
The Shape of Things to Come

Today's Landscape

Of Interdisciplinary Research

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Large Proposal Expectations

Large proposals are more complex and require PIs to address several areas in addition to research, often including:

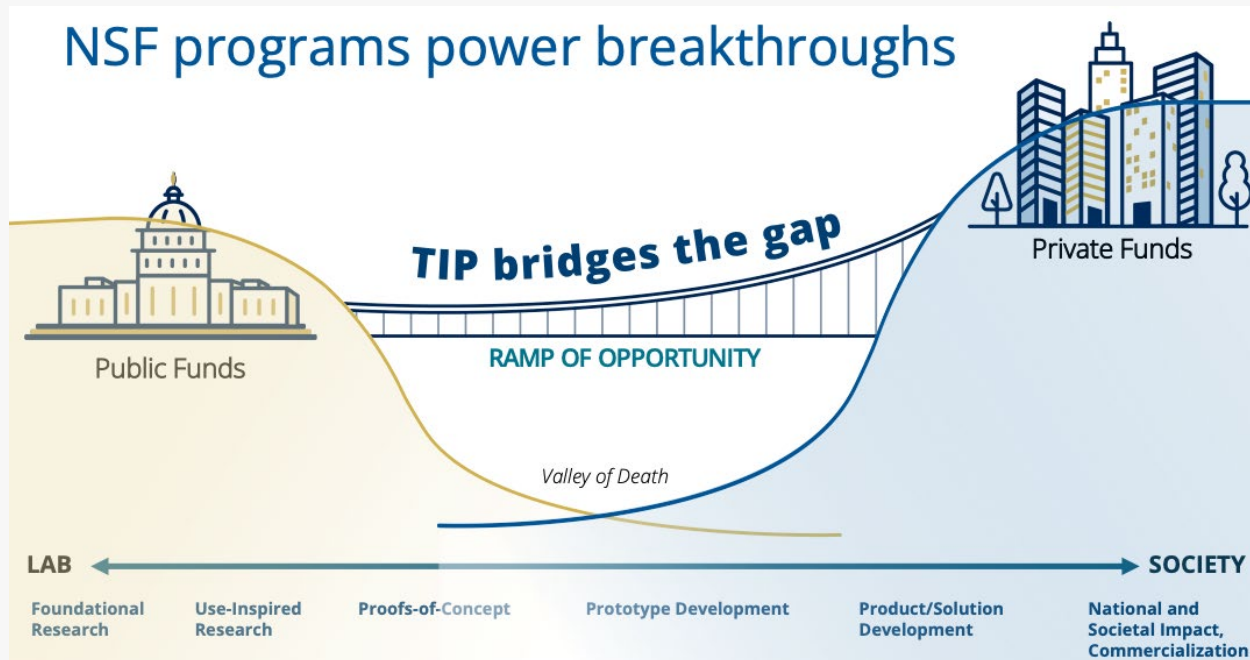
- Convergence
- Partnerships, Commercialization, and Tech Transfer
- Education and Workforce Development
- Diversity, Equity, Inclusion, Justice, and Acceptance (DEIJA)
- Comprehensive management, oversight, and advisory plans

A Changing Landscape

The CHIPS and Science Act of 2022 directed \$280B in scientific R&D spending. Passage of the CHIPS Act led directly to the creation of the new Technology, Innovation and Partnerships (TIP) directorate at the NSF.

The Inflation Reduction Act (IRA) of 2022 directed nearly \$400 billion in federal funding to clean energy, with the goal of substantially lowering the nation's carbon emissions by the end of this decade. IRA led to an immediate allocation of \$1.5B in the DOE Office of Science's FY22 budget.

A Changing Landscape



Other shifts:

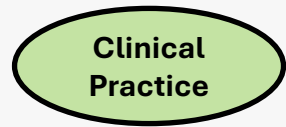
- Community input is critical, and valued
- The definition of the “community” is expanding
- The line between basic and applied research funding continues to blur
- Intent is to bridge research to product development – the “valley of death”

Convergence Research

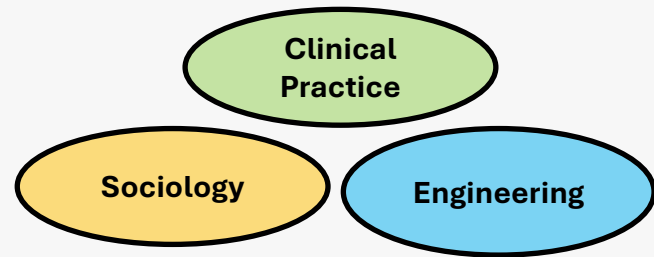
NSF Definition: Convergence research is a means of solving vexing research problems, especially those focusing on societal needs. It has two primary characteristics:

- It is driven by a specific and compelling problem, whether that problem arises from deep scientific questions or pressing societal needs.
- It shows deep integration across disciplines. Convergence research intentionally brings together intellectually diverse researchers to develop effective ways of communicating across disciplines. As experts from different disciplines pursue a common research challenge, their knowledge, theories, methods, data and research communities increasingly intermingle.

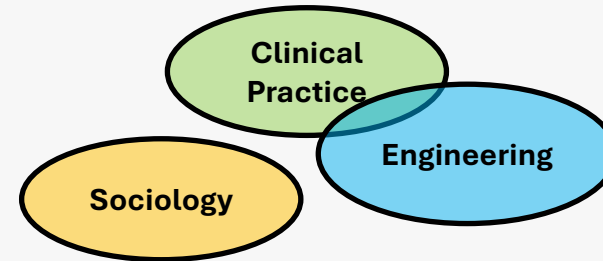
Convergence Research



Disciplinary

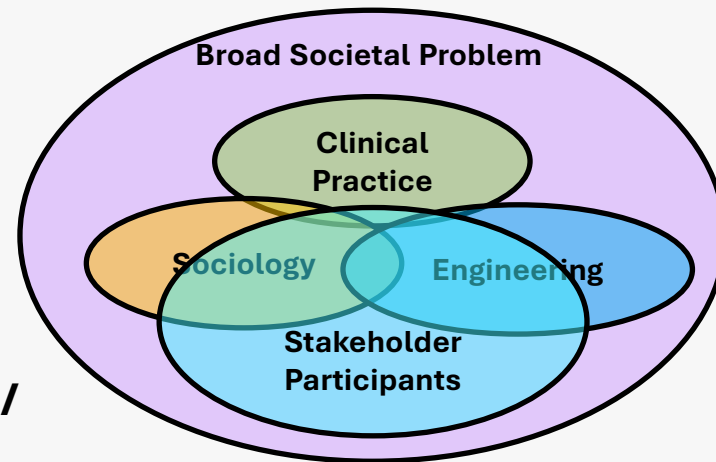


Multidisciplinary



Interdisciplinary

(Can address smaller short-term problems)



**Transdisciplinary /
Convergence**

Convergence Research: Two critical questions

How do you build a transdisciplinary research team?

How do you engage the stakeholders?

Partnerships: Why?

Objective: De-risk funder investment

- Increase impact opportunity
- Decrease time to impact

Funding opps often require partners:

- Primarily Undergraduate Institutions (PUIs)
- Minority Serving Institutions (MSIs)
- Commercialization Partner(s)
- Knowledge-to-Action Specialists
- Technical Experts
- Stakeholders

“Diversity of perspective and expertise is a fundamental aspect of convergence...”

National Research Council, 2014

Partnerships: Who?

- Industry
- Community Agencies and NGOs
- Academic Institutions (*PUIs, MSIs*, community colleges, other universities)
- National Laboratories & Research Centers (DOE, NASA, DOD)
- Strategic Broader Impact Partners
- Institutional Colleagues (researchers, STEM Education outreach specialists, practitioners)
- *Commercialization Partner(s)*
- *Knowledge-to-Action Specialists*
- *Technical Experts*
- *Stakeholders*

Partnerships: How?

- Partnerships need to be authentic
- Seek conversations early and often
- Engage partners in iterative design process
- Build value proposition and intellectual asset management into research lifecycle
- Recognize the challenges
- Identify resources
- Invest in creating a team with your partner

Interdisciplinary Teams

To take full advantage of partnerships, it's critically important to acquire the skills to manage multiple frames of reference that will include:

- Different vocabularies
 - Different senses of data and what it means
 - Different methodologies
 - Different approaches to making decisions and sharing responsibility
 - Learning to listen to and work through differences
-

Interdisciplinary Teams: Benefits

- Increases competitiveness of proposals
- Builds pipeline for bringing undergraduate, graduate students, and post-docs to your research group
- Write and publish more papers
- Experience less unproductive competition
- Creates more inclusive working environments
- Includes diverse skill sets needed to manage large complex project

References and Resources

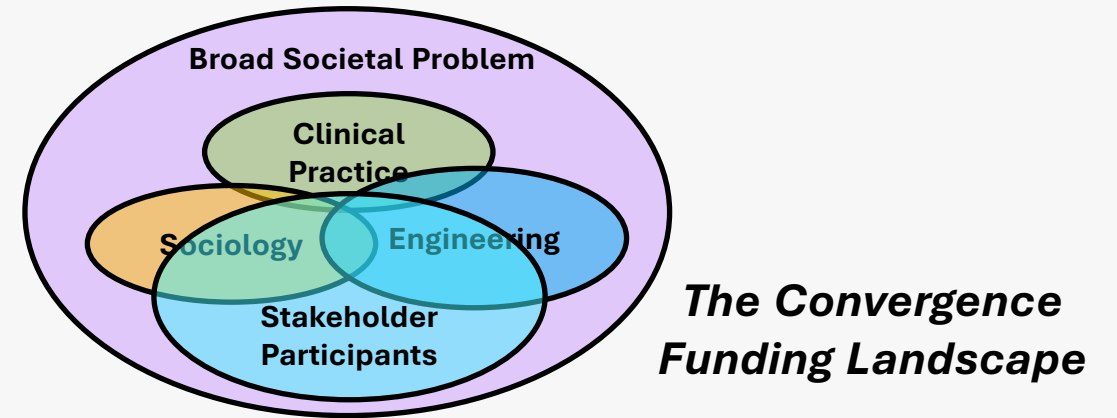
The CHIPS and Science Act: Here's what's in it. October 4, 2022. <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/the-chips-and-science-act-heres-whats-in-it>

The Inflation Reduction Act: Here's what's in it. October 24, 2022. <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/the-inflation-reduction-act-heres-whats-in-it>

Meet TIP – Technology, Innovation and Partnerships. A new directorate at the U.S. National Science Foundation. <https://beta.nsf.gov/tip/latest>

DOE Projects Putting Inflation Reduction Act Funds to Work. December 1, 2022. <https://www.aip.org/fyi/2022/doe-projects-putting-inflation-reduction-act-funds-work>

Transdisciplinary / Convergence Research References:



[Where it started for the NSF:](#)

Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond (National Research Council 2014)

Characterizes and provides examples of convergence in relation to other forms of research such as multidisciplinary, interdisciplinary and transdisciplinary. Discusses strategies that foster convergence in organizations and revising STEM education to facilitate convergence.

[NIH's Follow On:](#)

Convergence: The Future of Health (Sharp et al. 2016)

Describes opportunities for convergent approaches in the biomedical sciences, such as in treating brain disorders, cancer, and infection and immunity.

[Other References:](#)

Principles and Methods that Facilitate Convergence (Roco 2016)

Describes approaches to facilitate a more effective and rapid process of convergence across scientific and technological domains.

Convergence of Knowledge, Technology and Society: Beyond Convergence of Nano-Bio- Info-Cognitive Technologies (Roco et al. 2013)

Characterizes convergence as part of a fundamental dynamic, the *convergence-divergence cycle*, that has existed throughout the history of scientific and technological development.

The Third Revolution: The Convergence of the Life Sciences, Physical Sciences, and Engineering (MIT 2011)

Describes convergence as the third revolution in biomedical research, following molecular/cellular biology and genomics.

The Co-evolution of Human Potential and Converging Technologies (Roco and Montemagno 2004)

Concludes that "human abilities in learning, working and active aging will intimately depend on the confluence of various technological, medical, cognitive and social developments."

Resources for Team Building

Pursue team science and start learning the science of team science

Explore through pilot programs at your institution—Dartmouth Venn Vision grants and UNH CoRE program, among others

Gather information through innovation incubators—Dartmouth's Magnuson Center and UNHInnovation

Engage in outreach to your community, industry partners, IDE colleagues

FIRST STEP? Reach out to GrantGPS and UNH Research and Large Center Development