

U.S. DEPARTMENT OF  
**ENERGY**

Office of  
**ENERGY EFFICIENCY &  
RENEWABLE ENERGY**

# Treau, Inc.

## Kipp Bradford, CTO





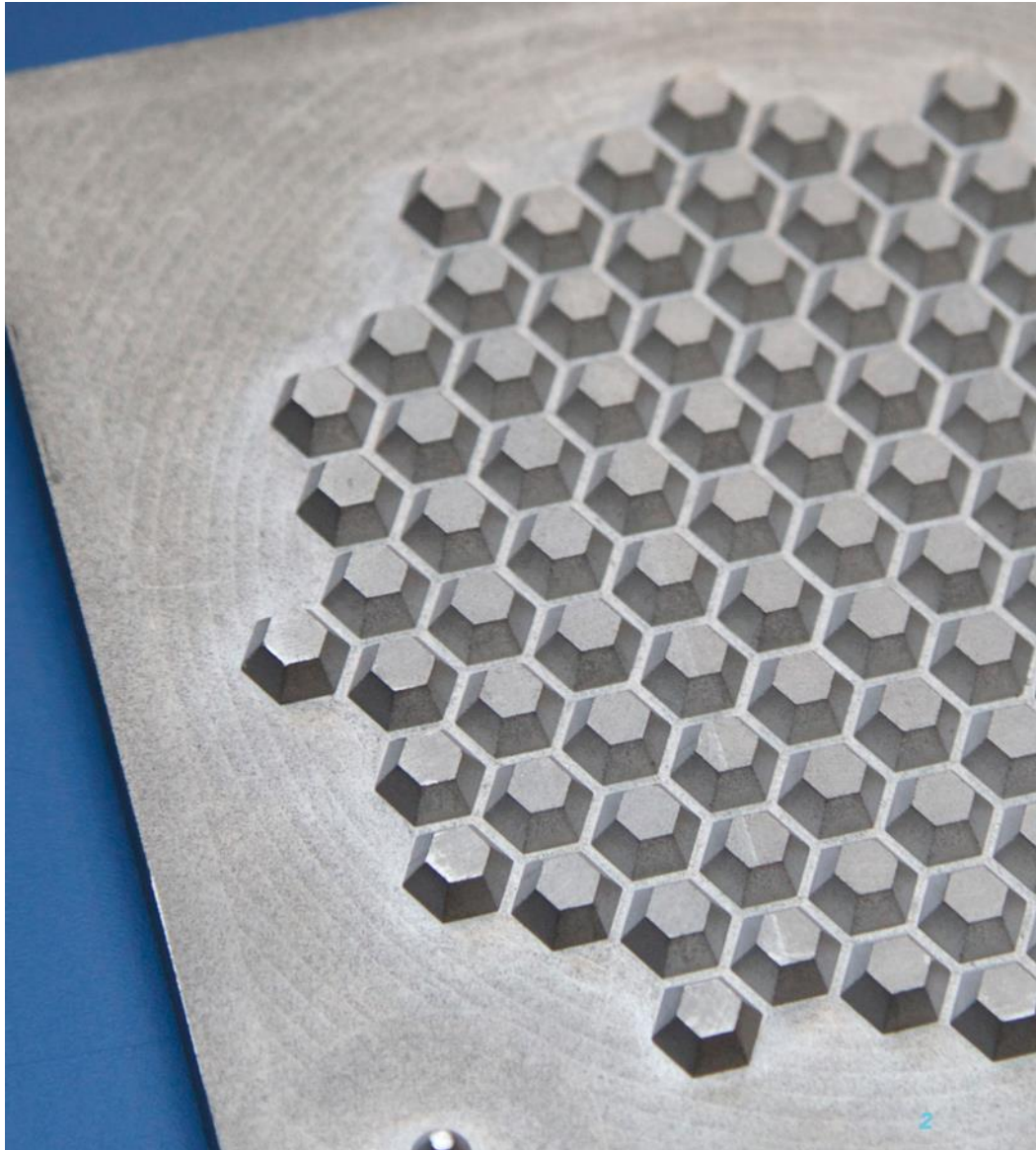
# Otherlab

Who, What, and How.  
2017

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3101 20th St,  
San Francisco,  
CA 94110**

**[info@otherlab.com](mailto:info@otherlab.com)**

# Intro to Otherlab



## Otherlab is...

Otherlab is an independent research and product development facility located in the heart of San Francisco's Mission district. Otherlab runs a number of projects at any given moment. We prioritize the projects we work on to maximize impact in our focus areas.

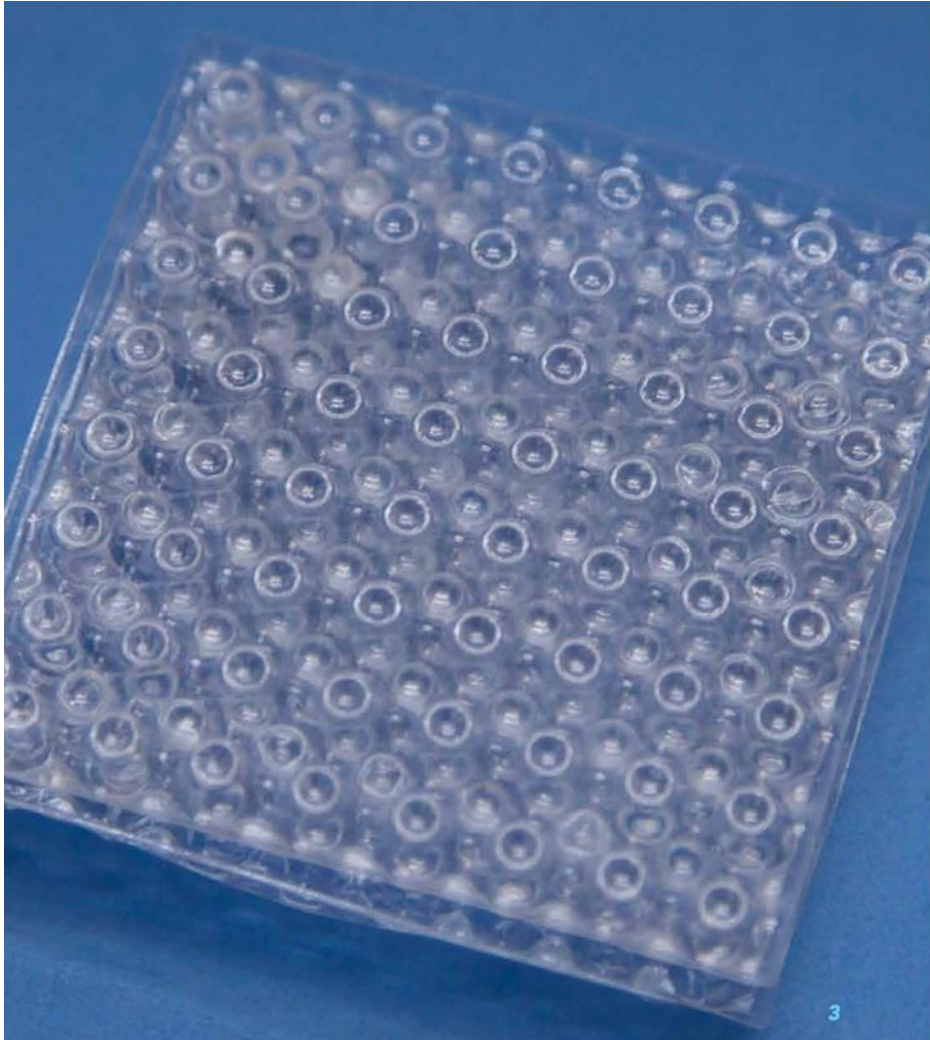
Our focus areas are *clean-energy*, *clean-tech*, *robotics* and *advanced manufacturing*.

Typical early stage projects are funded with research contracts, and/or internal or external seed funding. Maturing projects are typically funded with Venture Capital or external partnerships.

Successful Otherlab projects either spin-up into independent companies that ultimately leave our facility, or they become IP and technology that is deployed with corporate partners.

*Image : Porous aluminum mold for nested vacuum formed sheets optimized for crash protection and energy absorption. 2015.*

# Intro to Otherlab



## There is a quiet revolution in hardware.

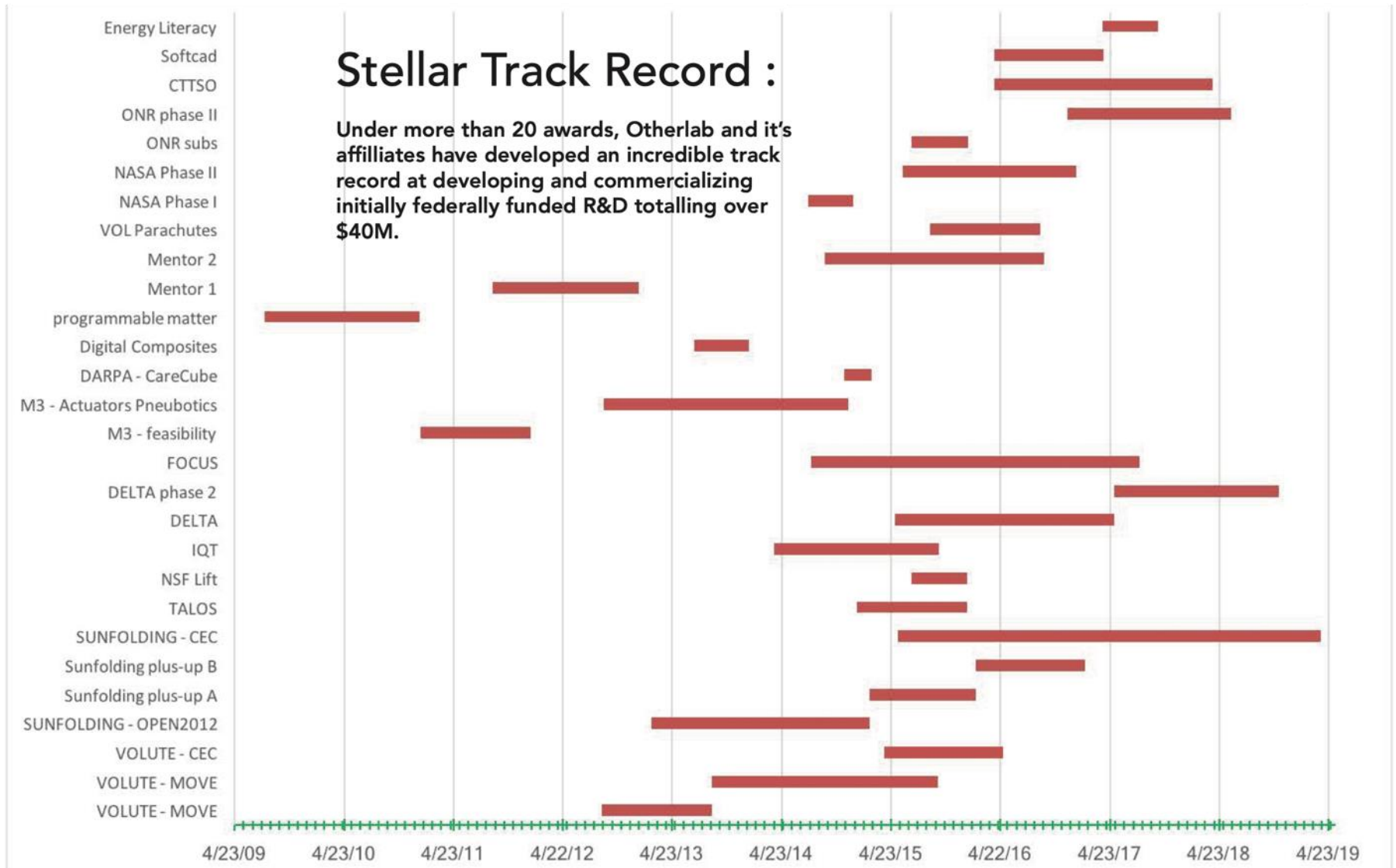
The increasing power and plummeting cost of computation drove the revolution that is the internet, and now mobile devices.

Computing power continues to be even cheaper, but more importantly mobile devices are dropping the size and prices of sensors to commodity levels. This enables the real revolution that is happening in hardware. The capacity to design and build machines that have never existed before.

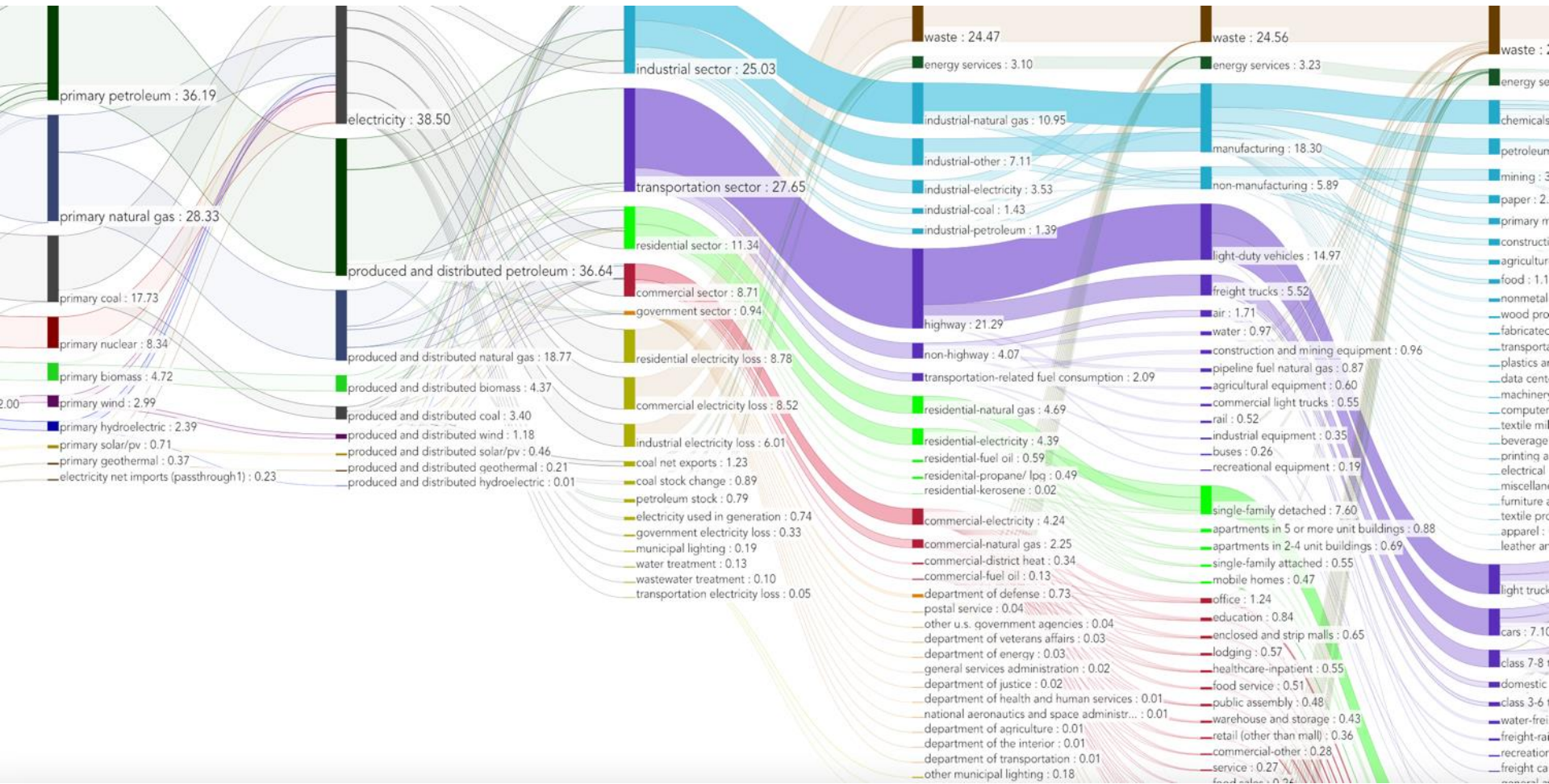
At other lab we see this manifesting itself in the following ways (1) precision is now cheap, (2) sensors and control systems can be used where once materials and mass were, (3) we can now design machines to accommodate the highly non-linear behaviour of liquids and elastomers, (4) complexity (geometric) is cheap and geometry can do things materials alone can not (5) automation of manufacturing is at an unprecedented level.

Otherlab is a leader in these big important trends, not merely chasing the hardware-headline-du-jour. Join us in the new industrial revolution.

# Intro to Otherlab

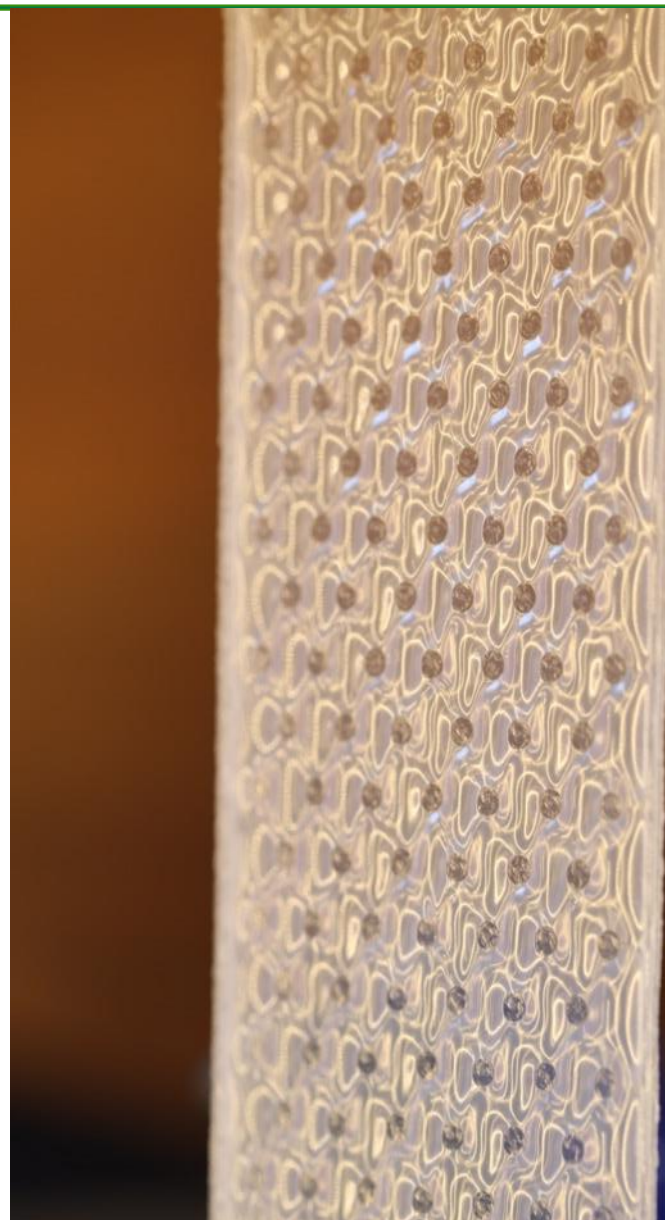


# US Energy Sankey Diagram



# Treau, an Otherlab Spin-out

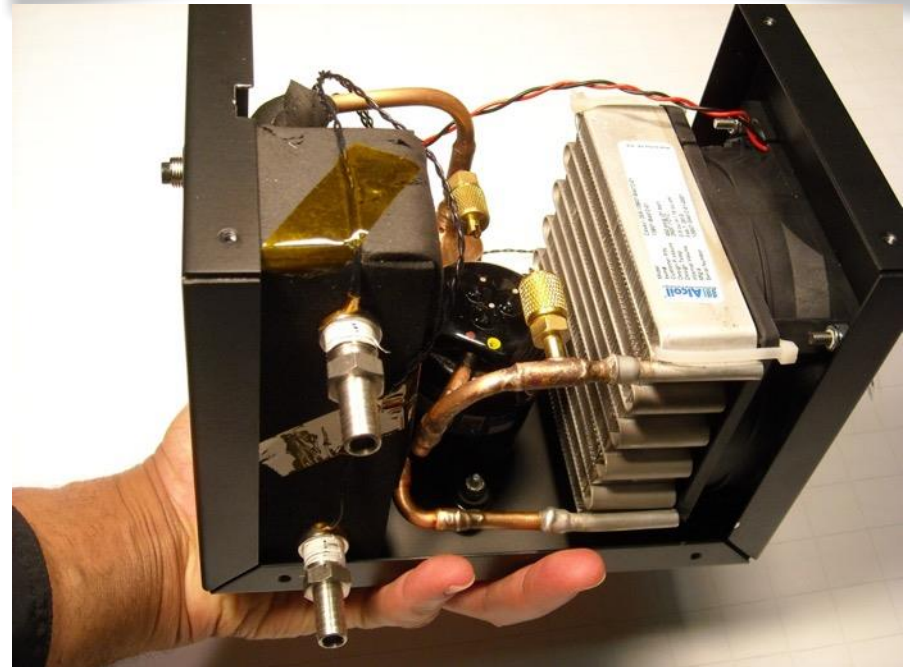
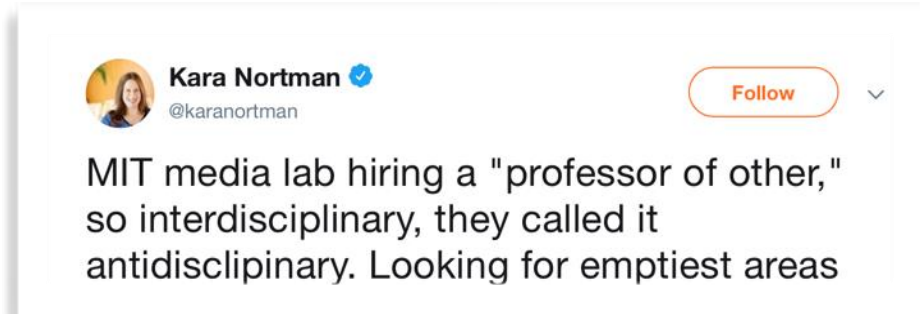
- A fundamentally new HVAC platform
  - No HVAC technician
  - Move water, not refrigerant
  - 14 patents issued or pending
  - Plug-and-play architecture



# Treau, Otherlab, MIT



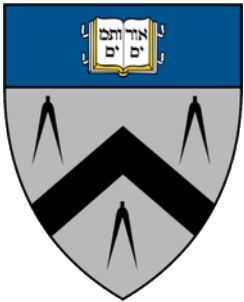
# Otherlab





# Treau, Otherlab, MIT + Yale

**Sustainable & Self  
Sustaining  
Disaster Relief and  
Refugee Housing**



**United Nations Environmental  
Program  
Yale School of Architecture  
(Center For Ecosystems in  
Architecture) and  
Gray Organschi Architects**



# CHAOS Lab at Princeton University



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## Membrane-assisted radiant cooling for expanding thermal comfort zones globally without air conditioning

 Eric Teitelbaum, Kian Wee Chen, Dorit Aviv, Kipp Bradford, Lea Ruefenacht, Denon Sheppard, Megan Teitelbaum, Forrest Meggers, Jovan Pantelic, and Adam Rysanek

PNAS September 1, 2020 117 (35) 21162-21169; first published August 18, 2020;

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Article

Figures & SI

Info & Metrics

 PDF

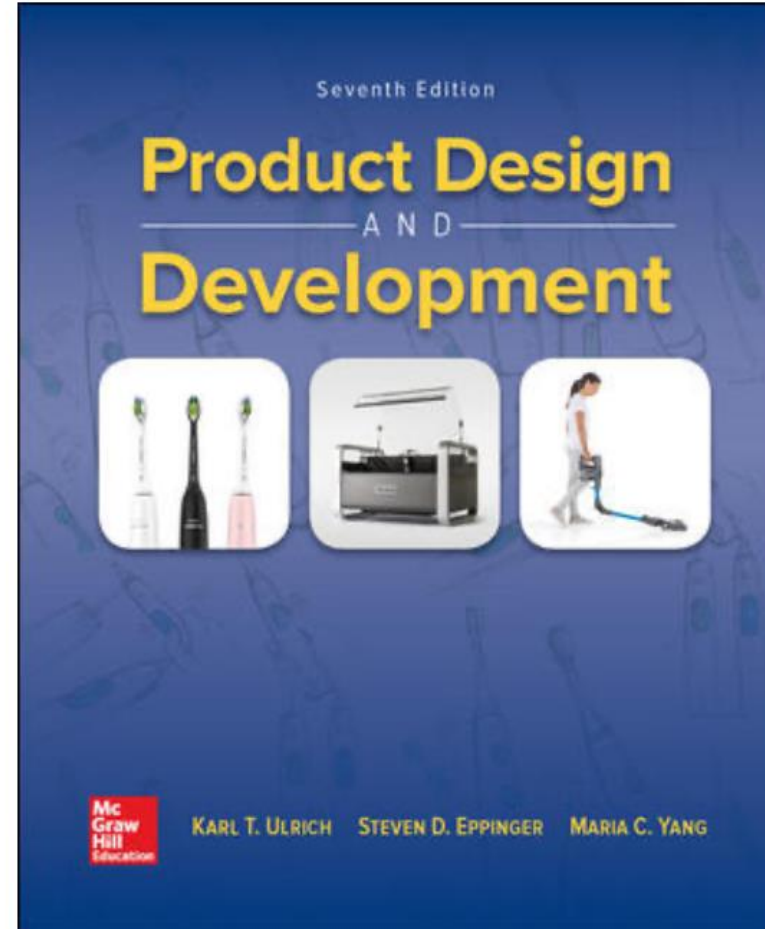
# Hard Tech - Crossing the Chasm

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# Hard Tech Reflections - 0

- Lots of good books on engineering design
- Look for other good resources:
  - Startup Accelerators
  - Seasoned tech transfer founders
  - Hard Tech investors



# Hard Tech Reflections - 1

- Develop comprehensive requirements documents
  - And know that everything is an assumption until it is tested
  - Build a plan to test each assumption



# Hard Tech Reflections - 2

- Iterate Between TRLs
  - What question are you answering with each step?
  - What tools do you need to answer each question?



# Hard Tech Reflections - 3

- Simulation is great... once it is validated
- Nothing is real until it has been built and tested



# Hard Tech Reflections - 4

- **Iterate Between TRLs**
  - **Plan for multiple steps between major milestones**
  - **Iterate, iterate, iterate**
  - **Break work into small projects**
  - **Accumulate small successes towards goals**





# Hard Tech Reflections - 5

- Patents are worthless
- Build a portfolio
  - 10+ patents
- Protect them aggressively



A series of studies conducted by several authors over a span of nearly 30 years (1957 to 1984) have asked whether inventors find patents useful for excluding imitators and/or capturing royalty income. The answer uniformly found: The patent grant is not useful for either purpose in most industries.

Eric Von Hippel - THE SOURCES OF INNOVATION

# Hard Tech Reflections - 6

- Building industry (Architecture/Engineering/Construction) moves slowly
- Very conservative/risk averse regarding new technology



# Hard Tech Reflections - 7

- Focus on value in the marketplace
- Find investors that align with your business model
- Big markets > disposables/recurring revenue

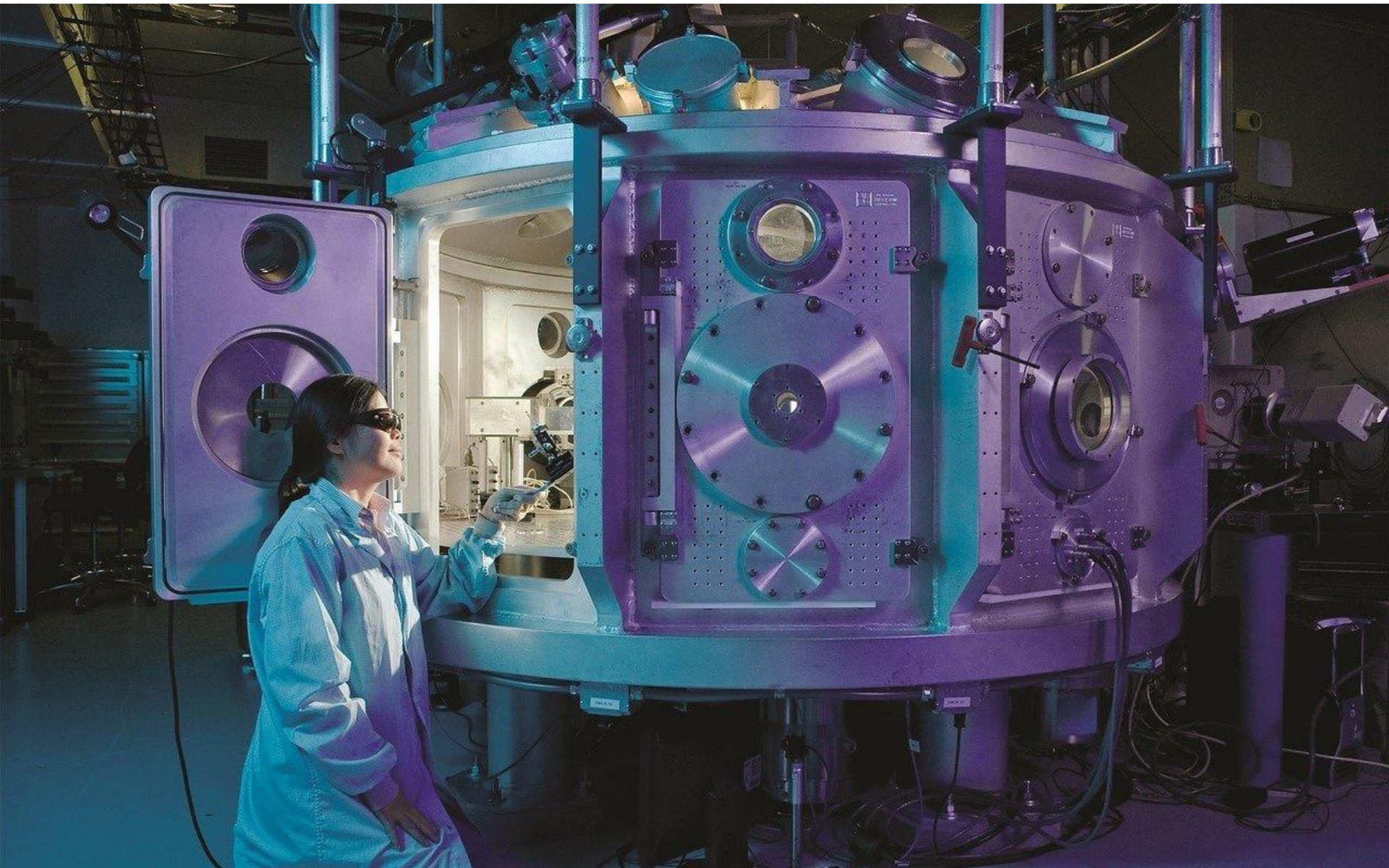


# Hard Tech Reflections - 8

- **Scaling Hard Tech Is Hard**
  - Takes a long time
  - Capital intensive
  - Funding is challenging



# Remember that you can do hard things!



**Thank you!**

**Kipp Bradford  
CTO, Treau Inc.**