Building Innovation Ecosystem

- *Catalyzing Technology Commercialization and Cultivating Entrepreneurship*

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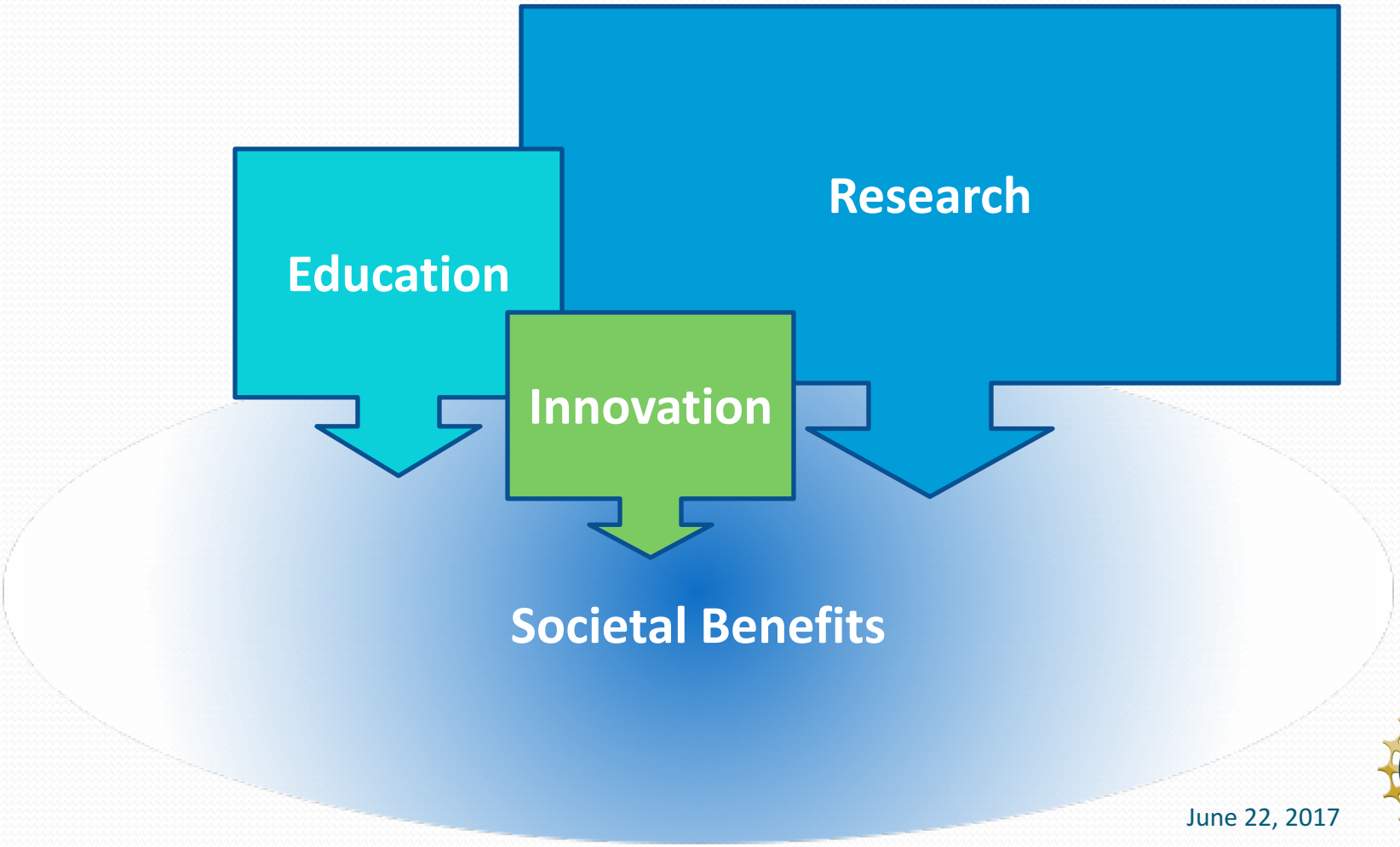
NSF Strategic Plan - 2011

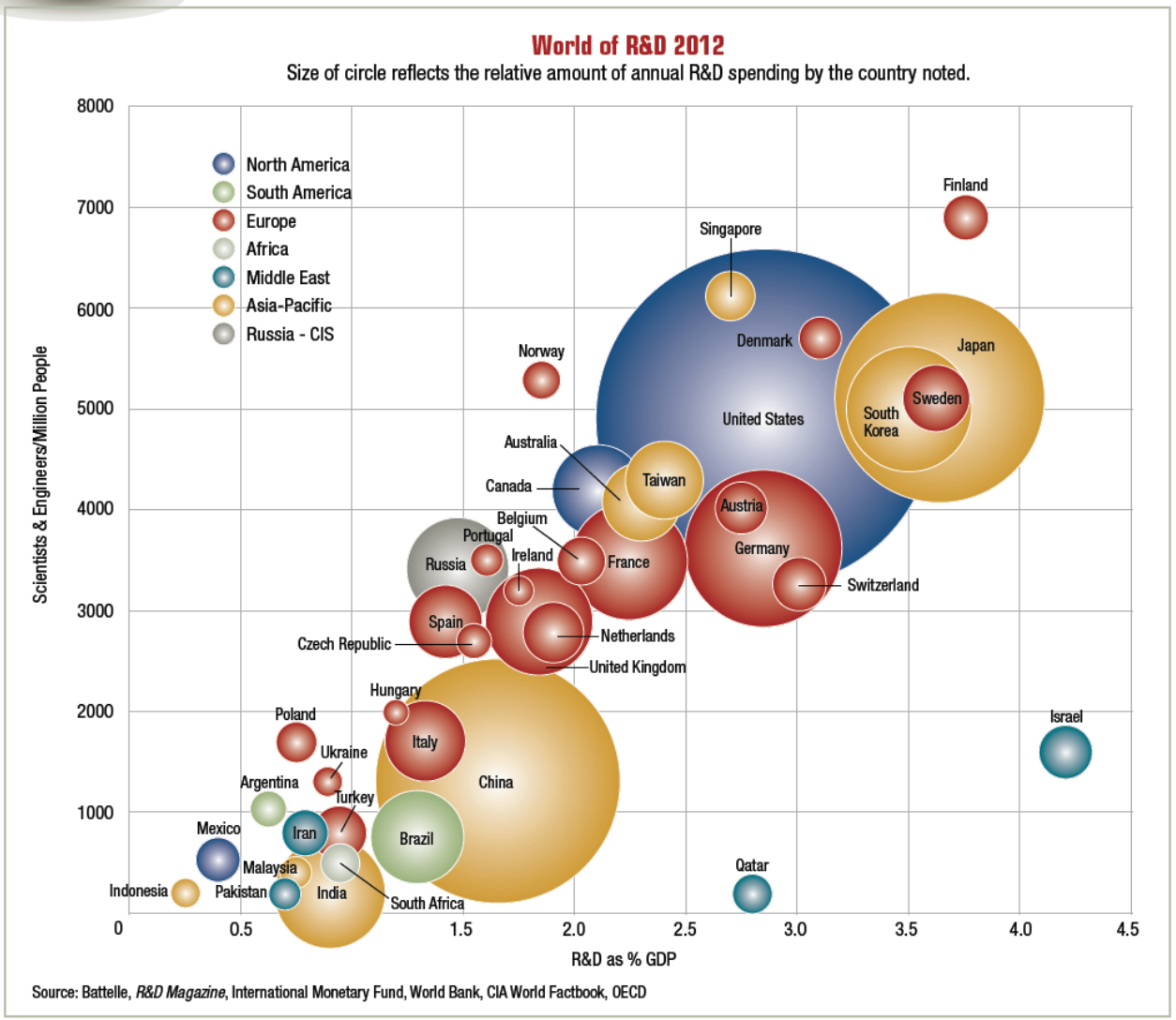
- Vision: NSF envisions a nation that capitalizes on new concepts in science and engineering and provides global leadership in advancing research and education.
- Three Strategic Goals:
  - Transform the frontiers
  - Innovate for society
  - Perform as a model organization

NSF ENG: Investing in engineering research and education to foster innovations for benefit to society

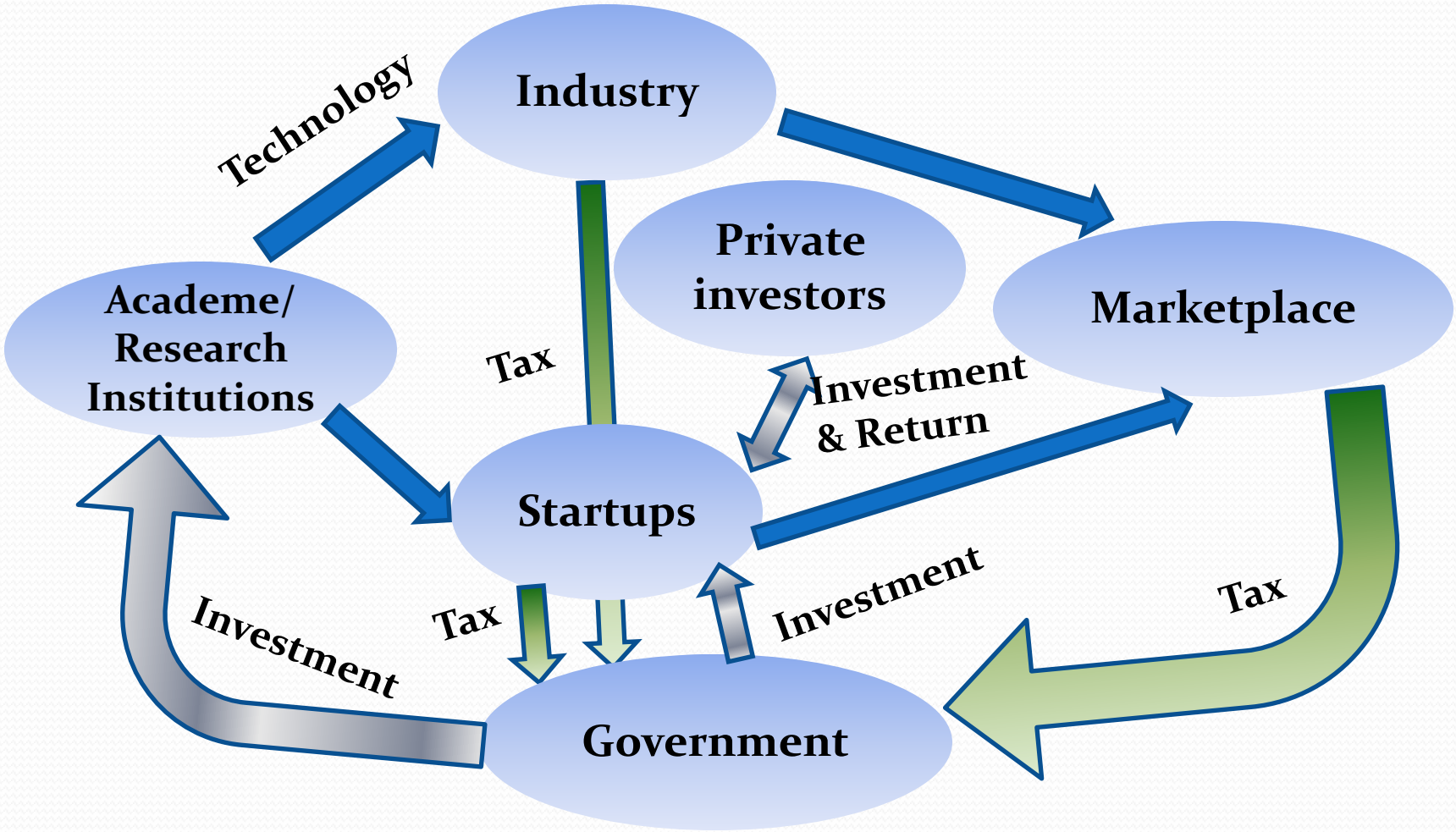


Global R&D

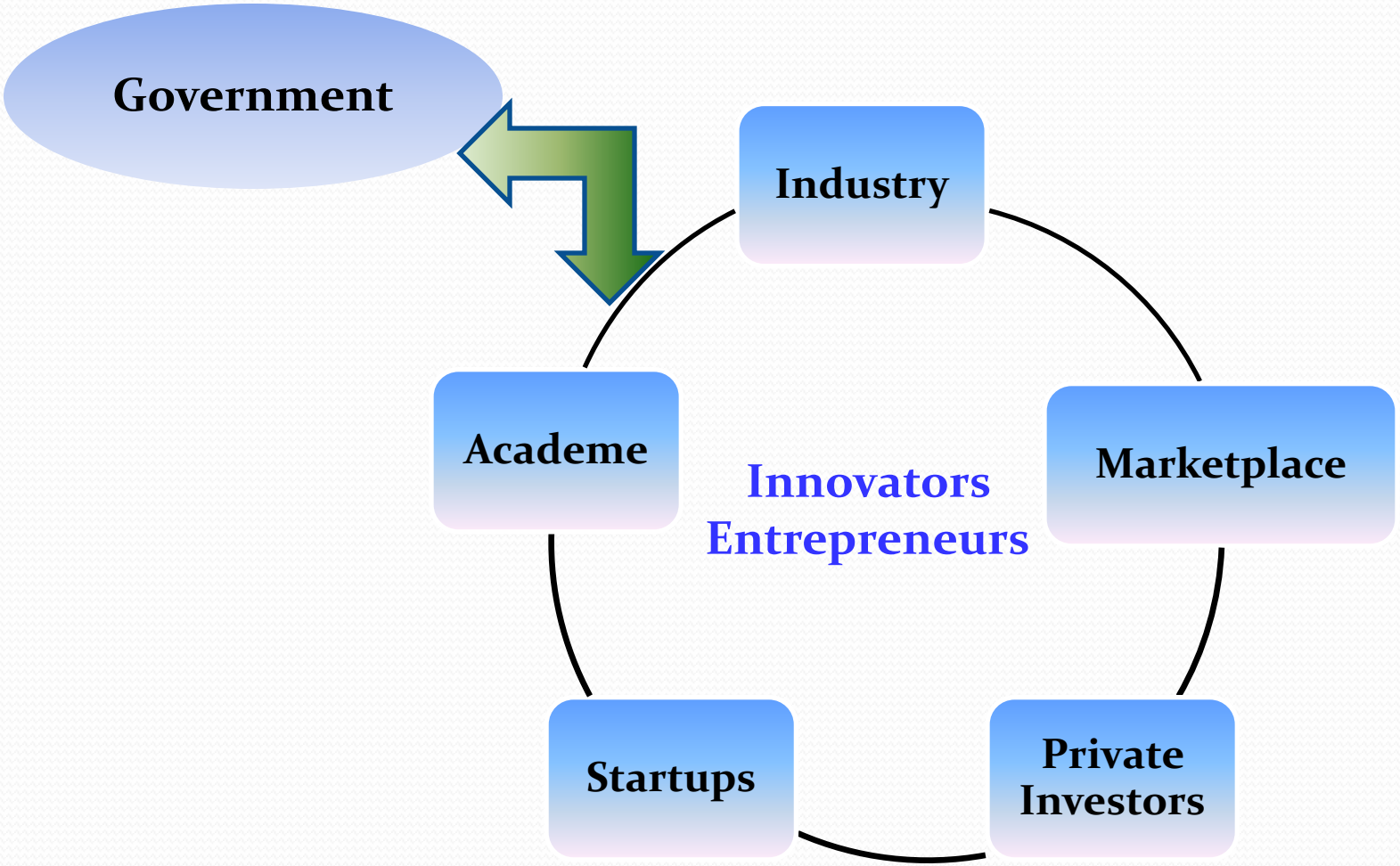
2013 Global *R&D Funding Forecast*



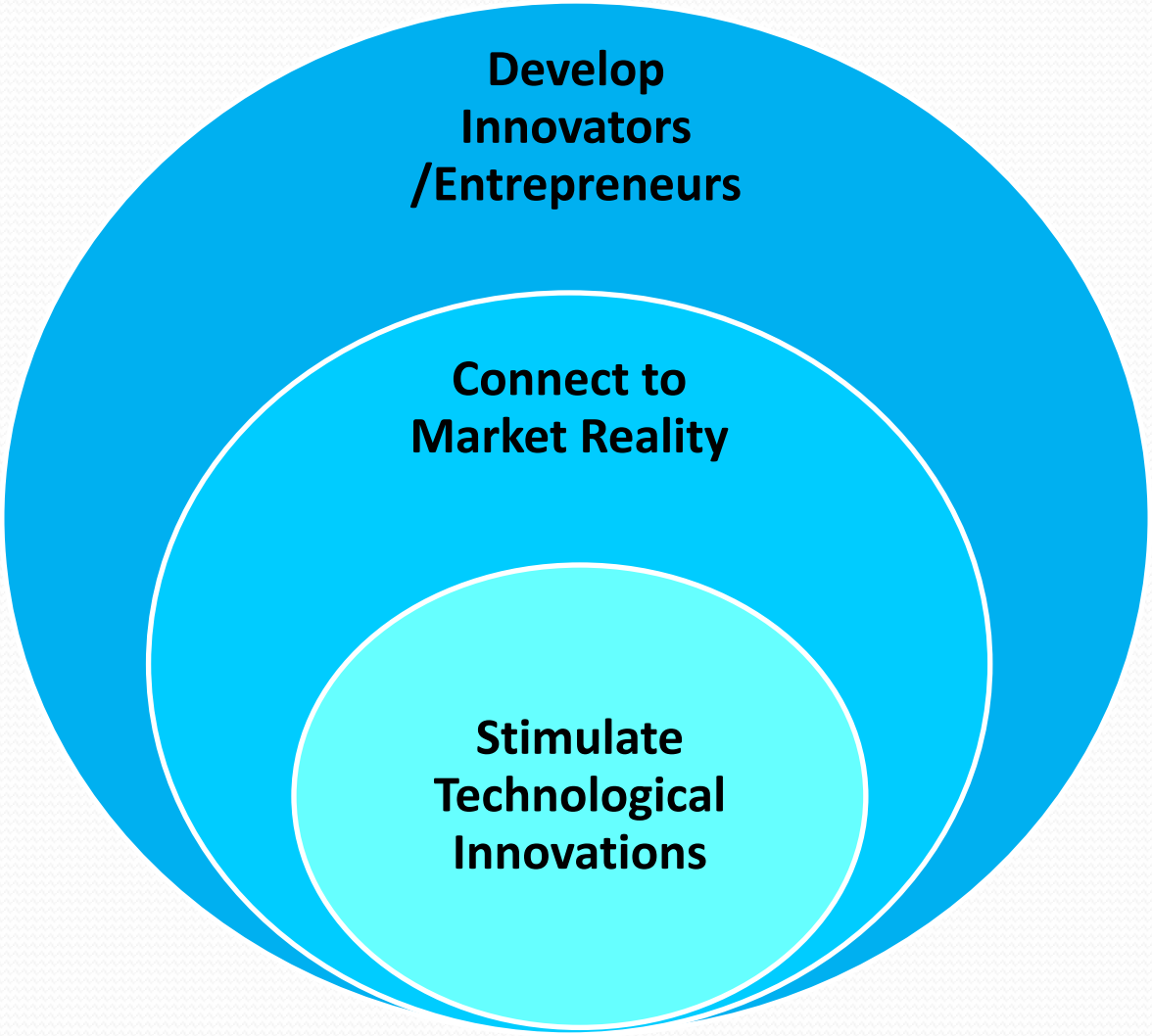
Traditional Innovation Ecosystem



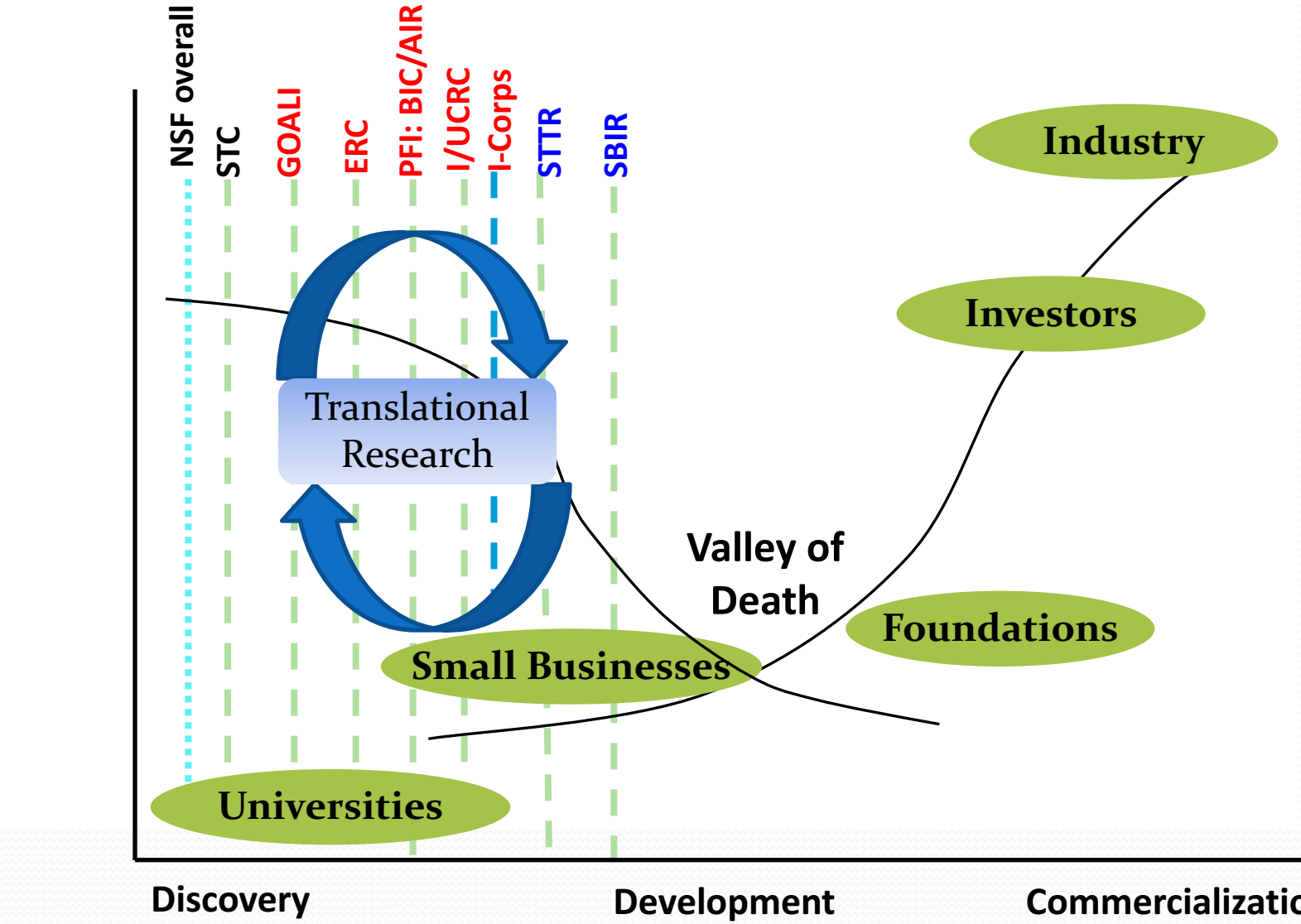
A More Connected Innovation Ecosystem



Catalyzing Technology Commercialization and Cultivating Entrepreneurship

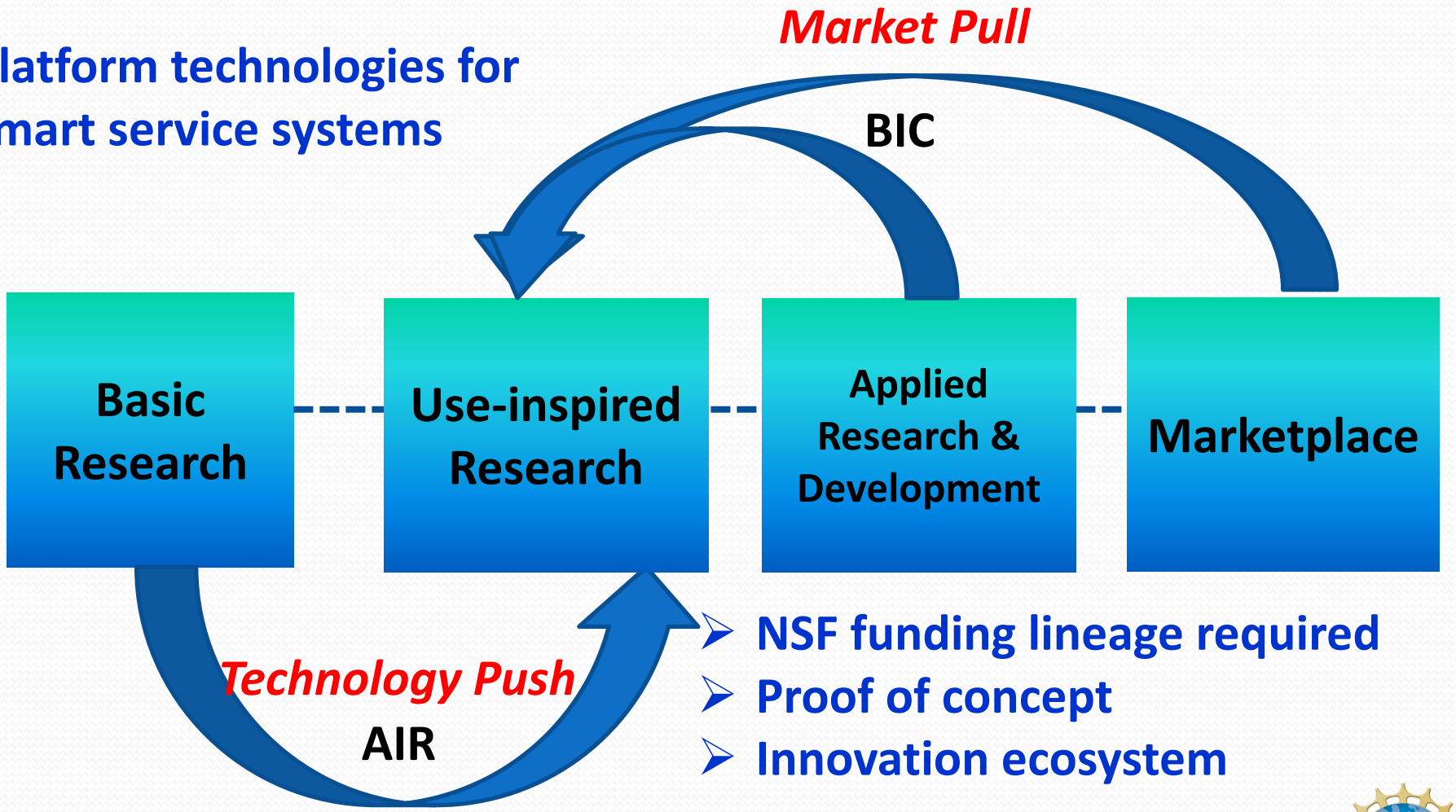


Research to Commercialization: Filling the Gap



Accelerating Innovation Research (AIR)
Building Innovation Capacity (BIC)

Platform technologies for smart service systems



- NSF funding lineage required
- Proof of concept
- Innovation ecosystem

Accelerating Innovation Research (AIR)

NSF funding lineage requested

- **AIR choice 1: TECHNOLOGY TRANSLATION (TT)**
  - Proofs-of-concept and/or pre-commercial prototypes
  - Promote entrepreneurial thinking among faculty and students
  - In FY2013, 41 projects were funded

- **AIR choice 2: RESEARCH ALLIANCE (RA)**
  - Develop innovation ecosystem
  - Stimulate entrepreneurial & innovation activities
  - I n FY2013, 6 projects were supported

Research Centers/Consortia

- Engineering Research Centers (ERC)
  - System-level engineering research

- Industry/University Cooperative research Centers (I/UCRC)
  - Pre-competitive **industry-inspired** research consortia

ERC 3-4 slides

MRSEC: Laser Transmission

***MRSEC*: Materials Research Science and Engineering Centers support interdisciplinary and multidisciplinary materials research and education of the highest quality while addressing fundamental problems in science and engineering that are important to society.**

On Friday November 19th 2004, a minimally invasive procedure was performed on a patient with near-total obstruction of the larynx and trachea.

The procedure was performed by Dr. Jamie Koufman, the director of the Center for Voice and Swallowing Disorders of Wake Forest University at the Voice Center in Winston-Salem, North Carolina. The patient was awake during the procedure and was able to go home immediately thereafter.

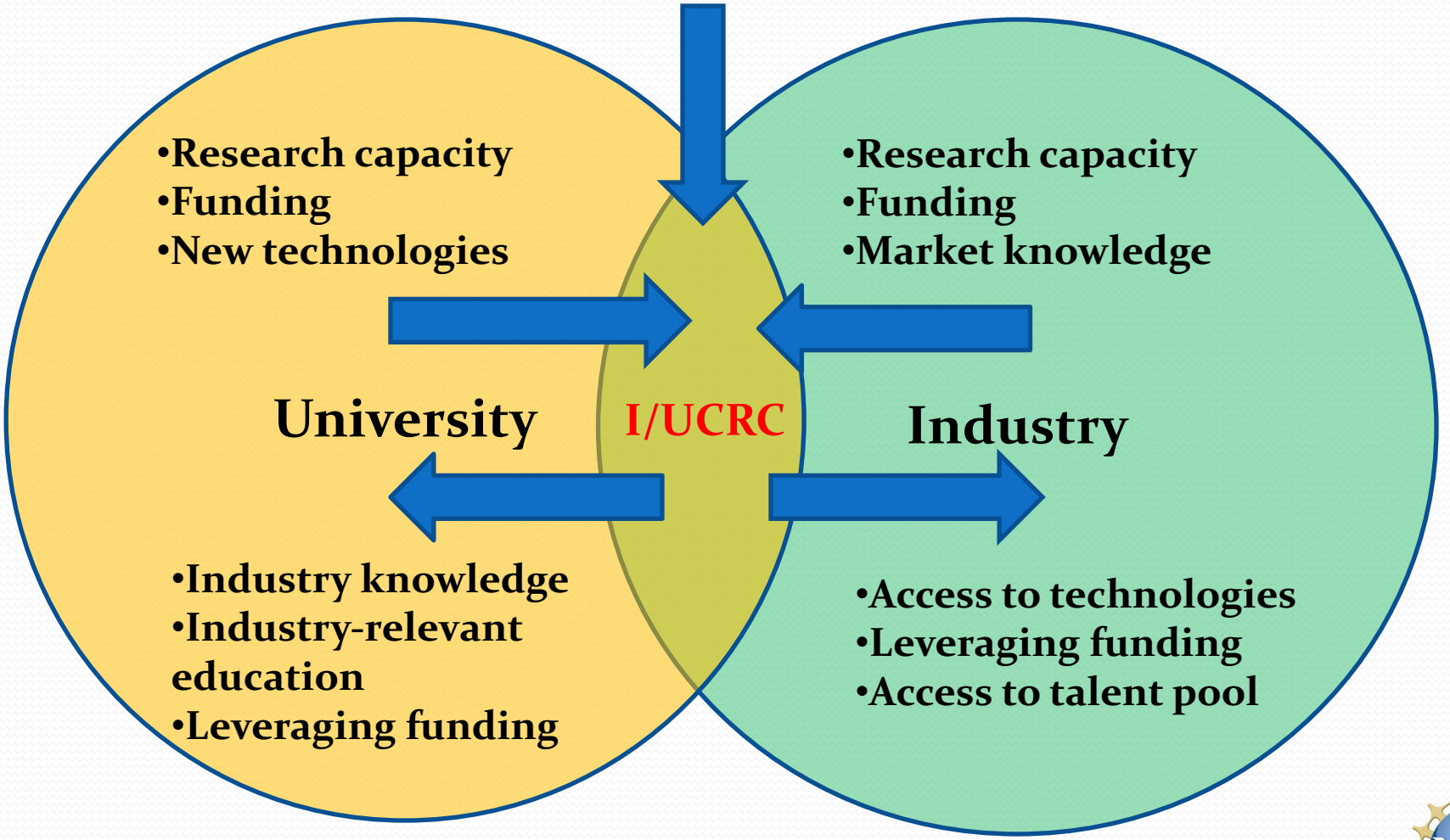
Enabling Technology: a new class of photonic bandgap fibers capable of transmitting CO_2 laser energy at a wavelength of 10.6 microns. This technology evolved from MRSEC supported fundamental research (Temelkuran et al., *Nature* **420**, 650-653, 2002). The technology was licensed exclusively to OmniGuide by MIT for further development in 2003.

I/UCRC Centers – A Nation-wide Network

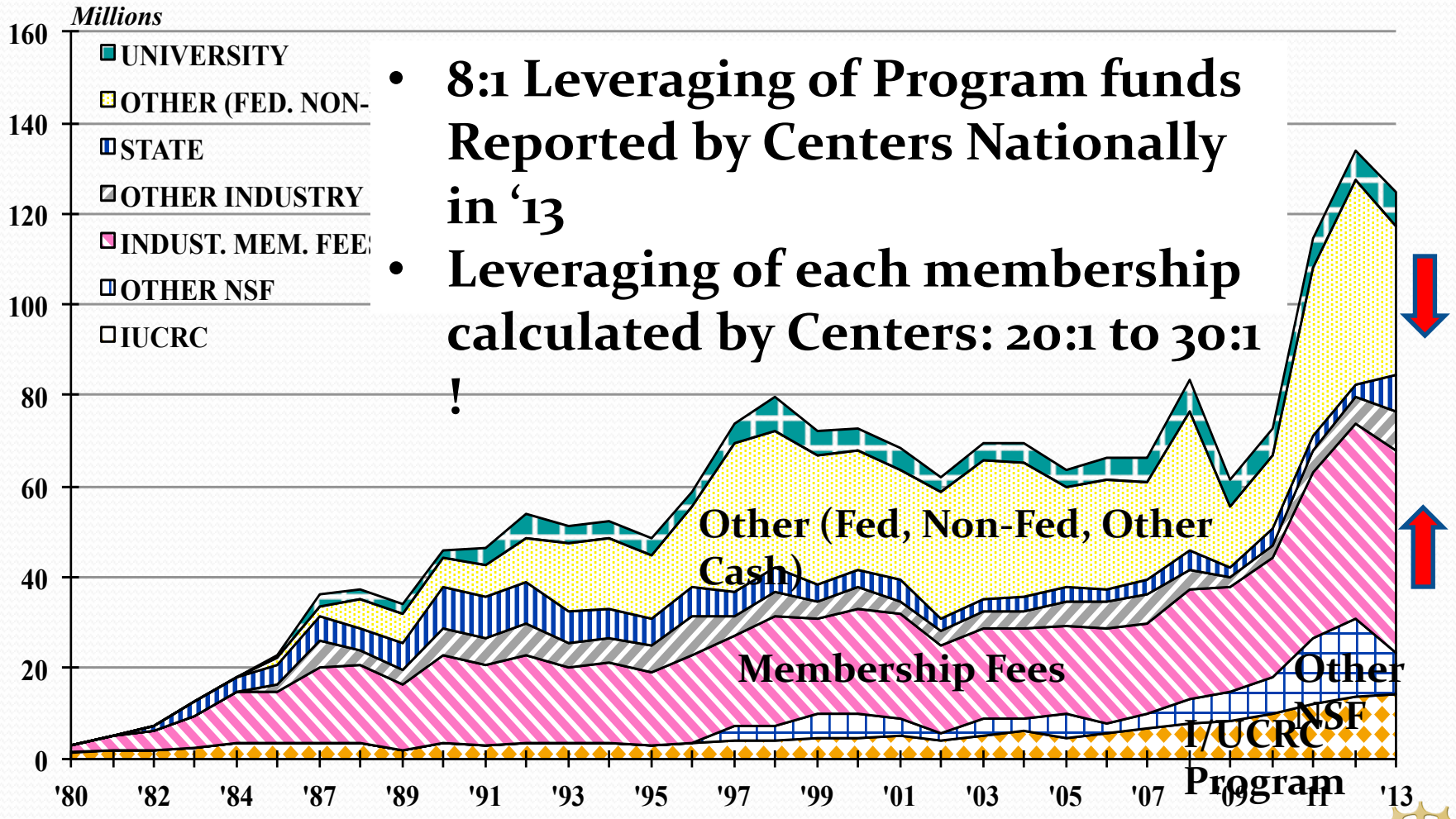
- 67 centers (over 190 universities participated)
- Over 900 faculty and 2100 students participate in I/UCRC projects
- Over 1000 memberships by 760 members
- A network of more than 4000 people
- 4 formal international sites

Industry University Cooperative Research Centers (I/UCRC)

NSF provides seed funding and framework



Total Funding by Source in Dollars



- 8:1 Leveraging of Program funds Reported by Centers Nationally in '13
- Leveraging of each membership calculated by Centers: 20:1 to 30:1 !

FY 2012-2013 NSF-I/UCRC Center Structure Database

I/UCRC Impact vs. Investment: Examples

IMS: Intelligent Maintenance Systems (2001)
CPaSS: Center for Particulates & Surfactants (1998)
BSAC: Berkeley Sensors and Actuators Center (1986)

IUCRC investments & Impacts	TOTAL	IMS	BSAC	CPaSS
Estimated impacts (present value)	$1267.1M	$846,738,946	$410,727,849	$9,638,633
Total investments (present value)	$19.6M	$3,133,857	$13,250,712	$3,203,057
Benefit:Cost Ratio	64.7:1	270.2:1	31.2:1	3.0:1
Net Present Value	$1247.5M	$843,605,090	$397,477,137	$6,435,577

- Realized impacts with a net present value of $1.25B.
- Each dollar invested by NSF-I/UCRC generated an estimated 64.7 dollars in impacts.

IUCRC Evaluation Team (D. Gray, et al.)

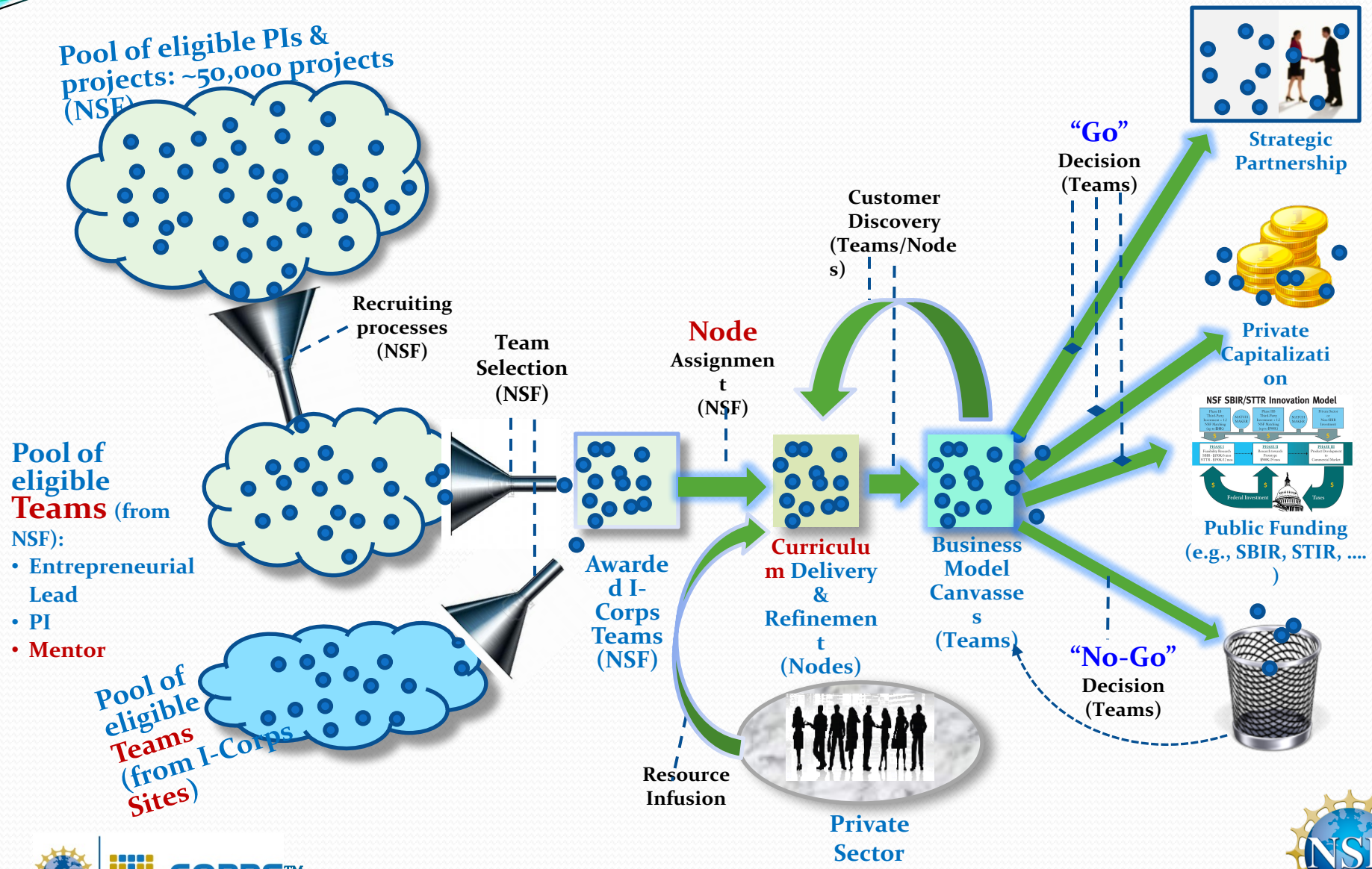
Cultivate Entrepreneurship

- Innovation-Corps (I-Corps)
- Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR)

I-Corps™ Approach

- Emphasizes experiential learning and feedback
- Challenges teams to create their own business model canvas
- Values revision and continual improvement of business development elements
- Expects teams to be inquisitive, motivated and capable of self management
- Full contact immersive class

I-Corps™ Flow Diagram



CORPS™ NSF Innovation Corps

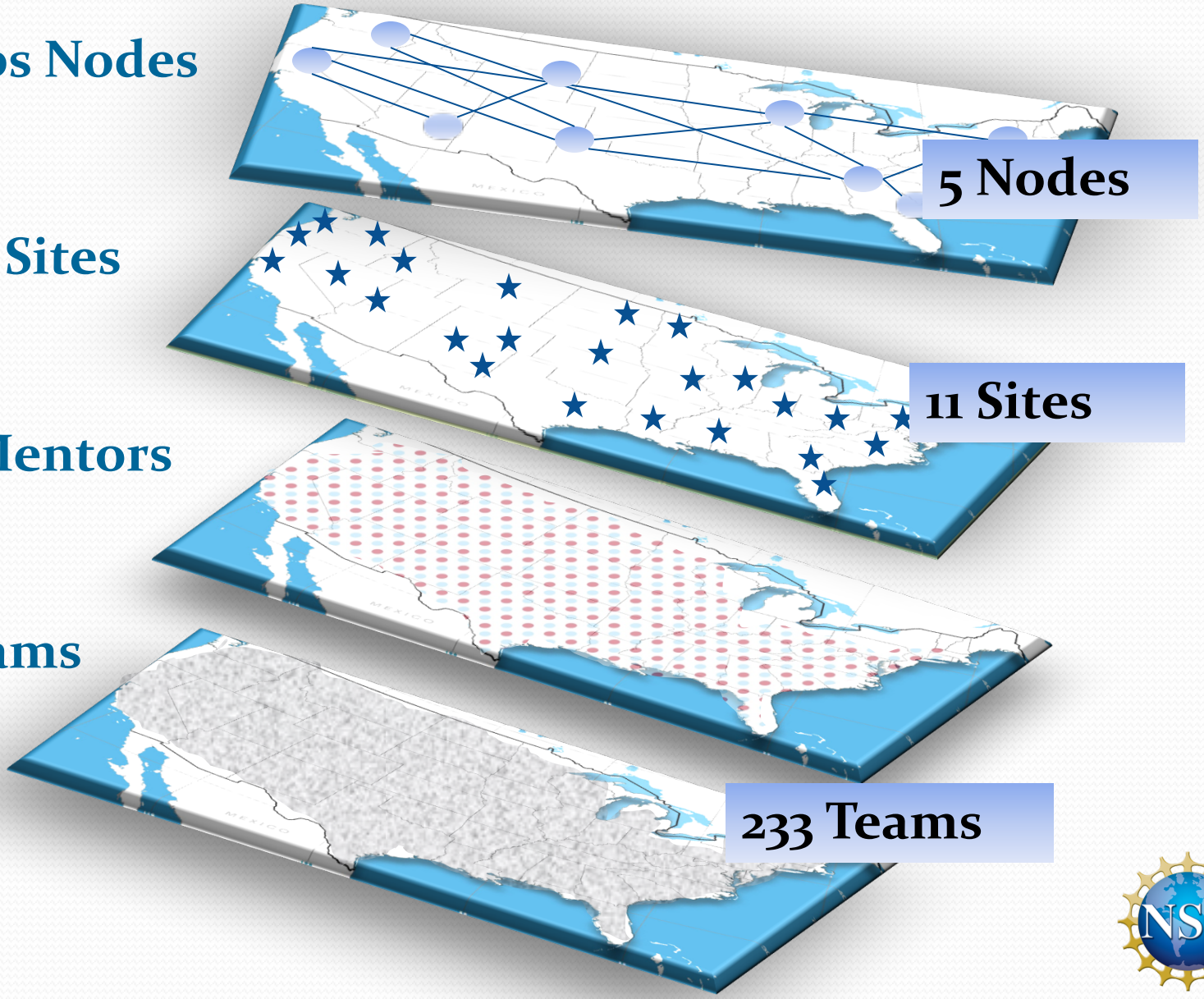
Building the Nation's I-Corps™ "Fabric"

I-Corps Nodes

I-Corps Sites

I-Corps Mentors

I-Corps Teams



anchovilabs

New way to organize, browse and share your photos.

Acquired by Dropbox

Developed software to annotate a large number of images quickly and accurately

Combining human input with an annotation algorithm
Facilitate image analysis

Founders

Serge Belongie
Professor at UC San Diego

Peter Welinder
Award-winning research in computer vision, machine learning and crowdsourcing.

Boris Babenko
Co-founder of @Anchovi Labs, Inc.

Small Business Innovation Research (SBIR) & Small Business Technology Transfer (STTR)

Seeking high-risk, high-payback innovations with high commercialization potential

- ***Equity-free investment in for-profit small businesses***
- ***Helping mitigate technical and business risks***
- ***Focusing on commercialization***



Entrepreneur Boot-Camp

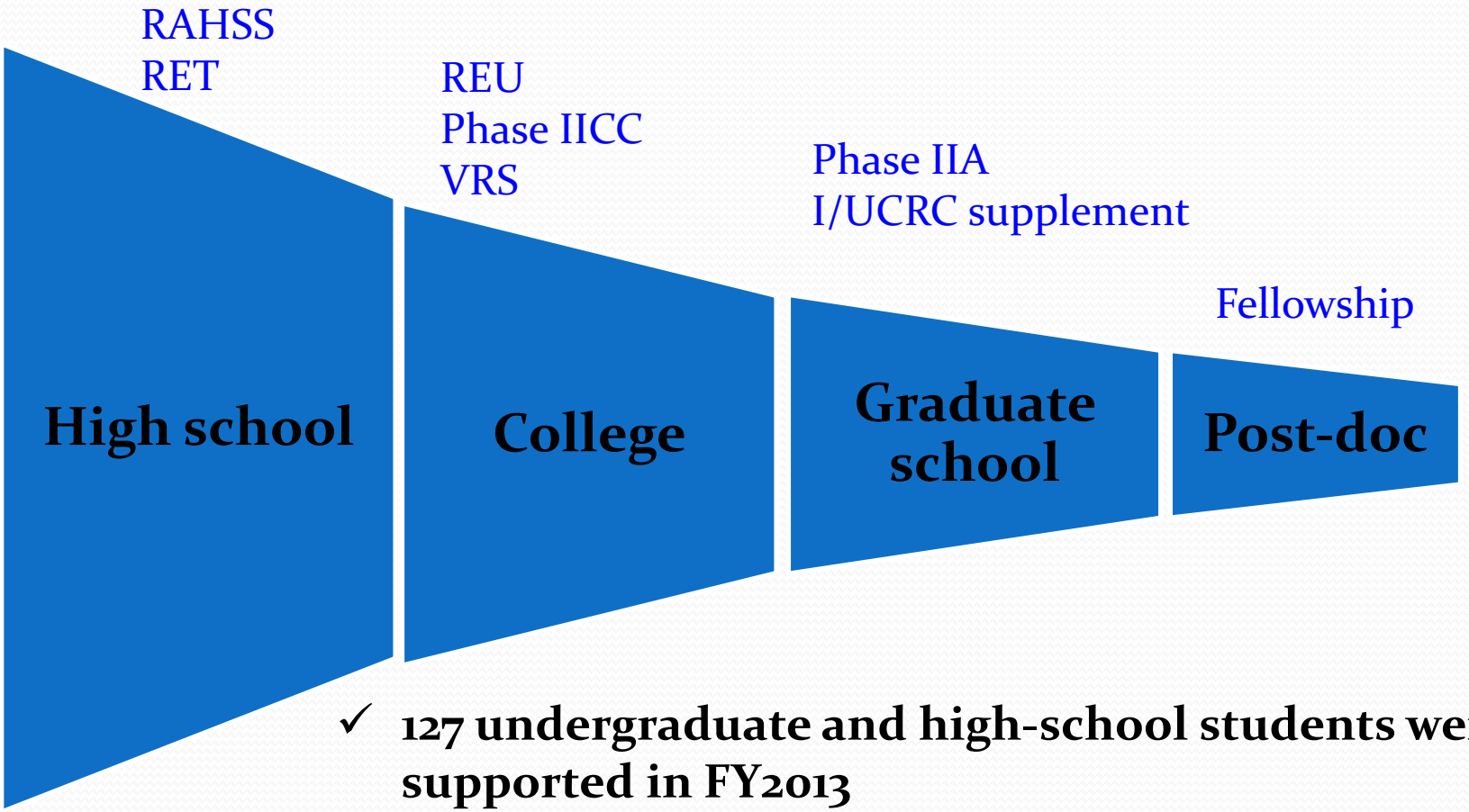
- An NSF internal evaluation indicated
  - Majority of SBIR/STTR Phase II project failures are due to market issues

- Launched SBIR Entrepreneur Boot-Camp in 2013
  - 69 small businesses participated
  - Focused on customer discovery and understanding market needs
  - Overwhelmingly positive feedback

Cultivate Entrepreneurial Culture
- *Supporting High-Risk Startups*

- **FY2012 SBIR/STTR Phase I awardees**
  - ✓ **73% - no prior Phase II award**
  - ✓ **86% - 10 and fewer employees**
  - ✓ **90% - 5 years old or younger**

Startup Experience through SBIR/STTR Program



- ✓ **127 undergraduate and high-school students were supported in FY2013**
- ✓ **70 Postdoc fellows were supported in last 2 years**

IntraLase Corp

- "The Origins of Laser Cataract Surgery"
- Fundamental research: NSF STC "Center for Ultrafast Optical Science"

- Around 1994: Company founded (Ann Arbor, MI)
- 1998-2001: NSF SBIR Phase I & II
- Acquired by Advanced Medical Optic for $808M, which was later acquired by Abbott Laboratories

BLUEFIN LABS, Inc.

- Social web and TV analytics to index video
- Based on the founder's Ph.D. thesis research performed at MIT's Media Labs
- Fundamental research: supported by NSF

- 2008: founded (Cambridge, MA)
- 2008-2012: NSF SBIR Phase I & II
- 2013: Acquired by Twitter for about $100 million

ABS Materials

- Produced water treatment using nano-engineered material
- Fundamental research: supported by NSF

- 2008: founded (Wooster, OH)
- 2010-present: NSF SBIR Phase I & II
- 2010: # of full-time employees = 4
- 2013: # of full-time employees = 52
- Forbes “Names You Need to Know: Osorb”

Collaboration with Other Federal Agencies

- Inter-agency working groups
- Many partnerships in basic research funding
  - DoD, DoE, NIH, …
- University researchers receive funding from many Federal agencies as well as industry, state, and local governments
- I-Corps™
  - DoE (ARPA-E)
  - Potential: NIH, DoD, USDA, …
- SBIR/STTR
  - Member of the Federal SBIR/STTR team

Closing Thoughts

- Stimulate industry-inspired and market-relevant pre-competitive research
- Connect to market reality
- Develop next-generation innovators and entrepreneurs

Questions?

Ideas, thoughts!

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