



Center For

# ENGINEERING INNOVATION

COLLEGE OF ENGINEERING | THE UNIVERSITY OF UTAH

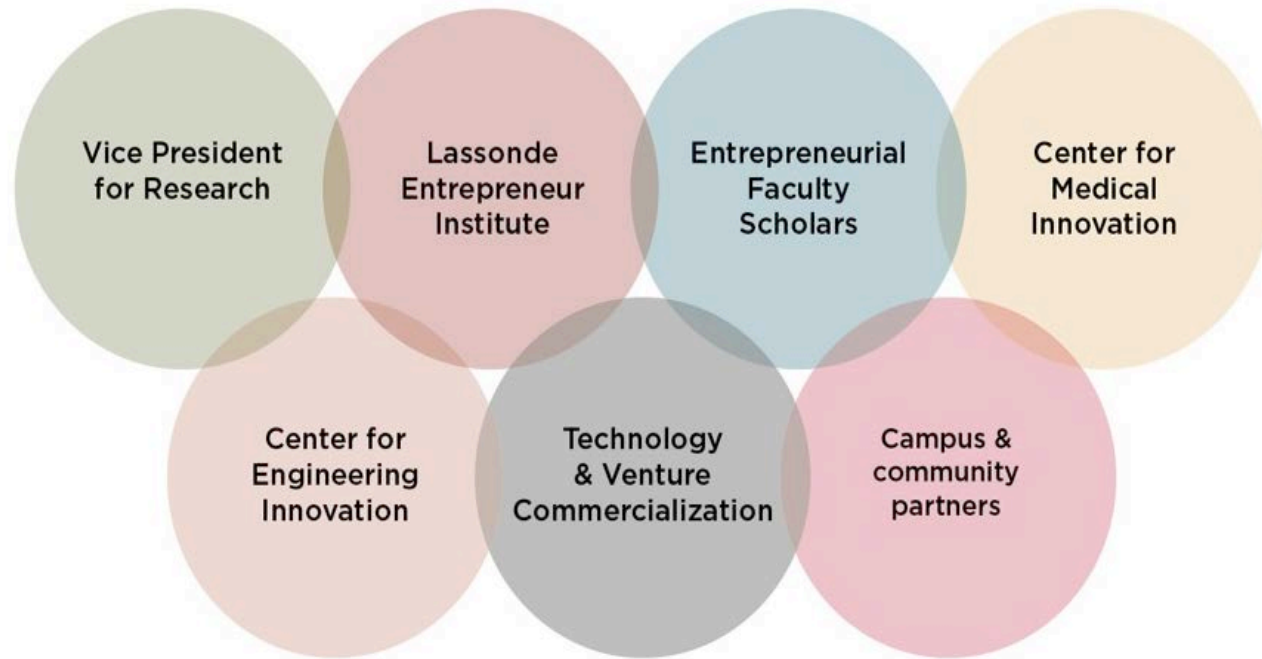


DEPARTMENT OF

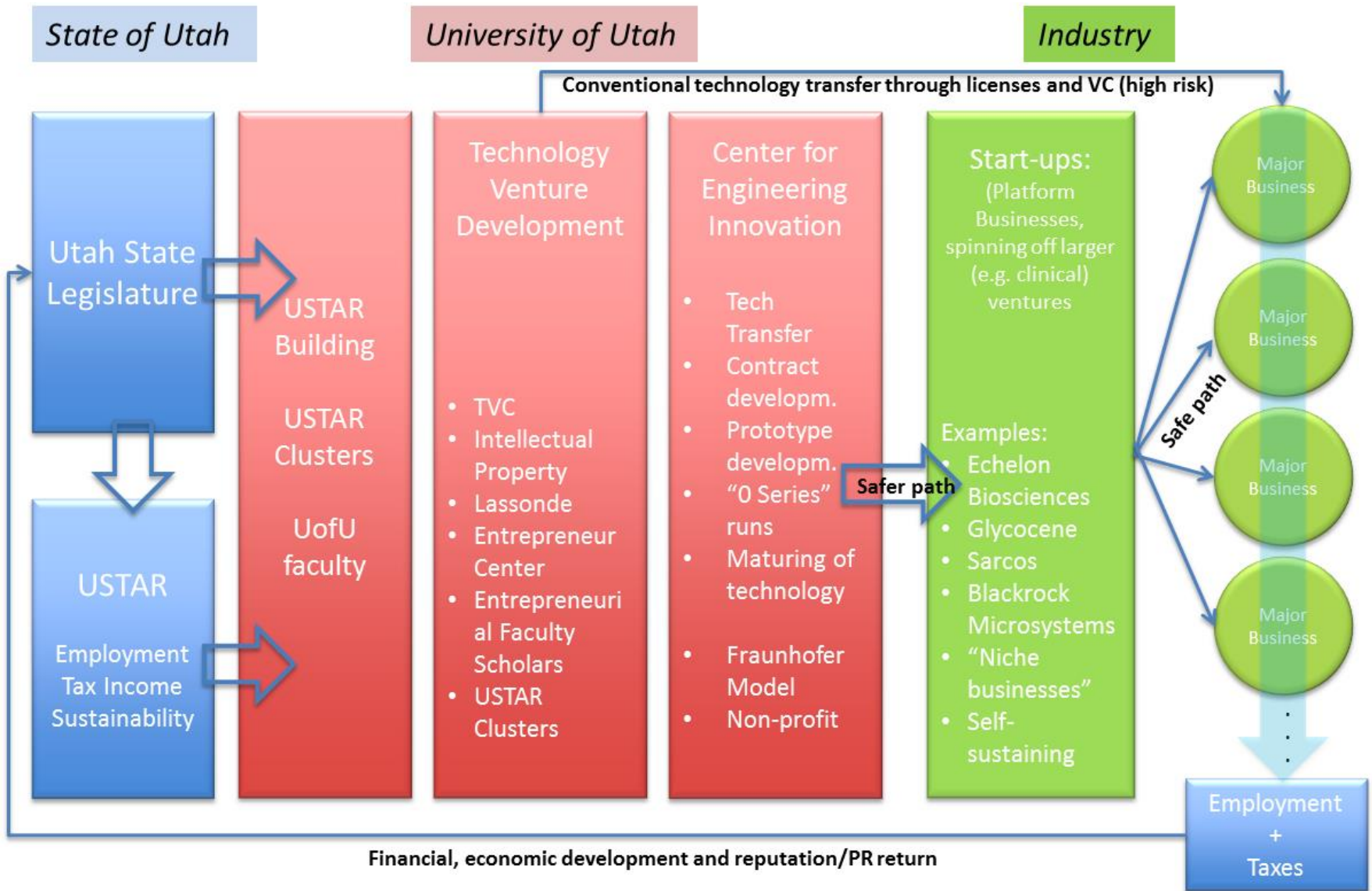
## Electrical & Computer Engineering

COLLEGE OF ENGINEERING | THE UNIVERSITY OF UTAH

# Commercialization Ecosystem



# Positioning





# Overview

## Vision

Establish a professionally staffed and organically growing center for engineering innovation that focuses on translational development work, bridging the gap between basic science and engineering innovation and commercial product development.

- (1) facilitate sustainability and success of existing and future startups,
- (2) Mature and de-risk technologies and thus increase IP value, and
- (3) develop a source of larger scale contract funding for sponsored research and development.

## Rationale

- Long term decline of conventional federally/state sponsored research and educational funding and increasing competition
- Need to develop new revenue streams
- The University, with the help of the USTAR program, has developed a national reputation for spinning out startup companies. Success, however, requires survival and sustained growth of those businesses.

## Activities

- Mature technologies and increase their IP value through prototyping services
- Support TVC with technical knowhow
- Advise faculty and student inventors on commercialization issues
- Provide service for local industry through contract research and development
- Support early stage (SBIR-type) engineering / translational development and proposals
- Support small businesses and UofU startups with access to professional/senior support
- Connect entrepreneurial researchers across college boundaries



# Overview

## Success Metrics

- Increase in licensing fees per license
- Increase in industrial and government development contract /service income to UofU
- Increase in UofU spinoff survivability/sustainability
- Increase in sustainable job base in UofU startups and Utah tax income
- USTAR metrics (jobs, payroll, etc.)

## Business Model

- Modeled after non-profit engineering centers (JHU/APL, Draper Labs, Fraunhofer etc.)
- Established as Affiliated Lab to Nanofab Recharge Center: i.e. expenditures remain with department/faculty

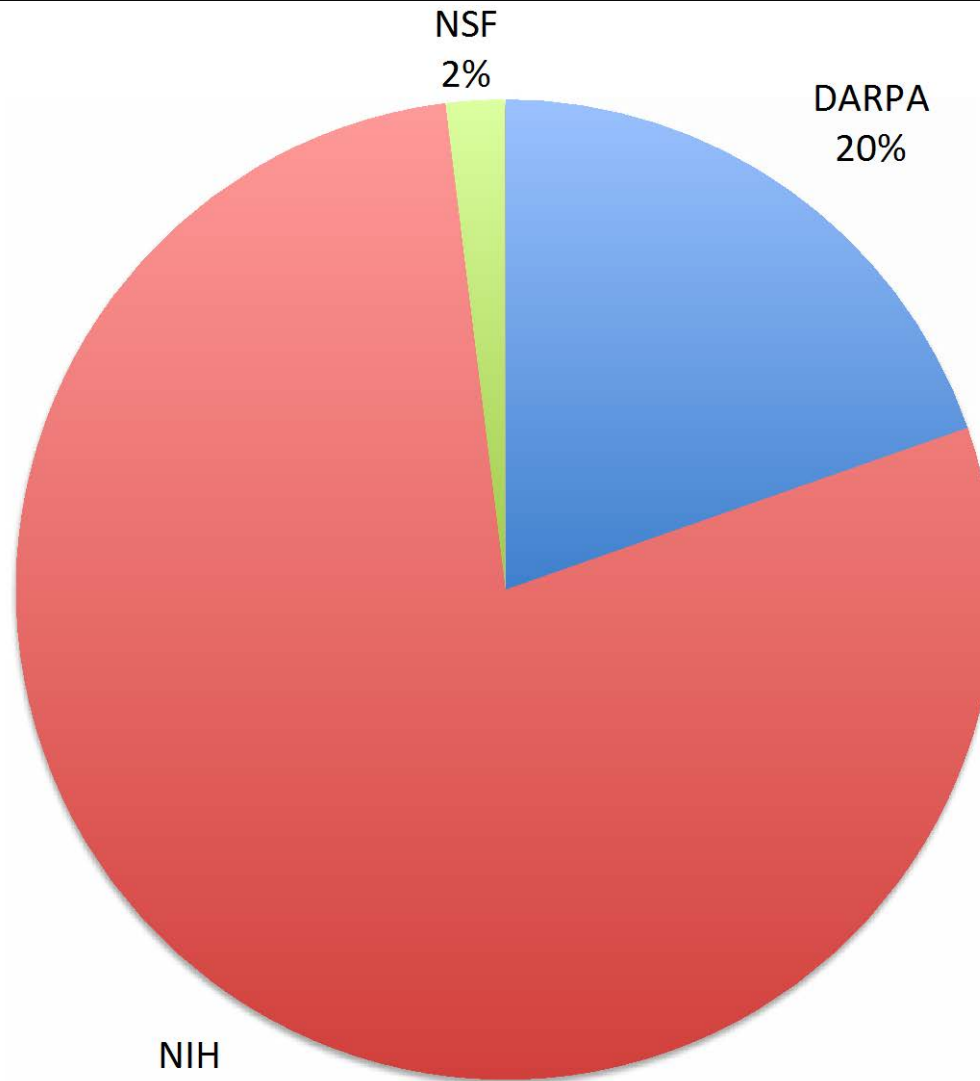
## Opportunity

- Make Utah the leading institution for translation and engineering impact while delivering on USTAR promises and diversifying the income base.

## How do you work with CEI?

- Contact through webpage/interface leading directly to suitable contact person
- Sorted by Capabilities and Markets/Application areas
- Engineering or prototyping support for existing commercial or federal contracts
- Team building and bidding for large procurement style government contracts
- Team building and proposal writing for SBIRs/STTRs
- Grants/contracts run through departments, expenses for senior staff/prototyping work paid to Nanofab/CEI recharge center

# Federal Grants/Contracts



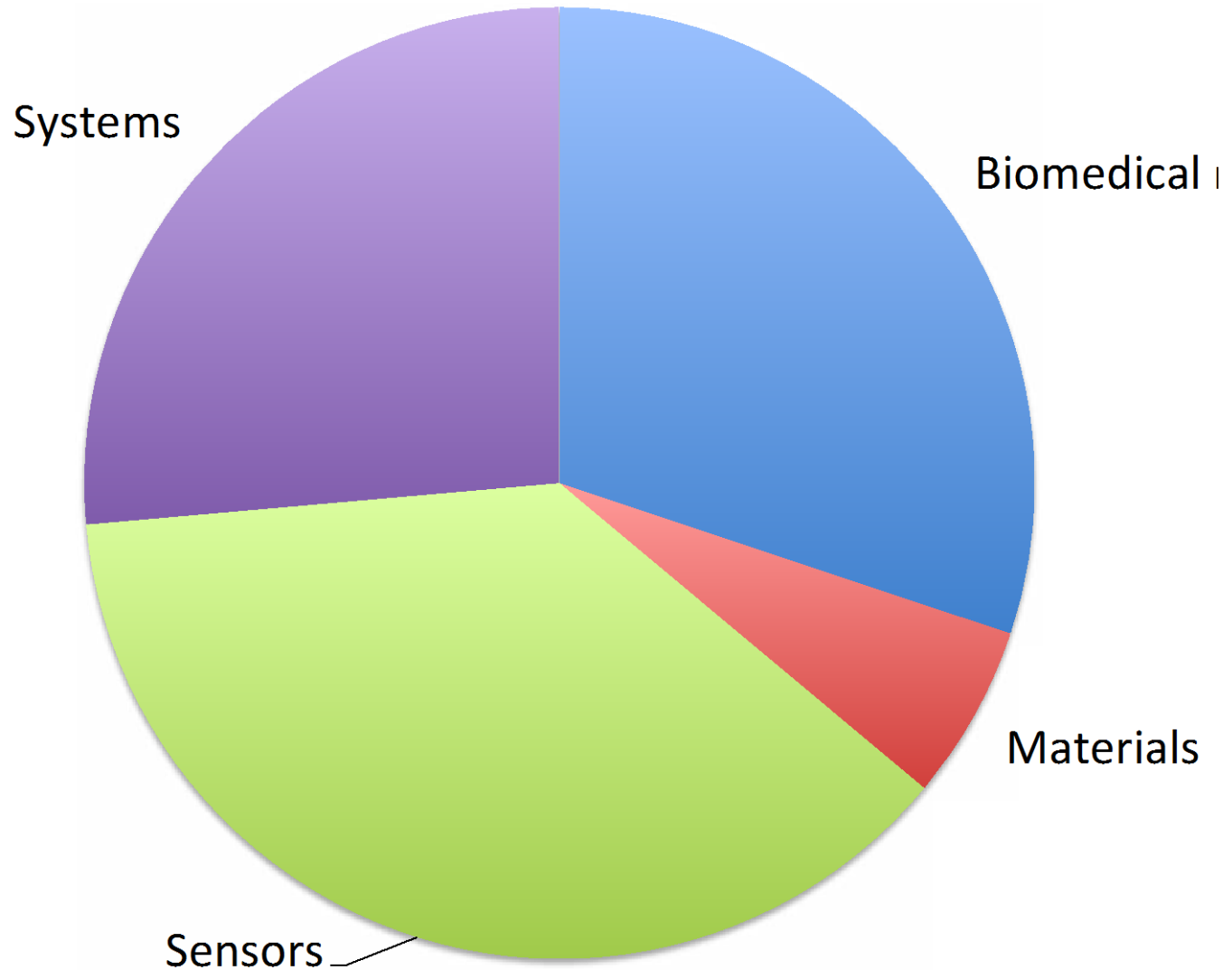
NIH  
78%

DARPA  
20%

NSF  
2%

Total Volume : \$ 451,451

# Purchase Orders



Purchase Order Value: \$, 137



# PO Pipeline

Browser: Pipedrive Inc app.pipedrive.com/pipeline/2/filter/1

Navigation: weather, yoga, research, computers, societies, recreation, nanofab, home, university, funding

Search: pipedrive

User: Loren Rieth, Center for Engineering Innovation

Buttons: Add deal, CEI Sales Pipeline, All open deals

| Idea & Assesment<br>\$100,000 1 deal          | Negotiations<br>\$162,936 3 deals   | Quotations (Drafts) | Quotations (Issued) | Purchase Orders (Received)<br>\$98,694.80 5 deals  | Invoices (Drafts)<br>\$61,956.44 3 deals   | Invoices (Issued) | Payment Received<br>\$194,995.39 19 deals   |
|---|---|---------------------|---------------------|--|--|-------------------|---|
| <p>Monaco System<br/>\$100,000 Siemens AX</p> | <p>Denton (ALD IDEs)<br/>\$2,000 Denton Vacuum</p> <p>Acutus - Animal studies<br/>Group 2<br/>\$71,909 CEI</p> <p>Acutus - Animal studies<br/>Group 1<br/>\$89,027 Acutus</p> |                     |                     | <p>Long Human<br/>Electrodes<br/>\$5,000 University of Utah</p> <p>Sub-dicing ASICs<br/>\$1,200 ECE, University of Utah</p> <p>Acutus - OSP<br/>\$10,000 Acutus Medical</p> <p>Sniper Scope<br/>\$23,192.80 Desert Tech</p> <p>Heart lesioning<br/>\$59,302 St. Jude</p> | <p>Standard USEA - Imperial<br/>\$8,970 Imperial College London</p> <p>ZigZag Arrays<br/>\$17,013 Blackrock Microsystems</p> <p>HD-USEA - Imperial<br/>\$35,973.44 Imperial College London</p> |                   | <p>VaporSens (Phase 2)<br/>\$14,038.69 VaporSens</p> <p>Iridium Oxide (Acutus)<br/>\$7,239.78 Acutus Medical</p> <p>LED array optogenetics (MIT)<br/>\$70,895.39 MIT</p> <p>Phase 1: Vaporsens<br/>\$7,873.30 VaporSens</p> <p>IDEs- BRM<br/>\$720 Blackrock Microsystems</p> <p>MRI Enhancement Coil<br/>\$1,000 CARMA Center</p> <p>Long Cardiac Electrodes<br/>\$5,856.45 Blackrock Microsystems</p> <p>TiN Testing (Denton)<br/>\$2,447 Denton Vacuum</p> <p>Applied Biosensors<br/>Phase 2<br/>\$30,917.25 Applied Biosensors</p> <p>HD-UEAs (BRM)<br/>\$5,111.70 Blackrock Microsystems</p> |

# Grant Pipedrive

Browser: Pipedrive Inc app.pipedrive.com/pipeline/1/filter/1

Navigation: weather yoga research computers societies recreation nanofab home university funding

Search: Search

Deals: 5 Activities: 18 Contacts: 1 Statistics: 1

User: Loren Rieth, Center for Engineering Innovation

Internal Proposal Pipeline | All open deals

| <b>Ideas &amp; Talks</b><br>\$16,742,673.45 7 deals                     | <b>Writing Phase</b><br>\$4,600,000 4 deals         | <b>Under Review (By Agency)</b><br>\$9,927,625 9 deals   | <b>Awarded Grants</b><br>\$5,931,451 8 deals                                 | <b>Grants Rejected by Agency</b><br>\$11,556,170 10 deals   |
|---|---|--|--|---|
| Keck Foundation<br>\$0 UofU   | Charles Gilbert/John Rogers Opto<br>\$2,500,000 CEI | SPARC - Warren Grill<br>\$600,000 Blackrock Microsystems | Highly customizable neural implants (Sub-contract, Phase 1)<br>\$115,407 NIH | Novel Neural Interfaces for Application in Millimeter and Sub-millimeter Neuroanatomical Structures (SBIR, Phase 1)<br>\$149,751 Blackrock Microsystems |
| CDMRP - ePOD EMG<br>\$1,500,000 Loren Rieth                             | Software: Visualization<br>\$100,000 UofU           | SPARC - Hines - USEA<br>\$600,000 UofU                   | UEA Surface Modification (SBIR Sub-Contract)<br>\$99,130 NIH                 | Closed loop implantable fronto-limbic sensing and modulation systems (DARPA)<br>\$2,000,000 TMC   |
| CDMRP - System<br>\$10,000,000 UofU                                     | AF substrate changes (NIH R01)<br>\$1,800,000 CEI   | NSF BRAIN Optogenetics<br>\$1,500,000 UofU               | Dual Encapsulation (SBIR Sub-Contract, Phase 1)<br>\$220,000 NIH             | NSF CRCNS HHMRI<br>\$38,000 U of U Bioengineering   |
| AHA Established Investigator Award -AF<br>\$400,000 CEI                 | Hypothermia UEA Implantation<br>\$200,000 CEI       | Sentiomed - Poland proposal<br>\$366,380 CEI             | Metabolic sensors (STTR Sub-Contract, Phase 1)<br>\$107,000 NSF              | Charles Gilbert, Karl Diesseroth BRAIN Initiative<br>\$810,000 Rockefeller University   |
| Horizon 2020/Blackrock/Matching science<br>\$4,000,000 CEI              |   | Sentiomed Europe Proposal<br>\$2,000,000 CEI             | Multisite high channel neural implants (RO1)<br>\$1,090,512 Sandeep          | Next generation wireless implants (BRP)<br>\$4,891,923 NIH  |
| Flow detecting stent (STTR)<br>\$280,000 Hanseup Kim and Derek Dossdall |   | EU Horizon 2020<br>\$761,245 CEI                         | HAPTIX<br>\$1,070,793 UofU   | HAPTIX: Advanced Studies<br>\$2,502,082 UofU  |
| Cardiac Neural Arrays<br>\$0 UofU - UCLA                                |   | BRAIN Initiative - Lee Miller<br>\$2,000,000 UofU        | Cardiac - Purkinje Defib<br>\$2,528,609 CEI                                  | Modified UEA for AF mapping -Seed grant<br>\$35,000 CEI   |
|   |   | NIH SPARC-Pulmonary<br>\$600,000 UofU                    | SBIR - ECoG<br>\$700,000 Sande   | Low energy defib through His pacing<br>\$140,000 AHA.Dossdall   |
|   |   | Optrode - Alessandra<br>\$1,500,000 UofU                 |  | Hydrogel sensors (Phase 2 NSF)<br>\$120,000 rohit sharma  |
|   |   |  |  | Brown University deal<br>\$869,414 Brown University   |

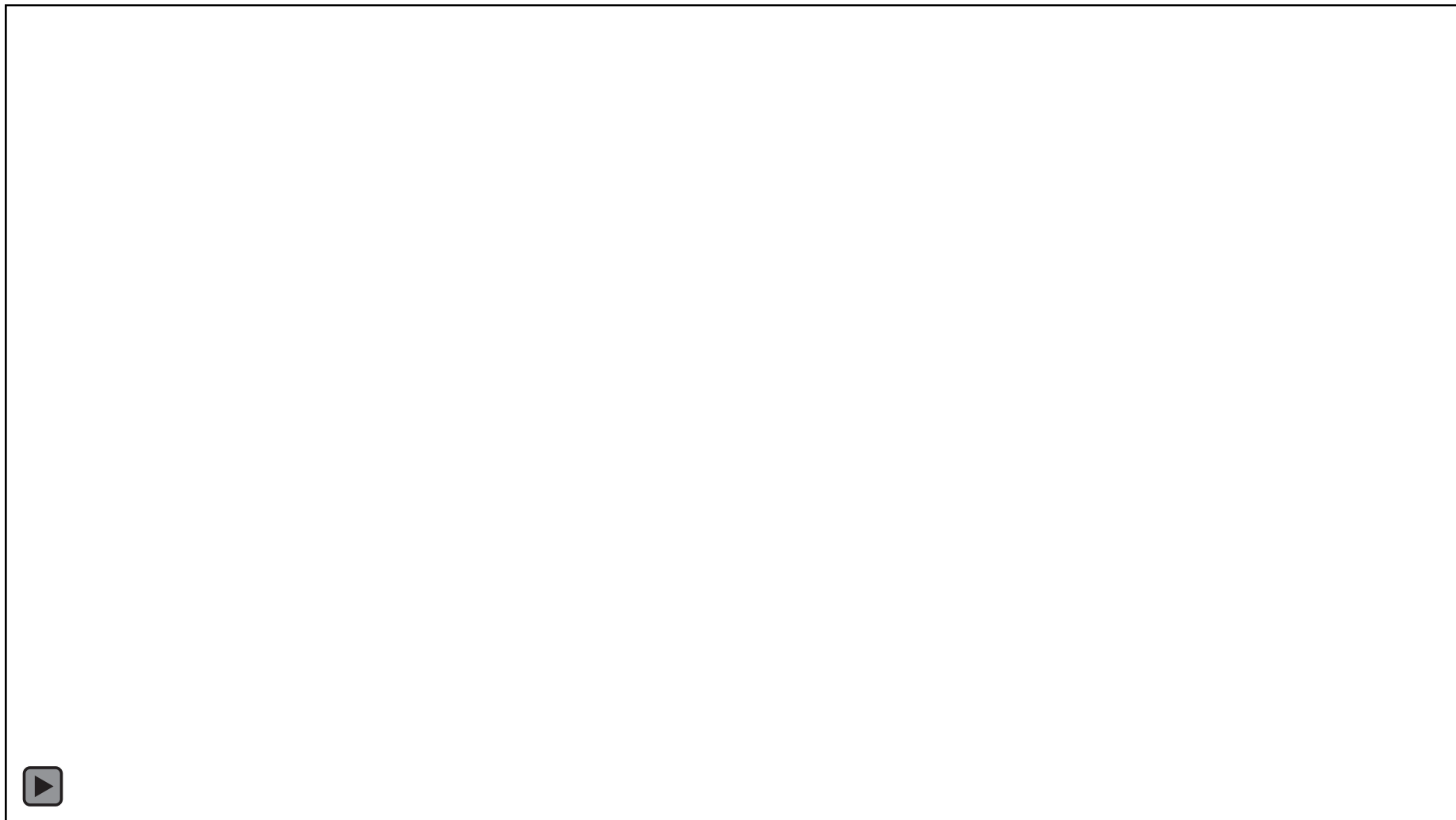
# MIT Implantable LEDs



- 0.67% intensity
- 24 chip-scale LEDs
- 1 NTC Thermistor
- 100 gold wire-bonds
- custom silicone mold
- IZM Integrated LEDs
- Conductive adhesive and wire bonding

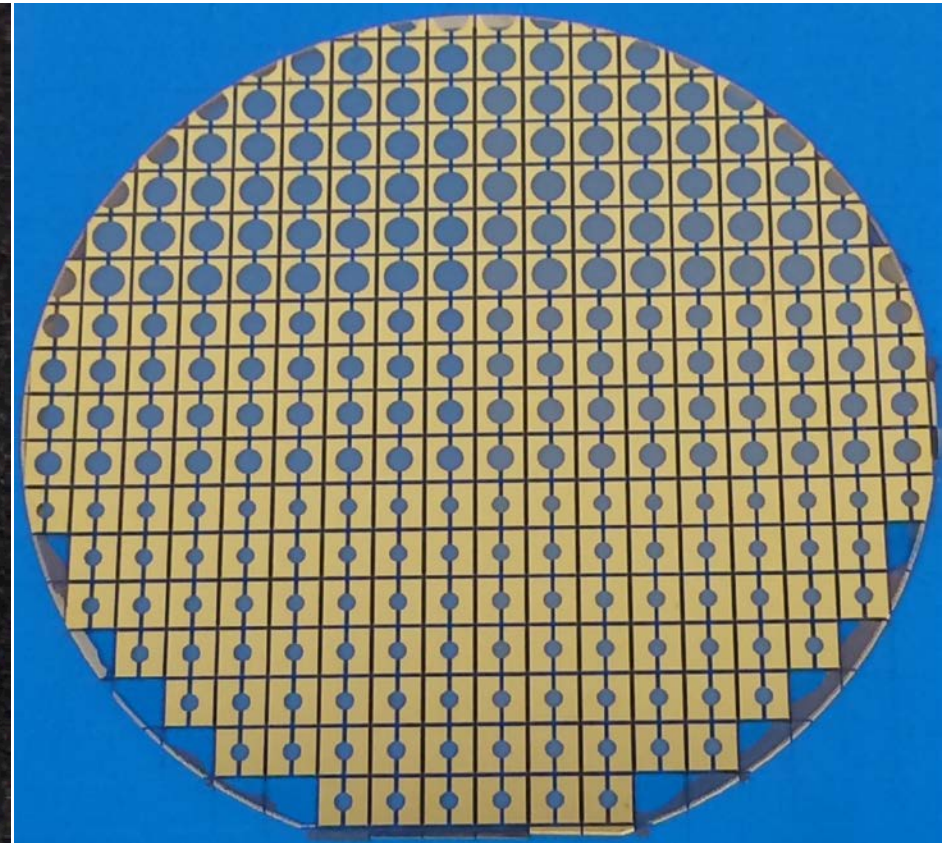
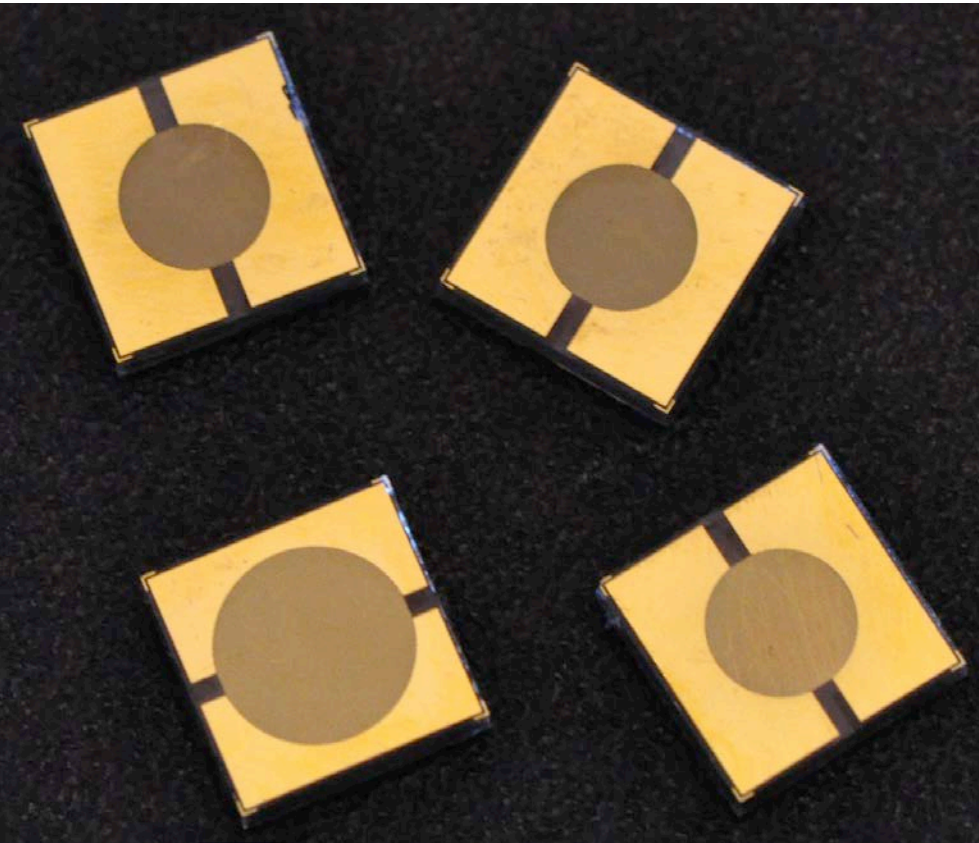


# MIT Implantable LEDs



After > 1 month soaking in Phosphate Buffered Saline

# Vaporsens IDE Development



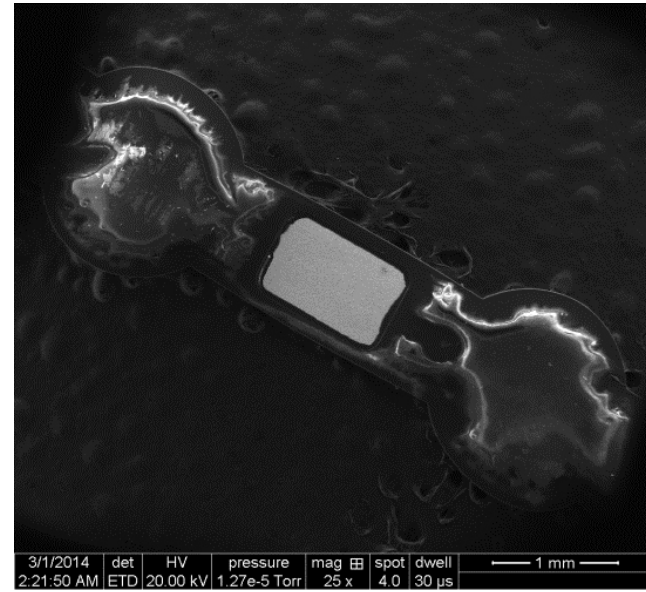
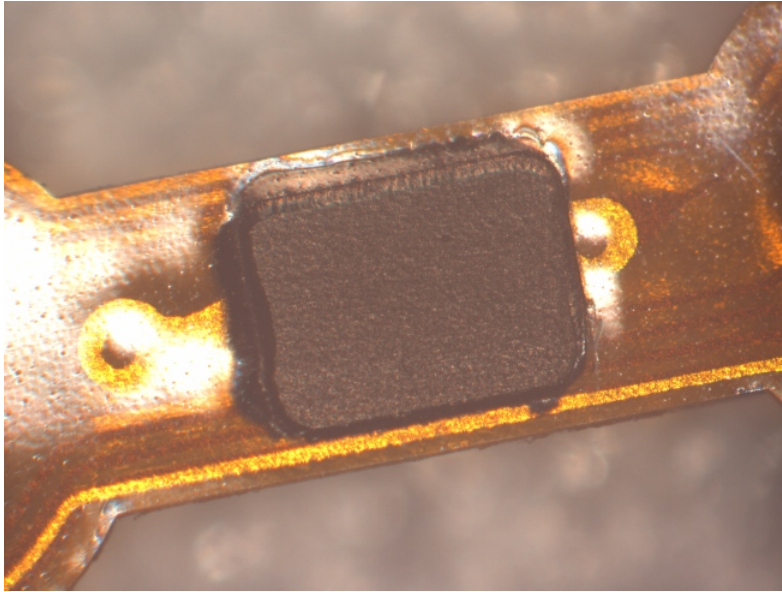
- Large area interdigitated electrodes
- fA to pA leakage currents
- Yield to 78%
- Developed faster than Albany CNSE fab
- Connect to functionalized CNTs
- Developed new masks, etch processes, packaging, surface energies with customer

# Acutus Medical

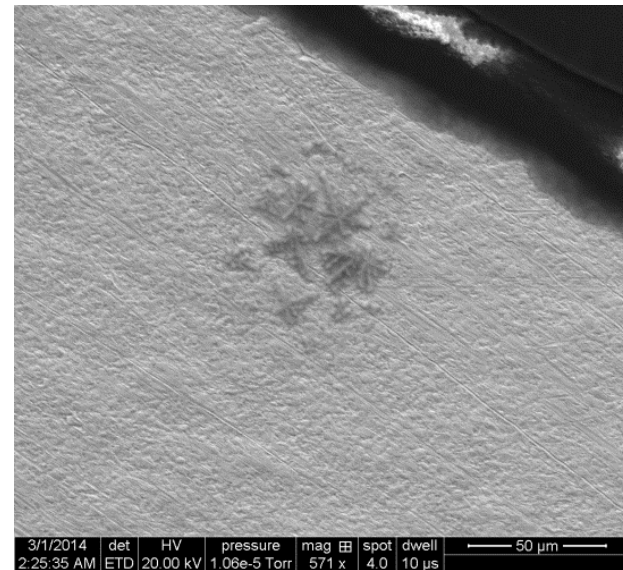
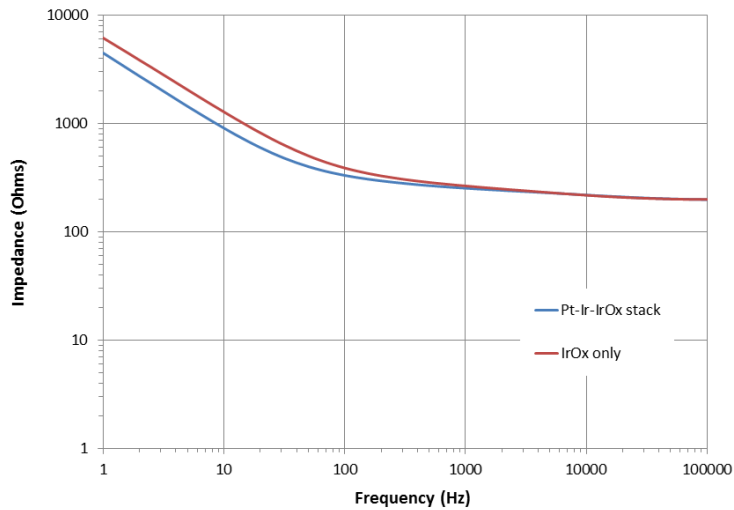
- Novel cardiac electrophysiology mapping catheters based on dipole measurement
- Requires state-of-the-art in-vivo electrical measurements
- Scope:
  - Develop IrO<sub>x</sub> coatings for electrode sites on flexible catheter splines
  - Perform electrochemical analysis on IrO<sub>x</sub> and alternative materials
  - Understand and minimize motion artifact caused by disruption of the Helmholtz bi-layer
  - Materials analysis and packaging wrt eletrophysiology



# Acutus Medical



Average magnitude



# Team

University of Utah

Florian G. Schmitt (Director), David R. Bristle (Associate Director), Robert...

Affilia  
Mechan  
engine

Extern  
Fraun  
Fraun

Thank  
Presid  
Vice P  
Colleg  
Depart  
Depart  
Depart  
All col



USTAR, and many more...