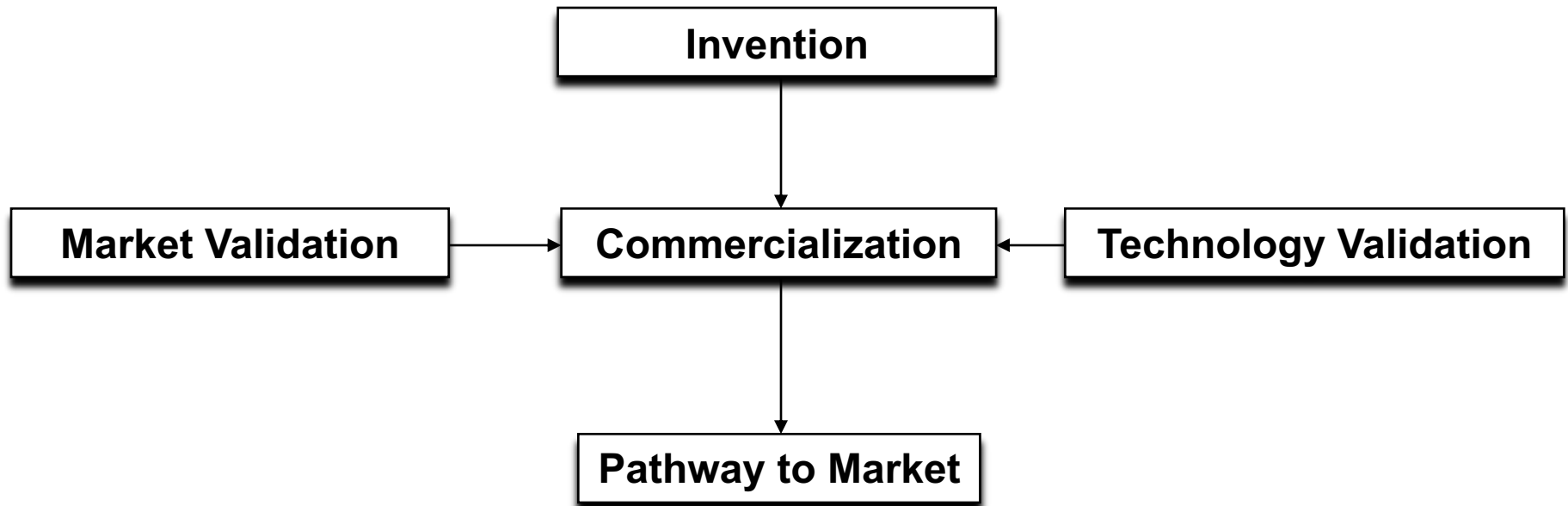
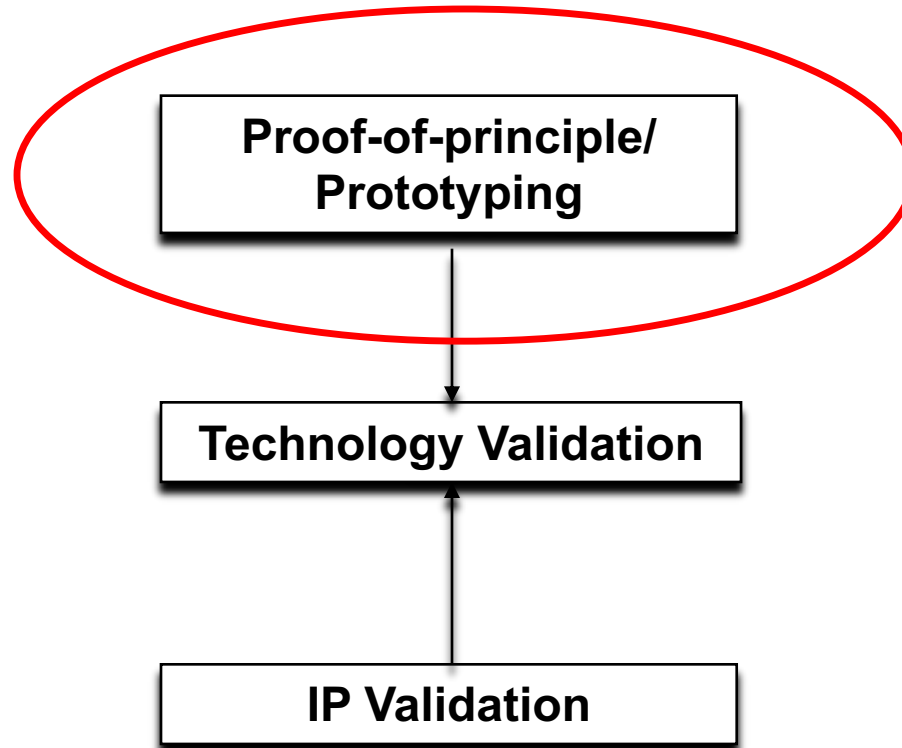


# Technology Development and PoC / Prototyping

Dr. Ashley J. Stevens  
President







# Proof-of-Concept (“PoC”) Funding

- Aka “Translational Research”

“Translational research is what we call product development in academia. We can’t call it “Product Development”, so we call it “Translational Research” and everyone’s happy”

*Paul Zavracky*

*Dean, School of Technological Entrepreneurship*

*Northeastern University*

*2008*

# Purpose of PoC Funding

- ❑ Reduce technical risk
- ❑ Reduce market risk
- ❑ Help Technology Push find its Market Pull

# Typical Uses of Funds

- ❑ Proof of Concept
  - ❑ Hiring of additional staff/grad students for specific experiments
  - ❑ Buying of specific testing equipment
  - ❑ Pivotal translational proof of concept experiments
  
- ❑ Prototype development
  - ❑ Testing in an industrial setting or by 3rd Parties
  - ❑ Clinical Development
  
- ❑ Marketing and Customer Development
  - ❑ Developing user friendly interfaces
  - ❑ Engaging end users to evaluate the technology

# Disallowed Uses of Funds

- ❑ IP expenses (may be allowed if capped)
- ❑ Major equipment
- ❑ Laptops
- ❑ Travel to academic conferences
  
- ❑ Sector/Discipline/School Specific Funds

# The Challenge

- ❑ Funding
  - ❑ US Government's primary investment in PoC funding is the SBIR and STTR programs
  - ❑ \$2.5 billion annually; **BUT**
    - ❑ SBIR must be led by a company; can involve a university
    - ❑ STTR must involve a company and a university; either can lead
      - ❑ i.e., The technology must already have been transferred
  - ❑ Some faculty start a company just to apply for SBIR or STTR grants

# Proof of Concept Funding

- ❑ Majority of PoC funding to date has come from institutional, philanthropic or state sources
- ❑ Philanthropic
  - ❑ Individual institution
    - ❑ MIT/Deshpande, UCSD/von Liebig, USC/Stevens
  - ❑ National
    - ❑ Coulter, Kauffman Entrepreneurial postdoctoral fellowships
- ❑ State
  - ❑ Massachusetts Technology Transfer Center
  - ❑ Ben Franklin (Pennsylvania)
  - ❑ Edison (Ohio)

# William J. von Liebig

- ❑ Founded Meadox Medical Inc.
- ❑ Manufactured textiles for vascular grafts
- ❑ Acquired by Boston Scientific for \$425 million in 1995
- ❑ Founded the William J. von Liebig Foundation in 1975
- ❑ Died 1999
- ❑ \$10 million gift to UCSD Jaobs School of Engineering in 2001

Boston  
Scientific





VON LIEBIG  
C E N T E R



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## Accelerating Innovation

Advisory services and seed funding to advance commercialization of Jacobs School discoveries

# Short, On-Chip Light Pulses

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**Support**  
the von Liebig Center

### EVENTS

There are not any von Liebig events listed at this time. [View other Jacobs School events »](#)

### ANNOUNCEMENTS

[Innovation Day Expo and Symposia](#)

[Call for Entries - LES Foundation Graduation Student Business Plan Competition](#)

[San Diego's Leading Ventures Takes on Commercialization of Bioengineering Breakthroughs | Xconomy](#)

[von Liebig Center startup Ortiva Raises \\$8M from Intel Capital](#)

# Von Liebig Center

- ❑ Advisory services:
  - ❑ Stimulate University/Industry exchange
  - ❑ Develop new alliances
  - ❑ Explore appropriate commercialization strategies for new technologies
- ❑ Analyze Commercial Potential
  - ❑ Protect Intellectual Property
  - ❑ Identify Potential Licensees
  - ❑ Market to Companies
  - ❑ Write Business Plan
  - ❑ Market to Investors

# Von Liebig Center

- ❑ Seed grants
  - ❑ \$75,000 for proof of concept

# Desh Deshpande

- ❑ Serial entrepreneur
  - ❑ Coral Networks, routers, 1987, sold for \$15 million in 1989
  - ❑ Cascade Communications, 1990, sold to Ascend Communications for \$3.7 billion in 1997.
  - ❑ Sycamore Networks in 199; IPO in 1999 achieved market cap of \$18 billion (briefly!)
  - ❑ Tejas Networks, 2000
  - ❑ ASG-Omni, 2000
- ❑ Gave \$20 million to establish Deshpande Center in 2002



Great Ideas abound at MIT, and The Deshpande Center strives to make them a reality. By funding novel-early stage research and connecting MIT's innovators to the business community, the center helps emerging technologies to emerge.

 KEEP ME INFORMED

BRIDGING THE GAP BETWEEN IDEA AND IMPLEMENTATION

- ABOUT THE CENTER
- RESEARCH PORTFOLIO
- ACTIVITIES
- CALENDAR
- GRANT PROGRAM
- NEWS
- SPINOUTS
- SUPPORT THE CENTER
- RESOURCES FOR INNOVATORS

ACTIVITIES

- [Grant Program](#)
- [Catalyst Program](#)
- [i-Teams](#)
- [IdeaStream](#)

INNOVATION AT MIT:

In 2006, 23 MIT technology-based startups were funded.

NEWS

October 19, 2010

*Press Release*

[MIT Deshpande Center Announces Fall 2010 Research Grants](#)

September 17, 2010

*In The News*

[Digital ear canal scanner project spins out into Lantos Technologies.](#)

June 28, 2010

*In The News*

A recent NY Times article, "[The Idea Incubator Goes to Campus](#)", discusses how visionaries, researchers, engineers, and entrepreneurs, are all working together to make the Deshpande Center for Technological Innovation.

May 28, 2010

*In The News*

Can a 'tattoo' help diabetics track their blood sugar? In the [Department of Chemical Engineering](#), [Prof. Michael Strano](#) and postdoctoral researcher, Paul Barone, are exploring ways to use tattoos under the skin to reveal blood glucose levels. This research is being funded by the Deshpande Center. Read the [full article](#) on the [MIT News Office](#) site.

May 21, 2010

*In The News*

[Prof. Chris Love](#), of the [Department of Chemical Engineering](#), believes that there is a better way to diagnose food allergies. One of his projects, funded in part by the Deshpande Center, involves analyzing individual immune cells taken from patients, allowing for precise measurement of the cells' response to allergens such as milk and peanuts. To learn about this project, read the [full article](#) on the [MIT News Office](#) site.

May 20, 2010

*In The News*

Hear ye, hear ye! [Prof. Doug Hart](#), of the [Department of Mechanical Engineering](#), and his research team are developing 3-D imaging technology, funded by the Deshpande Center, that can detect a wide range of functions — better than current models. To learn about this project read the [MIT News Office article](#).

# Deshpande Center

- ❑ Grant Program
  - ❑ Ignition Grants – upto \$50,000
  - ❑ Innovation Grants – upto \$250,000
- ❑ Catalyst Program
  - ❑ Mentors
- ❑ i-Teams
  - ❑ For-credit courses
    - ❑ Fall and Spring semesters
  - ❑ Offered through MIT Entrepreneurship Center
- ❑ IdeaStream
  - ❑ Early stage investors' forum for Deshpande funded spin-outs

**Proof of Concept Centers:  
Accelerating the Commercialization  
of University Innovation**

January 2008

Ewing Marion

**KAUFFMAN**  
Foundation

# Results

	<u>Von Liebig</u>	<u>Deshpande</u>
Annual Investment	\$1.2 mm	\$1.7 mm
Projects Funded	66	64
Average Investment	\$42k	\$109k
Licenses	4 (6%)	1 (2%)
Start-Ups	16 (24%)	10 (16%)
Total Capital Raised	\$71 mm	\$88.7 mm
Average per Start-Up	\$4.4mm	\$8.9mm
Leverage	105x	81x

Source: Kauffman Foundation, 2008

# Wallace H. Coulter

- ❑ Electrical engineer (Georgia Tech) who applied his skills to biomedical problems
  - ❑ Regarded himself as one of the first biomedical engineers
  - ❑ Worked in his garage
  - ❑ Created the Coulter Counter in 1949
  - ❑ Patent issued 1953; sent 2 prototypes to the NIH
- ❑ Founded the Coulter Electronics, Inc. with his brother Joe in 1958
- ❑ Acquired by Beckman Instruments in 1997 for \$1.1 billion
  - ❑ Beckman-Coulter acquired by Danaher Corporation for \$6.8 billion February 2011
- ❑ Founded Wallace H. Coulter Foundation in 1997
- ❑ Died 1998





Wallace H. Coulter

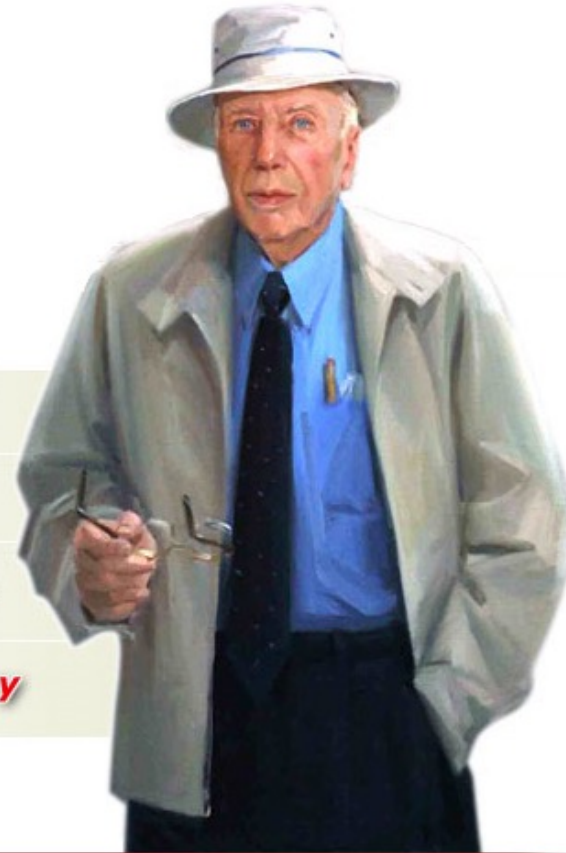
The Coulter Foundation

Coulter Translational  
Partnership Award

Coulter Translational  
Research Award

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*Engineer*

*Inventor*

*Entrepreneur*

*Visionary*

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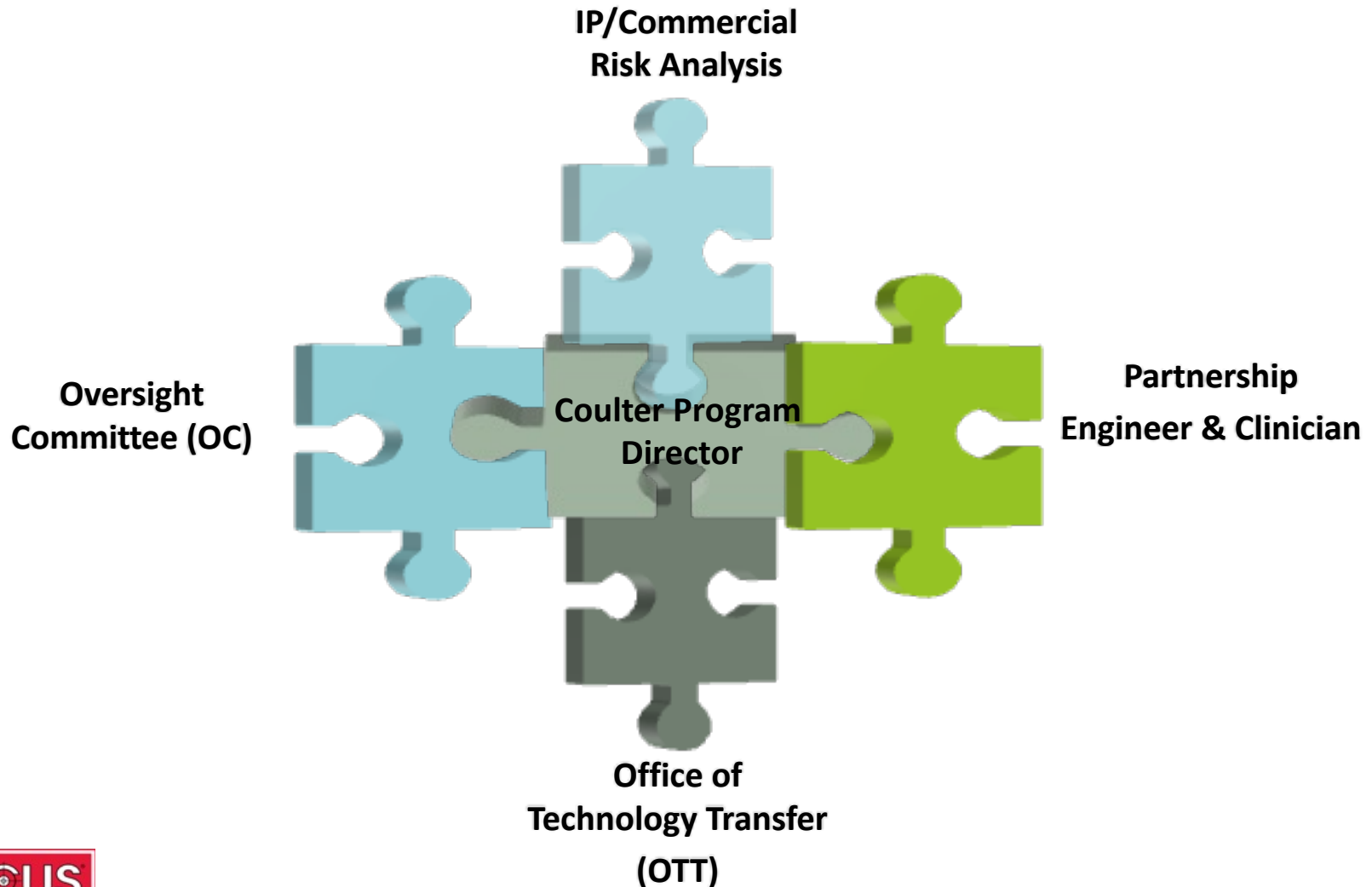
# Wallace H. Coulter Foundation

- ❑ Established Coulter Translational Research Programs in Biomedical Engineering in 2005
- ❑ National solicitation:
  - ❑ 83 universities with BME attended kick-off meeting
  - ❑ 20 invited to submit full applications
  - ❑ 14 site visited
  - ❑ 10 selected
    - ❑ Boston University
    - ❑ Case Western Reserve University
    - ❑ Drexel University
    - ❑ Duke University
    - ❑ Georgia Tech / Emory University
    - ❑ Stanford University
    - ❑ University of Michigan
    - ❑ University of Virginia
    - ❑ University of Washington
    - ❑ University of Wisconsin

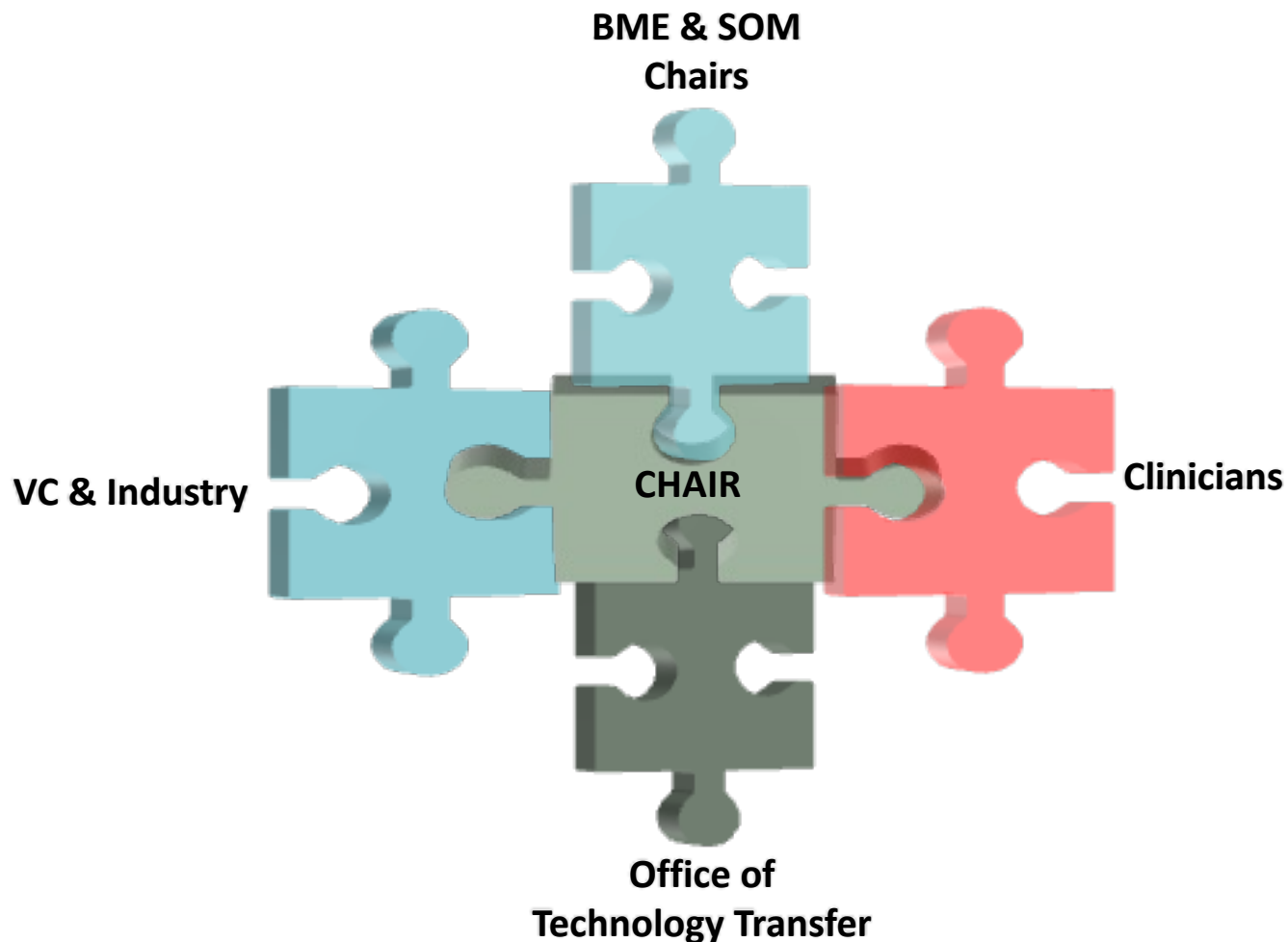
# Wallace H. Coulter Foundation

- ❑ Launched in 2006
- ❑ 5 year program;
- ❑ \$1 million per year
- ❑ Program Director
  - ❑ Senior level medical device industry
- ❑ Key elements
  - ❑ Co-PI's
  - ❑ Committee to select projects
    - ❑ University
    - ❑ Coulter Foundation
    - ❑ Local community
      - ❑ VC's
      - ❑ Entrepreneurs
      - ❑ Industry

# Coulter Process Elements



# Oversight Committee



# Coulter Process

DE-RISKING



PROGRAM MANAGEMENT

# Proposal Evaluation

- ❑ Opportunity for impact
  - ❑ Unmet clinical need
- ❑ Technology
  - ❑ Development stage
    - ❑ If any discovery remains to be done, it's too early
  - ❑ IP
- ❑ Team
  - ❑ Competency, commitment
- ❑ Plan
  - ❑ Commercial risk mitigated
  - ❑ Appropriate endpoint and years of funding
  - ❑ Milestones
  - ❑ Follow-on-funding sources identified

# Project Rationale and Impact

(Highlight any changes since last review)

	Coulter Project	“Gold Standard”
What is the market size (how many people are afflicted each year?)		
Who are the main competitors?		
List Five Critical Customer Product Attributes *		
1.		
2.		
3.		
4.		
5.		
What does the current gold standard do and how can your product do it better?		

# Needs a rich ecosystem

- ❑ Internal resources:
  - ❑ Tech Transfer Office
  - ❑ Research Administration - COI
  - ❑ Prototype/Machine Shop
  - ❑ Business School
  - ❑ Animal Facilities
  - ❑ Clinical Research Services
  - ❑ SBIR/STTR Funding Office

# Needs a rich ecosystem


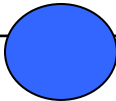
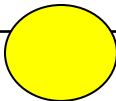
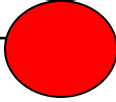
- ❑ Potential interactions externally:
  - ❑ Patent Consultants
  - ❑ Business Incubators
  - ❑ Regulatory Consultants
  - ❑ Market Research Firms
  - ❑ Clinical Research Organizations
  - ❑ Business Consultants
  - ❑ Industry experts, investors
  - ❑ NIH/DOD/NSF supplemental funding

# Support for Awardees

- ❑ Business Skills
  - ❑ Marketing and business development support
  - ❑ Project/Sub-contractor management
  - ❑ Competitive analysis
  
- ❑ Mentoring
  - ❑ “Personal Commercialization Coach”
  - ❑ Managing consultants
  - ❑ Maintaining momentum
  - ❑ Networking

# Project Management

- ❑ Brutally honest assessments of progress

Milestones as described in application	Status	Comments
		<b>Completed</b>
		<b>On Schedule</b>
		<b>Late but Recoverable</b>
		<b>Major Issue</b>

# Measuring Outcomes

- ❑ New funding
  - ❑ New grants
  - ❑ Sponsored research
- ❑ New intellectual property
  - ❑ New disclosures
  - ❑ New licenses
  - ❑ Publications
- ❑ Increased commercialization progress
  - ❑ Advancing on the commercialization path
  - ❑ New companies
  - ❑ Closer to the clinic
  - ❑ Increased faculty participation in commercialization activities
- ❑ Other
  - ❑ Engaging students

# Coulter Translational Research Programs in Biomedical Engineering

(Audited data after year 5; \$ millions)

	<u>Number</u>	<u>Amount</u> (\$ mm)	<u>Average</u> (\$ mm)	<u>Leverage</u>
<u>Projects Funded</u>	200	\$46	\$0.23	
<u>Start-Ups</u>				
VC Funded	38	\$294	\$7.74	34.4x
Seed Stage	28	\$5	\$0.18	0.8x
Total Start-Ups	66	\$299	\$4.53	20.1x
<u>Licensed to Industry</u>	28			
<u>Gov't Follow-on Funding</u>		\$150		
<b>Total</b>	94	\$305	\$3.24	14.4x
 LSR	47.0%			

Source: Caro Elias, Wallace H. Coulter Foundation, Personal Communication, February 2012

# Conclusions on Translational Research Programs

- ❑ Successful
- ❑ Don't increase the overall licensing success rate
  - ❑ Still ~25% success rate
- ❑ Are highly effective at generating start-ups
  - ❑ 6x the normal rate
- ❑ Are highly effective at leveraging the translational research funding into venture capital investment
  - ❑ 30-100x

# Translational research funding is only the first step



# Kauffman Foundation Entrepreneurial Postdoctoral Fellowships

- ❑ Provides 6 months funding to postdocs who want to commercialize the science they've been working on
- ❑ High rate of SBIR applications and company formation at end of 6 months

# i-Corps

- ❑ Recent experiment from NSF
  - ❑ Partner with Deshpande Center and Kauffman Foundation
  - ❑ \$50,000/6 month grants to bring together PI, mentor and an entrepreneur
  - ❑ Initially 100 grants (\$5 million)