NSF Support for Research in the 21st Century Innovation Environment

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National Science Foundation

October 17, 2018

Presentation Outline

- Introduction
- National Science Foundation
  - Mission
  - Vision
  - Core Values
- NSF Initiatives
  - Big Ideas
  - Idea Machine
  - Convergence Accelerators
- Bridging the Gap
  - Lab to Market
  - Accelerating Impact
  - Partnerships
- Discussion

National Science Foundation
Alexandria, Virginia

Mission and Vision

Mission

"to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."

Vision

"A Nation that is the global leader in research and innovation."

"Partnerships with other federal agencies, nonprofits, private-sector collaborators, industry partners and the public will help advance these research areas."

Dr. France Córdova
Director, National Science Foundation

Core Values: Excellence, Public Service, Learning, Inclusion, Collaboration, Integrity, Transparency

Big Ideas

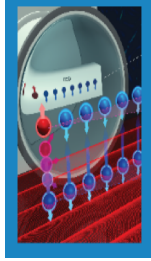
RESEARCH IDEAS

Harnessing Data for 21st Century Science and Engineering

Work at the Human-Technology Frontier: Shaping the Future

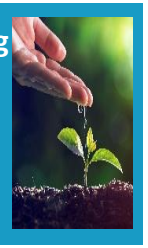
Navigating the New Arctic

Windows on the Universe: Multi-messenger Astrophysics



Quantum Leap: Leading the Next Quantum Revolution

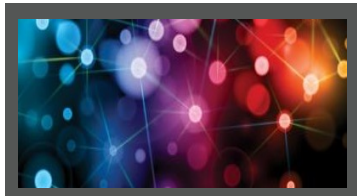
Understanding the Rules of Life: Predicting Phenotype



PROCESS IDEAS

Mid-scale Research Infrastructure

NSF 2026



Growing Convergence Research at NSF

NSF INCLUDES: Enhancing STEM through Diversity and Inclusion

" … bold questions that will drive NSF's long-term research agenda — questions that will ensure future generations continue to reap the benefits of fundamental S&E research. "

Idea Machine

National Science Foundation

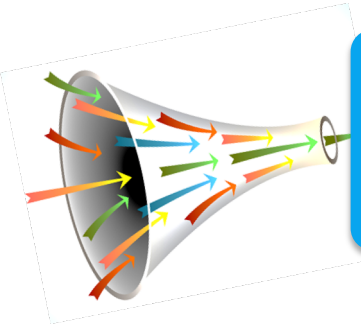
THE NSF 2026 IDEA MACHINE

- Entrants suggest ”grand challenge” questions for future research
- Video pitches & public comments
- A blue-ribbon panel advises NSF
- Best ideas receive public recognition, cash prizes
- Launches around August 31, 2018
- http://bit.ly/NSF_IDEA_MACHINE

Identifying new directions for research.

STEP 01	STEP 02	STEP 03	STEP 04	STEP 05	STEP 06	STEP 07	STEP 08	STEP 09	STEP 10
Competition opens/ entries accepted	NSF staff selects 30 representative entries	Videos invited & posted online	Public comments collected; NSF analysis added	Blue-Ribbon Panel picks 12 entries for remote interviews	Blue-Ribbon Panel recommends 6 entries	NSF staff adds analysis	NSF Leadership selects 2-4 winning entries	Prizes awarded for winning ideas	Funding opportunities

Convergence Accelerators



NSF PIs, partners, basic research results

Team Seeding

- Organic or through structured workshops
- Multi-disciplinary
- Diverse membership

Team Formation

- Cohorts of ~20 teams in 3-5 tracks
- ~6 months
- **Ideation**
- **Convergence**
- **Team dynamics**

Accelerated Research

- Large grants to selected teams
- Semi-annual or annual reviews
- Maintain cohort structure

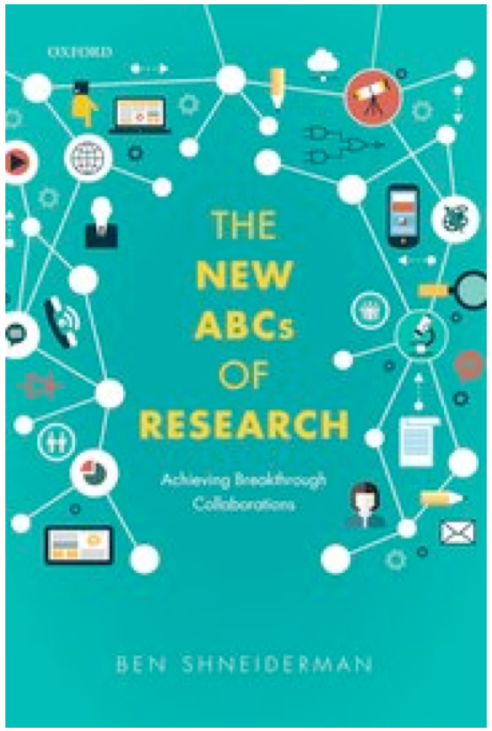
Prize(s)

Review

Pitch

Compete

Bridging the Gap: Accelerating Research to Impact

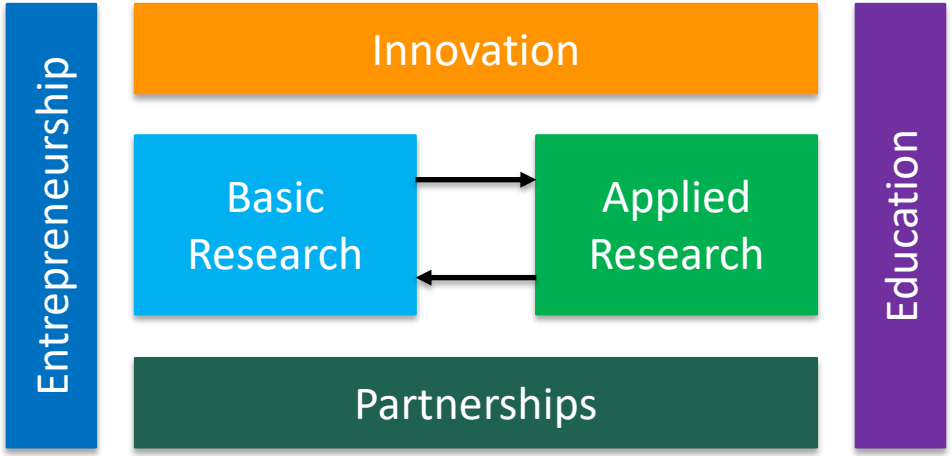


The ABC Principle

Combining applied and basic research produces higher-impact research, compared to doing them separately.

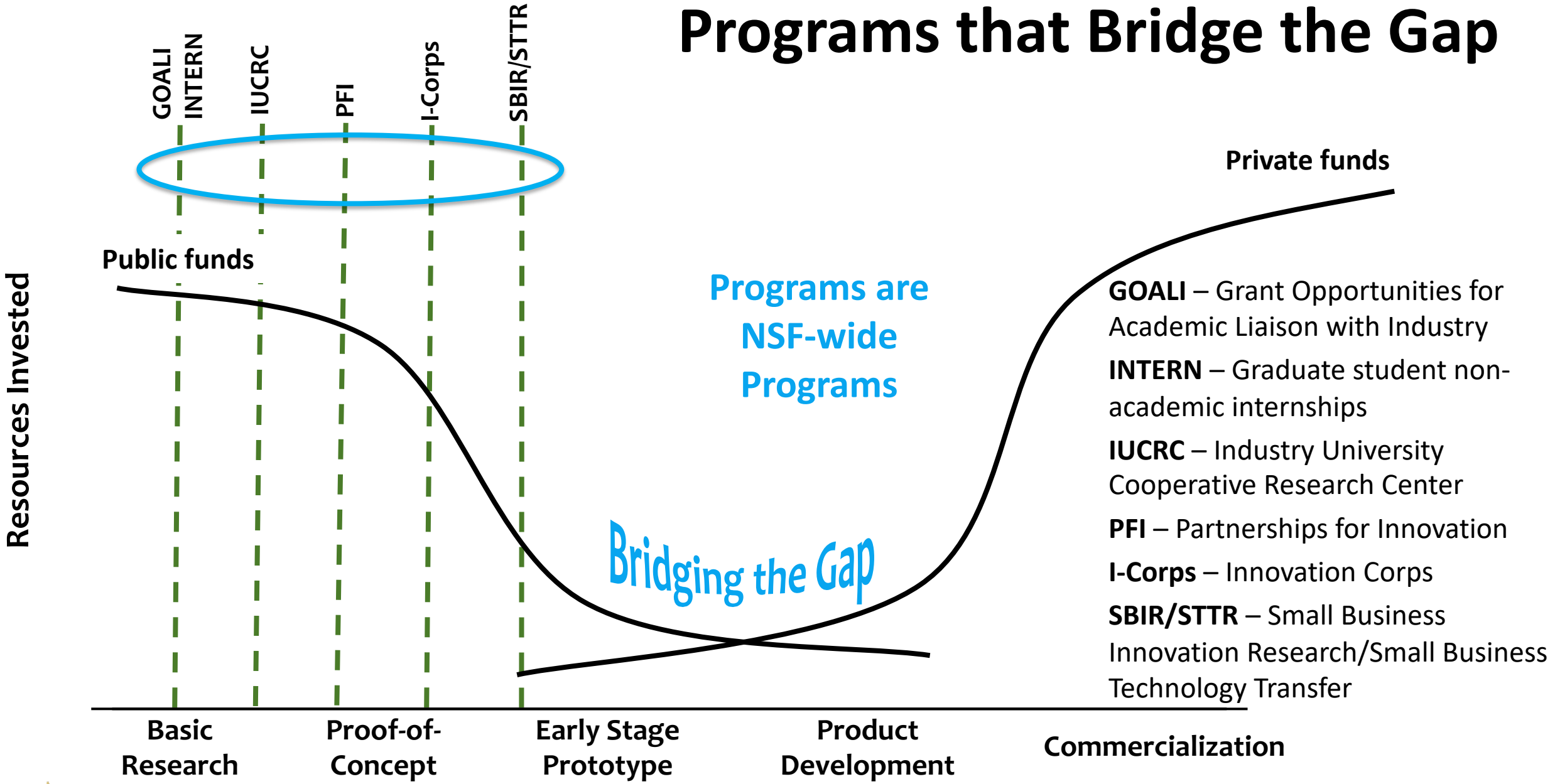
ABC – Applied and Basic Combined

ABC – Achieving Breakthrough Collaborations



Source: Ben Shneiderman, *The New ABCs of Research – Achieving Breakthrough Collaborations*, Oxford University Press, Oxford, United Kingdom, 2016.

Programs that Bridge the Gap



GOALI – Grant Opportunities for Academic Liaison with Industry

INTERN – Graduate student non-academic internships

IUCRC – Industry University Cooperative Research Center

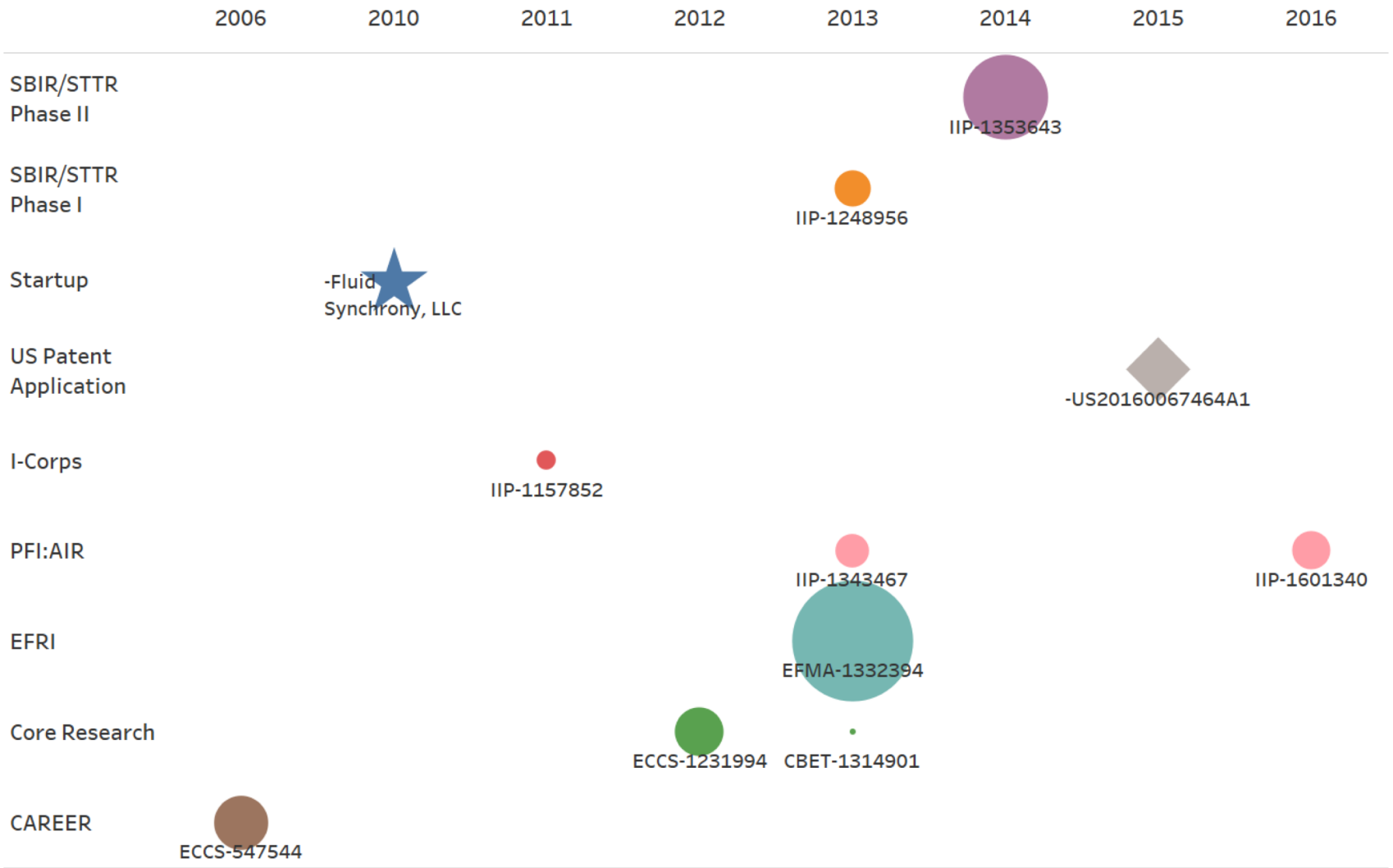
PFI – Partnerships for Innovation

I-Corps – Innovation Corps

SBIR/STTR – Small Business Innovation Research/Small Business Technology Transfer

Example Transition of Basic Research to Market

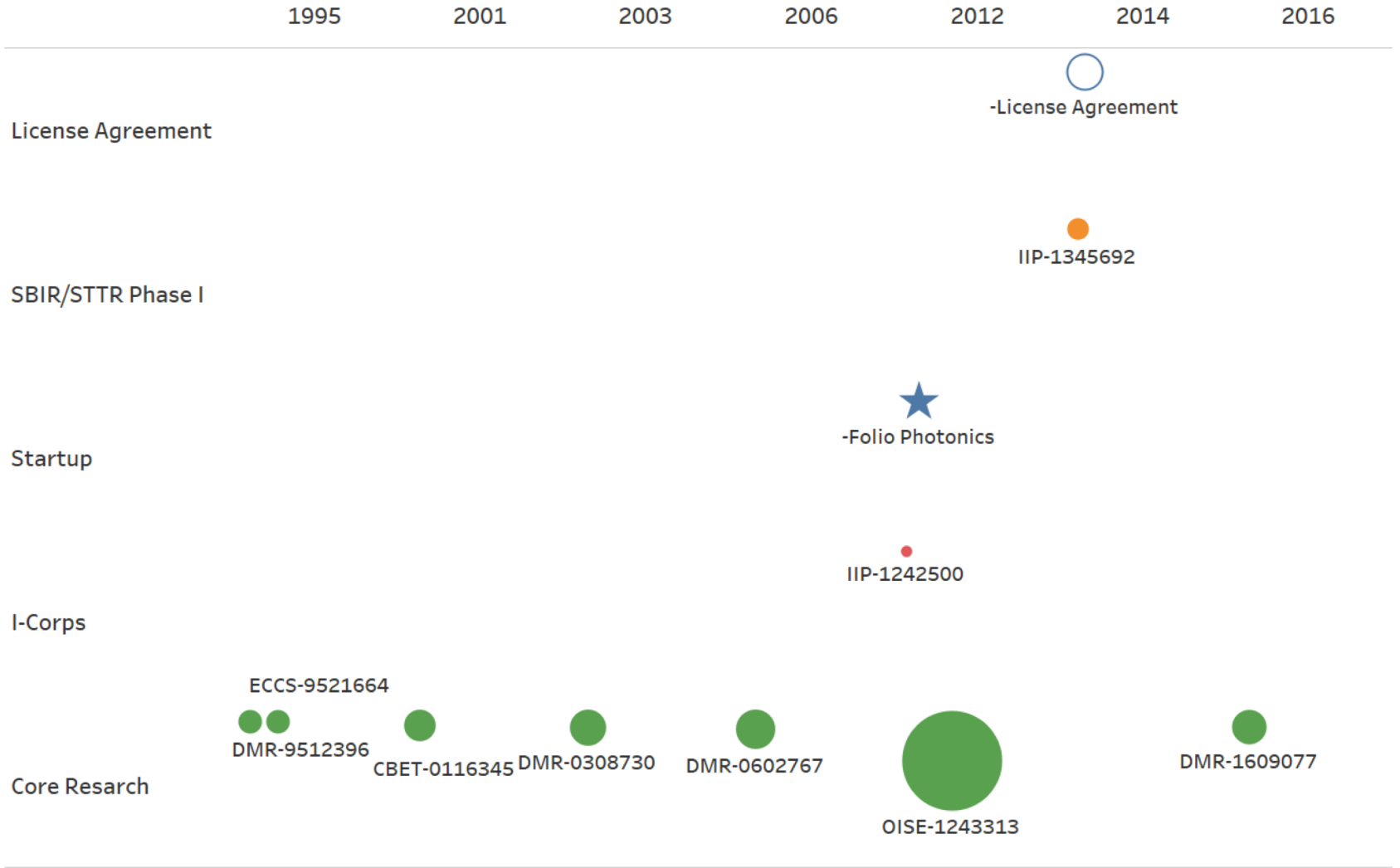
Dr. Ellis Meng
University of Southern California



Example Transition of Basic Research to Market

Dr. Kenneth Singer
Case Western Reserve University

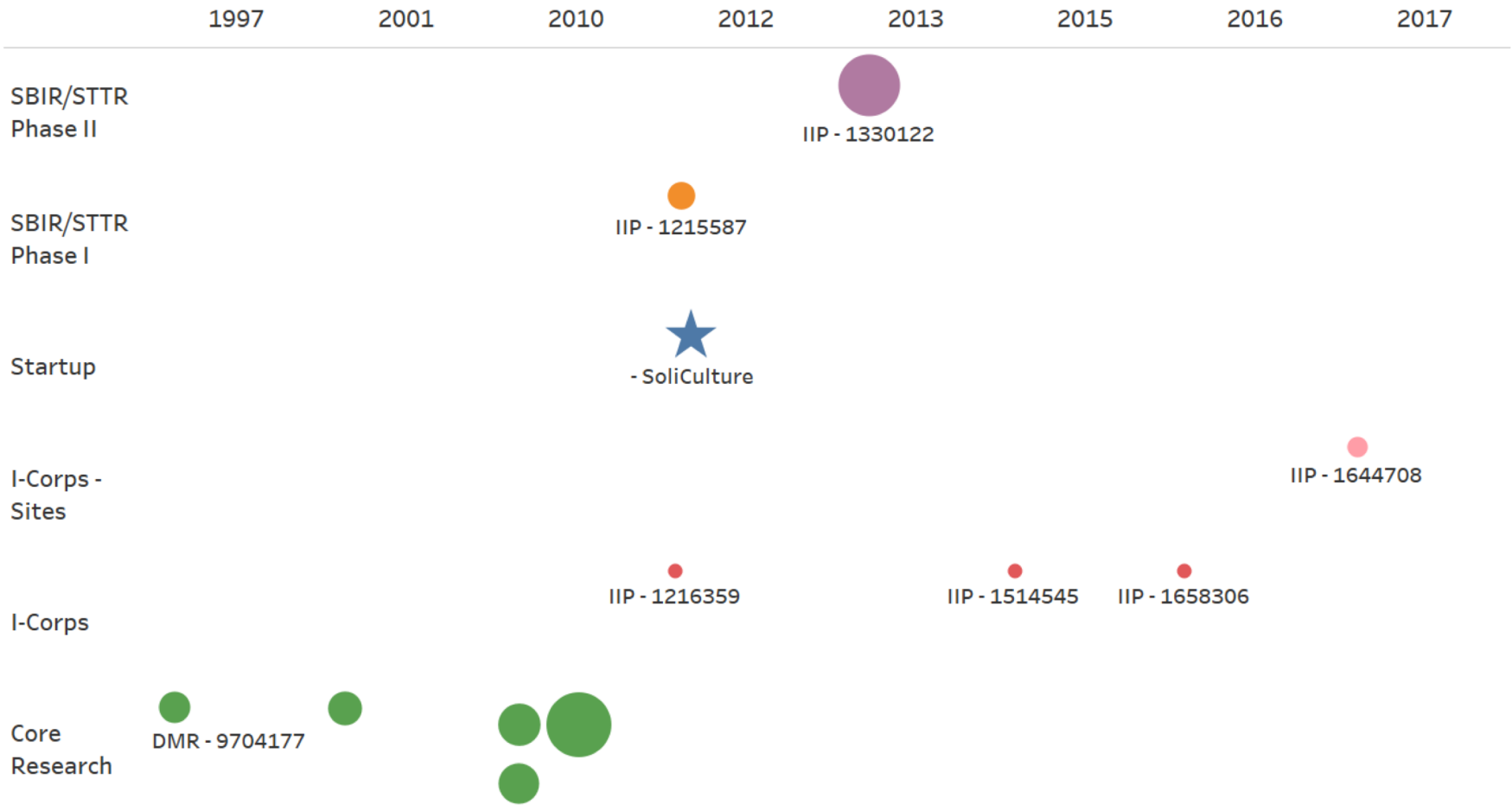
Folio Photonics
Terabyte scale optical data storage



Example Transition of Basic Research to Market

Dr. Sue Carter
University of
California-Santa Cruz

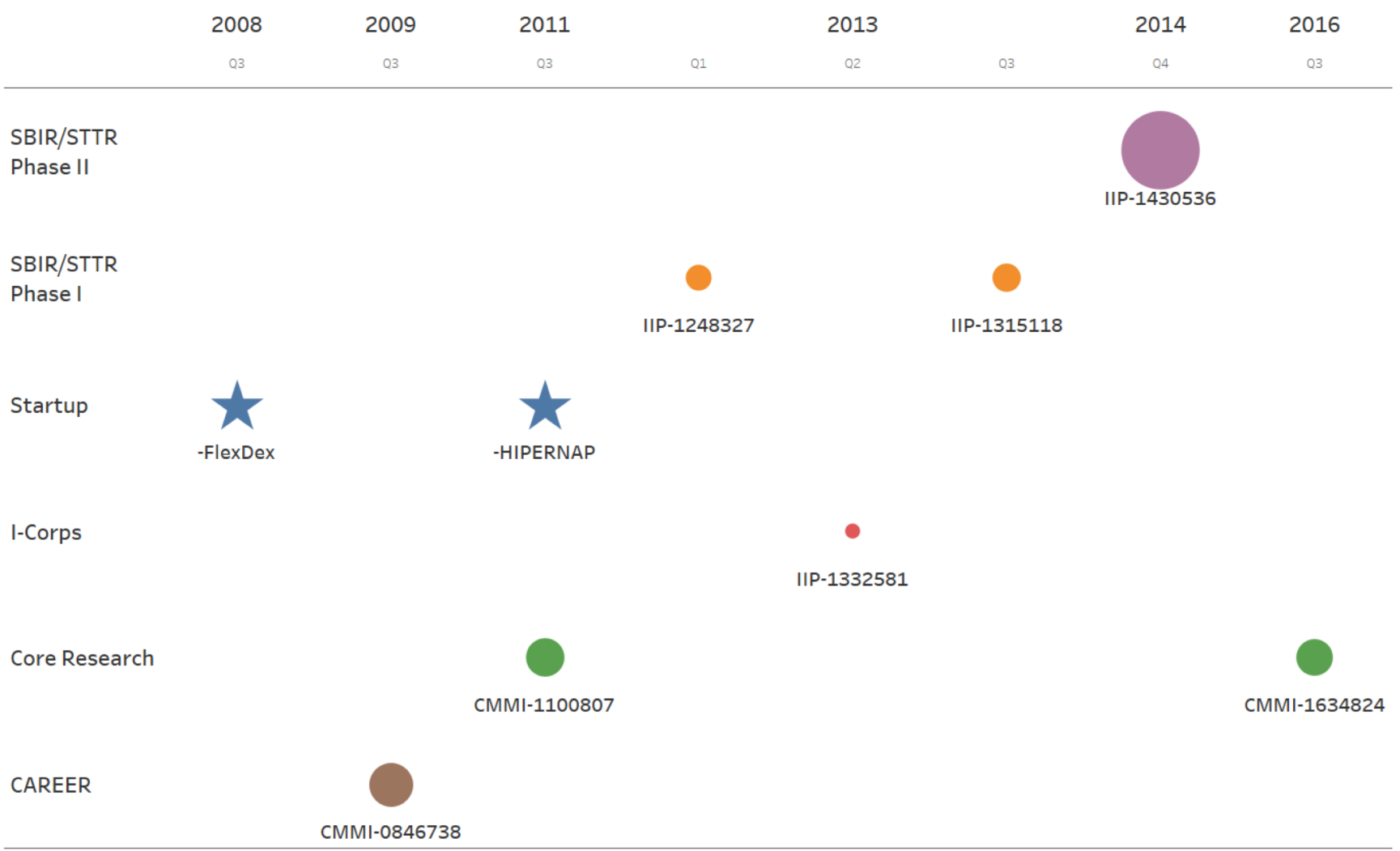
SOLI CULTURE



Example Transition of Basic Research to Market

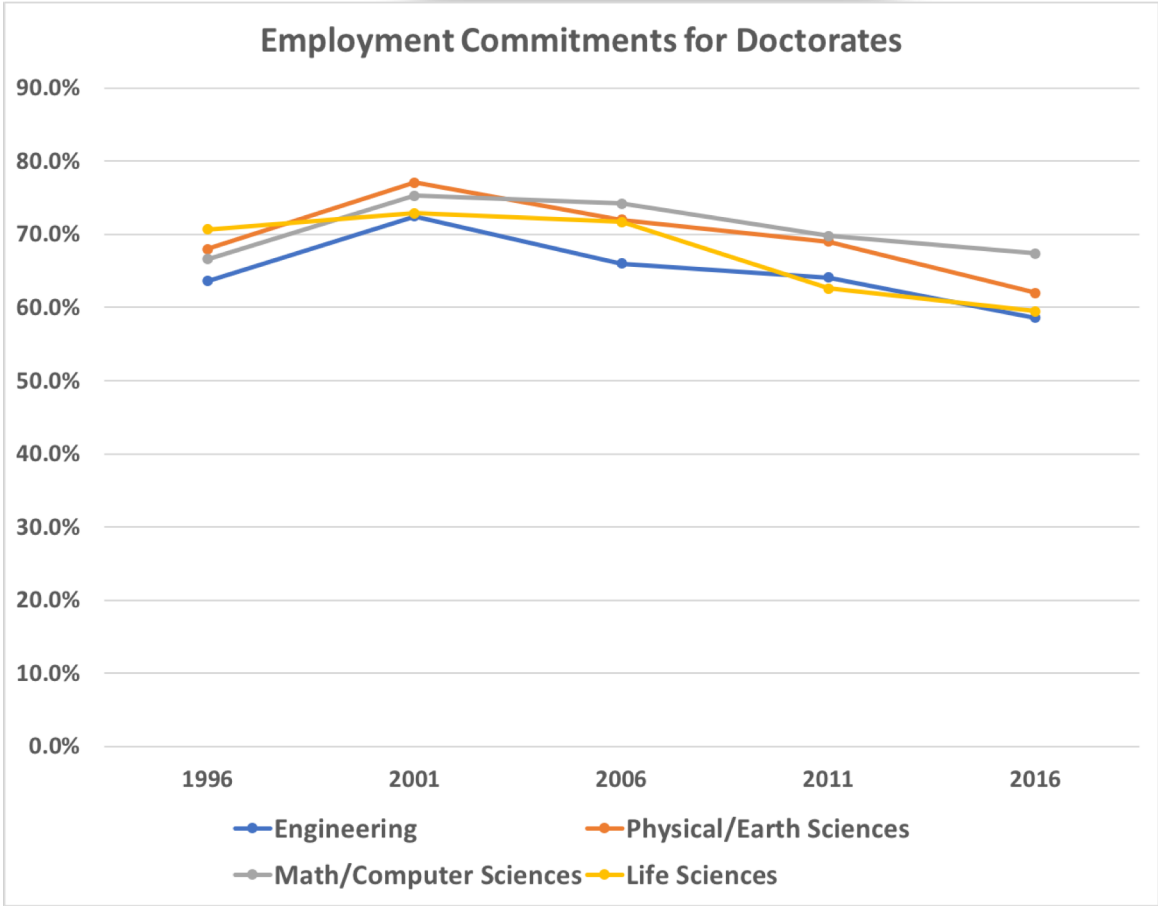
Dr. Shorya Awtar
University of Michigan
Ann Arbor

FlexDex SURGICAL™



INTERN

- Non-academic graduate research internships.
- Host organizations:
  - Industry laboratories or research and development groups.
  - Start-ups or small businesses.
  - Government agencies and National Laboratories.
  - Policy think-tanks.
  - Non-profit organizations.
- Supplement to any active NSF research grant.
- Up to six months for up to $55,000.
- 195 internships funded (first 15 months).
- 200 internships planned (Fiscal Year 2019).
- All NSF Directorates participating.



Source: National Center for Science and Engineering Statistics (NCSES), Doctoral Survey, 2016

IUCRC Partnership Model

IUCRC Research Domain

Academic Fundamental Research

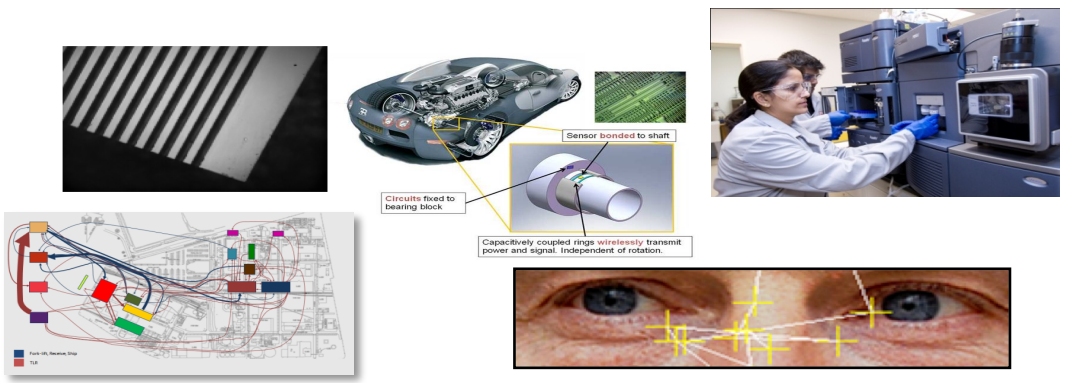
Pre-Competitive Research

Industry Applied and Competitive Research

Partnership Domain

- **Use-Inspired**
- **Fundamental Research**
- **Jointly Funded**
- **Non-exclusive IP access**
- **Trusted relationships**
- **Delivery of value**

- Advanced Electronics and Photonics
- Advanced Manufacturing
- Advanced Materials
- Biotechnology
- Civil Infrastructure Systems
- Energy and Environment
- Health and Safety
- Information Communication & Computing
- System Design and Simulation



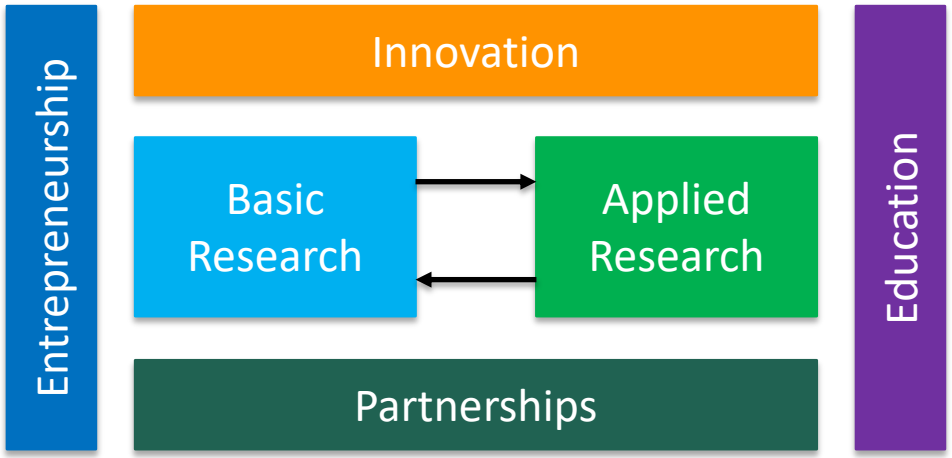
IUCRC

- Focused on long-term partnerships.
  - Between industry, university, and government.
  - Cooperatively defined and shared pre-competitive research.
- 74 Active Centers.
- 211 research sites.
- 37 states with at least one IUCRC site.
- 6 international sites.
- 876 unique members
- ~2,500 graduate students supported in centers.

Especially encouraging IUCRCs that focus on the "Big Ideas" and related topics.

PFI

- Program goals:
  - Accelerate translation of research results to societal impact.
  - Promote a sustainable university-based innovation ecosystem.
  - Train faculty and students in technological innovation.
  - Engage women and other underrepresented groups in innovation.
- PFI-RP grants are up to $750,000 over 3 years.
  - Focused on multidisciplinary teams.
  - Requires an industry partner.
  - Proof of concept demonstrations or prototypes.
- PFI-TT grants are up to $200,000 over 18 months.
  - Applied research.
  - Proof-of-concept demonstrations or prototypes.



PFI-RP – Partnerships for Innovation-Research Partnerships
PFI-TT – Partnerships for Innovation-Technology Translation

I-Corps™

- Program goals
  - Spur translation of fundamental research to the market.
  - Encourage collaboration between academe and industry.
  - Train NSF-funded researchers in innovation and entrepreneurship.
- Components of I-Corps™
  - Teams – Technical Lead (TL), Entrepreneurial Lead (EL), Mentor (M).
  - Nodes – Hubs that engage scientists and engineers.
  - Sites – Institutions that catalyze the engagement of local teams.
- Results to date
  - 9 Nodes (28 universities)
  - 96 Sites (96 universities)
  - 1,316 Teams trained
  - 640 startups created
  - $313 million raised by startups

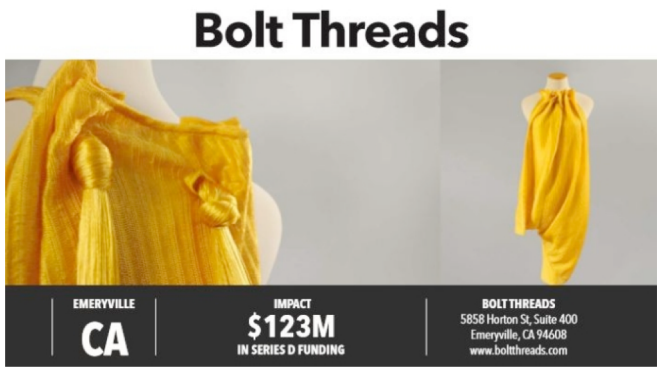
I-Corps@NIH

I-Corps@DoD

Lab-Corps

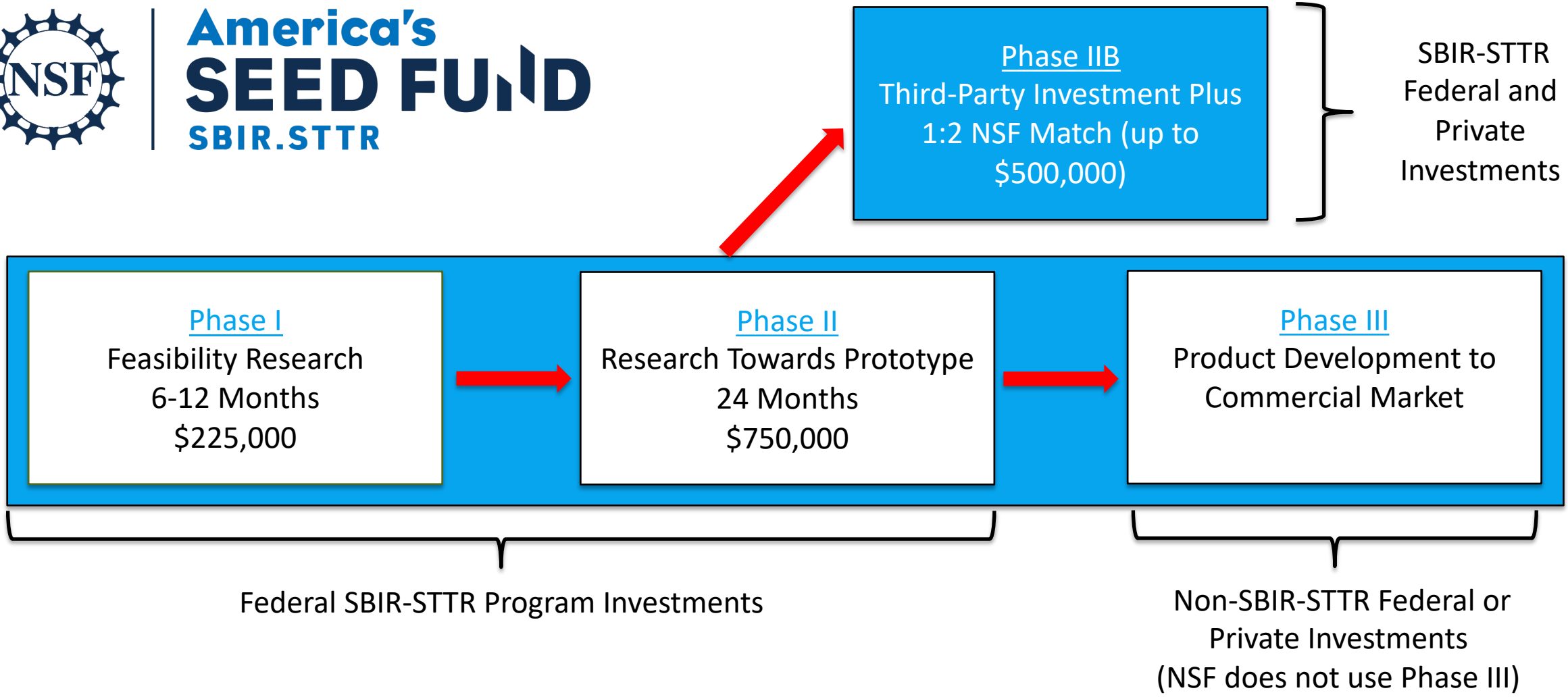
SBIR-STTR

- SBIR started at NSF in 1976.
  - 11 federal agencies have SBIR programs.
  - Budget is 3.2% of agency's extramural research and development budget.
- STTR added in 1992.
  - 5 federal agencies have STTR programs.
  - Budget is 0.45% of extramural research and development budget.
- Program Goals
  - Stimulate technological innovation.
  - Increase commercialization of innovations derived from Federal research.
  - Meet federal research and development needs.
  - Foster and encourage participation by disadvantaged persons.
  - Foster technology transfer from research institutions.



SBIR – Small Business Innovation Research
STTR – Small Business Technology Transfer

NSF SBIR-STTR Model



Questions and Contact

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