

What is the Network-to- Network Approach?

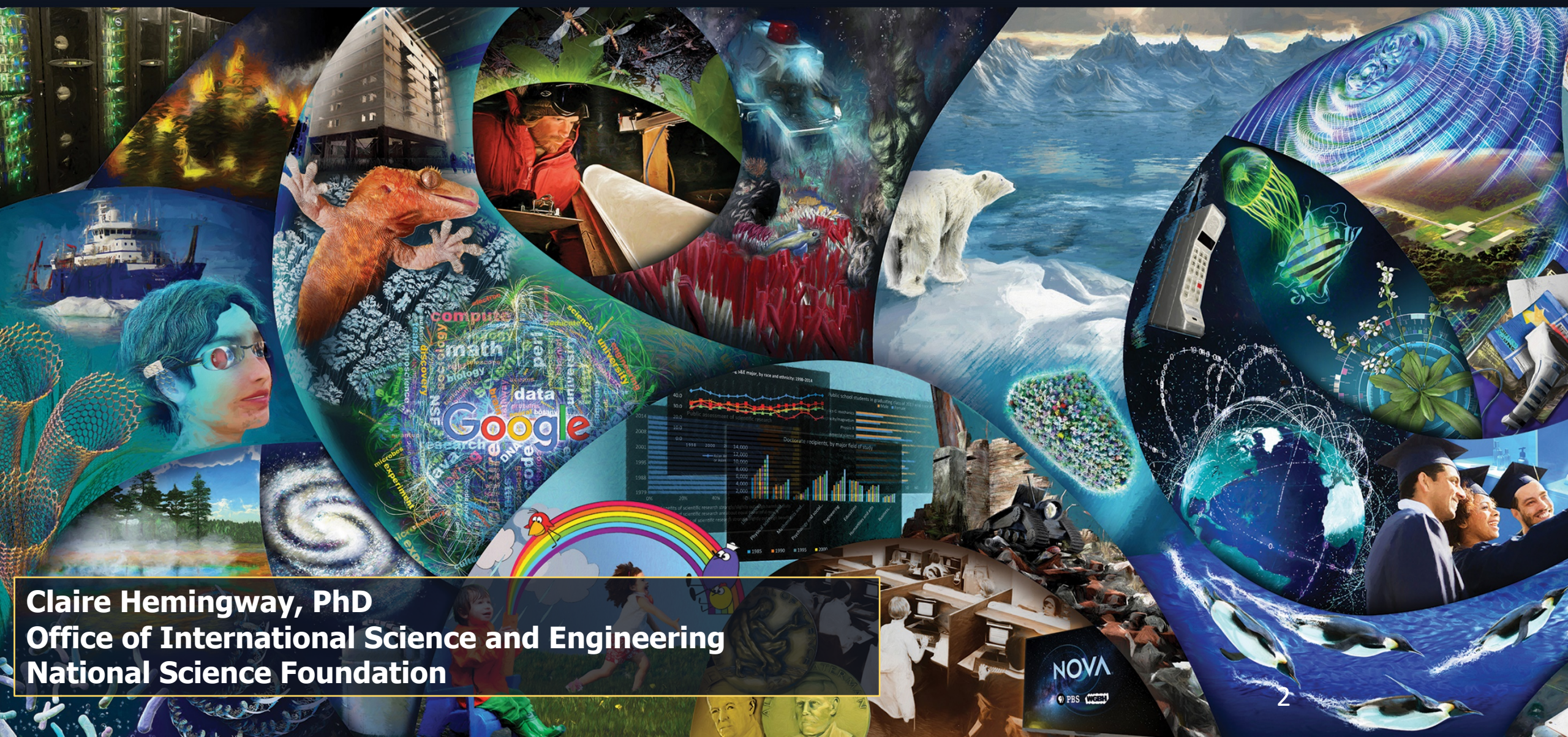
Dr. Claire Hemingway

*Program Director, Office of International
Science and Engineering*

National Science Foundation



What is the Network-to-Network Approach?



Claire Hemingway, PhD
Office of International Science and Engineering
National Science Foundation

NSF supports collaborations at multiple levels

(explicitly international opportunities underlined)

Networks of Networks: AccelNet

Networks: Research Coordination N, NeuroNex, Artic Observing N

Centers, Institutes, Consortia: Engineering Research Centers

Collaborative Research Proposals: PIRE, Dimensions of Biodiversity

Individual Research Teams: Single Investigator Grants



Example: International Network Collaboration

Next Generation Networks for Neuroscience (NeuroNex)

Technology-enabled, Team-based Neuroscience

PROGRAM SOLICITATION

NSF 19-563

REPLACES DOCUMENT(S):

NSF 16-569



National Science Foundation

Directorate for Biological Sciences
Division of Biological Infrastructure
Division of Integrative Organismal Systems

Office of International Science and Engineering



Canadian Institutes of Health Research



Deutsche Forschungsgemeinschaft



Fonds de Recherche du Québec



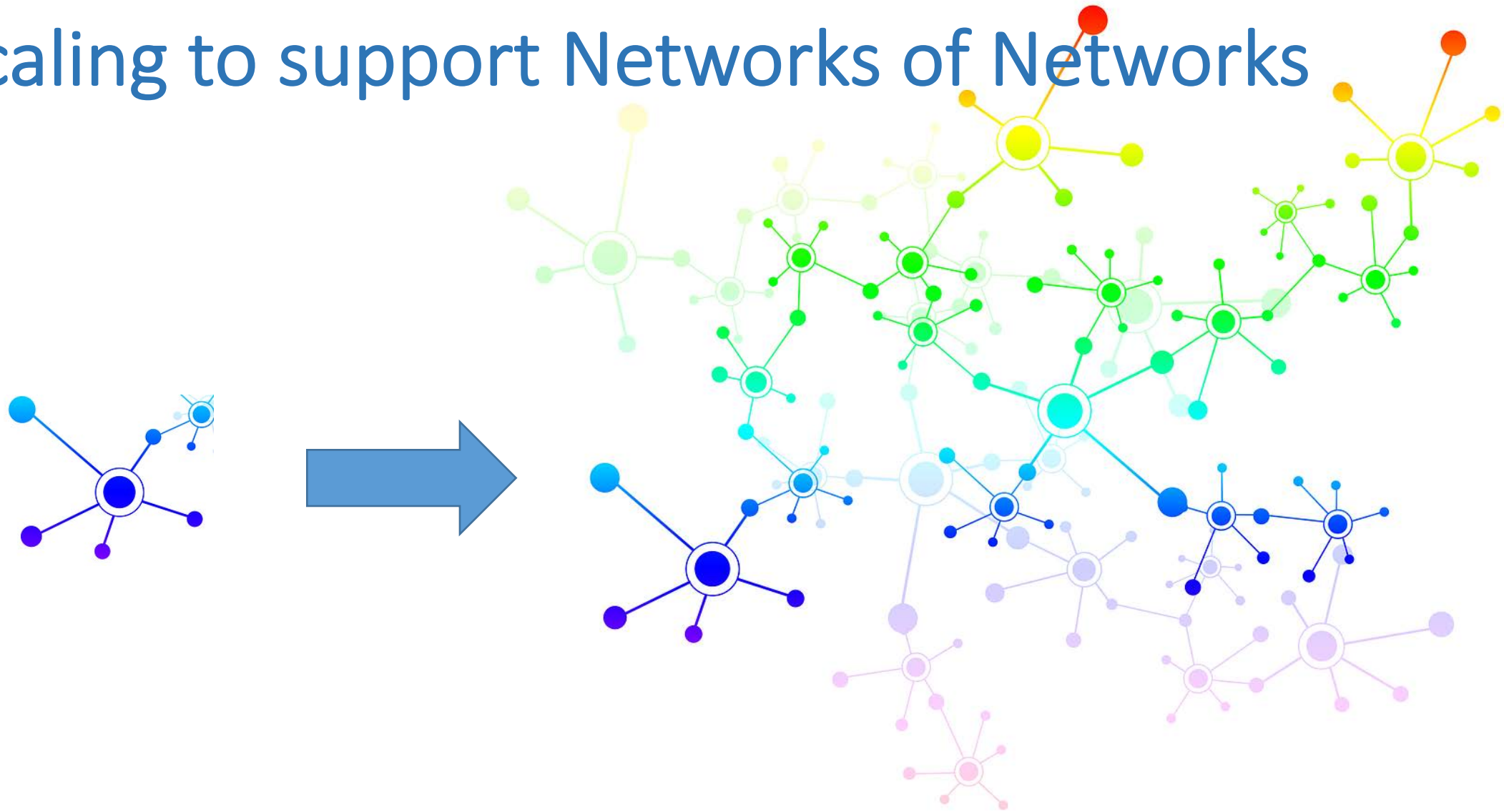
Medical Research Council (part of UK Research and Innovation)

To support collaborative networks (~ 15-20 investigators in each network) ...

enable experimentation, analysis and discovery in neuroscience at **scales much larger than currently possible.**



Scaling to support Networks of Networks



Distinguishing research groups and networks

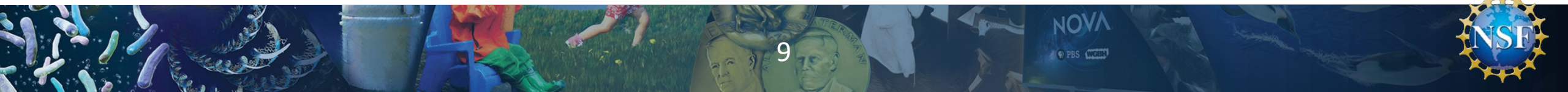
Research groups =
institutionally based
collaborations

Networks = collaborations
that cross institutional
boundaries

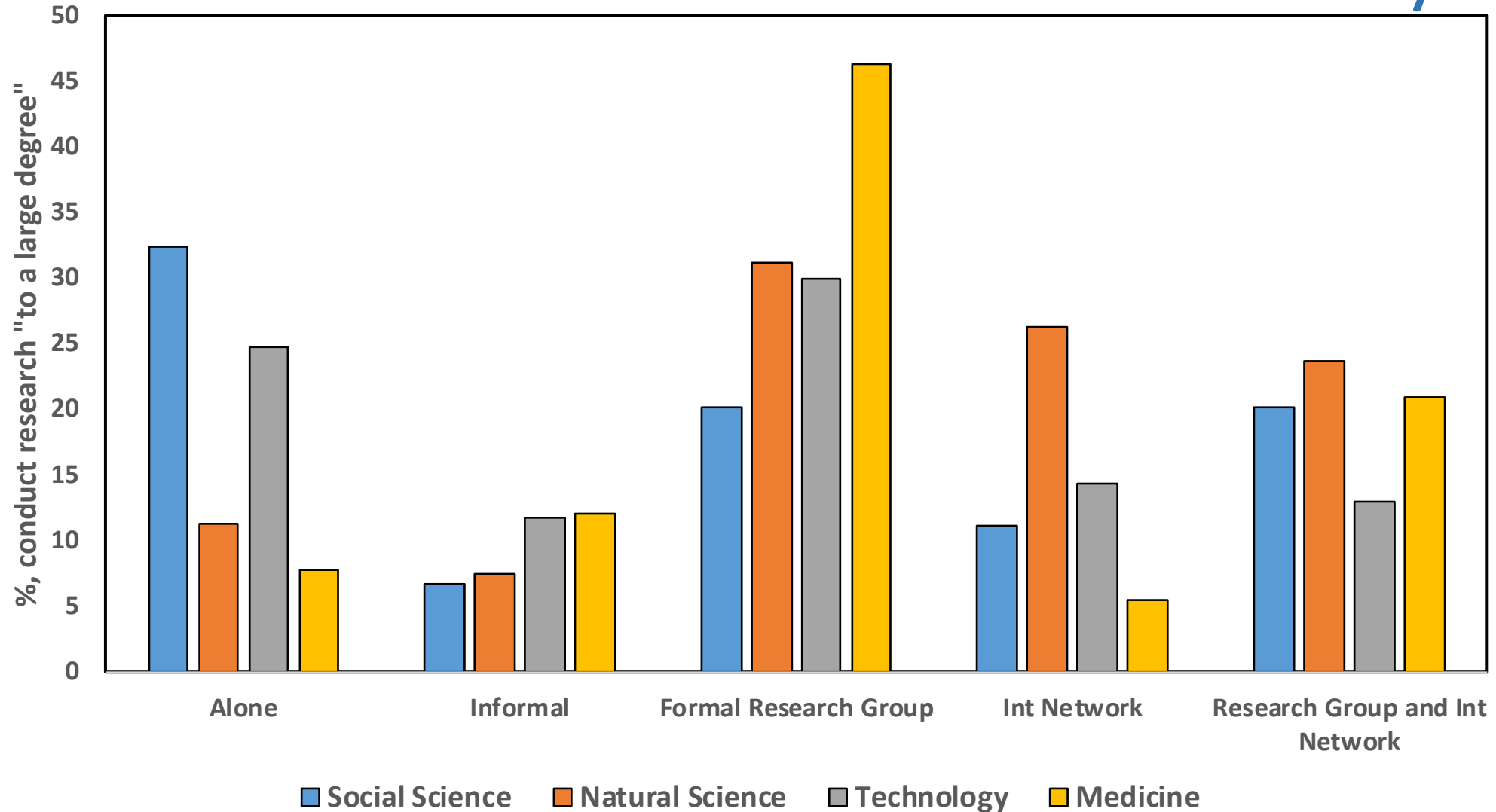
**Recognizing the
realities....**

Researchers collaborate
simultaneously in multiple ways

Kyvik, S. & I. Reymert 2017. Research collaborations in groups and networks: differences across academic fields. *Scientometrics* 113: 951-967.



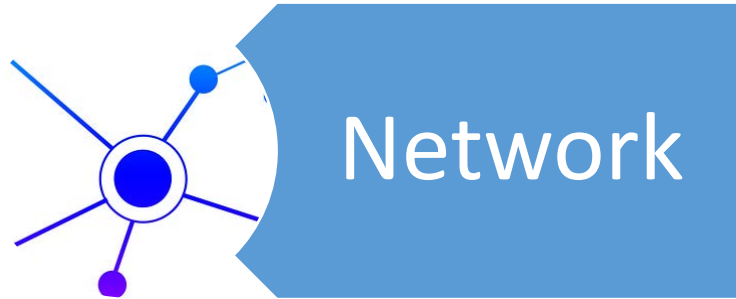
A view of research collaborations in Norway



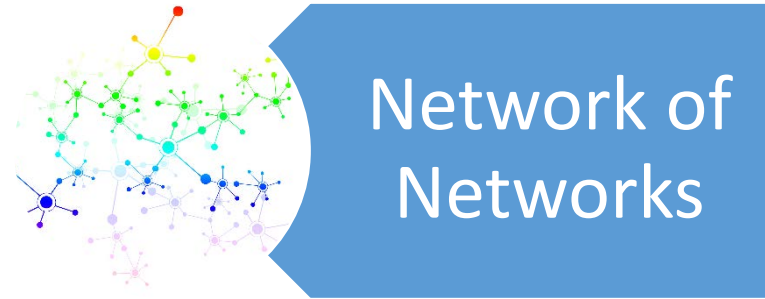
Kyvik, S. & J. Reymert 2017. Research collaborations in groups and networks: differences across academic fields.



AccelNet definitions: distribution of researchers, function of collaboration, scope of contribution



= established, **coordinated and distributed** groups of scientific researchers who **cooperate** within or across fields to collect and share **resources, knowledge, and expertise**



= formal link among networks as a “force multiplier” to **advance the frontiers of science**



Distinguishing network of networks



Not a research network of networks

- 1-2 formal research groups in US linked to 1-2 research groups abroad
- Activities/benefits limited to institutions of PI, Co-PIs
- An entity such as national laboratory, National Park Service, etc. \neq a network, but is a stakeholder in the research

Fits AccelNet view

- Key roles held by members of multiple networks/benefits to all networks
- Open membership based on shared research efforts
- Evolves overtime, with potential to expand network participants



Background on AccelNet

A look into the launch process

- Input from multiple sources

Features of current AccelNet call

- Scope, Goals, Expectations

Status

- First cohort of awards

An Artist in His Museum. By Charles Willson Peale - www.vcdh.virginia.edu, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=175516>



Activities to Inform Network of Network Program

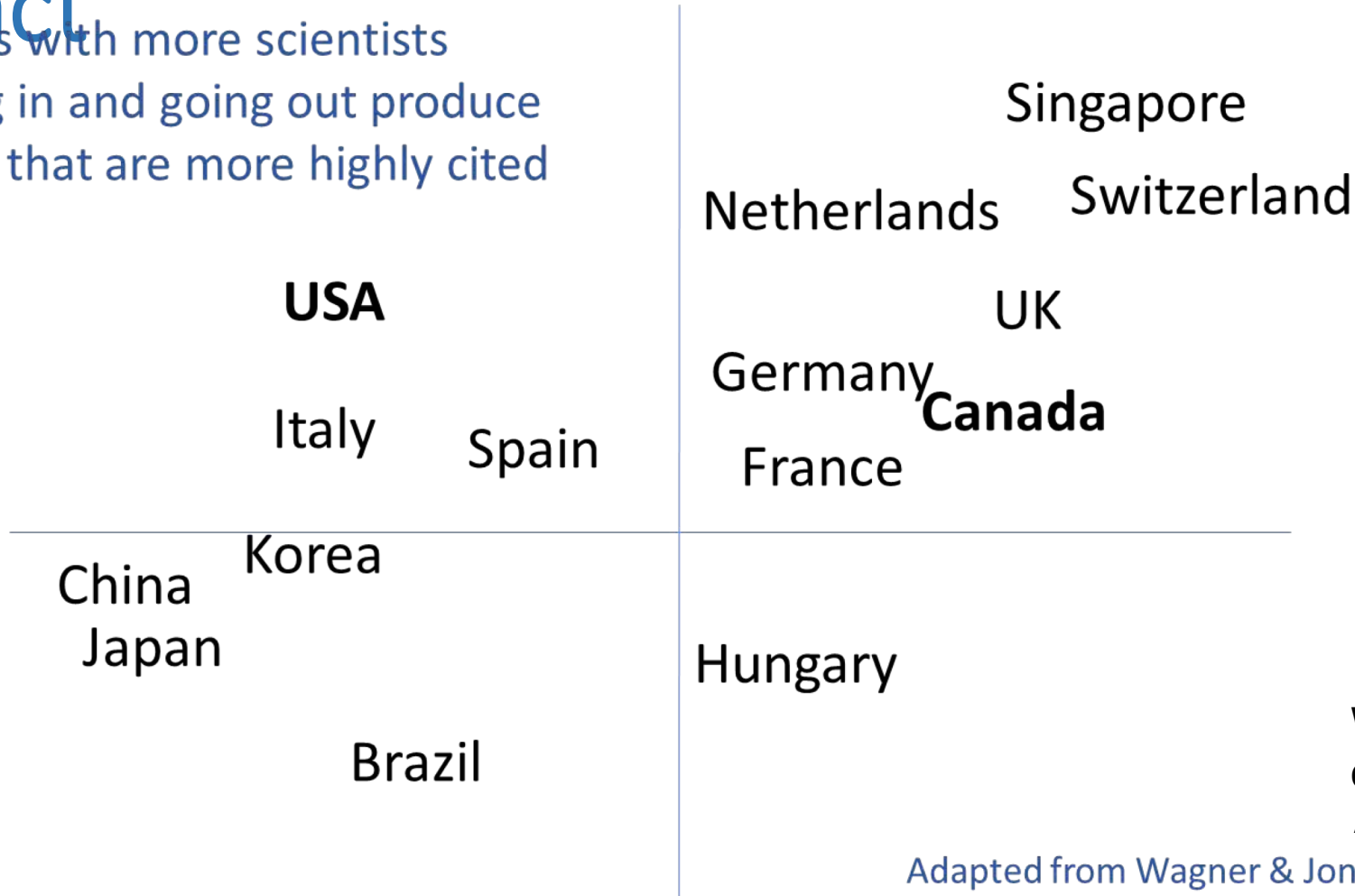
- **Is there a gap in NSF offerings?** Internal discussions, review of NSF programs
- **Do researchers view their fields as ready?** Dear Colleague Letter NSF 17-131 – Call for community input in 2017
- **What do experts advise?** Subcommittee of Advisory Committee on International Science and Engineering – Report
<https://www.nsf.gov/od/oise/OISE-AC/Report/InputOnAcceleratingResearchThroughInternationalNetwork-to-NetworkCollaboration.pdf>
- **What are lessons?** Literature on international research, team science



Open international science (mobility) has impact

Nations with more scientists coming in and going out produce papers that are more highly cited

↑
Impact



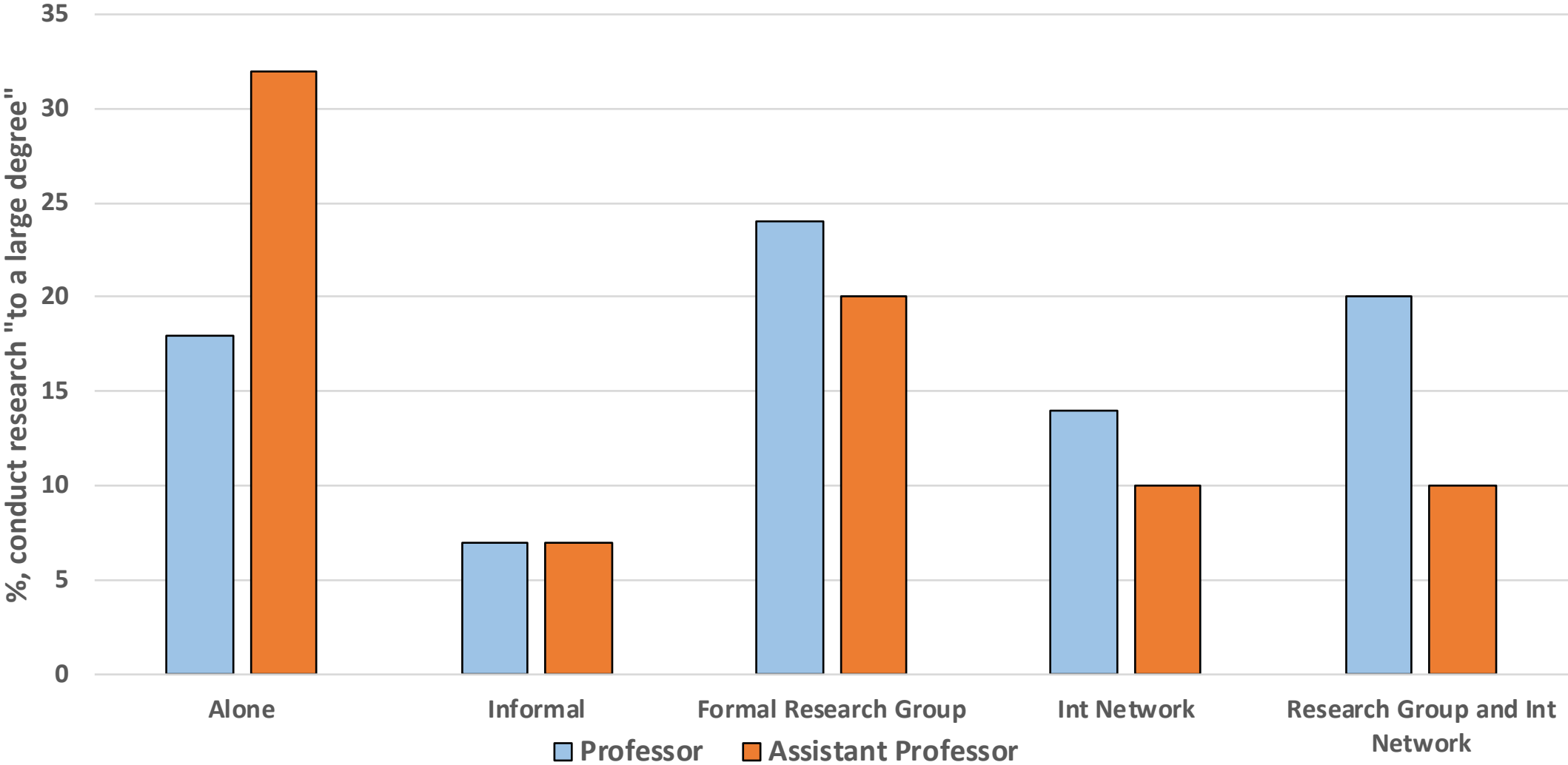
Wagner and Jonkers. Open countries have strong science. *Nature* 550: 32-33. (2017)

Adapted from Wagner & Jonkers 2017

Openness →



Early career researchers in fewer collaborations



AccelNet Goals

Supports **strategic linkages** among U.S. research networks and complementary networks abroad to tackle **grand scientific challenges**

To:

- Accelerate the progress of scientific discovery
- Prepare U.S. students, postdoctoral scholars and early career researchers in conducting and leading multiteam international collaborations

<https://www.nsf.gov/pubs/2019/nsf19501/nsf19501.pdf>



Network of Network Characteristics

- International engagement integral to success of activities
- Aligned mission and goals among the participating networks
- Leveraged resources across networks for mutual benefit
- Professional skills and global research perspectives developed
- Protocols, activities, products developed that reduce barriers to international collaboration



Projects expected to:

Catalytic Level
(up to 3 yrs, \$750K)

Full-Scale Level
(up to 5 yrs, \$2M)

- Have Vision and Goals that would significantly advance the research field
- Align with either (1) a community identified grand scientific challenge in area NSF funds OR (2) NSF Big Idea
- Plan effective international collaboration activities across networks
- Plan professional development opportunities for students, post-doctoral researchers, and early-career researchers
- Establish means of handling data sharing, IP, other collaboration needs
- Set milestones and evaluation measures



Success requires intentional approach

Coordination/Management

- Leadership
- Communication
- Organizational structure
- Personnel and partner roles

Skill Development

- Not simply by osmosis for graduate students, post-docs
- Learning in community
- Leadership opportunities



1st AccelNet cohort, 2019 awards thus far

Full Scale Level
Catalytic Level

- Accelerating Discovery in Multilevel Network Science, S. Fortunato, Indiana University
- International Collaboration to Accelerate Research in Robotic Surgery, P. Kazanzides, Johns Hopkins University
- Nature-based Solutions for Urban Resilience in the Anthropocene, N. Grimm, Arizona State University
- Catalyzing international research networks to transform human-computer relationships for the future of work, E. Moore, University of Colorado Boulder
- An International Network of Networks for Well-being in the Built Environment, Z. O'Neill, University of Alabama Tuscaloosa
- ICNet Global, J. Jacobs, University of New Hampshire
- Sustainable Capture and Conversion of CO₂ to Chemicals and Fuels using Renewable Electrons, A. Park, Columbia University

