

Scialog

Accelerating Scientific Breakthroughs with Small Team Science

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Research Corporation for Science Advancement

SciTS 2011 Conference
Chicago, IL



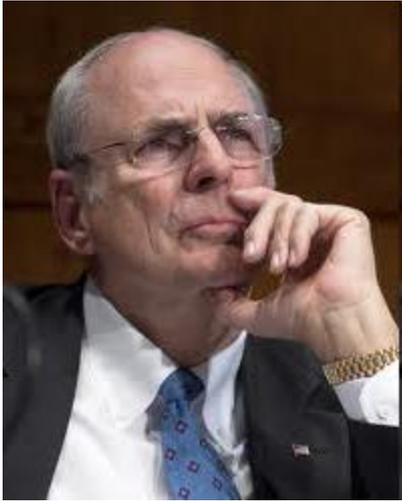
Research Corporation for Science Advancement

MISSION STATEMENT

Research Corporation for Science Advancement is a foundation that provides catalytic and opportunistic funding for innovative scientific research and the development of academic scientists, which will have a lasting impact on science and society



The National Scene : High Risk, High Reward Research



“...Science and technology can present part of the answer to such a turbulent global circumstance by providing clean, affordable, sustainable and secure sources of energy. But this can only be accomplished by investing in research and development—particularly research and development that has high potential payoff but of the type that, unfortunately, is often accompanied by high risk.”

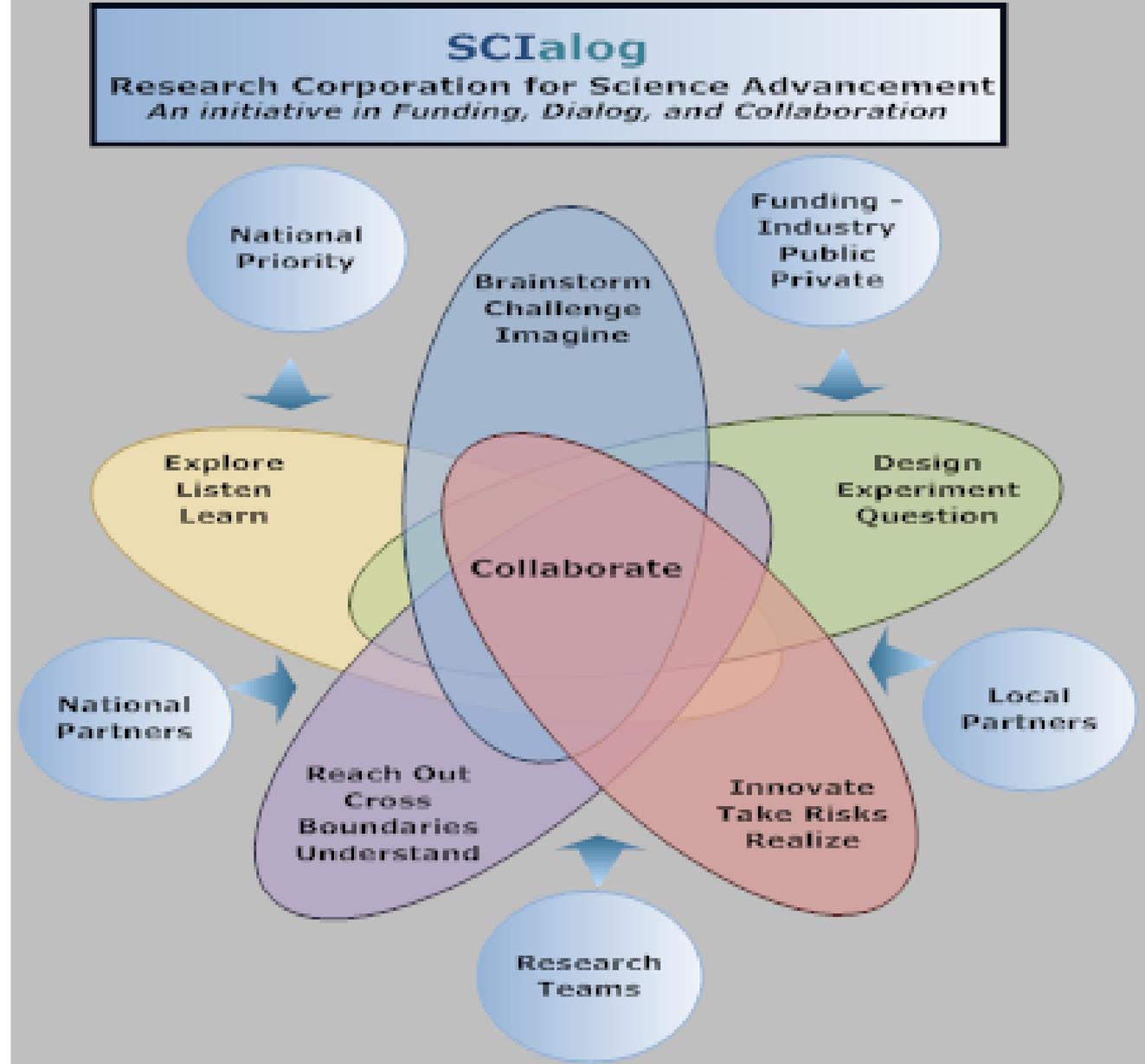
Norm Augustine, former chairman of Lockheed Martin and former Undersecretary of the Army

**“Gentlemen, we have run out of money.
It is time to start thinking.”**

Sir Ernest Rutherford, Nobel Laureate (Physics)



Scialog: Science & Dialog

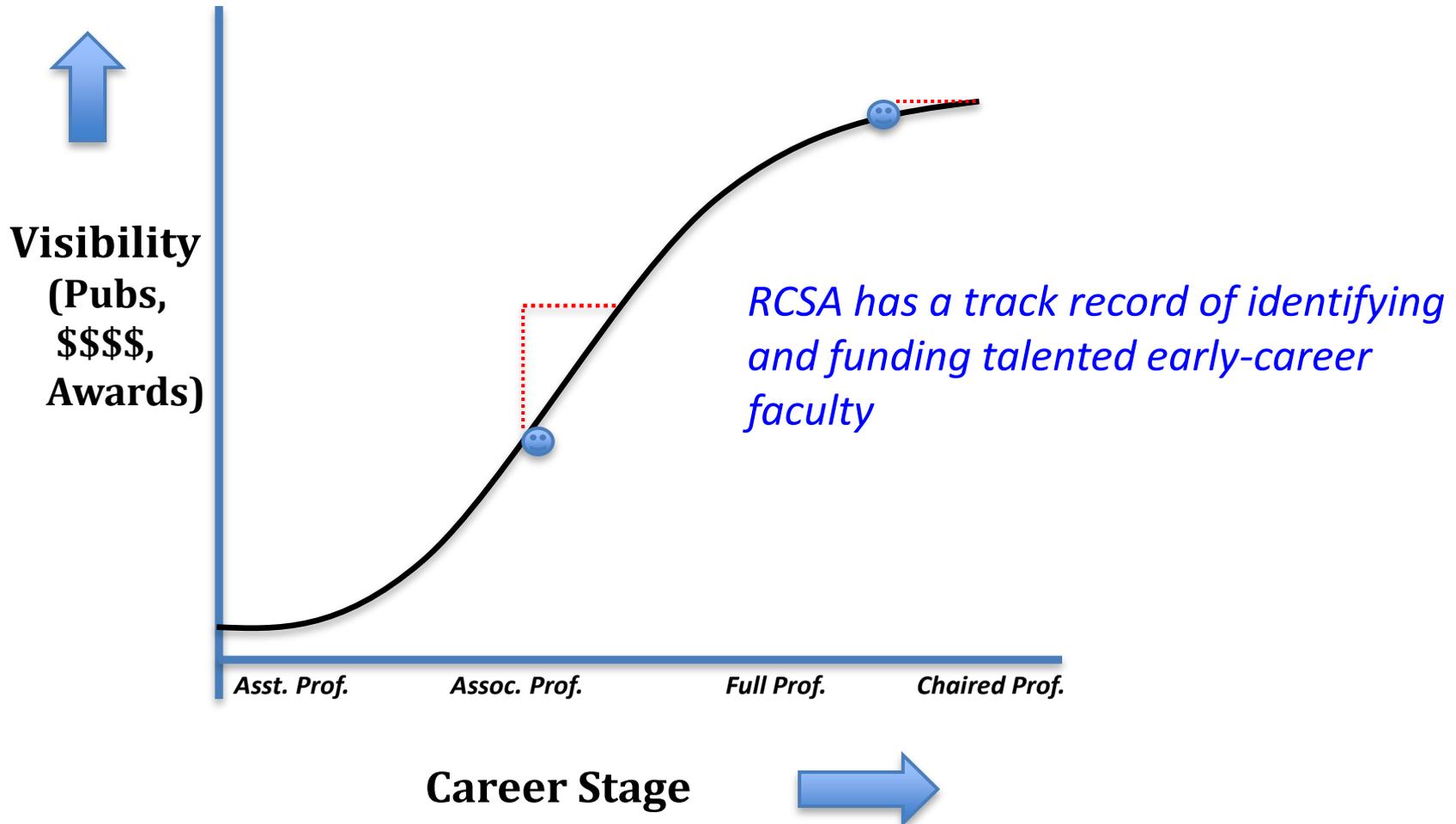


Scialog Objectives

- * Focus funding on early career scientists*
- * Enable higher-risk research that might fall outside the boundaries of traditional funding streams*
- * Establish and convene interdisciplinary communities of researchers who will interact intellectually to move the broader research agenda forward*
- * Leverage funding to further support successful lines of research*



Scialog Faculty Target (Tenure to Tenure + Five)



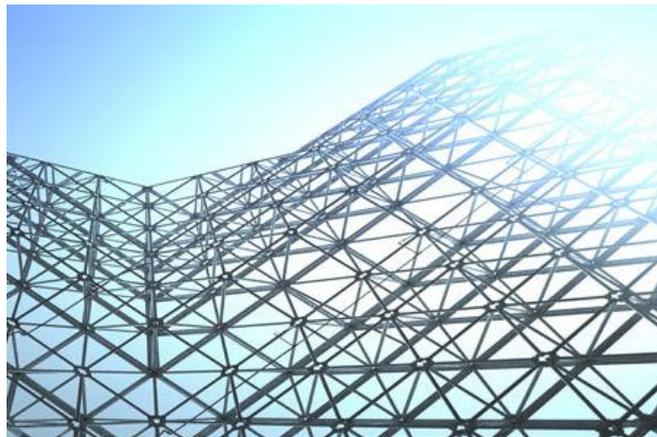
Why Focus on Recently Tenured Faculty?

- Highly creative, original and transformative research is often initiated early in one's career.
- A small early career investment can have a much larger impact than a similar grant later on.
- They have:
 - *been vetted by their departments*
 - *established labs*
 - *a record of accomplishment*
 - *can take risks & collaborate*
 - *are “hungry dogs” (this is a compliment)*



Scialog 2010: Solar Energy Conversion

- *Vetted 101 pre-proposals – received 78 full proposals*
- *10 person review panel chaired by Nate Lewis (Caltech)*
- *Funded 13 proposals (why so low?) up to \$250K each*
- *Scialog Conference – October 2010 at Biosphere 2*



2010 Scialog Awards

Boston University : *Transforming Heme Proteins into Solar Driven Redox Catalysts by Site-Directed Zinc Porphyrin Mutation*

Case Western Reserve : *Overcoming Shockley-Queisser Limit on PV Solar-Energy Conversion Efficiency: Multiple Exciton Generation in One-Dimensional Nanostructures*

Emory : *Directed Evolution of Hydrogenase for Efficient Light-Driven Hydrogen Production via Quantum Dot-Enzyme Hybrid Systems*

Indiana : *Toward Converting CO₂ to Fuel: A Computer-Aided Experimental Discovery of Novel CO₂ Reductase Catalysts*

NC State : *Molecular-Level Design of Metal-Oxyfluoride/Organic Solids for Visible-Light Photocatalysis*

Penn State : *Synthesis and Characterization of Core-Shell Wire Heterostructures*

Penn State : *New Chemical Routes for Discovering and Improving Visible-Light Photocatalysts*

Purdue : *Photoconversion Physics in Quantum-Wire Arrays with Double-Gyroid Topology*

U C-Davis : *Bottom-Up Assembly of Nanoscale Heterojunctions for Photochemical Energy Conversion*

Utah : *Nanoplasmonic Focusing of Light Fields to Amplify Non-Linear Optical Effects in Composite Photovoltaics*

UC-Irvine : *Molecular Approach to Converting Solar Energy into Chemical Fuel*

Vanderbilt : *Biologically Optimized Protein Films for Solar Energy Conversion*

2010 Scialog Conference* Objectives

- Identify and analyze bottlenecks in solar energy conversion & develop breakthroughs
- Build a creative cross-disciplinary community more likely to produce breakthroughs
- Form teams to write proposals for supplemental funding based on ideas that emerge during dialog
- Engage in authentic dialog & help determine if this process accelerates high-risk/high-reward research

*Cosponsored by NSF



Participants

- Scialog Fellows
- Recognized leaders solar energy conversion
- Accomplished scientists funded by the NSF, the DOE, & Science Foundation Arizona





Scialog 2010 Conference Keynote Speakers

- *Arun Majumdar, ARPA-E*
 - *Nate Lewis, CalTech*
 - *Eric Mazur, Harvard*
 - *Tom Moore, ASU*
 - *Roger Angel, UA*
-
- *Elizabeth McCormack, Dean of Graduate Studies, Bryn Mawr facilitator of dialog at the conference*



Facilitated Dialog*

- Inspired by theoretical physicist David Bohm
- Suspend judgment
- Listen without the need for debate
- Create the “feel” of the coffee shop or pub
- Share an “off the wall” idea & “what if” conversation that leads to a breakthrough

*Gilliland & Wiener, The Electrochemical Society **Interface** Winter 2010, 47-48



Scialog Challenge

- *\$100k Challenge Grants During Meeting*
- *9 new teams formed*
- *3 Collaborative Innovation Awards (challenge grants)*



Key insights from the Scialog Conference

- Out of 36 researchers, 12.7 new awareness connections, 9.0 new discussion connections, and 1.2 new collaboration connections to other researchers.
- Over 60% of new collaboration connections were made between individuals who were unfamiliar with each other prior to the conference.
- Whereas traditional conference activities (formal presentations, poster sessions, and undirected dialog) tend to lead to awareness and discussion among participants, writing joint proposals is a strong incentive for Scialog participants to collaborate.

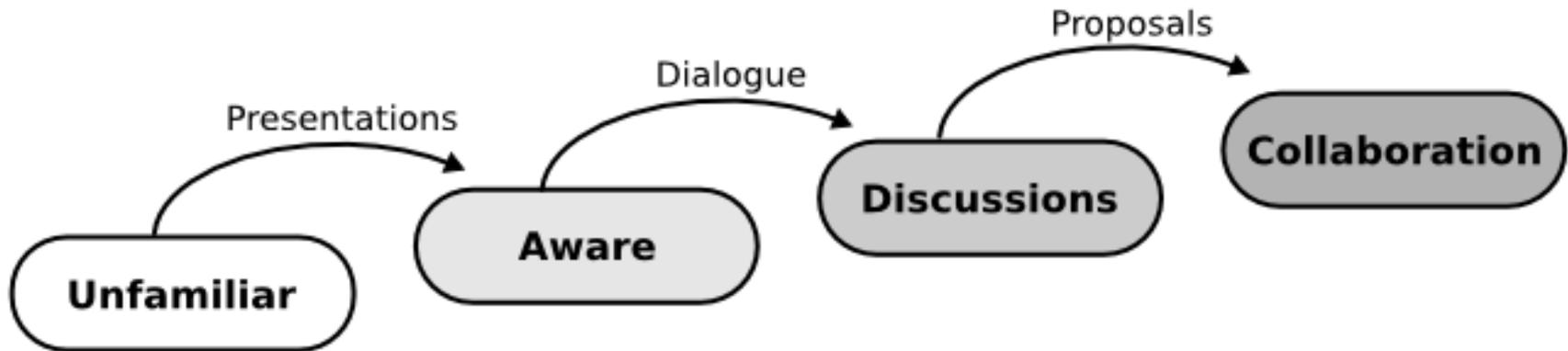


Key insights from the Scialog Conference cont.

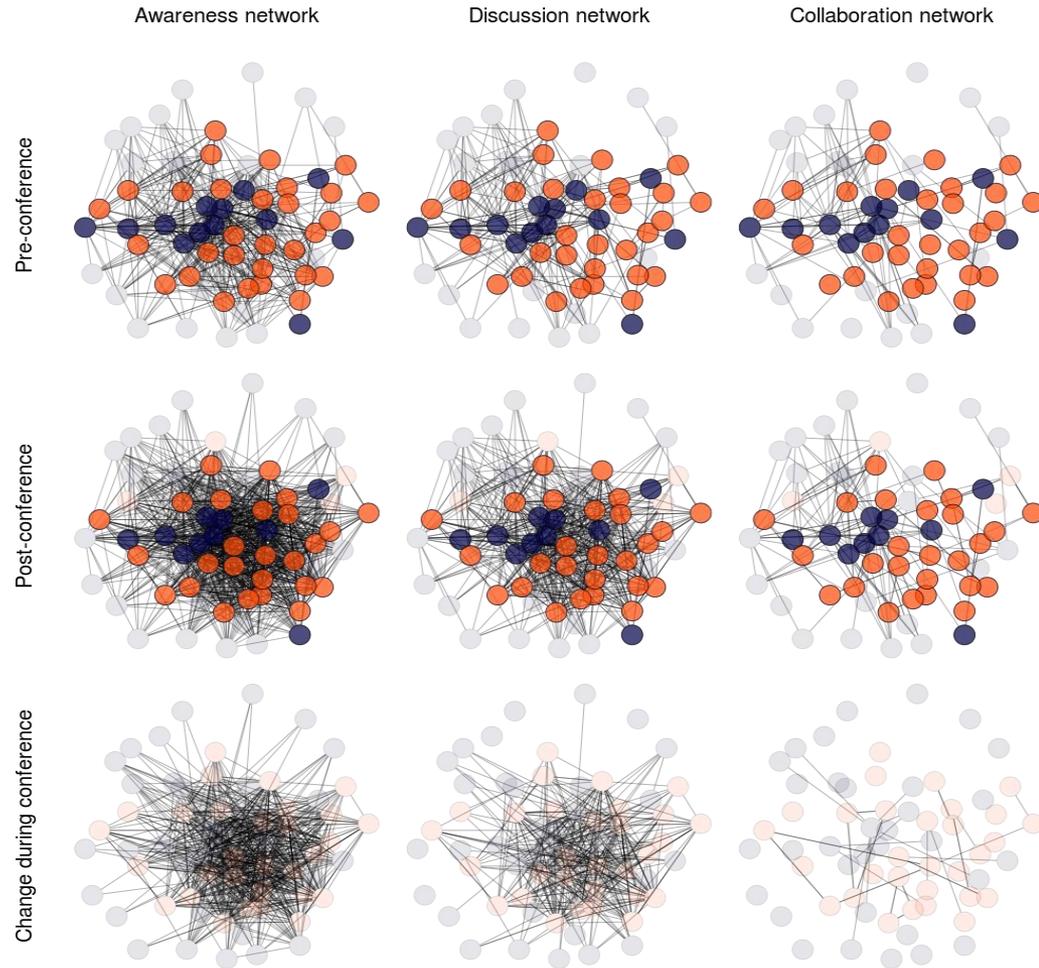
- About 75% of the most innovative ideas tend to be shared during formal presentations (52%) and undirected dialogs (23%).
- Over 45% of new collaboration connections were made between individuals that thought each other's ideas were very innovative.
- Undirected dialog fosters the most referrals.



A simple model of steps required to create new collaborations

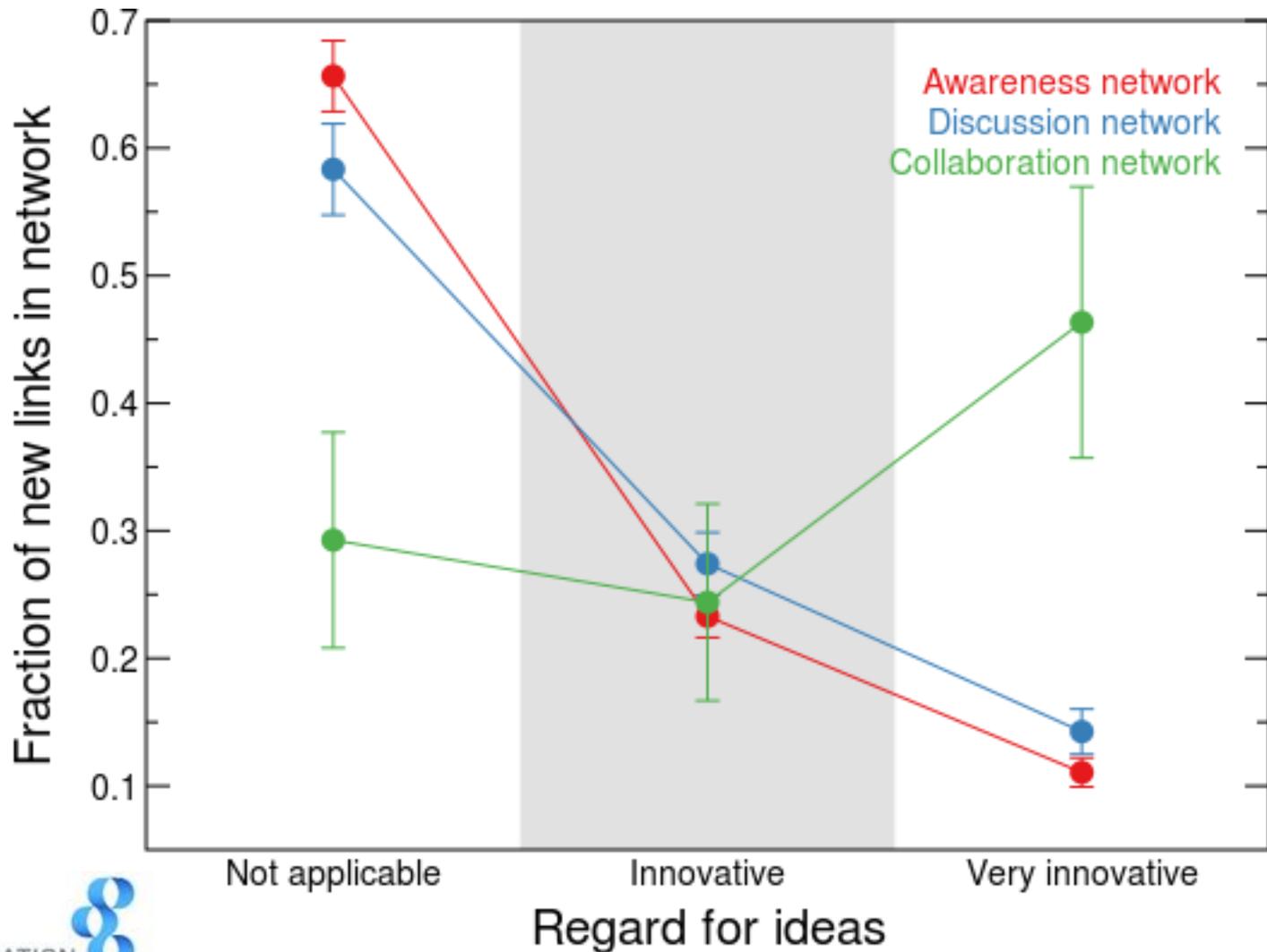


Network Connectivity Before & After Conference



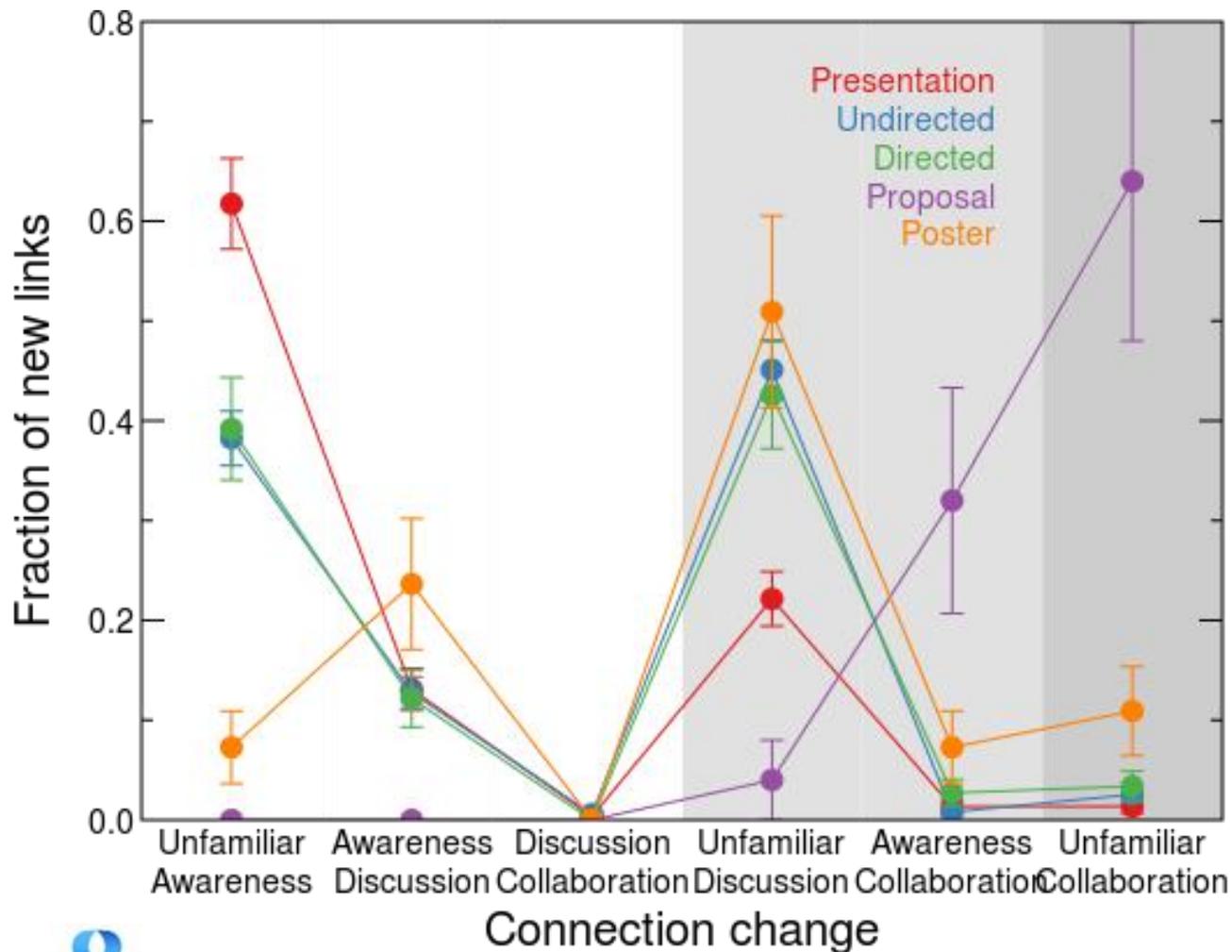
Collaboration from reverence

Over 45% of new collaboration connections were made with individuals whose ideas were regarded as very innovative



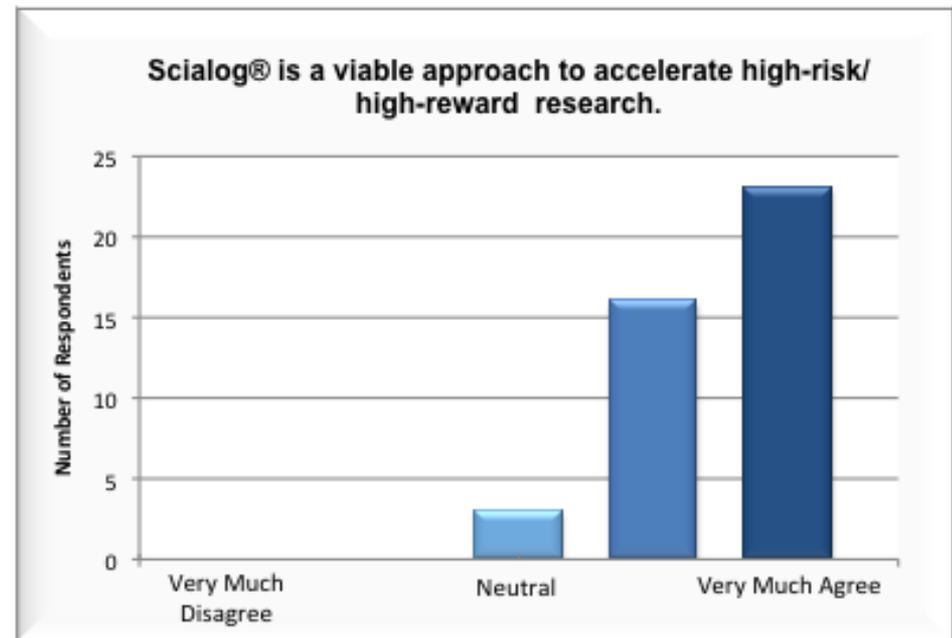
Strangers meeting

Over 60% of new collaboration connections made between individuals unfamiliar with each other prior to the conference



Scialog Feedback: Accelerating Research

- I was part of and overheard several "A Ha" conversations where people were clearly coming to new understandings of the problems they'd be working on
- **Very nice concept...we need alternatives to the Gordon conferences.**
- More science-focused dialog would have facilitated this even more
- **The competition for supplemental funding, the high level talks by invited speakers and the passion about the topic at hand were strong catalysts for new thoughts about high risk/high reward research**
- Not sure, seems like a experiment so far
- You should include mathematicians in a more direct way!
- **The key is small incremental steps in funding, and putting everyone in the same room**



Acknowledgements

James Gentile, Martha Gilliland, Silvia Ronco, Jack Pladziejewicz &
Kathleen Parson

RCSA

Dean Malmgren & Michael Stringer
Northwestern University & Datascope Analytics

Lisa Ordóñez
Eller College of Management, University of Arizona

NSF Che 1052728

