NSF Growing Convergence Research

Town Hall Webinar

January 2025

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GROWING CONVERGENCE RESEARCH (GCR) WEBINAR AGENDA

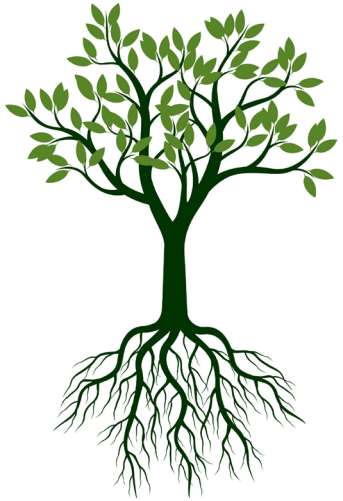
- **GROWING CONVERGENCE RESEARCH program** presenters
  - Dragana Brzakovic, dbrzakov@nsf.gov
  - Rebecca Morss, reellis@nsf.gov
  - Chet McLeskey, chetmcleskey@toolboxdialogue.com
  - Michael O'Rourke, orourk51@msu.edu
- **AGENDA**
  - **Part I: Summary of frequently asked questions**
  - **Part II: Q&A**

WEBINAR INFORMATION

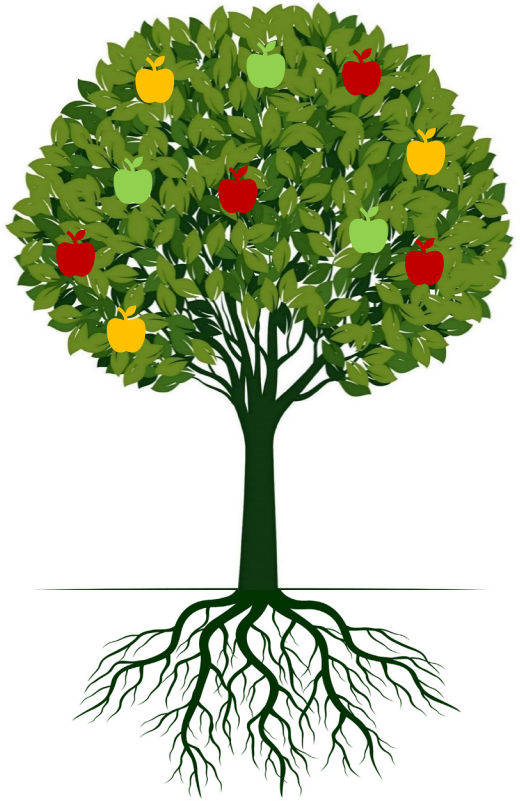
- **Goals for webinar**
  - Summarize answers to frequently asked questions about key elements of NSF GCR program
  - Address questions from attendees
- **Please ask questions using the Q&A in Zoom**, at any time during the webinar
- **Webinar slides and recording** will be posted on the NSF GCR web site in 1–2 weeks.

Cultivation of Convergenc Research at NSF

GROWING CONVERGENCE RESEARCH PROGRAM



OTHER NSF PROGRAMS AND INITIATIVES



CONVERGENCE ACCELERATORS

Growing Convergence Research Program Goals

The NSF GCR program aspires to build **new research capacity by growing the earliest foundations of convergent approaches** for addressing a specific and compelling problem resulting in **paradigm shifting approaches** within disciplines, establishment of **new disciplines** and scientific communities, or development of **transformative technologies** that have the potential for broad scientific or societal impact.

Characteristics of Convergence Research Supported by GCR

- *Research driven by a specific and compelling problem*
- *Deep integration across disciplines*. As experts from different disciplines pursue common research challenges, their knowledge, theories, methods, data, research communities and languages become increasingly intermingled or integrated. **New frameworks, paradigms or even disciplines** can form sustained interactions across multiple communities.

Growing Convergence Research
Unique Program Features

- Five-year research plan, organized as two phases (2 + 3 years)
- Initial funding for first two years, up to $1.2 million
- Mandatory workshop for each GCR team at start of award
- Reverse site visit near the end of Year 2
- Phase II funding requires exceptional progress in achieving scientific goals and developing convergent team in Phase I

Proposal Structure ⟷ Solicitation-Specific Review Criteria

- Long-term vision
  - *Is the vision motivating this proposal sufficiently compelling and ambitious to justify investment in growing new convergence research? Is there potential for this project to transform foundational scientific understanding and open new research vistas?*
- Appropriateness for this solicitation
  - *Is the proposed research appropriate for this solicitation?* ***Do the proposed ideas integrate deeply across disciplines and differ markedly from research supported by other NSF programs, solicitations, or funding mechanisms****?*
- **Research plan**
  - ***Are the goals outlined for the two phases of the research plan sufficiently novel to develop new paradigms and approaches and move the science toward addressing the problem that engendered the proposal?***
  - ***Are the proposed research activities innovative, promising, and appropriate for growing convergence research? Are these activities well-suited to building convergence and addressing scientific and/or technical challenges that are currently limiting progress?***

Proposal Structure ⟷ Solicitation-Specific Review Criteria

- Convergence Management Plan (supplementary documents) = Project Management + Convergence Management

- *Is the proposed management plan appropriate to foster an effective convergent team and advance the intended convergence and research outcomes?*
- *Is the assembled team of project participants and partners appropriate and essential for the planned project? Are the partner organizations and participants meaningfully integrated?*

Reviewers also evaluate each proposal using the 2 NSF Review Criteria

- *Intellectual Merit*
- *Broader Impacts*

Multi-institutional Proposals

items to consider

- *Collaborative proposals vs. subawards: advantages and disadvantages*

- *Foreign partners*

Growing Convergence Research: Appropriateness for GCR solicitation

- Convergence research is supported in many ways by the Programs of NSF …
  - The focus of GCR is to facilitate the growth and development of the earliest foundations of new convergence research approaches.

- Proposers must make a convincing case that the research to be conducted
  - is within NSF's purview,
  - integrates across NSF directorate or division boundaries, and
  - is currently not supported by other NSF programs or solicitations.

Growing Convergence Research: Research Emphasis

- Research plan
  - Describe the research questions or hypotheses and gaps in science, engineering and/or education knowledge that the proposed research will address.
  - Integrate knowledge, methods, and expertise from different disciplines and develop novel paradigms that catalyze scientific discovery and innovation
- Project outcomes
  - Specify the new knowledge and changes in research paradigms that are anticipated and types of outcomes that these will enable.

GCR and Deep Integration

Chet McLeskey
Michael O'Rourke

http://tdi.msu.edu/

U.S. National Science Foundation

Chet McLeskey

- Ph.D. in Philosophy
- Associate Director, Toolbox Dialogue Initiative Center, Michigan State University
- Epistemology of interdisciplinarity, team science, and communication; research ethics
- With TDI since 2017

Michael O'Rourke

- Ph.D. in Philosophy
- Executive Director, Toolbox Dialogue Initiative Center, Michigan State University
- Team science, communication, interdisciplinarity
- With TDI since 2005

Characterizing Convergence

I. "Research driven by a specific and compelling problem"*

II. *Deep integration* of different perspectives from inside and outside the academy

* National Science Foundation. (2019). Convergence research at NSF. Online at https://www.nsf.gov/od/oia/convergence/index.jsp

Locating Convergence*

Epistemic / Social	Low integration	Medium integration	High integration
Academic disciplines only	Multidisciplinarity	Interdisciplinarity	Transdisciplinarity a
Academic disciplines plus other communities		Transdisciplinarity b	

* Eigenbrode, S. D., Eckert, S., Eschen, R., Mbaabu, P. R., Schaffner, U., O'Rourke, M. (2025). Lessons for the management of cross-disciplinary research teams. In U. Schaffner, B. W. van Wilgen, A. Ehrensperger, and K. Bekele (Eds.), *The Ecology and Management of Invasive Prosopis Trees in Eastern Africa* (pp. 233-254). Oxfordshire, UK: CAB International.

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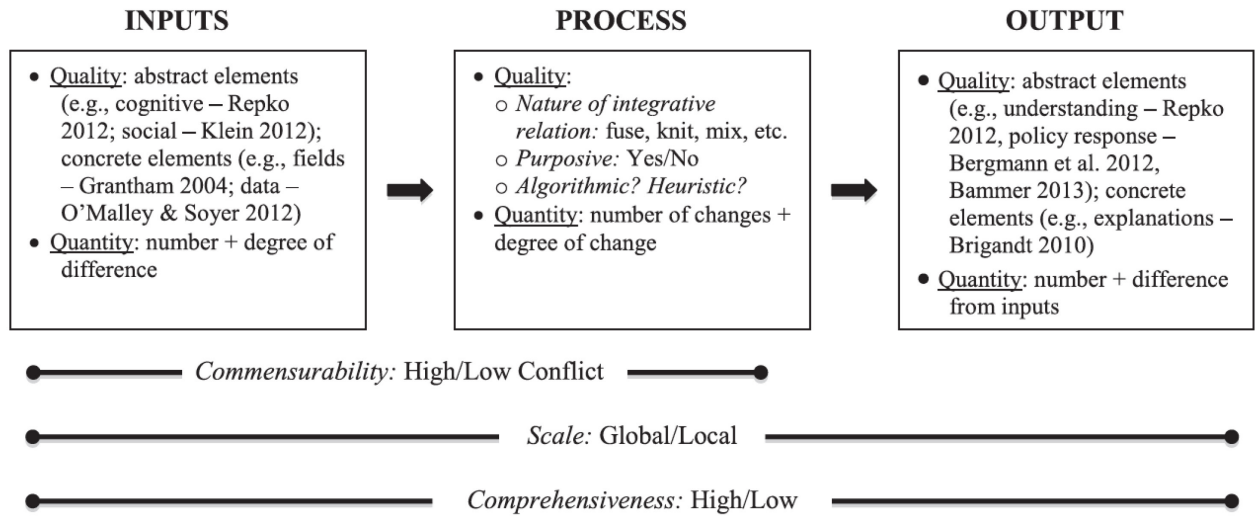
Klein, J. T. (2014). Discourses of transdisciplinarity: Looking back to the future. *Futures*, 63, 68-74.

Characterizing Integration

TOOLBOX DIALOGUE INITIATIVE ™

Integration involves:

- Combination of inputs in the production of an output
- It can be reflected in the reductio of the number of inputs
- It varies in degree according to th mutual dependence induced among the inputs



* O'Rourke, M., Crowley, S., Gonnerman, C. (2016). On the nature of cross-disciplinary integration: A philosophical framework. *Studies in History and Philosophy of Biological and Biomedical Sciences* 56: 62–70.

Characterizing Deep Integration

Deep integration can be characterized from the perspective of each part of the IPO model:

- Inputs: Combine things from fields that requires deep knowledge of them
- Process: Create mutual dependencies among inputs in the production of the output that makes it difficult or impossible to recover the inputs from the output
- Outputs: "Wow" science — something you wouldn't think of from a disciplinary angle

Be Intentional About Integration!

I. It is critical that you be *explicit* and *intentional* about integration in your projects!

- Don't just wait for the magic to happen
- What integrative outputs do you want to achieve? How will you achieve them? Who will be involved?
- One way to model this is in terms of *integrative pathways* and *integrative mechanisms*

Integrative Pathways & Mechanisms

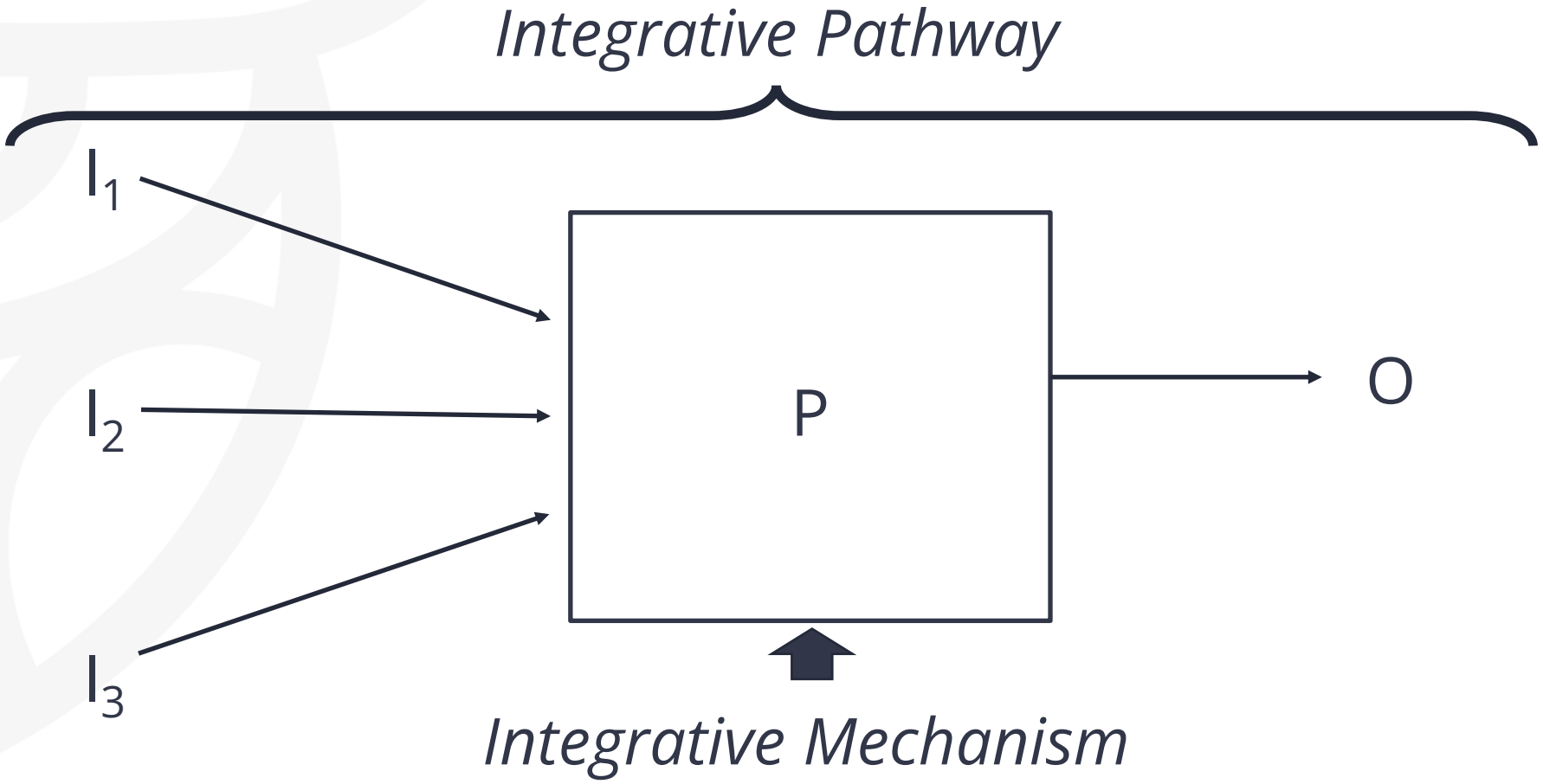
I. Integrative pathway:

- A series of changes to inputs that results in the production of an integrated output

II. Integrative mechanism:

- A device, system, tool, or approach that facilitates the combination of inputs into an integrated output

Integrative Pathways & Mechanisms



Examples of Integrative Mechanisms

TOOLBOX DIALOGUE INITIATIVE ™

I. Create a ***common goal*** to which collaborators can contribute, perhaps in sequence – e.g., conduct interviews to determine the environmental variables to foreground

II. Use a ***boundary object*** (e.g., an urban area, a watershed) to reveal relationships among different perspectives

Examples of Integrative Mechanisms

III. Use ***GIS*** to related different types of information (e.g., social, economic, physical) about a location

IV. Create a ***model (e.g., a concept map)*** of the system that elucidates causal relationships among different parts

Thank you for joining!

- Webinar slides and recording will be posted on the NSF GCR web site in 1-2 weeks
- Previous GCR informational webinars were held in March 2024 and November 2024
  - Slides and recordings are available on the NSF GCR web site
- GCR program contact information: gcr@nsf.gov