CURRICULAR

DES INV Courses

Student-taught DeCals

Courses From COE Departments & Other Colleges

Berkeley Certificate in Design Innovation

CO-CURRICULAR

Maker Pass: Lab + Tool Access

Fellowships/ AiR

Design Nights

Student Club Meetings & Events

PUBLIC

Invited Design Events

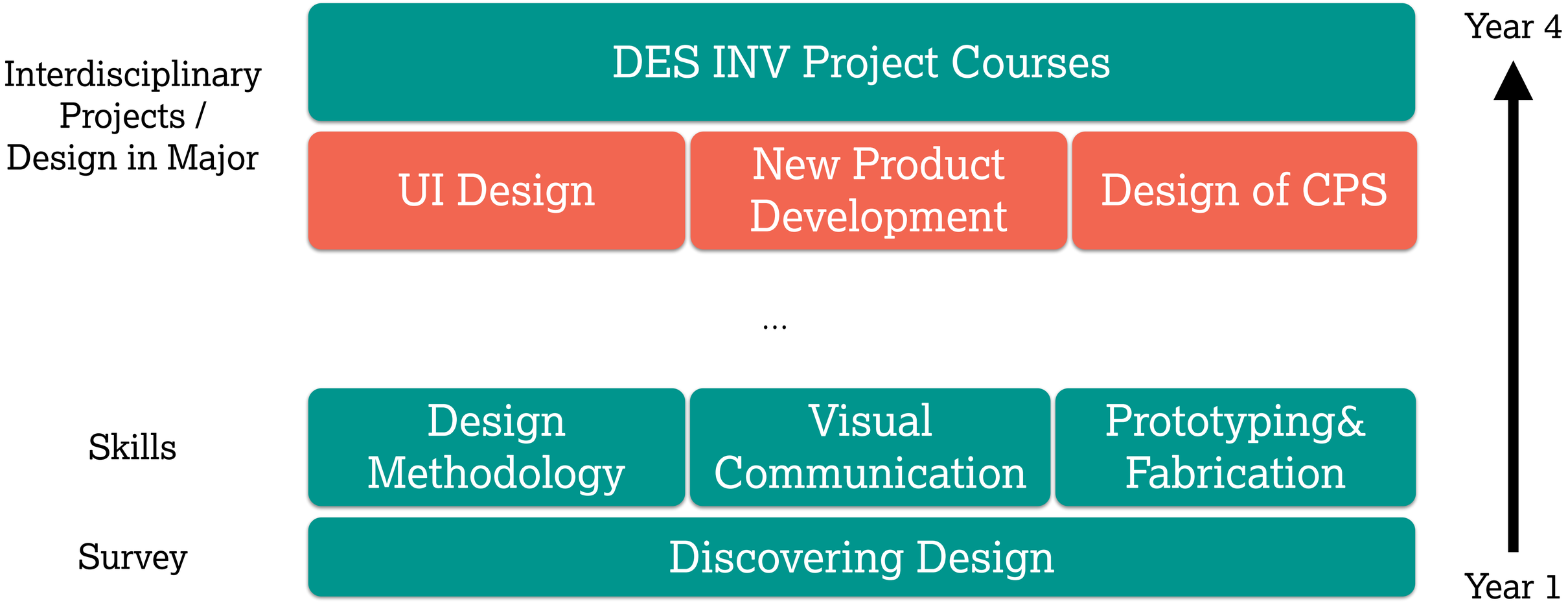
Talks

Design Showcases

Core Jacobs Institute Programs

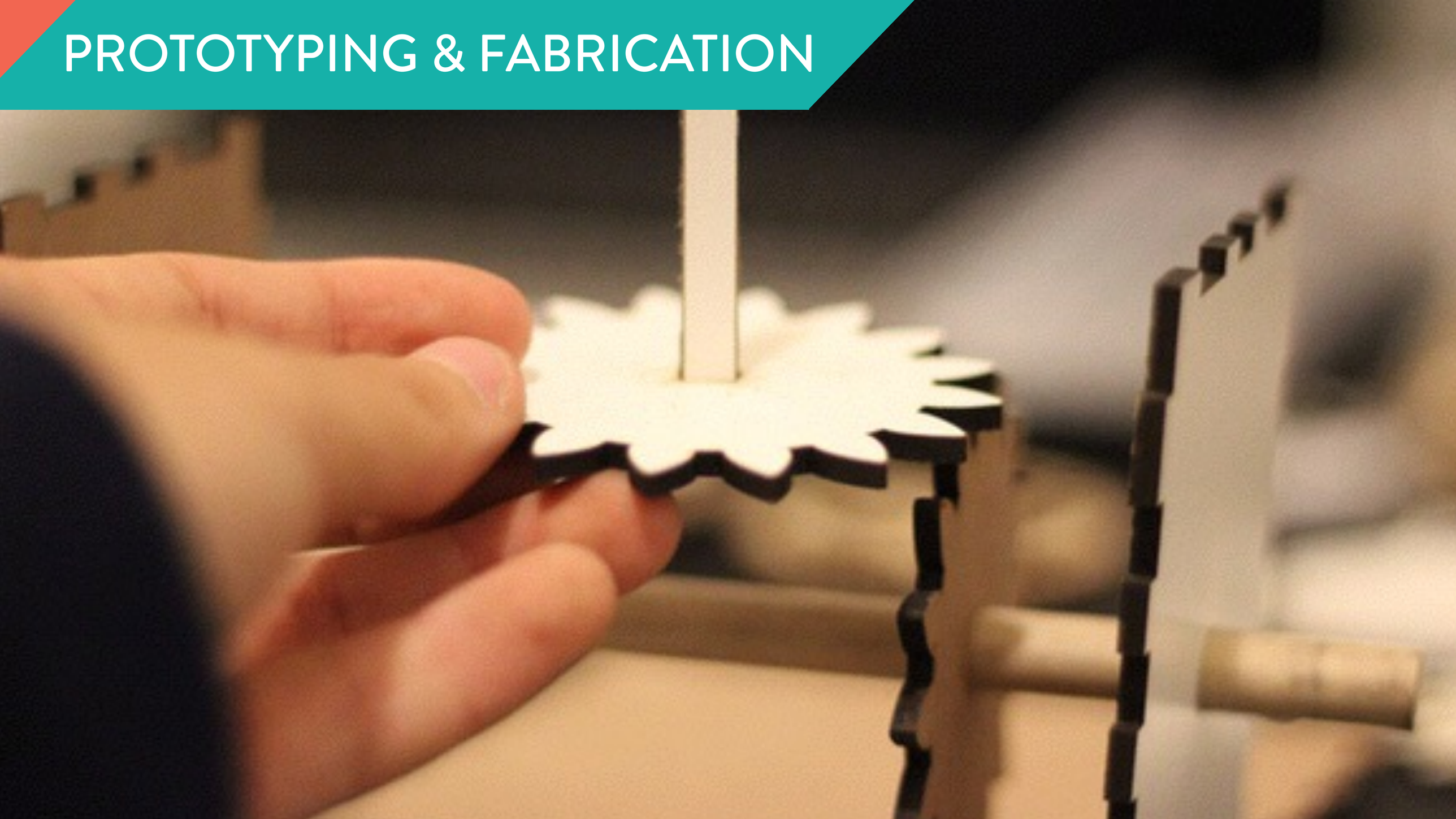
Connections to other units/groups

JACOBS CURRICULUM

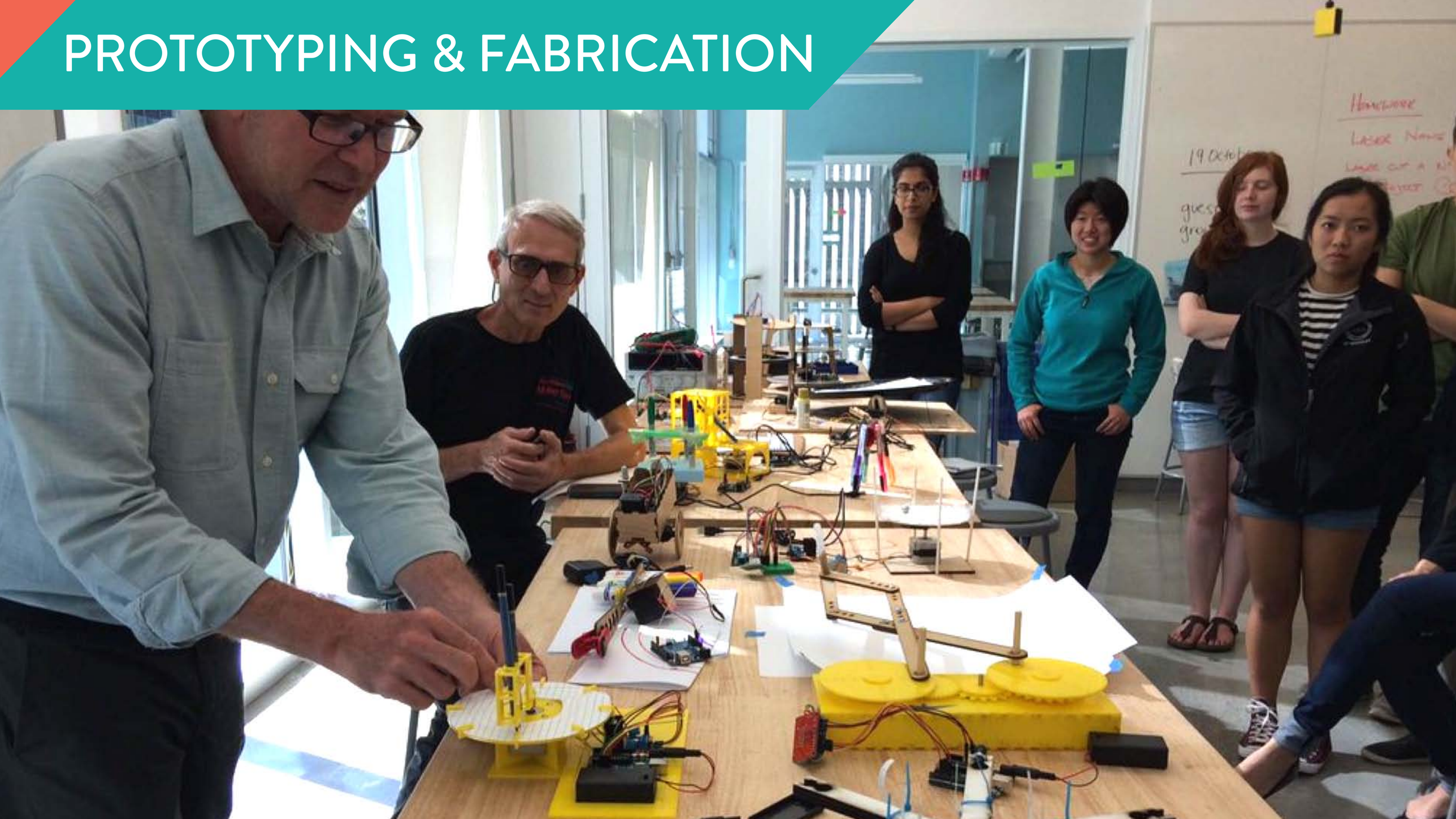


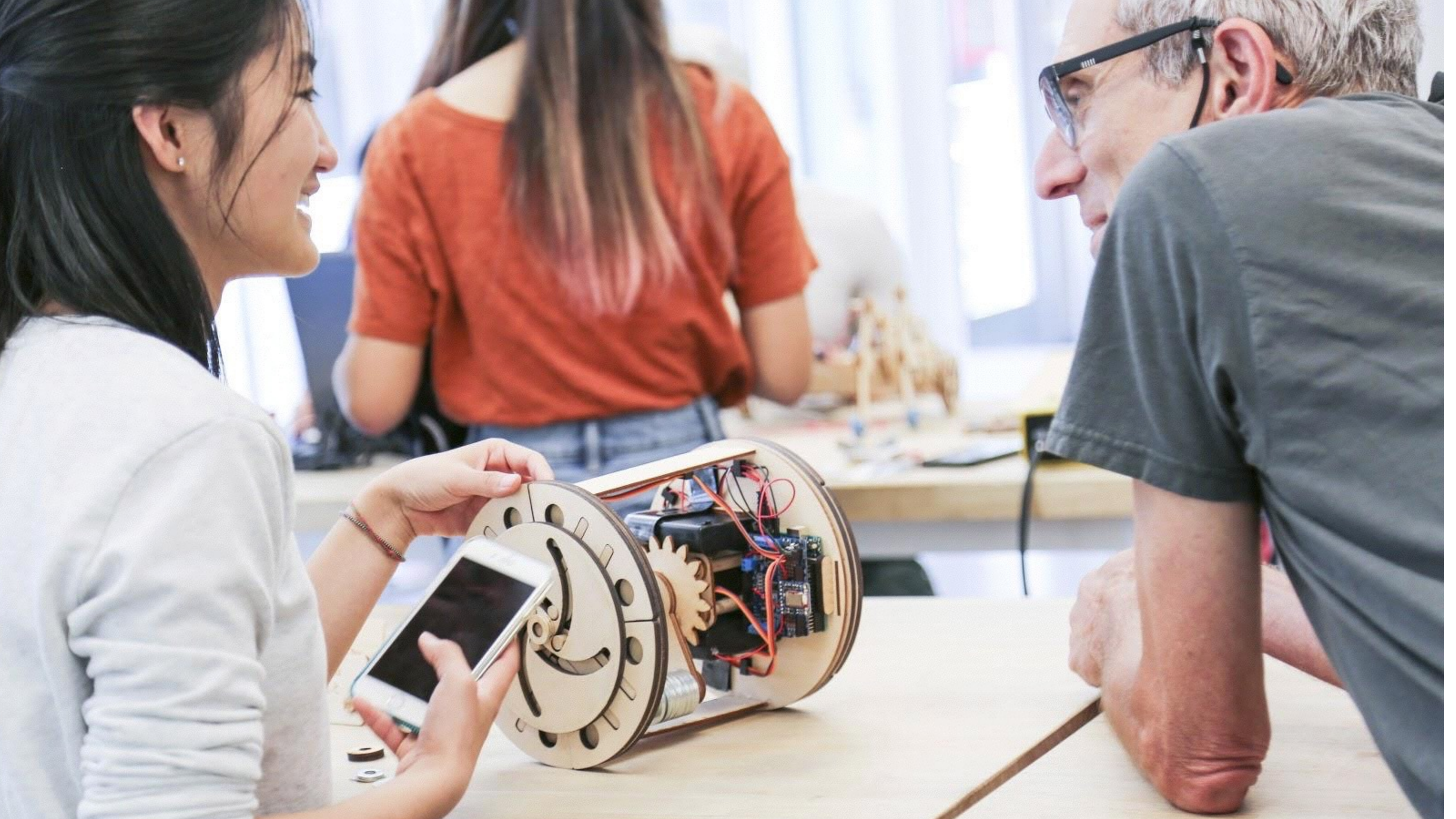
DESIGN METHODOLOGY

PROTOTYPING & FABRICATION



PROTOTYPING & FABRICATION





SOME OTHER COURSES

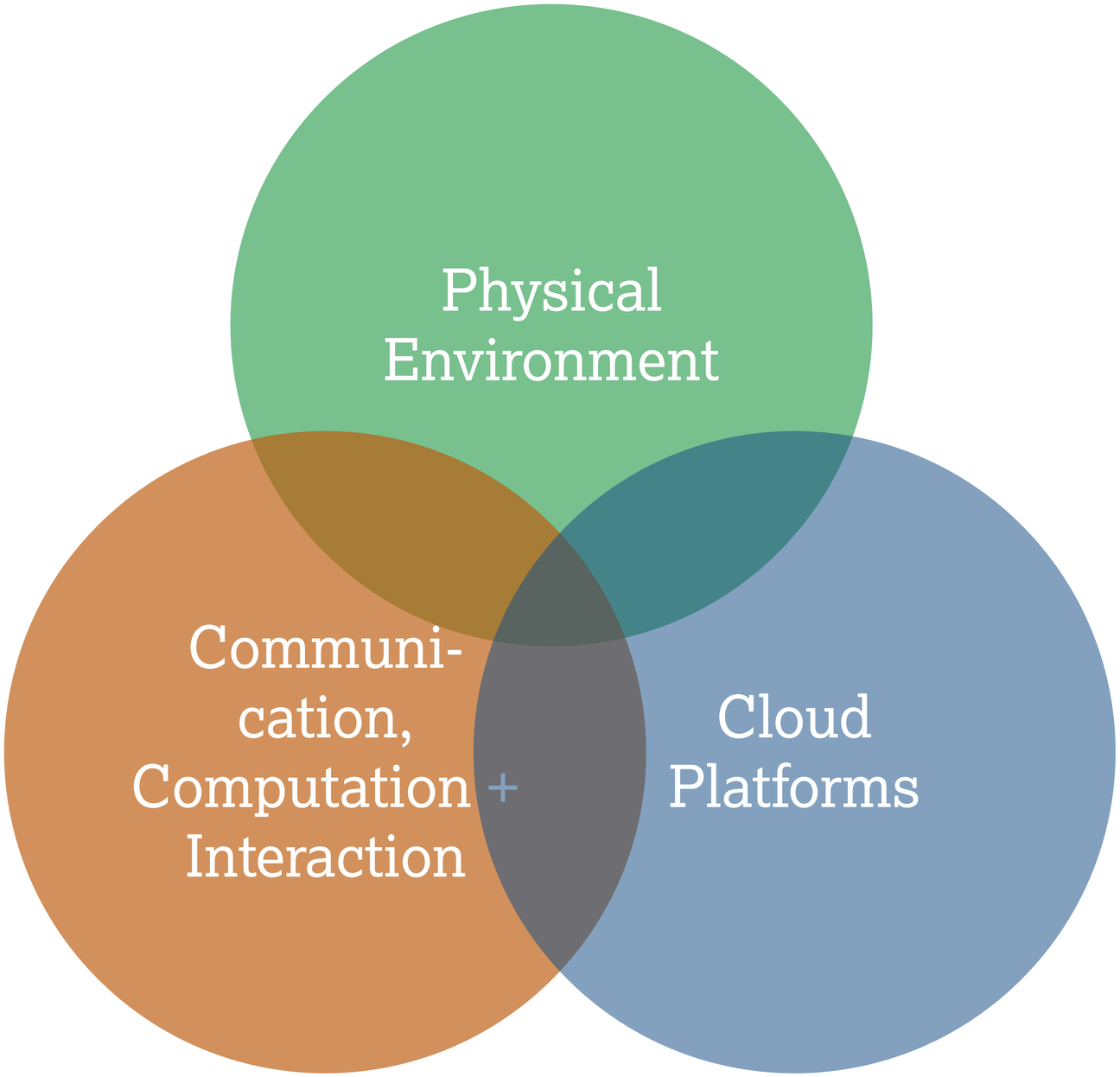
- Bio-Inspired Design
- User Experience Design
- Intro to Manufacturing
- How It’s Made
- Industrial Design and Human Factors
- Critical Making
- Critical Practices
- Reimagining Mobility
- Eat. Think. Design.
- Reimagining Slums
- Collaborative Innovation
- Social Entrepreneurship
- Social Innovation On-Ramp
- New Product Development
- Product Management Essentials
- Design of Cyber-Physical Systems
- Sustainable Residential Design
- Interactive Device Design
- Designing for the Human Body
- Reimagining Mobility

STUDENT-LED PROGRAMS

DESIGN CONVERSATIONS

- **Bernie Roth** (Stanford d.school)
- **Benjamin Joffe** (General Partner, HAX Hardware Accelerator)
- **Ellen Luption** (Curator, Cooper-Hewitt National Design Museum)
- **Carla Diana** (Interaction & Robot Design, University of Pennylvania)
- **Steve Johnson** (VP UX, LinkedIn)
- **Yoon Lee** (SVP Product Innovation, Samsung)
- **Greg Petroff** (CXO, GE Digital)
- **Elizabeth Gerber** (Design for America / Northwestern)
- **James Tichenor & Joshua Walton** (Microsoft Hololens)
- **Marc Tarpenning** (Co-Founder, Tesla)
- Plus **Design Field Notes**: Charles Huang (Guitar Hero), Misha Cornes (Lunar), Amy Wibowo (BubbleSort), Alec Rivers (Shaper Tools), …

EXAMPLE CLASS:
INTERACTIVE DEVICE DESIGN


Physical
Environment
Communi-
cation,
Computation
Interaction
+
Cloud
Platforms


nest
IN 20 MIN
21

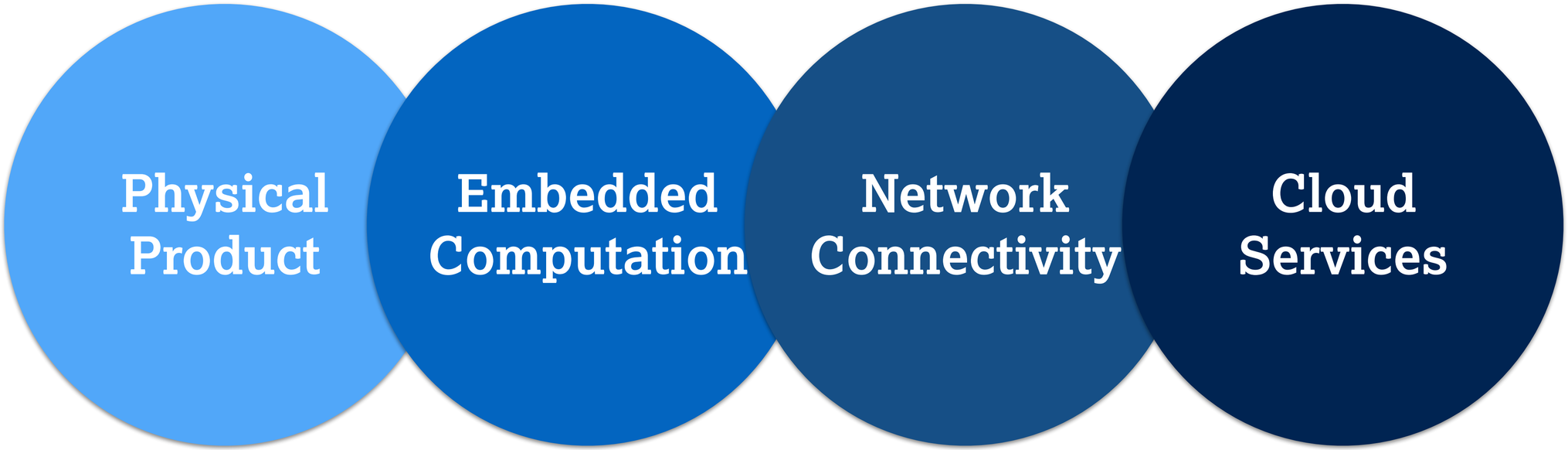

tagg


Readout
99.8°
LOW FEVER
Are you feeling any of these common symptoms?
SAVE READOUT
Sarah's History
NEW ENTRY
98.8°
100.3°


deeper
Fishfinder

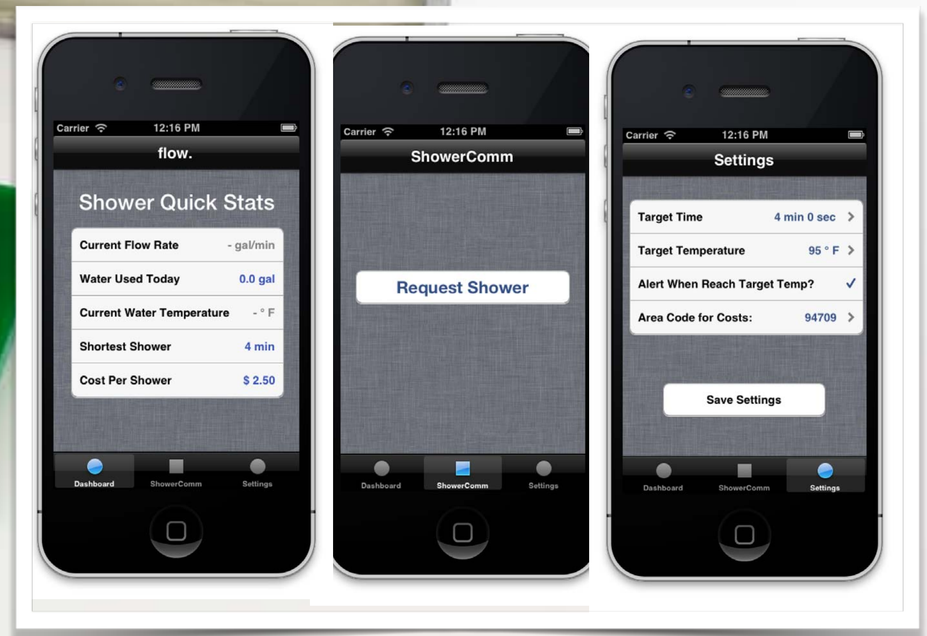

CLICK & GROW

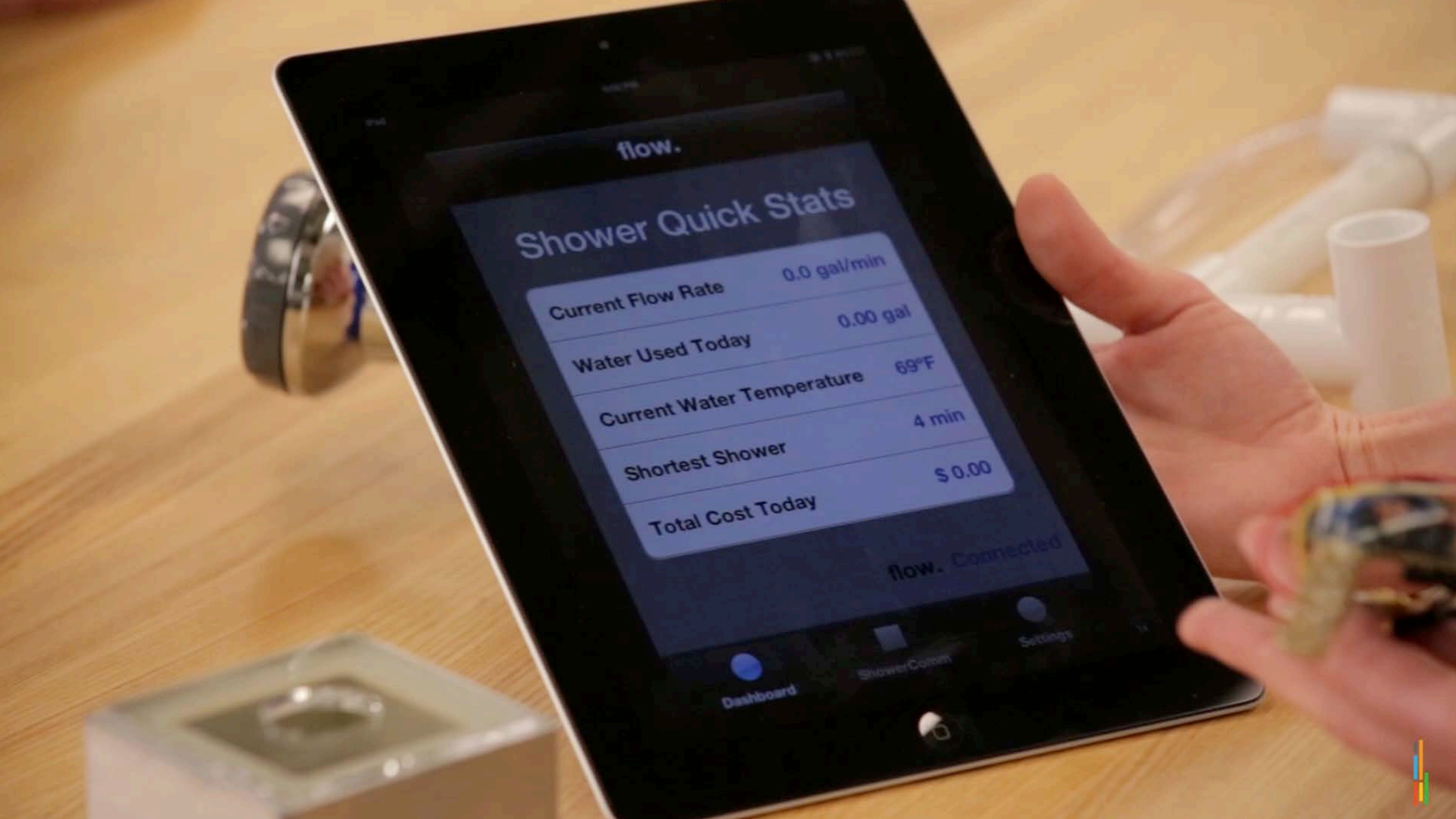

Evolution Series
a product of
ecomagination
2015


Physical Product
Embedded Computation
Network Connectivity
Cloud Services

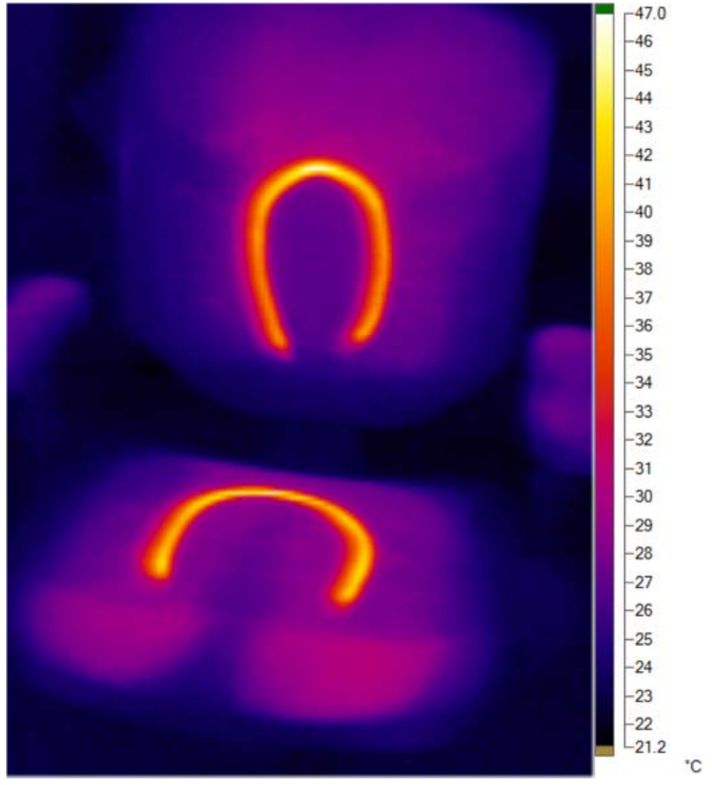
flow

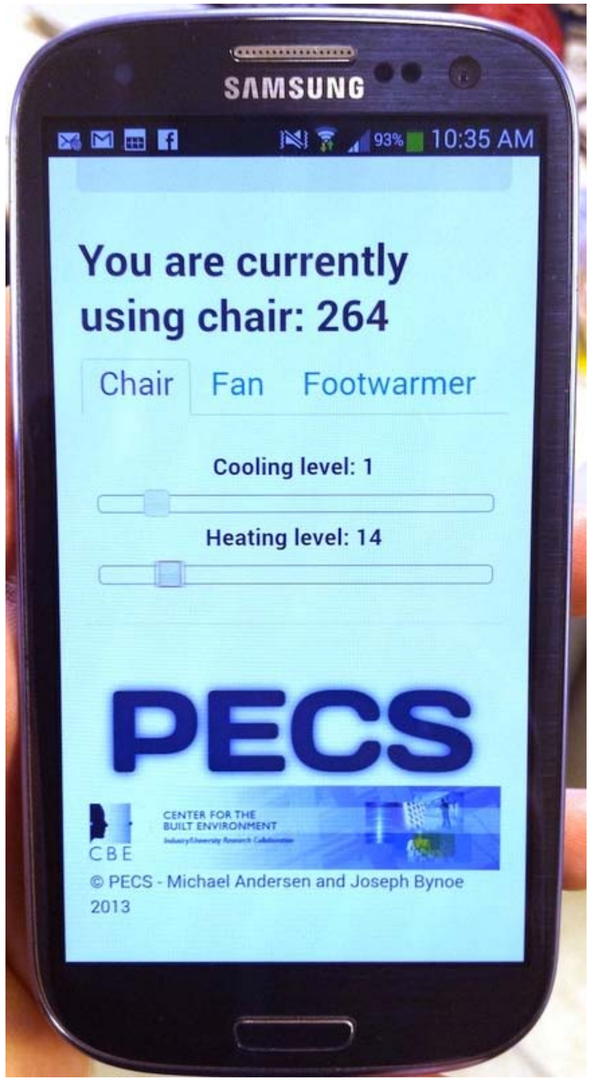
Zach Wasson
Jackie Leverett
Tim Lee




flow.
Shower Quick Stats
Current Flow Rate
0.0 gal/min
Water Used Today
0.00 gal
Current Water Temperature
69°F
Shortest Shower
4 min
Total Cost Today
$ 0.00
flow. Connected
Dashboard
Settings

Personal Environmental Control System (PECS)
Michael Andersen, Joseph Bynoe





Zinfadel Batch is reading loud and clear. It has been running for 21 days.

Measurement Data

Tue Dec 02 2014 16:12:08 GMT-0800 (PST)

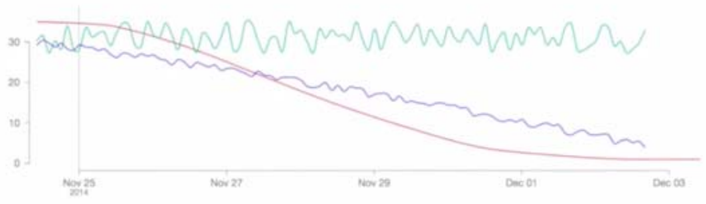
Expected Brix 1.00 degrees Brix

Actual Brix 3.92 degrees Brix

Temperature 32.95 degrees Celsius

Expected Brix Curve

Day 1:	35.00	Day 6:	9.00
Day 2:	34.00	Day 7:	4.00
Day 3:	2.00	Day 8:	2.00
Day 4:	22.00	Day 9:	1.00
Day 5:	15.00	Day 10:	1.00



— Expected Brix (in degrees Brix) — Temperature (in degrees Celsius) — Actual Brix (in degrees Brix)

Done with this batch? Mark it as finished!

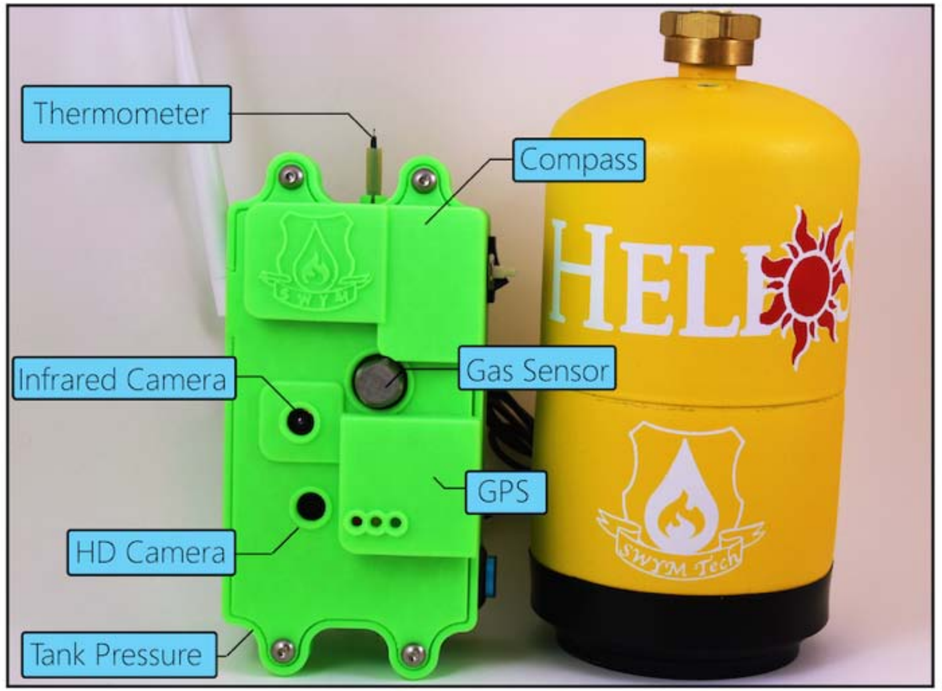
Warning! Once a tank is marked as finished, the tank will no longer receive or record measurements.

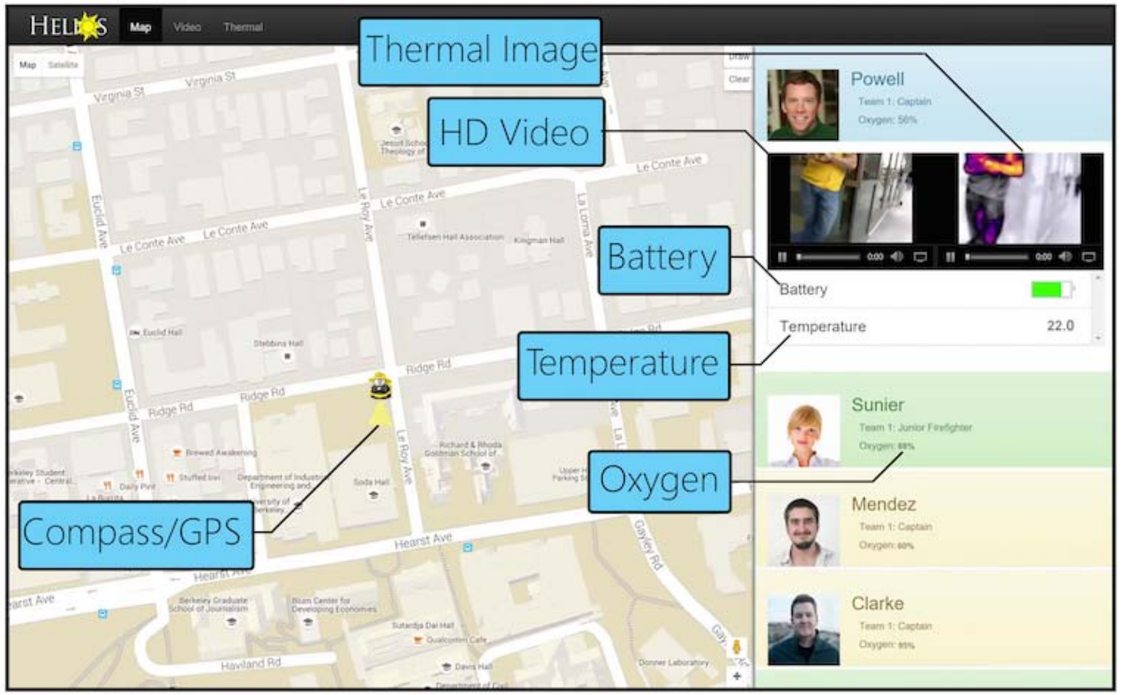
Anthony Sutardja
Maxwell Micali
Christine Dierk
Zachary Gima

Sunita Venkatesh
Lucy Corippo
Adarsh Mani
(w/ UCSF)

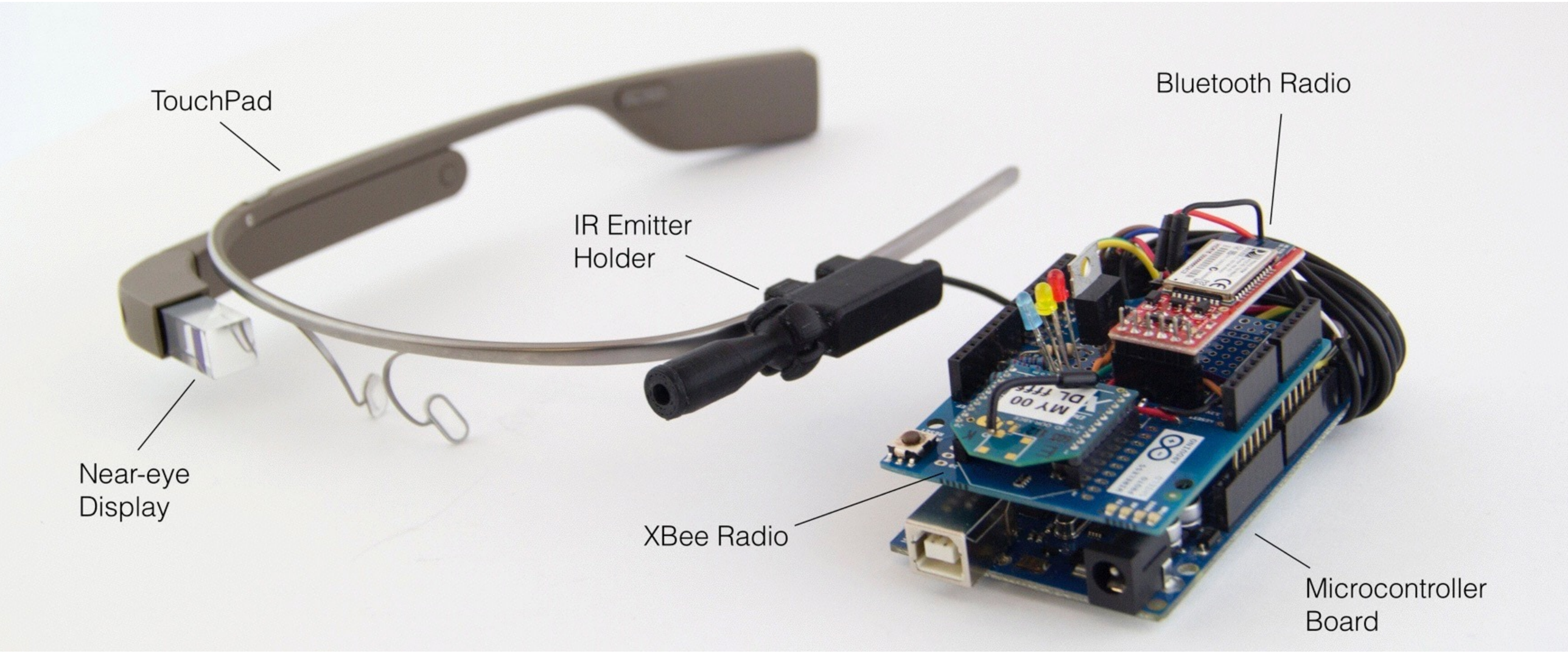
HELIOS

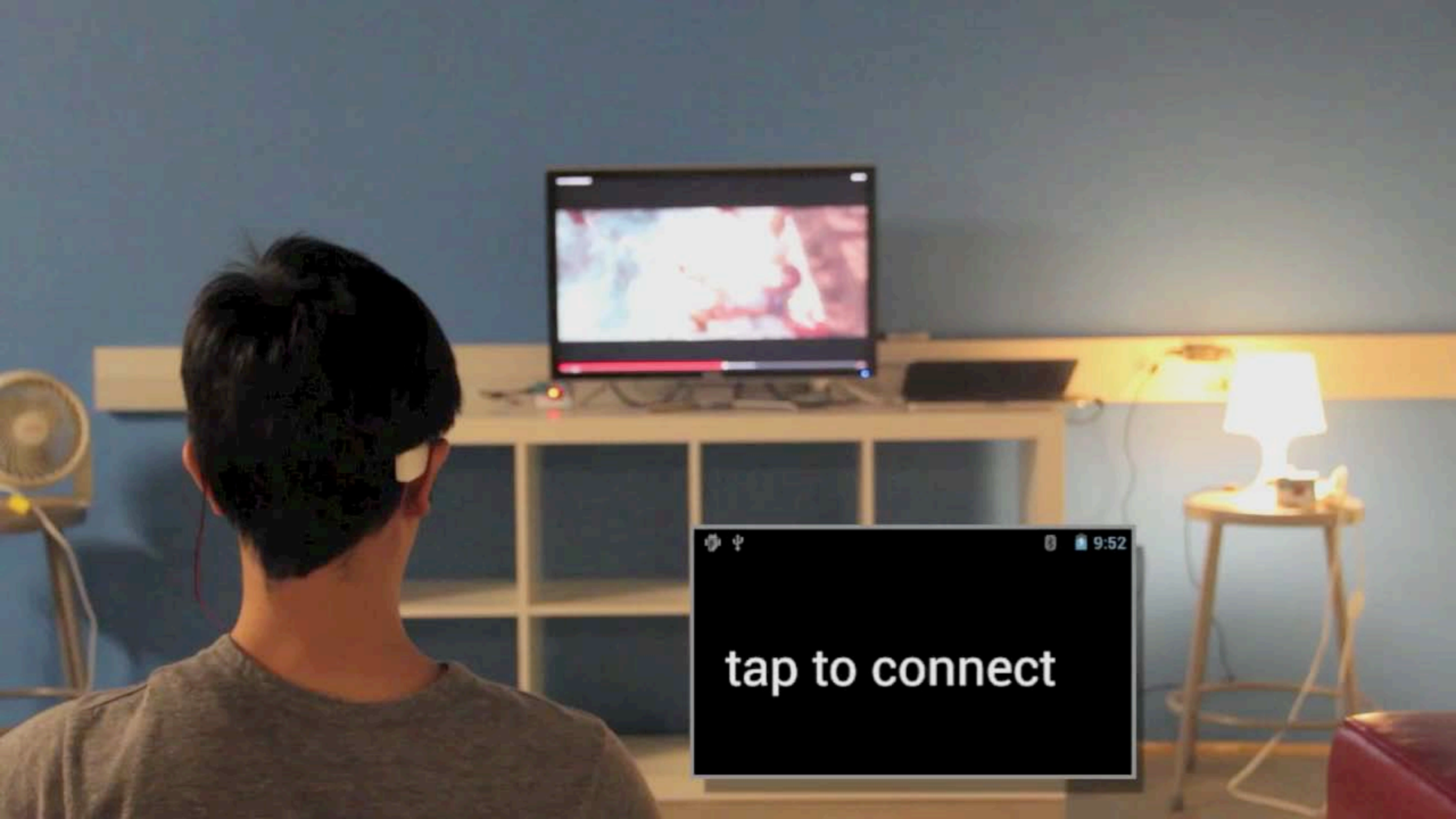
Keeping Firefighters Safe





Simon Scott, Will Porter, Yi Tong, Mitchell Karchemsky


TouchPad
Bluetooth Radio
IR Emitter
Holder
Near-eye
Display
XBee Radio
Microcontroller
Board


9:52
tap to connect

Drill Sergeant

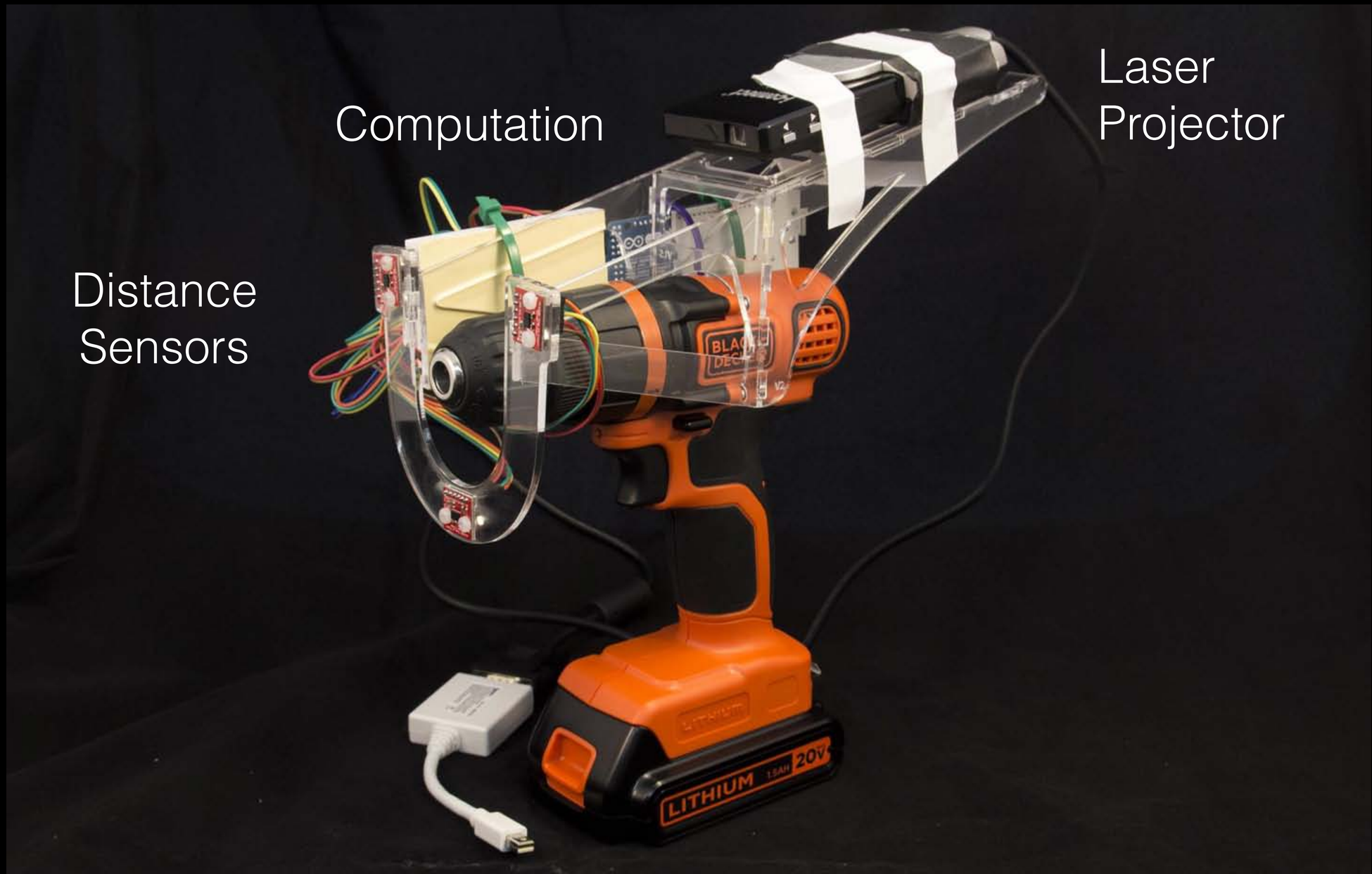
2016 Finalist for **Students**

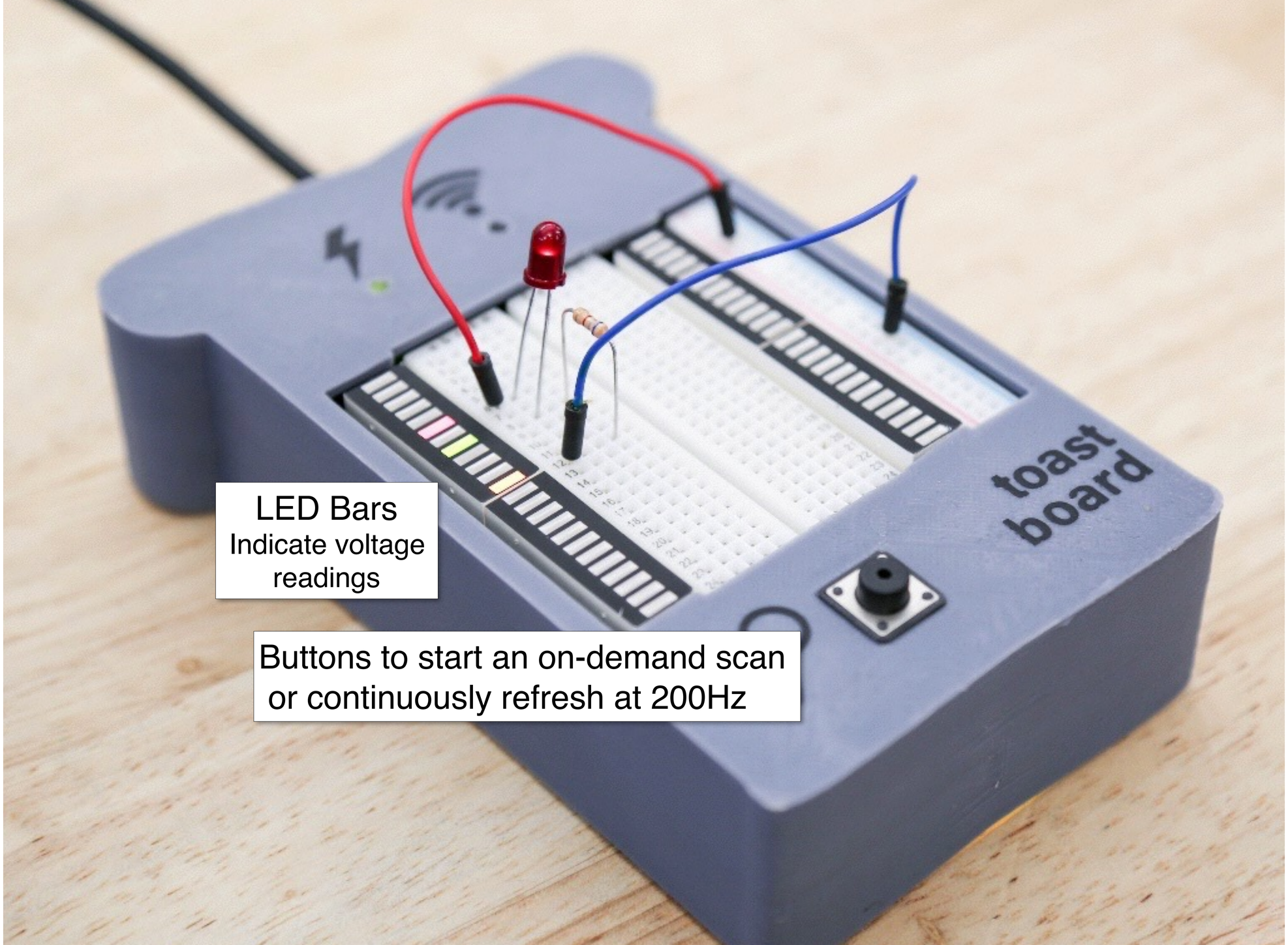
Using power tools can be a daunting proposition for beginners. But Drill Sergeant, a group of augmented power tools that coach you with real-time feedback and safety tips, can help you build confidence when you're starting out. A small digital projector transmits helpful images onto the surface you're working on, with visualizations also available via tablet, in order to help you safely master the tool while you're using it.

CREATORS

Michelle Nguyen, Eldon Schoop

Augmented Drill




LED Bars
Indicate voltage readings
Buttons to start an on-demand scan or continuously refresh at 200Hz
toast board

Toastboard

Row to Graph: Row Left

Stop scan

a b c d e f g h i j

VDD: 3.3V

Clear Board Save Board

design.berkeley.edu

ISAM 2017

September 24th – 27th, 2017

Proceedings of the 1st International Symposium on Academic Makerspaces

A Research Agenda for Academic Makerspaces

ISAM 2016 Paper No.: 08

Björn Hartmann
Jacobs Institute for Design Innovation, University of California, Berkeley; e-mail: bjoern@berkeley.edu

INTRODUCTION

A key characteristic of academic makerspaces that distinguishes them from fab labs in secondary schools, non-profit community spaces, or for-profit membership facilities is of course that they are embedded in institutions with significant research activity. Yet academic makerspaces also differ from traditional research labs in that they are open to a broader set of constituents and expertise levels, and often support a larger variety of possible uses. While many emerging academic makerspaces are primarily associated with instruction and student service goals, we argue that research and making can and should intersect in productive ways. This paper lays out the landscape of possible engagements based on our own experience and observations.

A tight connection to academic research promises benefits for both sides:

1) Educational research and qualitative observational research can improve our fundamental understanding of the values of making for students; as well as elucidate the conceptual and pragmatic hurdles makers face today through careful study of making in practice.

2) Makers can serve as a new target audience for technology research and development in engineering disciplines.

3) Research projects in a large number of domains can leverage makerspace resources to accelerate their progress and engage students to turn fundamental discoveries into usable devices and services.

In addition to these intellectual threads, research integration can also contribute to important pragmatic and operational goals, for example ensuring that makerspaces receive appropriate institutional attention, credit, and funding.

We next present our own institutional context, review the

Proceedings of the 1st International Symposium on Academic Makerspaces

The Value of Campus Collaboration for Higher Education Makerspaces

ISAM 2016 Paper No.: 48

P. Zachary Ali[1], Malcolm Cooke[2], Martin L. Culpepper[3], Craig R. Forest[4], Björn Hartmann[5], Marlo Kohn[6], Vincent Wilczynski[7]
[1]Carnegie Mellon University, [2]Case Western University, [3]Massachusetts Institute of Technology, [4]Georgia Institute of Technology, [5]University of California, Berkeley, [6]Stanford University, [7]Yale University

INTRODUCTION

The concepts of community and collaboration are essential characteristics of makerspaces. The value of collaboration has been highlighted as an idea accelerator by a number of authors including Jon Gertner's history of Bell Labs and its reliance on innovation as the fuel for discovery. Gertner described the "Black Box" lab as an innovation hub that relied on forced interactions to mesh "many interlocking small parts grouped physically near enough to one another" to create a powerful and purposeful machine [1]. The value of collaboration in the maker-movement was presented by Chris Anderson as critical to establish "open-innovation communities" where participants voluntarily join and contribute to common causes [2]. According to Anderson, the value of the work draws talented participants, and the openness of the activities in makerspaces serves as an invite for people to contribute to projects.

The importance of innovation within academic settings leads

CARNEGIE MELLON UNIVERSITY: INTEGRATIVE DESIGN, ARTS & TECHNOLOGY NETWORK (IDeATe)

CMU IDeATe Overview: At Carnegie Mellon University, innovation through efficient technical practices is supported through the Integrative Design, Arts & Technology (IDeATe) Network [5]. IDeATe serves as a campus-wide resource for the maker community, providing interdisciplinary courses, spaces, and resources that encourage collaboration between programs, faculty, students and staff. IDeATe facilities reside in Hunt Library and consist of five types of defined areas:

- Hybrid lecture, collaboration, and project spaces
- Studio lecture and collaboration spaces
- Dedicated collaboration spaces
- Dedicated equipment spaces
- Lending and administrative spaces

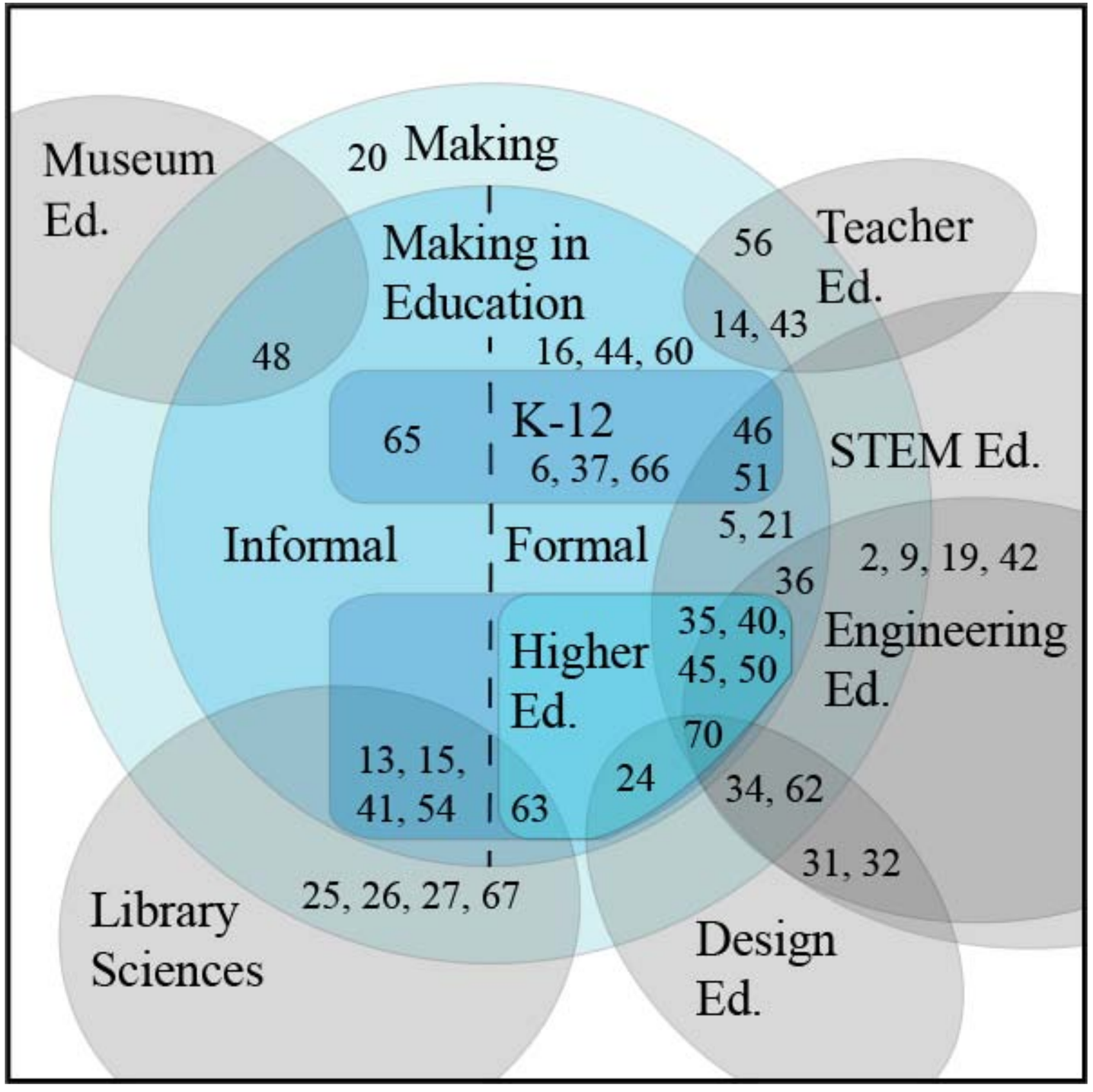
All activities and the associated work areas span across three floors, providing about 10,000 square feet of dedicated space.

Where Be Dragons? Charting the Known (and Not So Known) Areas of Research on Academic Makerspaces

Leah F. Rosenbaum[1] and Björn Hartmann[2]

[1]Leah F. Rosenbaum; Graduate School of Education, University of California, Berkeley; e-mail: leahr@berkeley.edu

[2] Björn Hartmann; Jacobs Institute for Design Innovation, University of California, Berkeley; e-mail: bjoern@berkeley.edu


Museum Ed.
20
Making
Making in Education
56
Teacher Ed.
14, 43
48
16, 44, 60
65
K-12
6, 37, 66
46
51
STEM Ed.
Informal
Formal
5, 21
2, 9, 19, 42
36
35, 40, 45, 50
Higher Ed.
Engineering Ed.
70
13, 15, 41, 54
63
24
34, 62
31, 32
25, 26, 27, 67
Library Sciences
Design Ed.

REFERENCES

[1] P. Z. Ali, M. Cooke, M. L. Culpepper, C. R. Forest, B. Hartmann, M. Kohn and V. Wilczynski. "The Value of Campus Collaboration for Higher Education Makerspaces," in Proceedings of 1st International Symposium on Academic Makerspaces, 2016 of Conference, 225-239.

[2] D. E. Bailey and S. R. Barley, "Return to work: Toward post-industrial engineering", IIE Transactions, 37, 8. 2005, 737-752.

[3] T. Barrett, M. Pizzico, B. D. Levy, R. L. Nagel, J. S. Linsey, K. G. Talley, C. R. Forest and W. C. Newstetter. "A review of university maker spaces," in Proceedings of 122nd ASEE Annual Conference & Exposition, 2015,

[4] D. Bennett, M. Honey and E. Siegel. in Proceedings of Innovation, Education, and the Maker Movement Workshop, 2010,

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