SciTS

2019 Conference
May 20-23, 2019 | Lansing, Michigan

Host: Center for Interdisciplinarity at Michigan State University
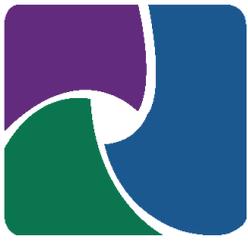
INSciTS

Building the knowledge base for effective team science

International Network for the Science of Team Science

Become a Founding Member of INSciTS

INSciTS launched in 2018 as the membership organization for team science and the SciTS field. INSciTS provides a forum to share the latest evidence for what works in team science and collaborate with colleagues to advance the SciTS field.

Individuals leading, engaging in, managing, facilitating, supporting, evaluating, and producing scholarship on team science will find a professional home in INSciTS.
All individuals who join INSciTS in 2019 and 2020 will be recognized as founding members.
Benefits of Membership:
* Receive a reduced annual conference registration rate
* Join up to two special interest groups that focus on your core interests
* Participate in a year-round forum for dialogue, coordination, and collaboration
* Be included in, and access, the INSciTS member directory
* Access leadership opportunities in the INSciTS organization

To learn more about membership, including levels and dues, go to: https://www.inscits.org/
While you're there, read testimonials from current INSciTS members about why they joined.

Please join the conversation -- attend an INSciTS Special Interest Group Meeting at SciTS 2019!

INSciTS Special Interest Groups (SIGs) will meet during the SciTS 2019 conference on Tuesday, May 21 at 12:15 pm. Meeting rooms are listed in the conference program.

Please join the conversation! You do not have to be an INSciTS member to participate in a SIG meeting at the SciTS 2019 meeting – all are welcome to participate and share their input!
SIGs are chaired by national leaders on key topics in the SciTS field. Current SIGs address:
* Fostering team science in academia
* Incubator spaces for team science
* Training and education for team science
* Scientometrics and data analytics
* Emerging careers in team science

SIGs build community around shared interests; enable dialogue, coordination of activities, and collaboration throughout the year; advance key priority areas in the SciTS field; and create opportunities to engage with external groups.

To learn more about the SIGs, go to: https://www.inscits.org/sigs

Table of Contents

Dear SciTS 2019 participants,

Welcome to the 2019 Science of Team Science (SciTS) Conference, the 10th annual gathering of individuals and groups interested in studying, practicing, and facilitating team science. This meeting is also the first SciTS conference since formation of the International Network for the Science of Team Science (INSciTS), a professional society advancing related interests in team science.

The conference leadership team —myself, Dr. Stephanie E. Vasko, Dr. Julie Thompson Klein, and Megghan Honke Seidel— has worked closely with the SciTS 2019 Planning Committee and the INSciTS board to design a conference that builds on existing research and practice strengths while also pointing in exciting new directions.

One of our aims for SciTS 2019 is to demonstrate how team science animates and propels research in environmental science, agriculture, and natural resources. To this end, we are pleased to feature for the first time panels focusing on Indigenous approaches to team science and collaborative approaches in agriculture and natural resources.

Other values drive SciTS 2019 as well. Diversity and inclusion have been fundamental commitments in our planning, driving our calls for participation, invited presentations, and fee structure. In addition, we have worked to ensure a "green" conference, giving you the option of an online program rather than a printed one and working to reduce food waste. And as the primary host, the MSU Center for Interdisciplinarity seeks to create opportunities to refine thinking about collaboration and cross-disciplinary research, education, and training.

We hope that you have an excellent time in Lansing while you enjoy SciTS 2019. Lansing has an active downtown with restaurants, local art shops, running trails, and local community classes such as kickboxing and pottery. Please consult the website for more detailed information.

If you have any questions or comments for the SciTS 2019 Planning Committee, please look for those of us with red ribbons on our name badges.

Michael O'Rourke
Chair, 2019 Science of Team Science Conference

Lansing Center WIFI Information - Username: scits and Password: 2019

Maritza Salazar Campo, Ph.D.
President President@INSciTS.org

Maritza Salazar Campo, Ph.D., is an Assistant Professor at the Paul Merage School of Business. She earned her PhD in Management from the Stern School of Business at New York University. She studies how interdisciplinary and culturally diverse teams collaborate to solve complex problems. She is also the recipient of numerous research awards including a major multi-year grant from the National Science Foundation focused on studying and facilitating the integrative capacity of interdisciplinary science teams through team training. She has published her work in journals such as American Psychologist, Group and Organizational Management, Journal of Organizational Behavior and Small Group Research. She has provided training and education about the science of team science at various academic institutions around the country including the National Academies of Science, NYU's Langone Medical Center, Stanford's School of Medicine, and the Feinberg School of Medicine at Northwestern University.

Gaetano R. Lotrecchiano, Ed.D., Ph.D.
Vice President / President-Elect
VicePresident@INSciTS.org

Gaetano R. Lotrecchiano, Ed.D., Ph.D. is an associate professor of Clinical Research and Leadership and of Pediatrics at the George Washington University School of Medicine and Health Sciences. He has been faculty at George Washington University since 2005 and has spent some of that time as faculty at Children's National Health System. He is a Morton A. Bender awardee for teaching excellence and past chair of the George Washington University Society of Distinguished Teachers. He is committed to the training of well-rounded health professionals with the knowledge, insight, and critical thinking skills to navigate the changing American healthcare environment and serves as the Director of Doctoral Candidacy for the PhD in Translational Health Sciences at GWU and is the Tean Science Lead for the Clinical Translational Science Institute at George Washington University. Professor Lotrecchiano's research interests include complexity leadership and characteristics, transdisciplinary team science, and motivation in team collaboration and principal investigator of the Motivation Assessment for Team Readiness Integration and Collaboration (MATRICx) project.

Holly J. Falk-Krzesinski, Ph.D.
Secretary
Secretary@INSciTS.org

Holly J. Falk-Krzesinski, Ph.D., is the Vice President, Research Intelligence on the Global Strategic Networks team at Elsevier, where her responsibilities center on how insights from data, metrics, and analytics guide collaboration and strategic planning for research institutions, funders, and science policy organizations. Prior to joining Elsevier, Dr. Falk-Krzesinski was a faculty member and administrator at Northwestern University where she launched a unit in the central Office for Research to support the development of interdisciplinary and collaborative grant proposals and built out a team science unit for the university's Clinical and Translational Science Institute. Through her leadership with the Annual International Science of Team Science Conference, TeamScience.net development, research on reward and recognition for team science, team science consulting work, and involvement with three national team science initiatives, Dr. Falk-Krzesinski has been instrumental in developing a strong international community of practice for team science and the field of study called the science of team science (SciTS).

Kevin C. Wooten, Ph.D.
Treasurer
Treasurer@INSciTS.org

Kevin C. Wooten, Ph.D. is currently Chair and Professor of Management and Human Resource Management at the University of Houston at Clear Lake. He teaches courses in Organizational Behavior, Organizational Theory, Organizational Design, as well as Human Resource Management courses such as Employee Selection, Organizational Development, and Employee Training. He also serves as an adjunct faculty member in the Department of Psychology at Rice University, and the Department of Preventative Medicine at the University of Texas – Medical Branch at Galveston. Prior to joining the University of Houston System, Kevin served on the faculty of the A.B. Freeman School of Business at Tulane University, teaching Organizational Behavior in the Executive MBA Program. He is also the co-founder of the UHCL MBA for Physicians Program, and currently serves as the Consulting Director of Tracking and Evaluation and Lead Consultant for Team Science for the University of Texas Medical Branch – Clinical and Translational Science Award. Kevin also serves on the Executive Committee and the Board of Directors for the International Science of Team Science Association.

Zaida Chinchilla Rodriguez, Ph.D.
Zaida.Chinchilla@csic.es

Zaida Chinchilla Rodríguez, Ph.D., is Associate Research Professor at the Institute of Public Goods and Policies (IPP) of the Spanish National Research Council (CSIC). She completed her Master and PhD. in Library and Information Science at the University of Granada (Spain) within the SCImago Research Group. In 2008, she moved to Madrid (Spain) to work with a tenured position in CSIC. Since then, she acts as an external advisor for SCImago Lab.She is a social scientist specialized in bibliometrics with a particular focus on institutional and national-level analysis. Her research interests include scientometrics, research evaluation, scholarly communication, the science of team science, and information visualization. She has participated in numerous research projects and contracts for different governments and funding agencies. She has been extensively working on drafting scientific reports and served as an analyst for a number of governments and research institutions analyzing national and global developments in science and technology. She is actively involved in mentoring and service and has published in numerous prestigious journals. Currently, she is Associate Editor of Frontiers in Research Metrics and Analytics.

Stephen M. Fiore, Ph.D.
sfiore@ist.ucf.edu

Dr. Stephen M. Fiore, Ph.D., is Director, Cognitive Sciences Laboratory, and Professor with the University of Central Florida's Cognitive Sciences Program in the Department of Philosophy and Institute for Simulation & Training. He maintains a multidisciplinary research interest that incorporates aspects of the cognitive, social, organizational, and computational sciences in the investigation of learning and performance in individuals and teams. His primary area of research is the interdisciplinary study of complex collaborative cognition and the understanding of how humans interact socially and with technology. Dr. Fiore is a founding conference committee member for the Science of Team Science annual conference, and a founding board member and past-president of the Interdisciplinary Network for Group Research. He has contributed to working groups for the National Academies of Sciences in understanding and measuring "21st Century Skills" and was a committee member of their "Science of Team Science" consensus study, as well as a member of the National Assessment of Educational Progress report Collaborative Problem Solving.

Kara Hall, Ph.D.
halka@mail.nih.gov

Kara L. Hall, Ph.D., is the Director of the Science of Team Science (SciTS), the Director of the Theories Initiative, health scientist, and program director in the Behavioral Research Program of the Division of Cancer Control and Population Sciences at National Cancer Institute (NCI) of the National Institutes of Health (NIH). Dr. Hall helped launch and build the SciTS field through her leadership in conducting empirical studies, developing conceptual frameworks, creating practical strategies and resources, editing special journal issues, chairing the Annual SciTS Conferences, and founding board member of INSciTS. Dr. Hall's work aims to build an evidence base for effective team science approaches and support the translation of emerging knowledge into policies and practices. Notably, she served as a member of The National Academies Committee on the Science of Team Science (2012-15), which produced the report, Enhancing the Effectiveness of Team Science (listed in the top 30 most downloaded National Academies Press reports out of the more than 9000 released online since 1994).

Andi Hess, MS(Tech)
Comm@INSciTS.org

Andi Hess, MS(Tech) is the Director of the Interdisciplinary Translation and Integration Sciences Initiative at Arizona State University, which aims to help research teams across the university bridge disciplinary gaps. Her research focuses on the Science of Team Science and Interdisciplinary Translation, a process of actively facilitating the exchange of knowledge across disciplinary languages in team research settings. Through the initiative, Andi organizes and leads custom workshops on the Science of Team Science for faculty interested in increasing the effectiveness of team science projects. She is currently designing Interdisciplinary Translation curriculum to develop team science competencies in undergraduate programs, and Continuing Education programs for Socio-Technical Integration Research. Other research interests include issues of identity, conflict resolution, and intercultural competencies. She teaches courses in Interdisciplinary Studies and Organizational Leadership, and serves as the Faculty Director for multiple Study Abroad programs.

Julie Thompson Klein, Ph.D.
Julietklein@comcast.net

Julie Thompson Klein, Ph.D., is Professor of Humanities Emerita in the English Department at Wayne State University and an Affiliate of the TdLab (Transdisciplinarity Lab) at the ETH-Zurich university for science and technology in Switzerland. She has also been a Mellon Fellow and a Visiting Professor in Digital Humanities at the University of Michigan. Klein is past president of the Association for Interdisciplinary Studies (AIS) and former editor of the AIS journal Issues in Interdisciplinary Studies. Her books include Interdisciplinarity (I990), Interdisciplinary Studies Today (co-edited 1994), Crossing Boundaries (1996), Transdisciplinarity (co-edited 2001), Interdisciplinary Education in K-12 and College (edited 2002),Mapping Interdisciplinary Studies (1999), Humanities, Culture, and Interdisciplinarity (2005), Creating Interdisciplinary Campus Cultures (2010), and Interdisciplining Digital Humanities (2015). She was also Associate Editor of The Oxford Handbook on Interdisciplinarity (2010, 2017). She has received numerous honors, including the Kenneth Boulding Award for outstanding scholarship on interdisciplinarity, the Yamamoorthy & Yeh Distinguished Transdisciplinary Achievement Award, the Joseph Katz Award for Distinguished Contributions to the Practice and Discourse of General and Liberal Education, and the Science of Team Science Recognition Award.

Shalini Misra, Ph.D., is an Assistant Professor in the School of Public and International Affairs at Virginia Tech. Her research focuses on the social, psychological, and cultural implications of the Internet and mobile communication technologies; and the study of the processes and outcomes of transdisciplinary collaborative scientific, training, and action research initiatives. Key themes in her research and writing include: cognitive and health consequences of information overload and multitasking; interpersonal relationships in ubiquitous computing environments; environmental orientations, identity, and sense of community in the Digital Age; contextual influences on interdisciplinary collaboration; interdisciplinary education and curriculum development; and evaluation of team science initiatives. Her research has been supported by grants from NSF, NIH, Urban Communication Foundation, Intel Digital Cultures, and the National Academies Keck Futures Initiative. She has a Ph.D. in Planning,Policy, and Design from University of California Irvine, an M.S. degree in Sustainable Resource Management (Technical University of Munich, Germany) and a B.S. degree in Civil Engineering (Gujarat University, India).

Shalini Misra, Ph.D.
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Darshana T. Shah, Ph.D., is a professor of pathology and associate dean for faculty advancement at the Marshall University Joan C. Edwards School of Medicine. Her passion for service has led her to attain diverse institutional roles, notably serving as founding editor-in-chief of the Marshall Journal of Medicine, peer-reviewed open access academic journal. The focus of Dr. Shah's work has been collaborating with institutional leaders in supporting faculty by creating resources, guiding policy-building and contributing to the development of programs and practices that positively impact the career advancement of faculty. Her research and scholarship delve deeply into faculty vitality and retention. Dr. Shah has held a number of leadership positions in regional, national and international organizations, including serving as national chair of the Association of American Medical Colleges' Group on Faculty Affairs to support the mission of building and sustaining faculty vitality in medical schools and teaching hospitals. As president of the Group for Research in Pathology Education, Dr. Shah led an academic society of medical educators who teach pathology and supported the promotion of scholarly research and innovation in medical education.

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Pips Veazey, Ph.D., is the Associate Project Director for the Alaska Established Program to Stimulate Competitive Research (EPSCoR), a statewide program funded by the National Science Foundation and the State of Alaska aimed at increasing research capacity. She is also the lead and creator of Vis Space, a high-resolution visual environment designed to promote conversations about complex problems, develop creative solutions and enhance team development. Her research interests include the development and implementation of interdisciplinary research teams, the interaction between teams and technology, and team science leadership.Building on academic foundations in psychology (BA, Bates College) and oceanography (MS, University of Alaska, Fairbanks), she completed an interdisciplinary doctoral degree in team science leadership at UAF, examining the competencies required to be an effective leader of large interdisciplinary team science projects. She carries a passion for synthesizing and implementing team science research to create more effective science teams to help propel innovative and transformative research.

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SciTS 2019 Planning & Advisory Committees

CONFERENCE CHAIR
Michael O'Rourke, Interim Director, MSU Center for Interdisciplinarity, Professor of Philosophy, AgBioResearch, Michigan State University

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Julie Thompson Klein, Professor of Humanities Emerita, English Department, Wayne State University; International Research Affiliate, Transdisciplinary Lab (USYSTdLab), ETH-Zurich

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Amanda Vogel, Global Health Evaluation Specialist, Leidos Biomedical Research, Inc.

MICHIGAN STATE UNIVERSITY ADVISORY COMMITTEE

|	
Marilyn Amey, Educational Administration	Dan Ilgen, Psychology and Management
Kendra Cheruvelil, Fisheries & Wildlife	Steve Kozlowski, Psychology
John Hollenbeck, Management	Pat Soranno, Fisheries & Wildlife

Lansing Center Facility Map

Exhibit Hall C

Exhibit Hall B

Exhibit Hall A

Dock C

Dock B

Dock A

Security Office

E-Desk

Offices

North Point Cafe

Pedway

Kitchen

River Street Pub

Main Concourse

River Concourse

Gazebo

Grand River

Cedar Street

Ballroom 2

Ballroom 1

Ballroom 4

Ballroom 3

Ballroom 6

Ballroom 5

Ballroom 8

Ballroom 7

Concessions

101 | 102 | 103 | 104

Michigan Ave. Concourse

Box Office

First Floor

Boardrooms

BR2 | BR1

Governor's Room

Offices

201 | 202 | 203 | 204 | 205

Upper Concourse

Second Floor

Michigan Avenue

MAP KEY

- ▬ **Removable Walls**
- **Elevators**
- **Men's Bathroom**
- **Coat Check**
- **Women's Bathroom**
- **Drinking Fountain**
- **First Aid**
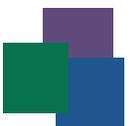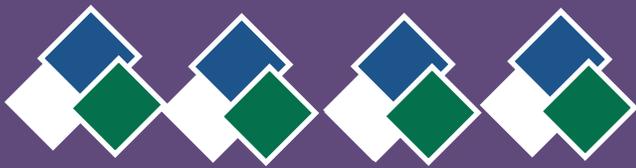
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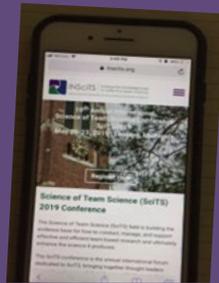
https:bit.ly/scits2019 or here

This should take you <2 minutes to complete

Aggregated feedback will be used to help improve programming at future SciTS conferences.

Thank you!
SciTS 2019
Conference Evaluation Committee

JOIN US

PANEL

Identifying the Behaviors and Actions of Facilitators of Successful Teams
Thursday at 11am

POSTER

Determining Depth of Collaboration Potential

PLANNER

Visualize your network with our free tool
https://www.exaptive.com/city-planner

exaptive

University Outreach and Engagement
MICHIGAN STATE UNIVERSITY

COLLABORATING WITH COMMUNITIES
IMPROVING LIVES

- BY -

Facilitating university-community partnerships for broader impacts

Promoting access to the University through public events, web portals, and K-12 programming

Providing educational programs to develop community-engaged scholarship for faculty, staff, and students

engage.msu.edu

Conference at a Glance

Monday, May 20, 2019

7:00 a.m.	7:30 a.m.	8:00 a.m.	8:30 a.m.	9:00 a.m.	9:30 a.m.	10:00 a.m.	10:30 a.m.	11:00 a.m.	11:30 a.m.	12:00 p.m.	12:30 p.m.	1:00 p.m.	1:30 p.m.

Registration

Conference Registration Opens

Lobby Coat Room

Breakfast Ballrooms 5-8

Workshops

Teaching the Science of Team Science (SciTS)	Ballrooms 1-2
Navigating team power dynamics in authorship decisions	Room 101
Optimizing mentoring relationships in team science: An engine for scientific accomplishment and inclusive excellence	Room 102
Mapping translational research stories: Team science storytelling using the NIEHS translational research framework	Room 103
Community playbooks and collaboration guides-creating documentation to facilitate effective scientific teamwork	Ballrooms 3-4
TBL 101: Introduction to team-based learning	Room 104

Lunch on your own

Welcome to SciTS 2019
Dr. Michael O'Rourke

Dr. Stephanie E. Vasko

MSU Provost June Youatt

Lansing Mayor Andy Schor

Ballrooms 1-4

Tuesday, May 21, 2019

8:00 a.m.	8:30 a.m.	9:00 a.m.	9:30 a.m.	10:00 a.m.	10:30 a.m.	11:00 a.m.	11:30 a.m.	12:00 p.m.	12:30 p.m	1:00 p.m.	1:30 p.m.	2:00 p.m.

Registration

Breakfast Ballrooms 5-8

Plenary Panel Team Science in Agriculture and Natural Resources

Ballrooms 1-4

Break and Sponsor Showcase Ballrooms 5-8

Concurrent Sessions

Innovating with Technology	Rm 101
Spatially Situated Case Studies	Rm 102
Collaboration Readiness	Rm 103
Tools For Team Science & The Science of Team Science	Rm 104
Training & Professional Development	Brm 1-4

SIGs

Fostering Team Science in Academia	Rm 101
Team Science Training	Rm 102
Incubator Spaces for Team Science	Rm 103
Scientometrics and Data Analytics for Team Science	Rm 104
Interreach	Brm 1-4

Lunch on your own

2019 SciTS Conference Program

Lansing Center, Lansing, Michigan | SciTSconference@gmail.com | https://www.inscits.org

2:00 p.m.	2:30 p.m.	3:00 p.m.	3:30 p.m.	4:00 p.m.	4:30 p.m.	5:00 p.m.	5:30 p.m.	6:00 p.m.	6:30 p.m.	7:00 p.m.	7:30 p.m.	8:00 p.m.

Registration

Keynote
Joy Balls-Berry
Mayo Clinic

Ballrooms 1-4

Break and Sponsor Showcase Ballrooms 5-8

Concurrent Panels

Intereach Community Effort...	Rm 101
The Resilience of Team Science...	Rm 102
Changing Academic Institutional Culture to Facilitate and Support Team Science	Rm 103
Increasing Research Effectiveness through Team Science Training for Research Teams	Rm 104
How to design teams, space and careers for better team science; a practical guide.	Rm 201

Break and Sponsor Showcase Ballrooms 5-8

Plenary Panel Indigenous Approaches to Team Science

Ballrooms 1-4

Break and Refresh

Networking Reception at Lansing Brewing Company

7:30 p.m. Networking Dinners (Self-Pay)

2:30 p.m.	3:00 p.m.	3:30 p.m.	4:00 p.m.	4:30 p.m.	5:00 p.m.	5:30 p.m.	6:00 p.m.	6:30 p.m.	7:00 p.m.	7:30 p.m.	8:00 p.m.

Registration

Plenary Panel Science of Groups and Teams

Ballrooms 1-4

Break and Sponsor Showcase Ballrooms 5-8

Concurrent Sessions

SocioEnvionmental Team Science	Rm 101
Team Science Evaluation	Rm 102
Team Process	Rm 103
Artistic & Humanistic Approaches to Team Science	Rm 104
Organizational & Management Factors	Brm 1-4

Break and Refresh

MSU Public Health Sponsored Dinner Integrating Team Science with Health Science Research and Practice

Ballrooms 1-4

Conference at a Glance

Wednesday, May 22, 2019

8:00 a.m.	8:30 a.m.	9:00 a.m.	9:30 a.m.	10:00 a.m.	10:30 a.m.	11:00 a.m.	11:30 a.m.	12:00 p.m.	12:30 p.m	1:00 p.m.	1:30 p.m.	2:00 p.m.

Registration

Breakfast Ballrooms 5-8

Plenary Panel Changing Scale and Scope of Collaboration

Ballrooms 1-4

Break and Sponsor Showcase Ballrooms 5-8

Concurrent Sessions

Collaborative Networks	Rm 101
Education & Teaching Team Science	Rm 102
Diversity On Teams	Rm 103
Scaffolding & Academic Settings	Rm 104
PANEL: Collaborative Scientific Writing: Challenges & Strategies	Brm 1-4

Buffet Lunch & Plenary Panel Agency Approaches to Team Science

Ballrooms 1-4

Thursday, May 23, 2019

8:00 a.m.	8:30 a.m.	9:00 a.m.	9:30 a.m.	10:00 a.m.	10:30 a.m.	11:00 a.m.	11:30 a.m.	12:00 a.m.	12:30 p.m.	1:00 p.m.	1:30 p.m.	2:00 p.m.

Registration

Breakfast Ballrooms 5-8

Concurrent Sessions

High Level Theory	Rm 101
CTSA	Rm 102
Disciplinary Diversity - Theory and Praxis	Rm 103
Creative Approaches To Support Team Science in Academia	Brm 1-4

Break and Sponsor Showcase Ballrooms 5-8

Concurrent Panels

Preparing Students for Interdisciplinary Collaboration and Team Research…	Rm 101
Reward and Recognition for Team-Based and Cross-disciplinary Research	Rm 102
SciCom meets SciTS. Interdisciplinary teamwork for science communication training	Rm 103
Identifying the Behaviors and Actions of Facilitators of Successful Teams	Brm 1-4

Light Lunch Closing Session

Banquet 1-4

2:30 p.m.	3:00 p.m.	3:30 p.m.	4:00 p.m.	4:30 p.m.	5:00 p.m.	5:30 p.m.	6:00 p.m.	6:30 p.m.	7:00 p.m.	7:30 p.m.	8:00 p.m.
					Registration						

Unconference

Ballrooms 1-4

Poster Session Sponsor Showcase and Reception

Ballrooms 5-8

MICHR Sponsored Dinner Cultivating Team Science in Clinical and Translational Research

Ballrooms 1-4

INSciTS

Save the date
11th Annual
International Science of Team Science Conference

June 1-4, 2020

We hope you'll join us at the
Durham Convention Center
in downtown Durham, North Carolina

Duke UNIVERSITY

Duke Clinical & Translational Science Institute

Joyce (Joy) Balls-Berry, Ph.D. , Mayo Clinic

Joyce (Joy) Balls-Berry, Ph.D. is an Assistant Professor of Epidemiology and Senior Associate Consultant at Mayo Clinic College of Medicine and Science. She completed her formal education at Xavier University of Louisiana with graduate training at Washington University School of Medicine and The University of Toledo. She completed a post-doctoral research fellowship in health equity, epidemiology, and biostatistics at The University of Florida.
Her work as a scientist centers on increasing awareness of the importance of community-patient engagement in research to increase health equity in minority and under-resourced communities. Dr. Balls-Berry is the principal investigator of several health disparities research studies. Recently, she completed a PCORI project to expand the efforts of the Minority Women in Research Network, which she established in 2011. The network's mission is to promote community-patient engagement in research conducted by minority women scientists interested in research collaborations, academic scholarship, innovation, and dissemination. She is the co-PI of a National Science Foundation Grant that seeks to expand opportunities for diverse scientists. As an educator, she received the Mayo Clinic Teacher of Year and CCaTS Educator of the Year awards. The faculty and the student body vote on these awards. Recently, she shared her story of living with dyslexia and handling personal challenges as TEDx Talk. Dr. Balls-Berry has served as a mentor and coach for students, academics, and leaders. Her work as a mentor focuses on assisting others in finding their true calling.

Focus areas of research:
- Determining the best community-engaged research approaches to increase health equity in populations at risk of premature death from preventable diseases
- Evaluation of the best practices for returning cumulative research results to study participants
- Determining the perceptions and practices of African-Americans' participation in clinical research in the post-Tuskegee experiment era
- Evaluation of the pedagogical approaches to increase learners' (students, trainees, fellows and community members) knowledge of community-engaged research and health disparities

Significance to patient care
Dr. Balls-Berry's research will help to improve patient care by helping community members learn new approaches to increase wellness. Much of Dr. Balls-Berry's research focuses on bringing awareness to populations that we serve, and she hopes this work promotes thoughtful collaborative partnerships among community members, medical practitioners and academic researchers to activity commit to helping to improve health care of individuals and communities.Furthermore, Dr. Balls-Berry is encouraged that this work will ultimately help to put the needs of our patients and communities first.

Indigenous Approaches to Team Science

This panel will discuss the different roles that collaboration plays in Indigenous responses to complex, socio-environmental problems in Canada and the United States.

Henry Lickers
Seneca Nation, Turtle Clan

Henry Lickers is a member of Seneca Nation, Turtle Clan. He has been married for 47 years and has three grown children. He has been the Director of the Mohawk Council of Akwesasne, Department of the Environment for 33 years and is now the Environmental Science Officer the past 6 years. During this time, he has been principle investigator on the EAGLE (Effects on Aboriginals in the Great Lakes Environment) Project and the Naturalized Knowledge Systems Project and the First Nation's Community Health Indicators Project, all of these projects are investigating First Nations Environmental issues. He was also one of the contributors to the First Nation Environment Assessment Toolkit for Ontario, Chiefs of Ontario.

Jimmie D Mitchell Jr
Chippewa Ottawa Resource Authority

Jimmie has actively served on the Board of the Chippewa Ottawa Resource Authority since 2003. He has focused his attention on protecting the environment and also Tribal Rights secured in the Treaty of 1836 and since, reaffirmed in the 2000 and 2007 Consent Decrees, respectively.His involvement during the contentious Inland phase of the landmark US v Michigan court case, was instrumental in convincing the parties to negotiate the case out of court. The results of this painstaking effort served to reaffirm the existence of Inland Hunting, Fishing and Gathering Rights, within the boundaries of the 13.8 million acre Ceded Territory and also, garnered Co-management rights and obligations outlined and secured within the 2007 Decree. He currently serves as an appointed representative on the Midwest Region Tribal Interior Budget Committee which is aimed to provide tribal guidance to insure the Trust Responsibilities of the United States to Tribal Nations are realized and incorporated into the President's Budget. On behalf of his Tribal Nation, the Little River Band of Ottawa Indians he is the Director of Natural Resources and is one of their Traditional Carriers of the Sacred Pipe. He is also an active member of Maaingun Dodem, (Wolf clan), he was born in Muskegon, Michigan, has traveled extensively throughout the world and now lives in Manistee with his family in a remote corner of 1836 reservation.

Dr. Kyle Whyte
Michigan State University

Kyle Whyte, Ph.D., is a professor and environmental activist working at Michigan State University. He focuses on teaching and research on #NoDAPL and Indigenous climate justice, and places where you can follow my updates. Whyte specifically focuses on the problems and possibilities Indigenous peoples face regarding climate change, environmental justice, and food sovereignty. He participates in a variety of programs at Michigan State University that include Philosophy, Community Sustainability, American Indian & Indigenous Studies, Environmental Science & Policy, Environmental Philosophy & Ethics and the Geocognition Research Lab.

Team Science in Agriculture and Natural Resources

This panel will address how research in agriculture and natural resources both depends on and informs team science.

Dr. Nick Haddad
Michigan State University

Nick Haddad is an ecologist and conservation biologist at the Kellogg Biological Station of Michigan State University. He is currently the Lead Principal Investigator for the 30-year old Long-Term Ecological Research experiment at Kellogg Biological Station. The research is on the effects of land use intensity on ecological systems, including effects of agricultural management on the environment, and effects of environmental management on agriculture. In 2018 there were 102 investigators and 57 graduate students conducting research at KBS Long-Term Ecological Research Center. He also directs a 25-year experimental study of effects of habitat loss and landscape corridors on biodiversity; and a 10-year experimental study of restoration on endangered butterflies.

Dr. Janice Siegford
Michigan State University

Dr. Janice Siegford is an Associate Professor in the Department of Animal Science at Michigan State University. She is an applied ethologist who uses a combination of non-invasive approaches to study the behavior of swine and laying hens in production systems with the goal of improving their welfare. She has spent the last 10 years examining how laying hens behave in aviary systems to understand if these expanded housing systems really do promote better welfare for the birds. She also works with a multi-disciplinary team to examine the connection between social behavior in group-living pigs and their underly-ing genotypes to determine if genetic selection can adapt pigs to modern pro-duction systems. Dr. Siegford mentors undergraduates completing independent research projects. She also teaches undergraduate courses in applied ethol-ogy and companion animal biology and management, a graduate course in ani-mal welfare, and delivers guest lectures across and beyond campus in courses ranging from current issues in agriculture to animal law.

Dr. Patricia Soranno
Michigan State University

Dr. Patricia A. Soranno is a broadly-trained ecologist who conducts interdisciplinary research on freshwater ecosystems at continental scales. All of her work is collaborative and much of it is also interdisciplinary. She enjoys crossing disciplinary boundaries to solve complex problems that benefit from a diversity of perspectives and approaches. She also conducts research about the contemporary practice of environmental science, including the emerging dominance of team-based research, open science, and data-intensive approaches. She is the founding editor-in-chief for the Association of the Sciences of Limnology and Oceanography's newest open-access journal, Limnology & Oceanography Letters. And, she is a Sustaining Fellow of the Association for the Sciences of Limnology & Oceanography.

Dr. Scott Swinton
Michigan State University

Scott Swinton is Professor in the Department of Agricultural, Food, and Resource Economics at Michigan State University. His research examines agriculture as a managed ecosystem, focusing on decision analysis for enhanced ecosystem services. He concentrates on problems involving crop, pest, pollination, and nutrient management; precision agriculture; resource conservation; and bioenergy production. Throughout his career, Scott has worked on multidisciplinary teams (mostly with biologists) seeking ways to make agriculture more sustainable via improved technology, information, and incentives. His research in the USA, Latin America, and Africa has been cited over 9,000 times (Google Scholar). Scott currently teaches undergraduate managerial economics and graduate research design & writing. He was elected president of the Agricultural and Applied Economics Association (AAEA) for 2016-19 after serving as director (2012-15).

Moderator:
Sheril Kirshenbaum
Michigan State University

Sheril Kirshenbaum works to enhance public understanding of science and improve communication between scientists, policymakers and the public. She has authored two books and her writing appears in popular publications and scientific journals. Sheril has been a 2015 Presidential Leadership Scholar, a Marshall Memorial Fellow, a legislative Fellow in the U.S. Senate and a Next Generation Fellow through the Robert Strauss Center for International Security and Law. She speaks internationally about science communication and has appeared at events like TEDGlobal and Cuidad de las Ideas. Sheril currently hosts "Our Table" at Michigan State University.

Notes:
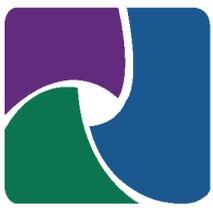
Plenary Panelists

Science of Groups and Teams

This panel will address recent work on the nature and function of teams and multi-team systems, with perspectives from psychology, management, and organizational behavior

Dr. Lindred (Lindy) Greer
University of Michigan

Lindred (Lindy) Greer is Associate Professor of Management & Organizations and faculty director of the Sanger Leadership Center at the Stephen M. Ross School of Business at the University of Michigan. Her research focuses on how to design and lead effective organizational teams, with specific interests in intra-group hierarchy, conflict, diversity, leadership, and emotion. Lindy has published in outlets such as Academy of Management Journal, Organization Science, Journal of Applied Psychology, Science, and Proceedings of the National Academy of Sciences, among others. Her work has been covered in media outlets including the New York Times, Forbes, and Fast Company, and she has received awards from the Academy of Management and American Psychological Association. Lindy received her B.S. from the Wharton School of Business at the University of Pennsylvania, and her Ph.D. in social and organizational psychology from Leiden University in the Netherlands.

Dr. John Hollenbeck
Michigan State University

John R. Hollenbeck holds the positions of University Distinguished Professor at Michigan State University and Eli Broad Professor of Management at the Eli Broad Graduate School of Business Administration. He received his Ph.D. in Management from New York University in 1984. He served as the acting editor at Organizational Behavior and Human Decision Processes in 1995, the associate editor of Decision Sciences from 1999 to 2004, and the editor of Personnel Psychology from 1996 to 2002. He has been awarded over $7 million in external research funding, most of which was granted by the U.S. Department of Defense and the National Science Foundation. He has been awarded fellowship status in both the Academy of Management and the American Psychological Association, and was recognized with the Career Achievement Award by the HR Division of the Academy of Management (2011), as well as the Early Career Award (1992) and Distinguished Service Contributions Award of the Society of Industrial and Organizational Psychology.

Dr. Daniel Ilgen
Michigan State University

Daniel R. Ilgen is John A. Hannah Distinguished Professor Emeritus at Michigan State University in the Departments of Psychology and Management. He received his Ph.D. in psychology from the University of Illinois and subsequently held faculty appointments at the University of Illinois, Urbana-Champaign, the U.S. Military Academy, West Point, and Purdue University before coming to Michigan State University. He a fellow of the Association for Psychological Science, the American Psychological Association, the International Association of Applied Psychology, the Academy of Management, the and the Society for Industrial and Organizational Psychology. His work is in the general areas of work motivation, team behavior, performance evaluation, and leadership. In recognition of this work, he received the Distinguished Scientific Contributions Award from the Society of Industrial and Organizational Psychology and the Herbert A Henneman, Jr. Lifetime Career Achievement Award given by the Human Resources Division of the Academy of Management.

Plenary Panelists

Dr. Steve Kozlowski
Michigan State University

Steve W. J. Kozlowski, Ph.D. is a Professor of Organizational Psychology at Michigan State University. He is a recognized authority in the areas of multilevel theory; team leadership and team effectiveness; and learning, training, and adaptation. The goal of his programmatic research is to generate actionable theory, research-based principles, and deployable tools to develop adaptive individuals, teams, and organizations. His research is, or has been, supported by the Agency for Health Research and Quality (AHRQ), the Air Force Office of Scientific Research (AFOSR), the Army Research Institute for the Behavioral and Social Sciences (ARI), the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the Office of Naval Research (ONR), among others. His research has generated over $10M in funded work. Dr. Kozlowski is the recipient of the SIOP Distinguished Scientific Contributions Award and the INGRoup McGrath Award for Lifetime Achievement in the Study of Groups.

Moderator:
Dr. Steve Fiore
University of Central Florida

Dr. Stephen M. Fiore is Director, Cognitive Sciences Laboratory, and Professor with the University of Central Florida's Cognitive Sciences Program in the Department of Philosophy and Institute for Simulation & Training. He maintains a multidisciplinary research interest that incorporates aspects of the cognitive, social, organizational, and computational sciences in the investigation of learning and performance in individuals and teams. His primary area of research is the interdisciplinary study of complex collaborative cognition and the understanding of how humans interact socially and with technology. He was president of the Interdisciplinary Network for Group Research (INGRoup) and is currently a founding board member of the International Network for the Science of Team Science. Dr. Fiore was a member of the expert panel for the Organisation for Economic Co-operation and Development's 2015 Programme for International Student Assessment (PISA) which focused on collaborative problem-solving skills.

Notes:

Plenary Panelists

Integrating Team Science with Health Science Research and Practice

This panel will discuss community-engaged research conducted by faculty in the Division of Public Health at the Michigan State University College of Human Medicine, Flint Campus and the use of team science to promote health equity in Flint, MI and beyond

Dr. Todd Lucas
Michigan State University

Todd Lucas, PhD, is a social and health psychologist whose research considers psychosocial causes of racial health disparities. He is focused on stress and preventive health behavior pathways, such as cancer screening. His research especially considers psychological justice - the causes and resulting health and social consequences of perceiving injustice for individuals and communities. His research is both psychophysiological, in considering the ways in which psychosocial factors "get under the skin" to affect health, and also intervention focused, in attempting to develop strategies to reduce disparities. He has received funding from sources such as the National Cancer Institute and the National Heart, Lung and Blood Institute to support his program of research on topics that have ranged from understanding stress reactivity responses to injustice to promoting better uptake of colorectal cancer screening. His Michigan upbringing is a perpetual influence on his approach to conducting research and forging collaborations that can reduce health and social disparities.

Dr. Vicki Johnson-Lawrence
Michigan State University

Dr. Johnson-Lawrence is a social epidemiologist that uses community-based approaches to address determinants and prevention practices to promote health equity. Her work has expanded from the role of a traditional secondary data-driven epidemiologist to use community-engaged research strategies that inform components of her research, but to also provide a direct context in which the work is applied, modified, and used to promote health improvements through existing health and community systems, with local and community-based organizations, and within the academic context. Her work considers the dynamic nature of psychosocial factors over the life course in relation to chronic disease risk, with a particular focus on co-morbid mental and physical health outcomes (particularly mood/anxiety disorders and cardiovascular disease risk factors) exacerbated by chronic stress, and strategies to address these conditions in vulnerable communities.

Dr. Rick Sadler
Michigan State University

Dr. Rick Sadler a Flint, MI native and urban geographer with expertise in environmental science, GIS, food systems planning, and land use policy in legacy cities. He attended the University of Michigan-Flint (BSc, 2007) to pursue his life-long dream of becoming a cartographer, and later attended graduate school in the Department of Geography at the University of Western Ontario (PhD, 2013) where he was immersed in the Canadian system of urban planning. His experiences growing up in the Flint region--where industrial growth, subsequent deindustrialization, and fragmented planning practices have had a profound influence on the built form--shaped his drive to resolve inequalities that arise from imbalances between the salutogenic and pathogenic properties of urban areas. His research interests reflect this concern and include an integration of urban planning and public health topics related to neighborhood/built environmental effects on health.

Discussant:
Dr. Debra Furr-Holden
Michigan State University

Dr. Debra Furr-Holden is an epidemiologist with expertise in addiction epidemiology, prevention science, psychosocial measurement and behavioral health equity research, interventions and policy. Her research focusees on developing environmental strategies, structural and policy interventions to promote behavioral health and health equity. Dr. Furr-Holden's community-based, action-oriented research has been well received by community stakeholders and drove multiple policy interventions to address some of the nation's greatest public health challenges, with a special emphasis on health equity and policy-level interventions. Her research is grounded in the rubrics of epidemiology and consistent with principles and practices for understanding social determinants of health and health equity. She is a C.S. Mott Endowed Professor of Public Health and the Interim Director at the Michigan State University College of Human Medicine Division of Public Health. She is also the Director of the National Institute on Minority Health and Health Disparities funded Flint Center for Health Equity Solutions.

Notes:

The Changing Scale and Scope of Collaboration: Implications for Team Science

This panel will address various ways in which team science is changing, including size, disciplinary and crossdisciplinary complexity, and geographical distribution (e.g., national, international).

Dr. Arun Agrawal
University of Michigan
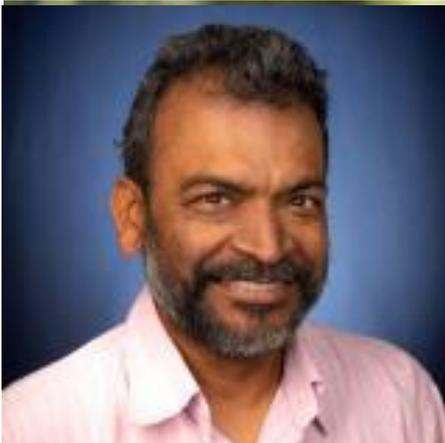
Arun Agrawal, PhD, emphasizes the politics of international development, institutional change, and environmental conservation in his research and teaching. He has written critically on indigenous knowledge, community-based conservation, common property, population resources, and environmental identities. Agrawal is the coordinator for the International Forestry Resources and Institutions network and is currently carrying out research in central and east Africa as well as South Asia. Since 2013, Agrawal has served as the editor-in-chief of World Development and his recent work has appeared in Science, PNAS, Conservation Biology, Development and Change, among other journals. Preceding his work at U-M, Agrawal was educated at Duke University, the Indian Institute of Management, and Delhi University and has held teaching and research positions at Yale, Florida, McGill, Berkeley, and Harvard among other universities.

Dr. Sanford Eigenbrode
University of Idaho

Sanford D. Eigenbrode is Professor of Entomology and University Distinguished Professor at the University of Idaho in the department of Entomology, Plant Pathology and Nematology. He received his MS in Natural Resources (1986) and his PhD Entomology (1990) from Cornell University. Sanford conducts research on insect ecology and insect-plant interactions in agroecosystems. An emphasis has been the chemical ecology, landscape ecology and management of insect-vectored viruses of wheat, potatoes and legumes in the Pacific Northwest. The broader context of his entomological research has led to interdisciplinary projects addressing the sustainability of agricultural systems. He was a co-PI on two NSF-IGERT projects on the ecological and social resilience in changing landscapes, and project director for a $20M NIFA-funded Coordinated Agricultural Project (CAP), Regional Approaches to Climate Change in Pacific Northwest Agriculture. He is a PI on a continuation NIFA CAP, Pacific Northwest Wheat-Based Systems: Landscapes in Transition.

Dr. Julie Thompson Klein
Wayne State University

Julie Thompson Klein, Ph.D., is Professor of Humanities Emerita in the English Department at Wayne State University and an Affiliate of the TdLab (Transdisciplinarity Lab) at the ETH-Zurich university for science and technology in Switzerland. She has also been a Mellon Fellow and a Visiting Professor in Digital Humanities at the University of Michigan. Klein is past president of the Association for Interdisciplinary Studies (AIS) and former editor of the AIS journal Issues in Interdisciplinary Studies. Her books include Interdisciplinarity (1990), Interdisciplinary Studies Today (co-edited 1994), Crossing Boundaries (1996), Transdisciplinarity (co-edited 2001), Interdisciplinary Education in K-12 and College (edited 2002),Mapping Interdisciplinary Studies (1999), Humanities, Culture, and Interdisciplinarity (2005), Creating Interdisciplinary Campus Cultures (2010), and Interdisciplining Digital Humanities (2015). She was also Associate Editor of The Oxford Handbook on Interdisciplinarity (2010, 2017).

Dr. Jonathan Kramer
University of Maryland

Jonathan Kramer is the Director for Interdisciplinary Science at the National Socio-Environmental Synthesis Center, University of Maryland (SESYNC). He focuses on the design of programs and the use of facilitation to advance synthesis-based research that can inform problem solving around socio-environmental issues. His work includes the development and use of effective practices that help interdisciplinary teams of scientists and others work effectively together. Jon has co-led the development and implementation of the SESYNC Graduate Research Fellows Program, a unique research and training experience that has engaged over 300 doctoral students over the past 5 years. His interests also include understanding and improving approaches that link science to decision-making in the environmental arena and he is engaged in efforts that foster organizational development, strategic planning and management to strengthen science-based organizations. Jon received a BS at the University of Massachusetts, MS at SUNY Stony Brook and Ph.D. at the University of Maryland.

Moderator:
Dr. Stephanie E. Vasko
Michigan State University

Dr. Stephanie E. Vasko is managing director for the MSU Center for Interdisciplinarity and co-chair of the 2019 SciTS Program Committee. She builds community and collaborative capacity among academic and blended academic/community research teams, develops and delivers philosophically-informed team based workshops as part of the Toolbox Dialogue Initiative, and researches the application of machine learning to team science and to agricultural diseases. She currently serves on the Mayors Arts and Culture Council in Lansing, MI and was former AAAS Community Engagement Fellow. Dr. Vasko is also a practicing artist who works with clay and iron, takes inspiration from dynamic natural forms, and explores interactions of soft/hard/malleable/brittle in form, as well as the materials chemistry of surface transformations.

Notes:

Agency Approaches to Team Science

This panel will provide a number of different perspectives on team science from NSF and NIH representatives.

Dr. Claire Hemingway
National Science Foundation

Dr. Sara Kiesler
Carnegie Mellon University

Dr. Peter R. Jackson
NIAID, NIH

Claire Hemingway is a program officer in Office of International Science and Engineering at the National Science Foundation (NSF), where she manages international programs, serves on the NSF working group for Navigating the New Arctic, and facilitates science cooperation with Canada. She is currently leading the new NSF-wide program to foster the creation of international networks of networks, AccelNet. She has previously managed the flagship interdisciplinary training program, NSF Research Traineeship Program, in the Education and Human Resources Directorate. Before joining NSF, she led a collaborative initiative across more than 18 international scientific organizations to enhance engagement in the scientific enterprise and scientific literacy by harnessing digital learning technologies and providing innovative online mentoring for student research teams.

Sara Kiesler is a rotator program manager in the Social, Behavioral, and Economics Directorate, managing interdisciplinary programs including Secure and Trustworthy Cyberspace and S&CC. She is University Professor and Hillman Chair Professor Emerita of Computer Science and Human-Computer Interaction at Carnegie Mellon University. Her Ph.D. was awarded in social psychology. Her research spans behavioral and social dimensions of technology, including the emergence of new forms of distributed work, science, and commerce, changes in how people communicate and group interactions in social media, human-robot interaction, and emerging threats to privacy, security, and information authenticity. She has been elected to the American Academy of Arts and Science and the National Academy of Engineering, and received the ACM CHI Lifetime Achievement Award, the Human-Robot Interaction Lifetime Service Award, the InGROUP McGrath Lifetime Award, the ICA Williams Prize, and the Allen Newell Award for Research Excellence.

Dr. Peter R. Jackson joined the NIAID Scientific Review Program (SRP) in 1990. During his tenure SRP grew from 10 to about 65 staff while NIAID's Extramural budget increased from approximately $500 million to $5 billion. Today the SRP manages the scientific and technical peer review of grant applications and contract proposals that request total direct costs ranging from $4 to $11 billion. As NIAID budgets grew and the Institute's research breadth has expanded, he had unique opportunities to influence the direction of research initiatives and peer review policies. As Chief of the AIDS Research Review Branch (ARRB), Dr. Jackson employs creative practices to facilitate the pursuit of NIAIDs national and International missions. He has represented the Director, SRP at NIH Review Policy Committee meetings where NIH peer review regulations, policies and processes are developed / discussed.

Dr. Anna L. Ramsey-Ewing
NCATS, NIH

On Sept. 20, 2015, Anna L. Ramsey-Ewing, Ph.D., joined NCATS as director of the Office of Grants Management and Scientific Review (OGMSR). She previously was the Office of Extramural Research Policy and Operations director at NIH's National Institute of Allergy and Infectious Diseases (NIAID). Ramsey-Ewing began her NIH career in 1991 as a research fellow at NIAID, and she later became a Fellows Award for Research Excellence recipient and senior staff fellow in NIAID's Laboratory of Viral Diseases. She subsequently served as NIAID's associate director for extramural science policy within the Division of Extramural Activities (DEA). In that role, Ramsey-Ewing was responsible for policy development and integration as well as dissemination and staff training in all facets of extramural policies and procedures. Her other DEA roles included serving as a special assistant to the DEA director and as a scientific review officer (SRO); as part of the latter role, she was instrumental in setting up a formal SRO training program.

Moderator:
Patricia Jones, Dr.P.H., M.P.H.
NCATS, NIH

Patricia Jones joined NCATS as a program director in April 2016. She began her federal career with the Centers for Disease Control and Prevention in 2004 and has been with NIH since 2012. Jones has experience overseeing, conducting and evaluating prevention science programs, implementation science, and international and domestic clinical trials sites. She also has a strong background in clinical networks. Jones has served as an associate editor for a clinical trials peer review journal and has taught psychology and research methods as a lecturer at Oglethorpe University. She is a behavioral scientist and holds a doctorate in public health in health promotion and health education with a concentration in psychology, health services research and epidemiology from Loma Linda University. Jones also holds an M.P.H. in behavioral sciences and health education from the University of California, Los Angeles, and a bachelor's degree in women's studies from the University of California, Berkeley. She is currently pursuing an M.S. in biotechnology with an emphasis in regulatory affairs as well as an M.B.A.

Notes:

Cultivating Team Science in Clinical and Translational Research

The Michigan Institute for Clinical & Health Research panel will describe how the Institute promotes team science by incorporating services and resources designed for teams into its clinical and translational research infrastructure. In doing so, it will also convey general lessons for the SciTS community.

Dr. Felix Kabo
University of Michigan

Dr. Beth LaPensee
University of Michigan

Susan Murphy, ScD, OTR
University of Michigan

Felix Kabo, M.Arch, Ph.D., is research faculty at the Institute for Social Research, the University of Michigan (U-M). His research expertise is in the ways in which our social and spatial worlds intersect and interact to influence outcomes such as collaboration, team science, innovation and entrepreneurship, and aging and racial disparities. Felix's work has appeared in Environment & Behavior, Research Policy, Environment and Planning B, Philosophical Transactions of the Royal Society B, Journal of Clinical and Translational Science, and Innovation in Aging. In addition to his role with the Network Science module of the Michigan Institute for Clinical & Translational Research. Dr. Kabo is simultaneously the Principal Investigator and Co-Investigator on multiple research projects. Funding for these projects is from several federal science agencies including the National Institute on Aging, the Institute of Museum and Library Services, and the TriService Nursing Research Program, as well as leading foundations like the Ewing Marion Kauffman Foundation.

Beth LaPensee, PhD, is the Administrative Program Director for Research Initiatives at the Michigan Institute for Clinical & Health Research, which is the University of Michigan's NIH-funded CTSA site. In her role, Beth provides leadership to four programs, including Research Development, Pilot Grants, Biostatistics and Project Management. In addition to overseeing the day to day operations, Beth contributes to the overall strategy, vision and direction of these programs, particularly as they relate to helping faculty achieve research and funding success. Most recently, Beth led the development and implementation of novel support and funding mechanisms that aim to help researchers synergize siloed efforts in order to tackle complex scientific questions. Beth obtained her BS in Biology from the College of William & Mary and her PhD in Cell & Molecular Biology from the University of Cincinnati where her thesis focused on understanding how hormones antagonize chemotherapy in breast cancer.

Dr. Susan Murphy has been the recipient of various grants through NIH, the department of Veteran's Affairs, and the American College of Rheumatology's Research and Education Foundation. She co-directs MICHR's Practice-Oriented Research Training (PORT) Program at the University of Michigan. Dr. Murphy is an associate editor of the American Journal of Occupational Therapy and on the editorial boards of the Arthritis Care and Research Journal and the Journal of Applied Gerontology. She is the conference president of the 2011 Society for Ambulatory Assessment conference held at the University of Michigan.
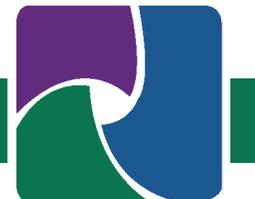
Moderator:
Dr. George Mashour
University of Michgian

George A. Mashour, M.D., Ph.D. is an anesthesiologist and NIH-funded neuroscientist at the University of Michigan. He is internationally recognized for his work on consciousness and the mechanisms of unconsciousness. Mashour has authored >200 publications, with key articles and commentaries appearing in the New England Journal of Medicine, Lancet, Science, and the Proceedings of the National Academy of Sciences. He has also been the lead editor of five textbooks related to anesthesiology and the neurosciences, published by Cambridge University Press and Oxford University Press. Mashour is the founding director of the Center for Consciousness Science at the University of Michigan. He also serves as the Associate Dean for Clinical & Translational Research at the medical school as well as Director of the Michigan Institute for Clinical & Health Research, the NIH-funded CTSA institute of the University of Michigan. Mashour has received numerous awards as a researcher and educator; in 2018, he was elected to the National Academy of Medicine.

Notes:

About INSciTS Special Interest Groups

INSciTS Special Interest Groups (SIGs) are member-led groups that provide a "home within a home" for INSciTS members to connect and collaborate with colleagues who have shared interests in the SciTS field.

INSciTS SIGs:

- Enable INSciTS members to connect around shared interests and aligned activities to build community Provide a forum for INSciTS members to collaborate with one another throughout the year
- Help to advance key priority areas in the Science of Team Science (SciTS) field, and
- Create opportunities to engage as a community with external groups.

Active Special Interest Groups

Active SIGs are described below. "Example topics" offer a sense of the current scope of each SIG. Focus areas and activities of each SIG will evolve based on the interests and goals of SIG members.

Fostering Team Science in Academia

Chair: Scott Leischow, PhD, Professor and Director, Translational Science, College of Health Solutions, Arizona State University

Example topics:
- Appointment, promotion, and tenure policies
- Institutional organization and structures (centers, cross-departmental),
- Funders' influence - funding mechanisms, policies, guidelines, requirements
- Publishing opportunities and challenges

Team Science Training

Chair: Wayne McCormack, PhD,Director, Clinical & Translational Science Predoctoral Training Program, University of Florida Clinical & Translational Science Institute, and Director, University of Florida Health Office of Biomedical Research Career Development

Example topics:
- Development and dissemination of curriculum, training, and educational resources
- Undergraduate, graduate, and early career training
- Professional development
- Syllabi - courses, workshops, training initiatives
- Team science competencies
- Online materials
- Train the trainer approaches

Incubator Spaces for Team Science

This SIG is for individuals seeking to develop programs and spaces that can serve to foster and incubate effective team science.

Chair: Ellen Fisher, PhD,Assistant Vice President for Research and Strategic Initiatives, Colorado State University

Example topics:
- Developing incubator activities and spaces at academic institutions (e.g., seed grants, cross-disciplinary centers, through CTSAs and other center-focused programs)
- Fostering Team Science in Academia
- Stimulating creativity through incubator activities and spaces
- Sharing/designing/disseminating best practices to support scientific teams
- Creating evidence-based interventions for team science

Scientometrics and Data Analytics for Team Science

Chair: Zaida Chinchilla-Rodríguez, PhD,Associate Research Professor, Spanish National Research Council (CSIC), Institute of Public Goods and Policies (IPP), Madrid, Spain

Example topics:
- Scientometrics indicators for longitudinal analysis of team outcomes and scholarly communications patterns (e.g., team size, productivity, persistence, diversity of collaborators, references, research topics)
- Network analysis for scientific collaborations and cognitive structures of team science
- Mechanisms and evaluation criteria (metrics) for authorship and contributorship in scientific publications and limits to scientific career advancement
- Measuring interdisciplinary, novelty and conventionality in collaborative research
- Data visualizations

Interreach - A SIG for Interdisciplinary Executive Scientists, Research Development Professionals, and I2S Specialists

The goals of this SIG are to articulate and promote the need for a dedicated career path around interdisciplinary research expertise, and to develop and improve practitioners' tools, best practices, success metrics, and career trajectories.

Chair: Christine Hendren, PhD, Assistant Research Professor, Department of Civil and Environmental Engineering, and Executive Director, Center for the Environmental Implications of NanoTechnology (CEINT) Duke University

Example topics:
- Developing the profession
- Professional development – effective best practices, tools, methods, etc.
- Evaluation
- Hiring, promotion and tenure

Daily Schedule - Monday, May 20, 2019

Time	Event	Location
7 a.m.	**Registration** *Open 7 a.m. – 6:30 p.m.*	Lobby Coat Room
8 a.m.	**Breakfast**	Ballrooms 5-8
9 a.m.	**Workshops**	
	Teaching the Science of Team Science (SciTS) *Dr. Jennifer Cross, Ms. Hannah Love, Dr. Ellen Fisher; Colorado State University*	Ballrooms 1-2
	Navigating Team Power Dynamics in Authorship Decisions *Dr. Kevin Elliott, Dr. Kendra Cheruvelil, Michigan State University; Dr. Isis Settles, University of Michigan; Dr. Patricia Soranno, Dr. Georgina Montgomery, Michigan State University*	Room 101
	Optimizing mentoring relationships in team science: An engine for scientific accomplishment and inclusive excellence *Dr. Melissa McDaniels, Dr. Katy Colbry; Michigan State University*	Room 102
	Mapping Transitional Research Stories: Team Science Storytelling using the NIEHS Translational Research Framework *Ms. Kristi Pettibone; National Institute of Environmental Health Science*	Room 103
	Community playbooks and collaboration guides – creating documentation to facilitate effective scientific teamwork *Ms. Lou Woodley, Dr. Rebecca Aicher; AAAS*	Ballrooms 3-4
	TBL 101: Introduction to Team-Based Learning *Dr. Wayne McCormack, University of Florida*	Room 104
12 p.m.	**Lunch on your own**	
1 p.m.	**Welcome to SciTS 2019 with Dr. Michael O'Rourke, Dr. Stephanie E. Vasko, MSU Provost June Youatt, Lansing Mayor Andy Schor**	Ballrooms 1-4
2 p.m.	**Keynote with Joy Balls-Berry, Mayo Clinic**	Ballrooms1-4
3 p.m.	**Beverage Break and Sponsor Showcase**	Ballrooms 5-8
3:15 p.m.	**Concurrent Panels**	
	Intereach Community Effort: A Live Action "Potluck" Approach to Assembling Shared Team Science Curricular Resources *Dr. Christine Hendren, Dr. Kristine Glauber; Duke Clinical & Translation Science Institute*	Room 101
	The Resilience of Team Science: Lessons for the Science of Team Science from Puerto Rico's Post Hurricane Maria Response, Recovery, and Reconstruction *Dr. Cecilio Ortiz Garcia, Dr. Marla Perez Lugo, Dr. Lionel Orama Exclusa, University of Puerto Rico~Mayaguez; Mr. Jacob Mans, University of Minnesota*	Room 102
	Changing Academic Institutional Culture to Facilitate and Support Team Science *Dr. Scott Leischow, Ms. Andi Hess,Dr. Deborah Williams, Arizona State University; Ms. Rachel Chown, Manchester Cancer Research Centre; Dr. Jennifer Cross, Colorado State University*	Room 103
	Increasing Research Effectiveness through Team Science Training for Research Teams *Ms. Jennifer Sprecher, Institute of Translational Health Sciences; Dr. Brenda Zierler, FAAN, Professor; Dr. Erin Blakeney, Ms. Nicole Summerside, MHA, University of Washington*	Room 104
	How to design teams, space and careers for better team science; a practical guide. *Dr. Claire Smith, Ms. Ruth Norris, Mrs. Charlotte Stockton Powdrell, The University of Manchester, UK; Ms. Rachel Chown, Manchester Research Centre, Manchester UK; Dr. Amanda Lamb, The University of Manchester, UK*	Room 201
4:45 p.m.	**Break and Sponsor Showcase**	Ballrooms 5-8
5 p.m.	**Plenary Panel: Indigenous Approaches to Team Science**	Ballrooms 1-4
6:15 p.m.	**Break and Refresh**	
6:30 p.m.	**Networking Reception at the Lansing Brewing Company**	

8 a.m.	**Registration** *Open 8 a.m.– 8 p.m.*	Lobby Coat Room
	Breakfast	Ballrooms 5-8
9 a.m.	**Plenary Panel: Team Science in Agriculture and Natural Resources**	Ballrooms 1-4
10:15 a.m.	**Beverage Break and Sponsor Showcase**	Ballrooms 5-8
10:30 a.m.	**Innovating with Technology**	Room 101

Getting Started with Machine Learning and Team Science & Science of Team Science Research
Dr. Stephanie E. Vasko, Michigan State University

Collaborative Data Design: A Tool for Multisector Alignment
Dr. Kathleen Pine, Dr. Michael Shafer, Dr. Margaret Hinrichs, Ms. Kailey Love, Dr. George Runger; Dr. William Riley, Arizona State University

CohortGen: Promoting Collaboration Through Automatic Cohort Generation
Dr. Charisse Madlock, Mr. Billy Barnett; University of Tennessee Health Science Center

Do More, Faster: Utilizing Advanced Computational Resources in Your Research Team
Dr. Dirk Colbry, Michigan State University

Supplanting Institutionalized Science of Science Data Collection with Big Data Methods 'in the Wild'
Dr. Loannis Pavlidis, Mr. Mohammed Emtiaz Ahmed, University of Houston

Spatially-Situated Case Studies	Room 102

Building climate resilience in Africa & South Asia: Lessons on membership, organization & collaboration from four transdisciplinary research consortia
Dr. Bruce Currie-Alder, International Development Research Centre (IDRC); Lucia Scodanibbio, University of Cape Town; Katharine Vincent, Kulima Integrated Development Solutions; Anjal Prakash, Teri School of Advanced Studies; Nathalie Nathe, Overseas Development Institute

A Scholar-Practitioner's Guide to Global Virtual Teams
Ms. Lejla Bilal-Maley, Antioch University

Using team science to identify important and innovative questions for cancer research
Ms. Rachel Chown, Dr. Sarah George, Ms. Pip Peakman, Dr. Robert Bristow, Manchester Cancer Research Centre

Collaboration Readiness	Room 103

The experience and confidence of researchers and research support staff in conducting cross-disciplinary research
Dr. Yan Ding, Dr. Justin Pulford, Dr. Imelda Bates, Liverpool School of Tropical Medicine

Building the Collaboration Readiness Framework for ad-interim Evaluation of Transdisciplinary Collaborations
Dr. Eva Kalmar, Dr. Maarten van den Sanden, Ms. Ingrid van Marion, TU Delft

Perceptions of Competence of Social Scientists and Natural Scientists
Ms. Caitlin Kirby, Ms. Patricia Jaimes, Dr. Amanda R. Lorenz-Reaves, Dr. Julie C. Libarkin; Michigan State University

Does a Shared Understanding Blind Groups to Surprise?
Ms. Michal Russo, U of M School of Environment & Sustainability

I'm ready, are you ready? How do you know of your team is ready?
Dr. Jennifer Cross, Dr. Bailey Fosdick, Dr. Hannah Beth Love, Dr. Meghan Suter, Ms. Dinada Egan, Dr. Ellen Fisher, Colorado State University

Tools For Team Science & The Science of Team Science	Room 104

11 Best Practices for Successful Team Science: A series of motivational videos
Ms. Nicole Exe, Ms. Laura Denton, Ms. Meg Fairchild, Mr. Jordan Hahn, Dr. Vicki Ellingrod, University of Michigan

Infrastructuring a Federated Research Network Node
Dr. Marcelline Harris, Lisa Ferguson, Airong Luo, University of Michigan

It's not all fun and games: Building multiplayer worlds to explore, learn and expand
Mr. Benjamin Green, Ms. Georgina Moulton, Ms. Victoria Turner, University of Manchester

Repertories as Blueprints and Frameworks for the Doing of Science
Dr. Rachel Ankeny, University of Adelaide; Dr. Sabina Leonelli, University of Exeter

Training & Professional Development	Ballrooms 1-4

Reflecting on Transdisciplinary Team Science Training
Dr. Stephen Fiore, University of Central Florida; Dr. Troy Hartley, College of William & Mary Virginia Institute of Marine Science; Dr. Linda Schaffner, College of William & Mary Virginia Institute of Marine Science; Dr. Karen McGlathery, University of Virginia; Dr. Deborah DiazGranados, Virginia Commonwealth University

10:30 a.m.	**Training & Professional Development** *Continued*	Ballrooms 1-4

Evidence-based Team Development: Pre-post Assessment of Team Experiences with Team Coaching
Dr. Tony Lingham, Antioch University; Dr. Bonnie Richley, Interaction Science, LLC

Developing Competencies for Team Science
Dr. Deborah DiazGranados, Virginia Commonwealth University; Dr. Heather Billings, Mayo Clinic; Dr. Allan Brasier, University of Wisconsin; Dr. Dan Lackland, Medical University of South Carolina; Dr. Wayne McCormack, University of Florida; Dr. Maritza Salazar, University of California, Irvine; Jennifer Sprecher, University of Washington; Dr. Beth Tigges, University of New Mexico; Dr. Kevin C. Wooten, University of Houston Dr. Dayan Ranwala, Medical University of South Carolina; Dr. Gaetano Lotrecchiano, George Washington University

Team Science Boot camp: Annual Trainings to Improve Team Performance
Dr. Brenda Zierler, Dr. Erin Blakeney, Ms. Jennifer Sprecher, Ms. Nicole Summerside, University of Washington

Mastering complex conversations
Dr. Katy Colbry, Dr. Dirk Colbry, Michigan State University

12:15 p.m.	**SIG Meetings**	
	Fostering Team Science in Academia	Room 101
	Team Science Training	Room 102
	Incubator Spaces for Team Science	Room 103
	Scientometrics and Data Analytics for Team Science	Room 104
	Interreach	Ballrooms 1-4
1:15 p.m.	**Lunch on Your Own**	
2:15 p.m.	**Plenary Panel: Science of Groups and Teams**	Ballrooms 1-4
3:30 p.m.	**Beverage Break and Sponsor Showcase**	Ballrooms 5-8
3:45 p.m.	**SocioEnvironmental Team Science**	Room 101

Interlinking open science to team-based action research for socio-environmental cases
Dr. Yasuhisa Kondo, Research Institute for Humanity and Nature; Mr. Akihiro Miyata, The University of Tokto; Dr. Ui Ikeuchi, University of Tsukuba; Dr. Satoe Nakahara, Research Institute for Humanity and Nature; Dr. Ken'ichiro Nakashima, Hiroshima University; Dr. Hideyuki Onishi, Doshisha University; Dr. Takeshi Osawa Tokyo Metropolitan University; Dr. Kazuhiko Ota Research Institute for Humanity and Nature; Dr. Kenichi Sato, Kyoto Sangyo University; Dr. Ken Ushijima ,Hokkaido Research Organization; Dr. Bianca Vienni Leuphana ,University of Lüneberg; Dr. Terukazu Kumazawa ,Research Institute for Humanity and Nature Dr. Kazuhiro Hayashi, National Institute of Science and Technology Policy; Dr. Yasuhiro Murayama , National Institute of Information and Communications Technology; Dr. Noboru Okuda, Research Institute for Humanity and Nature; Prof. Hisae Nakanishi, Doshisha University

Adopting a Community Science Model of Team Science for Addressing Environmental Inequities
Dr. Jennifer Carrera, Dr. Kent Key, Michigan State University; Ms. Karen Calhoun, University of Michigan; Dr. Sarah Bailey, All Faith and Health Alliance; Dr. Joseph Hamm, Dr. Courtney Cuthbertson, Michigan State University; Ms. Yvonne Lewis, National Center for African American Health Consciousness, Healthy Flint Research Coordinating Center; Dr. Susan J. Woolford, University of Michigan; Ms. E. Hill DeLoney, Flint Odyssey House Health Awareness Center; Ms. Ella Greene-Moton, Community Ethics Review Board; Ms. Kaneesha Wallace, Healthy Flint Research Coordinating Center; Mr. DeWaun E. Robinson, Artistic Visions Enterprise; Mr. Ismael Byers, Michigan State University; Ms. Patricia Piechowski-Whitney, University of Michigan; Mr. Luther Evans; Ms., Athena McKay, Dr. Don Vereen, University of Michigan; Ms. Arlene Sparks, Date2Dream

Leading large interdisciplinary research teams: Lessons from LAGOS
Dr. Patricia Soranno, Dr. Kendra S. Cheruvelil, Michigan State University

Managing interdisciplinary teams: Lessons learned from coupled natural and human systems modeling in lake catchments
Ms. Reilly Henson, Dr. Kelly Cobourn, Dr. Cayelan Carey, Virginia Tech; Dr. Kathleen Weathers, Cary Institute of Ecosystem Studies; Dr. Kaitlin Farrell, Ms. Nicole Ward, Ms. Weizhe Weng, Virginia Tech; Dr. Jennifer Klug, Fairfield University; Dr. Michael Sorice, Virginia Tech

Team Science Evaluation	Room 102

Indicators for measuring the contributions of individual knowledge brokers
Dr. Sabine Hoffmann, Eawag, Switzerland; Dr. Simon Maag, Parliamentary Services, Swiss Parliament; Dr. Robert Kase-Pasanen, University of Applied Sciences and Arts Northwestern Switzerland; Dr. Timothy J. Alexander, Eawag: Swiss Federal Institute of Aquatic Science and Technology

"Innovation happens at the intersections of disciplines." Transdisciplinary research outcomes based on the Transdisciplinary Research on Energetics and Cancer (TREC) II Initiative experience
Ms. Sarah D. Hohl, University of Washington/Fred Hutchinson Cancer Research Center; Dr. Sarah Knerr, University of Washington; Dr. Sarah Gehlert, University of South Carolina; Dr. Marian Neuhouser, Beti Thompson, Fred Hutchinson Cancer Research Center

2:15 p.m. | **Team Science Evaluation** *Continued* | **Room 102**

A new methodology for evaluating research integration
Ms. Bethany Laursen, Michigan State University; Dr. Nicole Motzer, National Socio-Environmental Synthesis Center (SESYNC)

Evaluation of Centers ad Institutes: Developing a Framework from Complex Systems and Team Science
Dr. Gwen C. Marchand, University of Nevada Las Vegas; Dr. Jonathan C. Hilpert, Georgia Southern University

Evaluating, Transdisciplinary, Sustainability-Focused Higher Education Programs: Using Transdisciplinary Orientation as a Performance Measure in Three NSF-Funded Program Contexts
Dr. Shirley Vincent, Vincent Evaluation Consulting; Dr. Deana Pennington, University of Texas at El Paso; Dr. Robert Chen, University of Massachusetts at Boston; Dr. Alan Berkowitz, Cary Institute of Ecosystem Studies; Dr. Aude Lochet, Cary Institute of Ecosystem Studies

Team Process | **Room 103**

Teamwork processes indicators: learning from the source materials of teams
Dr. Laura Anderson, IBM Research - Almaden

Exploring Narrative Mapping as a Lens into the Relationship of Team Member Attachment Styles with Team Psychological Safety
Mr. Jonathan Silk, Pepperdine University Graduate School of Education and Psychology; Ms. Michele Norton, Texas A&M University Department of Teaching, Learning, and Culture

An evaluation of researcher motivations and productivity outcomes in international research teams at a U.S. research-intensive university
Dr. Jane Payumo, Michigan State University; Dr. Danna Moore, Washington State University; Dr. Prema Arasu, North Carolina State University

Can we really use bibliometrics to form research teams?
Mr. Timothy Gawne, Ms. Kathryn Knight, Dr. Moody Altamimi, Oak Ridge National Laboratory; Dr. Jane Payumo, Michigan State University

Multiple Team Identities: A Person-By-Team Interaction Perspective
Dr. Tammy L. Rapp, Ohio University

Artistic & Humanistic Approaches to Team Science | **Room 104**

Poetry, Space, and Embodiment: A Case Study in Transdiciplinary Collaboration
Dr. Ellen Moll, Dr. Nancy DeJoy, Michigan State University

Connecting an Art-Science Practice to Collaborations
Dr. Edgar Cardenas, Michigan State University

Integration as a Non-Reductive Team Virtue
Dr. Stephen Crowley, Boise State University; Dr. Brian Robinson, Texas A&M University-Kingsville; Dr. Chad Gonnerman, University of Southern Indiana

TDI structured dialogue + pedagogy of the oppressed
Dr. Anna Malavisi, Western Connecticut State University

Organizational & Management Factors | **Ballrooms 1-4**

Principles of Community in Team Science
Dr. Ellen Fisher, Dr. Jennifer Cross, Dr. Hannah Love, Dr. Bailey Fosdick, Colorado State University

Overload, Stress, and Higher Order Cognition in Emergency Managers
Dr. Shalini Misra, Mr. Matthew Rhodes, Dr. Patrick Roberts, Virginia Tech University

Co-designed strategic planning and Agile project management in academia: case study of an action research group
Mr. Enric Senabre Hidalgo, Dimmons Research Group, Internet Interdisciplinary Institute ,Universitat Oberta de Catalunya) Dr. Mayo Fuster Morell, Berkman Center for Internet and Society - Harvard University

Building capacity and capability in Greater Manchester through peer to peer support and development: The Research Programme Managers' Network (RPMN)
Ms. Charlotte Stockton-Powdrell, Ms. Alison Littlewood, Ms. Sarah Ashton, The University of Manchester; Ms. Hayley Brooks, Manchester University NHS Foundation Trust; Ms. Cara Afzal, Health Innovation Manchester (HInM); Dr Dieter Weichart,The Christie NHS Foundation Trust

Multiagent Systems in an Agile Environment
Dr. John Turner, University of North Texas; Mr. Nigel Thurlow, Toyota Connected; Dr. Rose Baker, University of North Texas; Mr. David Northcutt, Toyota Connected; Ms. Kelsey Newman, Emory University

5:30 p.m. | **Break and Refresh**

6:15 p.m. | **Sponsored Dinner and Panel:** | **Ballrooms 1-4**
Integrating Team Science with Health Science Research and Practice

2019 SciTS Conference Program

8 a.m.	**Registration** *Open 8 a.m.– 8 p.m.*	Lobby Coat Room
	Breakfast	Ballrooms 5-8
9 a.m.	**Plenary Panel: Changing Scale and Scope of Collaboration**	Ballrooms 1-4
10:15 a.m.	**Break and Sponsor Showcase**	Ballrooms 5-8
10:30 a.m.	**Collaborative Networks**	Room 101

Finding Colleagues and Emerging sub-disciplines via Systematic Network Analysis of Funding Awards
Dr. Steve Elliott, Dr. Kimberly A. Scott, Elizabeth Wentz, Arizona State University

Patterns of newly formed interdisciplinary collaborations over time during an immersive training experience
Dr. Bonnie Spring, Mr. Phillip Rak, Mr. H. Gene McFadden, Mr. Leland Bardsley, Northwestern University Feinberg School of Medicine; Dr. Mark Hansen, Dr. Vivek Shetty, University of California, Los Angeles ; Dr. Angela Fidler Pfammatter, Northwestern University

Network Improvement Communities and Organizational Change: Considerations in Developing and Leading NICs
Dr. Marilyn Amey, Alexander Gardner, Michigan State University

Investigating Collaborative Processes of Research Teams through Social Network Analyses
Dr. Jonathan Hilpert, Georgia Southern University; Dr. Gwen C. Marchand, Dr. Kristine Bragg, University of Nevada Las Vegas

Understanding scientific collaboration through the sequence of authors in the publication bylines and the diversity of collaborators
Mr. Yi Bu, Indiana University; Mr. Yong Huang, Wuhan University; Dr. Cassidy R. Sugimoto, Indiana University; Dr. Zaida Chinchilla-Rodríguez, Spanish National Research Council

| **Education & Teaching Team Science** | Room 102 |

Co-development of Interdisciplinary Engineering Innovation in Health course by Engineering and Team Science Faculty to Accelerate Health Innovation from Bench to Bedside
Dr. Soyoung Kang, University of Washington; Dr. Erin Blakeney, Ms. Nicole Summerside, Dr. Brenda Zierler, UW School of Nursing; Ms. Jennifer Sprecher, Institute of Translational Health Sciences; Ms. Katrina Henrikson, Dr. Jonathan Liu, Dr. Eric Seibel, Dr. Jonathan Posner, UW Mechanical Engineering

Closing the Collaborative Skills Gap: Assessing the Effectiveness of a University-Wide Course Designed to Teach Students How to Collaborate in Diverse Groups
Dr. Kathryn Plaisance, Mr. Christopher Lok, Ness Lamont, University of Waterloo

The Development of a Competency- Based Team Science Training Program: A Case Study of TeamMAPPS
Dr. Kevin C. Wooten, University of Houston Clear Lake; Dr. Martiza R. Salazar, University of California Irvine; Dr. Theresa K. Lant, Pace University; Dr. Eduardo Salas, Rice University; Cynde Ferris, Lori A. Wiseman, The University of Texas Medical Branch

Training and Development on Interdisciplinary Scientific Teams
Ms. Hannah Beth Love, Dr. Jennifer Eileen Cross, Dr. Bailey Fosdick, Dr. Susan VandeWoude, Dr. Ellen Fisher, Colorado State University

10:30 a.m.	**Diversity on Teams**	Room 103

The impact of gender composition and leadership on the productivity and authorship practices of interdisciplinary research teams
Ms. Jacalyn Beck, Michigan State University; Ms. Sheila Brassel, University of Michigan; Ms. Ellie Phillips, Ms. Jordan Fornier, Dr. Robert Montgomery, Dr. Kevin Elliot, Dr. Kendra Cheruvelil, Michigan State University; Dr. Isis Settles, University of Michigan

Explorations of Temporal Diversity, Temporal Conflict, and Temporal Leadership
Dr. Susan Mohammed, Penn State University

Strategies for Promoting "Teaminess" with a Focus on Diversity and Inclusion
Dr. Binyam Nardos, Dr. Letisha Wyatt, Dr. Damien Fair, Oregon Health & Science University

What team characteristics relate to team performance – and what is the role of diversity?
Dr. Ulf Sandström, KTH, Royal Institute of Technology, Stockholm; Dr. Peter Van Den Besselaar, Teresa Mom Consultancy & Vrije Universiteit Amsterdam

Team Climate Mediates the Effect of Diversity on Science Teams
Dr. Isis Settles, Ms. Sheila Brassel, University of Michigan; Dr. Patricia Soranno, Dr. Kendra Cheruvelil, Dr. Georgina Montgomery, Dr. Kevin Elliott, Michigan State University

Scaffolding and Academic Settings	Room 104

Developing Team Science Capacity at a Technological University
Dr. Kathleen E Halvorsen, Michigan Technological University

A year implementing a team science movement in a British University
Ms. Ruth Norris, Dr. Claire Smith, Dr. Amanda Lamb, Ms. Charlotte Stockton-Powdrell, Ms. Rachel Chown, The University of Manchester

Assessing the Propensity of Research Collaboration in the Life Sciences
Dr. Kyuseon Lee, Dr. Steve Miller, Dr. Philip G. Pardey, University of Minnesota

Societal Impact of Research on the Complexity of Language in France
Dr. Audrey Mazur-Palandre, University of Lyon; Dr. Gerald Niccolai, CNRS: Centre National de la Recherche Scientifique; Dr. François Pellegrino, CNRS: Centre National de la Recherche Scientifique; Dr. Kristine Lund, CNRS: Centre National de la Recherche Scientifique

Deep Knowledge Integration across Disciplines: The EMBeRS Method
Dr. Deana Pennington, University of Texas at El Paso; Dr. Kate Thompson, Griffith University; Dr. Shirley Vincent, Vincent Evaluation Consulting, LLC; Dr. David Gosselin, University of Nebraska at Lincoln

PANEL: Collaborative Scientific Writing: Challenges and Strategies	Ballrooms 1-4

Dr. Graham Hubbs, University of Idaho; Dr. Kara Hall, Dr. Amanda Vogel, Leidos Biomed; Dr. Kendra Spence Cheruvelil; Dr. Patricia Soranno, Michigan State University

12:15 p.m.	**Lunch**	
1 p.m.	**Plenary Panel: Agency Approaches to Team Science**	Ballrooms 1-4
2:15 p.m.	**Unconference**	Ballrooms 1-4
4:45 p.m.	**Poster Session, Sponsor Showcase and Reception**	Ballrooms 5-8
6:15 p.m.	**Dinner and Plenary Panel: Cultivating Team Science in Clinical and Translational Research**	Ballrooms 1-4

| 8 a.m. | **Registration** *Open 8 a.m.– 2 p.m.* | Lobby Coat Room |
| | **Breakfast** | Ballrooms 5-8 |

| 9 a.m. | **High Level Theory** | Room 101 |

Towards a Theory of Replications, Open Science, and Reproducibility
Dr. Bert Baumgaertner, Dr. Berna Devezer, Dr. Erkan Buzbas, University of Idaho; Dr. Luis G. Nardin, Brandenburg University of Technology

Foxholes, Not Silos
Dr. James Foster, University of Idaho

Transdisciplinary Knowledge Producing Teams (KPTs): Typology, features, and communication skills
Dr. Gaetano Romano Lotrecchiano, George Washington University; Dr. Shalini Misra, Virginia Tech

| **CTSA** | Room 102 |

Using Instructional Design Principles to Engage Citizen Scientists as Clinical Research Partners
Ms. Janet Brishke, Ms. Christy Evans, Dr. Elizabeth Shenkman, University of Florida College of Medicine

An Integrated Approach to Promoting Team Science Principles Across a CTSA
Dr. John (Jack) Kues, Dr. Jackie Knapke, Dr. Saundra Regan, Dr. Jennifer Molano, Dr. Rebecca Lee, Ms. Laura Hildreth, Elizabeth Heubi, University of Cincinnati

Implementing a Continuous Quality Improvement Intervention in a Clinical and Transitional Research Network
Ms. LaKaija Johnson, Ms. Gwenndolyn Porter, Ms. Jolene Rohde, Dr. Mary E. Cramer, Dr. Paul A. Estabrooks, University of Nebraska Medical Center

The relationship between disciplinary diversity, team composition, time-workload pressures and quality of interactions during patient-reviews in multidisciplinary tumor boards
Dr. Tayana Soukup, King's College London; Mr. Ben W Lamb, Cambridge University; Mr. James SA Green, Whipps Cross University Hospital; Dr. Nick Sevdalis, King's College London

| **Disciplinary Diversity – Theory and Praxis** | Room 103 |

Assessing the effectiveness of various funding strategies to foster disciplinary diversity in research teams
Mr. David Campbell, Mr. Brooke Struck, Science-Metrix Inc.

Measuring the Division of Labor in Interdisciplinary Science
Dr. Phillip Honenberger, University of Nevada-Las Vegas; Dr. Evelyn Brister, Rochester Institute of Technology

Do Interdisciplinary Researchers Tend to Join Teams?
Dr. Kevin M. Kniffin, Cornell University; Dr. Andrew S. Hanks, The Ohio State University

Spectacles of Inquiry: Perspective-Taking and Interdisciplinary Values
Dr. Lisa Osbeck, University of West Georgia

A Team Science Approach to Advance the Understanding of Low Back Pain
Dr. Jacek Cholewicki, Dr. John M. Popovich, Jr., Ms. Angela S. Lee, Mr. Payam Aminpour, Dr. Steven Gray, Michigan State University; Dr. Paul W. Hodges, The University of Queensland

9 a.m.	**Creative Approaches to Support Team Science in Academia**	Ballrooms 1-4

Using Collaborative Design to Align Institutional Incentives and Interdisciplinary Team Expectations: The Case of Reappointment, Tenure, and Promotion
Dr. Veronica Stanich, Mr. Gabriel Harp, Alliance for the Arts in Research Universities

Mcubed: A Token-Based Seed Funding Program with No Formal Scientific Review
Dr. Valerie Johnson, Dr. Mark Burns, University of Michigan

Working with your Research Development Office to Support Team Science
Dr. Betsy Rolland, University of Wisconsin-Madison; Dr. Holly Falk-Krzesinski, Elsevier

Agbioscience: transdisciplinary collaboration and the land-grant university mission in the 21st century
Dr. Julie Aldridge, The Ohio State University

Rethinking science as a vocation: 100 years of bureaucratization of academic science
John P. Walsh, Georgia Institute of Technology; You-Na Lee, National University of Singapore

10:45a.m.	**Break and Sponsor Showcase**	Ballrooms 5-8
11 a.m.	**Concurrent Panels**	

Preparing Students for Interdisciplinary Collaboration and Team Research: Case Studies and Models from the Graduate and Undergraduate Level *Dr. Marisa Rinkus, Michigan State University; Dr. Graham Hubbs, University of Idaho; Dr. Chet McLeskey, Michigan State University*	Room 101
Reward and Recognition for Team-Based and Cross-disciplinary Research *Dr. Holly J. Falk-Krzesinski, Elsevier and Northwestern University; Dr. Kara L. Hall, National Cancer Institute, National Institutes of Health; Dr. Julie Thompson Klein, Wayne State University and International Research Affiliate, Transdisciplinarity Lab, ETH-Zurich; Dr. Amanda L. Vogel, Leidos Biomedical Research, Inc.*	Room 102
SciCom meets SciTS. Interdisciplinary teamwork for science communication training *Dr. Jack C. Schultz, University of Toledo; Dr. Suzanne Burgoyne, Dr. Bimal Balakrishnan, Dr. Jonathan Stemmle, Dr. Shellly Rodgers, University of Missouri*	Room 103
Identifying the Behaviors and Actions of Facilitators of Successful Teams *Ms. Jill Macchiaverna, Mr. Dave King, Exaptive, Inc.; Dr. Alicia Knoedler, Independent Contractor; Dr. Terri Gilbert, Cohen Veterans Bioscience; Mr. Victor Soji Ladele, Health Innovation Lab*	Ballrooms 1-4

12:45p.m.	**Light Lunch and Closing Session**	Ballrooms 1-4
2 p.m.	**Conference Adjourns**	

Don't forget to complete your session and post conference evaluations at:
https://bit.ly/scits2019

Teaching the Science of Team Science (SciTS)

Dr. Jennifer Cross, *Ms. Hannah Love*, *Dr. Ellen Fisher*, Colorado State University

Working on a team can be a challenge! Have you ever said, "I hate group projects" or "It isn't natural for me to work on a team?" There is a growing body of literature on what makes good teams, but how do you "DO" team science, and how do you "TEACH" team science? Educating teams about team science involves various levels of education and concepts including developing a vision, engaging in the process, using facilitation, and creating a shared language. In addition, the critical skills needed for team science are slightly different for pre and post-doctoral trainees compared to PIs. Join us for this three-part workshop to discuss what training is needed for different research levels, learn about best practices, and participate in a 1-hour mini short course. The workshop will involve small group work, facilitated dialogs, and an active-learning training session. Be prepared to learn from each other and the facilitation team. Detail on each part of the workshop below:

Part I: Team Training Levels
Any given team can consist of several different levels of investigators including pre and post-doctoral trainees, senior investigators, etc. What specific team science training do different groups (i.e. trainees, junior investigators, senior researchers, PIs, administrators, project managers, and community partners) need to be successful? This workshop will begin with small group discussions to brainstorm using what are the most critical training aspects. Using the matrix below, small groups will outline what critical team science skills, training and support is needed to train and support different team science groups (i.e. pre and post-doctoral trainees v PIs) on scientific teams.

Learning objective:
- Assess as a community what type of training is needed for different levels of research.
- Benefit to SciTS Community: Conduct a needs assessment for the scientific community.

Part II
Participants will discuss the results from their small group conversations. In a facilitated dialog, we will construct an overarching matrix of the critical aspects of training for each level. As a group we will:
- Add to the beginning list of Critical Skills to Develop
- List resources or active learning techniques for delivery for each audience

To conclude part II, participants will vote on the training area they would like to further focus on through a mini-training course that will constitute the last hour of the workshop.

Learning Objectives:
- Construct a matrix as a team science community about what trainings and skills are needed for all trainee levels.
- Engage in a conversation about best practices for team science training.
- Identity what trainings are needed in the team science community.

Part III. SciTS Training Demonstration
Based on the outcome of the vote (part II), during the last hour, the team will present a mini-training workshop that demonstrates 3 unique activities for developing teams. Our team science team has developed a series of training workshops for both pre and post docs and senior PIs. We will come prepared to the workshop to demonstrate 3 unique modules, based on requests from workshop participants.

Learning Objective:
- Achieve a greater understanding of best practices for team science training.
- Benefit to SciTS Community: Demonstration of how research, training, and action come together in research-based trainings.

Navigating Team Power Dynamics in Authorship Decisions

Dr. Kevin Elliott, *Dr. Kendra Cheruvelil*, Michigan State University*; Dr. Isis Settles*, University of Michigan; *Dr. Patricia Soranno*, *Dr. Georgina Montgomery*, Michigan State University

Objectives
1. To discuss current research about challenges that science teams face related to the ways power dynamics affect authorship decisions
2. To engage in a dialogue about both the role that team climate can play in addressing difficult authorship issues on science teams and strategies that can be used to improve team climate
3. To explore policies and procedures that can help teams productively navigate authorship decisions

Goals
1. To increase participants' understanding of the effects of power dynamics on authorship practices in science teams
2. To share research about the importance of team climate for addressing authorship issues on teams and to facilitate small- and large-group discussions about strategies for improving climate on participants' teams
3. To develop best practices and procedures that build upon published examples and can be tailored to participants' teams

Expected Outcomes
1. Participants will learn the latest research about the challenges teams face related to team power dynamics and authorship decisions.
2. Participants will develop greater understanding of the important effects of team climate on authorship decisions and identify strategies that they can use for promoting a positive climate on their own teams.
3. Participants will identify policies and procedures that can help their teams handle authorship decisions in a fair and transparent manner.

Optimizing Mentoring Relationships in Team Science: An Engine for Scientific Accomplishment and Inclusive Excellence.

Dr. Melissa McDaniels, *Dr. Katy Colbry*, Michigan State University

Inclusive and high quality mentorship is needed within and across scientific teams aiming to address complex and urgent scientific questions. In these environments, expertise is diffused – knowledge needed to address multi-faceted questions will be held across teams and institutions. A scientist's ability to participate and contribute fully in these environments will rely upon one's ability to mentor (and be mentored by) others from different disciplines and career stages (e.g., graduate students, postdoctoral fellows, junior faculty, mid-career, senior faculty).

In addition to research productivity (Steiner and Lanphear, 2004; 2007; Wingard et al, 2004), strong mentorship has been linked to increased recruitment and persistence in science, particularly for trainees from underrepresented groups (Hathaway et al, 2002; Nagda et al, 1998; Sambunjak et al, 2010; Williams et al, 2015; Bordes-Edgar et al., 2011;). Empirical research has indicated that trainees with strong mentorship experience an enhanced science identity, sense of belonging and self-efficacy (Cho et al, 2011; Chemers et al, 2011; Thiry and Laursen, 2011).

Federal (U.S.) agencies and foundations, including the National Academies of Science, National Institutes of Health, National Science Foundation, Sloan Foundation, Howard Hughes Medical Institute and Burroughs Wellcome Fund have invested significantly in the study and practice of optimizing mentoring relationships (Hemming, McDaniels, Pfund, Schwartz, Tartakovsky, & Yellin, 2018). Starting in 2018, the National Institutes of Health (NIGMS) started requiring applicants of training grants (e.g., T32s) to not only have robust professional development plans for trainees, but also for mentors.

In this interactive workshop, participants will (1) be introduced to the national landscape for supporting high quality and inclusive mentorship in research; (2) have the opportunity to share both needs and best practices with colleagues; (3) become familiar with Entering Mentoring, an evidence-based approach to supporting the professional development of mentors and mentees (and experience a portion of that curricula); and (4) leave with a plan to connect the professional development needs of research team members to institutional and national resources on mentorship.

Mapping Translational Research Stories: Team Science Storytelling Using the NIEHS Translational Research Framework

Ms. Kristi Pettibone, National Institute of Environmental Health Science

The NIEHS recently published a framework expanding the concept of translational research. While the framework was originally intended for the field of environmental health science, we purposely designed it to be useful for many types of team science and translational research activities. Team science is, after all, a necessary component of translational research, which we define as the evolution of a research idea into concrete strategies that protect and improve human health.

During this workshop, we will provide an overview of the framework, participants will work in small groups to plan a team to conduct a mock translational research project, and participants will use the translational research narrative template to map out a translational research story and identify opportunities for getting to public health impacts. The presenter will provide in-person consultations and feedback throughout the process. We'll talk about the things that facilitate translational research and the things that pose challenges to conducting translational research. Finally, we'll wrap up with a brief overview of how the translational research framework can be used for evaluation purposes.

Workshop Objectives:
- To provide an overview of the NIEHS translational research framework,
- To connect the framework to team science approaches
- To provide participants with an opportunity to apply the framework in mapping out a translational research story and identifying paths to achieving broader clinical, public health, and social and behavioral impacts.

Workshop Goals:
1. To educate participants on the NIEHS translational research framework
2. To understand how team science is necessary for translational research
3. To practice using the framework to plan a translational research project and map out paths for achieving meaningful impacts
4. To practice using the framework to tell a translational research story
5. To learn about the facilitators and challenges of conducting translational research

Expected Workshop Outcomes
- Increased understanding among participants of how to use the NIEHS translational research framework and of the resources available on www.niehs.nih.gov/tranlsation
- Increased understanding by NIEHS staff of the facilitators and challenges to conducting translational research in real-life situations.
- Written draft of a translational research stories for each participant.

Community Playbooks and Collaboration Guides – Creating Documentation to Facilitate Effective Scientific Teamwork

Ms. Lou Woodley, Dr. Rebecca Aicher, AAAS

Community playbooks or collaboration guides are the documentation that establish the key goals, personnel, activities and outputs of a collaborative project. They serve to create buy-in, illuminate processes, justify resource allocation, permit scaling of a project and more. We've made producing a playbook for their community one of the key deliverables for fellows participating in the AAAS Community Engagement Fellows Program. By working closely with the fellows we have gained broad perspective on the range of contexts in which this documentation adds value – and have created a new framework for conceptualizing the six core components of a community playbook.

In this workshop we will:
1. Work with participants via a multi-step activity that involves individual reflection and small group synthesis that builds to the self-discovery of the core components of a community playbook or collaboration guide;
2. Present and discuss the CSCCE framework describing the core components of a community playbook and;
3. Show and discuss examples of 4 different types of playbooks created by AAAS Community Engagement Fellows. These will include playbooks for a research collaboration, for an organization providing scientific tools and services, and for a scientific society working with its members.

Participants will leave with an understanding of the value of creating a playbook or collaboration guide for their own projects. They will be equipped with a framework to enable them to audit their existing documentation and to transform it into a crucial backbone of their collaborative work.

TBL 101: Introduction to Team-Based Learning

Dr. Wayne McCormack, University of Florida

Description of workshop: objectives, goals, and expected outcomes
Do your students dread the thought of working in groups or teams? Are you ready to incorporate more active learning methods into your teaching style? Have you ever wondered how to go about "flipping" your classroom? If either answer is "Yes", consider trying Team-Based Learning (TBL). TBL is a structured small group active learning method that motivates students through a readiness assurance process to come to class prepared, teaches team skills via experience, and focuses classroom time on higher order skills such as problem-solving and decision-making. This workshop will be a great introduction to TBL, and will be conducted in the TBL format. Participants will prepare ahead, take a readiness assurance test, and then engage actively with their assigned team members. The structure, process, and essential characteristics of an effective TBL module will be emphasized.

Objectives:
- Explain the key components of a successful TBL module.
- Outline how they would construct a TBL module from a set of objectives.
- Describe how they might convert a course/lecture they already teach into a TBL module.
- Illustrate how to transform a small group into a productive learning-team.

Statement regarding how the workshop can benefit SciTS attendees/community
The SciTS community focuses on the value of team science in research. TBL focuses on the value of team science in teaching and learning. SciTS attendees who are in academia may be particularly interested in applying team science to their teaching.

Intereach Community Effort: A Live Action "Potluck" Approach to Assembling Shared Team Science Curricular Resources.

Dr. Christine Hendren, *Dr. Kristine Glauber*, Duke Clinical & Translation Science Institute

For this panel presentation, we will take a "flash presentation" approach, with conference attendees being invited to submit 2-page presentations (and associated materials) ahead so we can use our time to share the floor and host a group working session, amassing resources for all of us to share. For those who are attending a different session, presentations and materials are still welcomed so we can include your input in the panel and your voice in the ongoing conversation.

The Resilience of Team Science: Lessons for the Science of Team Science from Puerto Rico's Post Hurricane Maria Response, Recovery and Reconstruction

Dr. Cecilio Ortiz Garcia, *Dr. Marla Perez Lugo*, *Dr. Lionel Orama Exclusa*, University of Puerto Rico,Mayaguez; *Mr. Jacob Mans*, University of Minnesota

There is consensus on the multidimensional uniqueness of Hurricane Maria's level of destructive impact on the Puerto Rican archipelago. The Maria blackout is now considered the longest in U.S. history. A George Washington University Report states that more than 2,975 deaths could be attributed to Hurricane Maria. Ultimately, FEMA describes the Hurricane Maria as "the largest operation in the history of the agency". Years before the storm however, The University of Puerto Rico developed a powerful resiliency tool for the archipelago. The National Institute of Energy and Island Sustainability, is a collaborative convergence platform that brings together over 90 resources in energy and sustainability among the eleven campuses of the UPR system. This Team Science initiative, became the only convergence platform capable of providing expertise necessary in the reconstruction of the island's electric grid. Alternatively, a National Science Foundation Critical Resilient Infrastructure Systems and Processes (CRISP) Grant had been awarded to the UPR years before the Hurricane.

The CRISP program studies the resilience of structurally critical, yet highly interdependent infrastructure systems and processes. As the quintessential Science of Team Science effort, the project brought together 9 researchers from psychology to electrical engineering, political science to climate science and radars, from environmental sociology to computer science. In the case of this grant the object of study was Puerto Rico's electric grid. Before Maria arrived in Puerto Rico, the Puerto Rican media had flagged this grant as a possible answer to Puerto Ricco's energy problems! Finally, a valuable lesson was also learned from Maria: the need for innovation in the way universities see themselves as intervenors in emergency management processes and practices. From disjointed, fragmented, competitors, we should be moving towards more heterarchical, polycentric, collaborative inter university platforms. Again, utilizing the Science of Team Science, the Resiliency through Innovation in Sustainable Energy Platform was created, to transfer the knowledge, technologies and science developed after the hurricane under a new ethic of equity and justice by universities which themselves might be hit with a catastrophic event in the future.

This panel proposes to introduce, analyze and compare these 3 major team science efforts dealing with energy and sustainability issues in Puerto Rico, assess their performance before and after Hurricane Maria in effectively improving the resiliency of communities in Puerto Rico and ultimately help answer the question: what is the relationship between resilience and team science? How well do Team Science Efforts respond to the impacts of Catastrophic Climatic Events? How can the Science of Team Science enhance the resiliency of these efforts and in turn, the resiliency of the communities engaged in these efforts? Panelists: Dr. Cecilio Ortiz Garcia, Dr. Marla Perez Lugo, Dr. Lionel Orama Exclusa; Discussant: Jacob Mans, AIA

Changing Academic Institutional Culture to Facilitate and Support Team Science

Dr. Scott Leischow, *Ms. Andi Hess*, *Dr. Deborah Williams*, Arizona State University; *Ms. Rachel Chown*, Manchester Cancer Research Centre; *Dr. Jennifer Cross*, Colorado State University; *Dr. Gaetano Lotrecchiano*, The George Washington University

Fostering Team Science requires new thinking and paradigmatic shifts in academia both structurally and functionally in order to maximize collaborative science efforts that improve both the educational process and the advancement of science to address increasingly complex and interconnected societal challenges and opportunities. Toward that end, INSciTS created a Special Interest Group (SIG) dedicated to Changing Academic Institutional Culture to Facilitate and Support Team Science. In order to begin exploring the evolving academic environment in support of enhancing team science, the leadership of this new SIG propose a panel session to explore examples of academic initiatives designed to develop and implement new ways to address complex challenges by improving teams and team science.

The approach in this panel is to highlight four universities that are actively involved in organizational efforts to foster team science, and working to document that process: Colorado State University, The University of Manchester, The George Washington University and Arizona State University. The four formal presentations by those institutions (see specifics below), will include a discussant summary followed by general discussion among attendees.

Rachel Chown, University of Manchester
Implementing a New Way of Answering Our Complex Research Questions, in Healthcare and Beyond
Effective changes in cancer treatment and care require a furthered awareness of multidisciplinary approaches to the increased complexity of patients. These are populations with multiple co-morbidities and polypharmacy based on aging cohorts, and are populations of unmet need within the UK. As a result, our academics institutions and hospitals need TS for the required expertise to manage these complex patients, and improve outcomes. Two practical elements of the TS approach within the Manchester Cancer Research Centre (MCRC) will be presented; and both represent the plans for significant cultural and environmental change at the centre. As part of a new programme, the MCRC is now strategically funding scientific projects that can show: (a) cross-disciplinary collaborations, (b) high-risk, high-impact ideas that will lead or can lead towards a step change in patient care, (c) newly formulated cross-disciplinary collaborations from different specialties, (d) projects that are unique to the Manchester environment Additionally, the planned physical co-location of 'non-traditional' teams in the building of a new comprehensive cancer centre (set to complete in 2021) aims to facilitate and develop more of these multidisciplinary teams.

Jennifer Cross, Colorado State University
The Institutional Change Pyramid: Policy, Education, and Intervention
As society is facing increasingly complex problems, scientists and universities are looking for ways to build and develop larger and more transdisciplinary teams. How can universities provide support for transdisciplinary teams and support the culture change needed to develop and advance team science? Organizational change to support new models of science requires several components: new policies and procedures that incentivize and reward transdisciplinary and team science, educational offerings that expand the specific skill sets for transdisciplinary and team science, and developmental interventions for teams to enhance their effectiveness. Two case studies will be presented that describe the spectrum of organizational change efforts. At the CU Anschutz Medical Campus, culture change efforts are focused on developing a spectrum of educational offerings that provide training for three primary audiences: senior researchers, junior researchers and pre and postdocs. At Colorado State University, the policies and procedures for annual review and tenure and promotion have been revised to explicitly support transdisciplinary science. In addition, Colorado State University has launched a program to fund and develop large transdisciplinary teams through the early stages of formation, preliminary data collection, and competition for external funding. These two institutions demonstrate the range of activities and strategies being used by universities to support culture change.

Deborah Williams, Arizona State University
A Network-centric College Transformation Focused on Translational Education, Research and Community Engagement to Improve Population Health
At Arizona State University, a team of diverse faculty and staff came together in 2017-2018 to fully redesign ASU's College of Health Solutions. The redesign was implemented with the goal of fostering team science, and included the elimination of departments and schools, linking innovative research and academic programs, and fostering translational science to improve population health. Two key components of this redesign are the creation of Translational Teams and Affinity Networks. Translational Teams bring together scientists, students and community members to address health challenges through transdisciplinary research, academic program development, and community engagement. Three different levels of Translational Teams have been implemented, ranging from incubation-oriented formative teams through established teams working to take their team to the next level. Affinity Networks are designed to address and improve methods and practices to enhance College and Translational Team functioning, similar to 'cores' but broader in scope. Thus far, 6 Translational Teams and 3 Affinity Networks have been implemented, and more are under development.

Gaetano R. Lotrecchiano, The George Washington University
Normalizing Collaboration Across the Institutional Spectrum of Learning, Research, and Practice
While embarking on the task of enhancing collaboration on the university campus, one would think that organizational level strategies and infrastructures are the only way to achieve a culture of collaboration. In reality, though many universities espouse collaboration as a key strategic element in learning, research and common practice, few structures and requirements are developed to ensure that such strategic interests become commonplace across the university. Normalizing collaboration starts with a commitment to the processes, behaviors, and expectations associated with shared knowledge and open environments. Individuals, small teams, local projects, and and changes in behavior and attitude are the beginning stages of creating a culture of collaboration university wide. In this presentation, the author will share some approaches used at GW that provide models for normalizing collaboration across the spectrum.

Increasing Research Effectiveness Through Team Science Training for Research Teams

Ms. Jennifer Sprecher, Institute of Translational Health Sciences; *Dr. Brenda Zierler*, *Dr. Erin Blakeney*, *Ms. Nicole Summerside*, School of Nursing, University of Washington

As team science has moved from industry to clinical to research environments, the approach, method and competencies have had to adjust to meet the needs of the various audiences. The goal of this workshop is to describe and demonstrate an approach to team training that meets the tailored needs of research teams. The SciTS community and attendees that attend this workshop will benefit from hearing common research team challenges and will gain access to interactive teaching approaches and resources used to facilitate team training. The workshop will focus on the following: lessons learned from our 10 years of team training, the need to standardize team science competencies for research teams, tools to measure the impact of team science training, linkages to translational research competencies, and efforts to create a sustainable, scalable method of training for research teams.

By the end of this panel, participants will gain a better understanding of team science and the growing need for team training among research teams. Participants will also leave with concrete examples of tools and strategies they can use with their own teams to help address common challenges among research teams (communication, meeting management, role clarity). The target audience for this workshop are academic and clinical researchers, team science researchers and trainers (particularly those working CTSA settings).

How to Design Teams, Space and Careers for Better Team Science; a Practical Guide

Dr. Claire Smith, Ms. Ruth Norris, *Mrs. Charlotte Stockton Powdrell,* The University of Manchester, UK; *Ms. Rachel Chown*, Manchester Research Centre, Manchester UK*; Dr. Amanda Lamb*, The University of Manchester, UK

The objectives of this workshop are for participants to be better able to i) Understand and devise an effective professional development framework for a diverse team; ii) Explore and apply strategies to assist in designing the most effective team for a proposed piece of research at the grant application stage ; iii) Consider how the physical research environment can be designed to facilitate team science The goals and expected outcomes from the session are: i) To improve the development pathways, opportunities and outputs of non-academic research team science roles beyond Manchester and the UK by ensuring that workshop participants understand how to create such a framework and the value of doing so ii) To increase the diversity and impact of research teams by ensuring that team structure and design are appropriately considered at the grant application stage iii) To increase knowledge and consideration of the positive contribution that the design of physical research environment can elicit for Team Science projects

We represent an interdisciplinary and transdisciplinary population, collaborating with colleagues from within our University (Manchester, UK) and between our local hospital organisations. Our team science approach has been working successfully for several years and, whilst we haven't always used the term 'team science', we certainly operationalise it on a daily basis and continue to increase awareness of this important and developing approach. SciTS attendees will benefit by gaining an understanding of how our approach to Team Science has developed over the last decade and accelerated over the past 12 months, with practical examples, which participants can implement within their own organisation. Specifically, attendees will gain an insight into how non-traditional roles are increasingly playing an essential cross-boundary/facilitation role but are often constrained by a lack of development opportunities. The development framework created for the Research Program Manager's Network is having a positive impact in this space and will be utilised as an exemplar. In addition, participants will be informed about our approach to team diversity for maximum research output as well as the significant impact that the bespoke design of research spaces to facilitate optimal opportunities for team science can provide.

Collaborative Scientific Writing: Challenges and Strategies

Dr. Graham Hubbs, University of Idah*o; Dr. Kara Hall*, National Cancer Institute; *Dr. Amanda Vogel,* Leidos Biomed*; Dr. Kendra Spence Cheruvelil*, *Dr. Patricia Soranno,* Michigan State University

One of the standard products of scientific research is collaboratively authored manuscript. Writing collaborative manuscripts—scientific or otherwise—involves challenges from start to finish that will be familiar to anyone who has ever engaged in the process of collective authorship. Such challenges include establishing workflow, maintaining progress (especially when authors are spread out geographically), developing and executing a unified vision of the goals and content of the paper, establishing a consistent voice, and agreeing upon order of authorship, to name but a few. This panel will discuss these challenges and highlight strategies for overcoming them. The session will feature conceptual and practical perspectives on collaborative writing by experts from across disciplines (philosophy, psychology, public health, ecology) who work in a variety of research-related organizations (academia, government, and consulting).

Collaborative Writing and Collective Intentionality
Dr. Graham Hubbs
Collaborative writing is a form of collective action: when two or more people write a manuscript together, they unite their forces to produce a single text, and they commonly mark this unity by listing all of their names as co-authors of the manuscript. This is an example of a kind of action that exhibits collective intentionality—the intentions that guide the work manage to bind the agents together into a group, a collective that is unified in a way that a mere aggregate of individuals is not. For several decades, philosophers have studied the nature of this unity, examining the conditions under which a group of individuals count as a group bound by a collective intention. This presentation will analyze collaborative writing, and more specifically the writing of team science, within the two dominant

philosophical frameworks on collective intentionality, the psychologistic framework (cf. Bratman 2014) and the normative framework (cf. Gilbert 2014). This analysis generates two hypotheses about successful collaborative writing: (1) members of an authorial team need to have individual intentions that interlock in specific ways, and (2) there needs to be a specific structure of accountability between authors. Probing these hypotheses may, in turn, offer guidance to writing teams.

Collaborative Writing Policies, Processes, and Practices
Dr. Kara L. Hall and Dr. Amanda L. Vogel

A key benefit to collaborative authorship is the opportunity for greater innovation in scholarship through the integration of diverse expertise and perspectives (Hall, Vogel, Huang, et al., 2018). Yet a recent study that explored retractions of collaboratively authored papers in the journal Science highlighted the vulnerability of collaborative authorship to misconduct and errors, particularly when there is a lack of team unity (Andersen & Wray, 2018). These findings point to the potential to increase the quality of scientific work (e.g., increases in innovation/productivity and reductions in errors/misconduct) through the use of effective collaborative processes aimed at enhancing authorship team unity.

In this presentation we offer considerations for how policies (e.g., promotion and tenure) and practices (e.g., author contribution tracking; CRediT taxonomy) can enhance transparency and accountability and thereby the degree of ownership, investment, and engagement in collective writing activities. We then go on to discuss effective practices for collaborative engagement depending on which writing phase collaborators are in (e.g., idea generation, planning, writing, editing, revising), how the writing occurs (e.g., sequential, parallel, simultaneous; in person vs. computer-mediated; full group vs. subgroups of authors), and what type of product is being developed (e.g., type and/or section of manuscript). Lastly we will identify how various strategies support key team processes and provide suggestions for which strategies to use when, and with whom, to meet collaborative writing goals.

Adventures in Environmental Collaborative Manuscript Writing
Dr. Kendra Spence Cheruvelil and Dr. Patricia A. Soranno

We are big data lake ecologists who study what affects lakes at broad scales of space and time to predict how lakes will respond to global pressures. To do so, we co-lead large and interdisciplinary research teams that include people from various institutions, disciplines, career stages, and backgrounds. Our research teams publish approximately 10 collaborative and interdisciplinary journal articles per year. In this presentation, we will draw on our 15 years of co-leading research teams to share the team policies and practices we have developed for collaborative writing. In particular, we will highlight the use of team authorship policies, collaborative manuscript management strategies, and author contribution paragraphs as mechanisms for improving collaborative writing.

Preparing Students for Interdisciplinary Collaboration and Team Research: Case Studies and Models from the Graduate and Undergraduate Level

Dr. Marisa Rinkus, Michigan State University; *Dr. Graham Hubbs*, University of Idaho; *Dr. Chet McLeskey*, Michigan State University

The challenges of team science in the 21st century call on educators to equip future researchers and practitioners with the skills they need to communicate and collaborate effectively across disciplinary boundaries. This panel will explain pedagogical techniques and strategies for providing students with these skills. Some presentations focus on direct student training, while other presentations discuss navigating institutional structures to set up team science programs. Much of the work here draws on the research and interventions of the Toolbox Dialogue Initiative (TDI).

Building Undergraduate SciTS Programs: Lessons from PPE
Dr. Graham Hubbs

Undergraduate education represents a next frontier for SciTS. As the SciTS community develops strategies for implementing its interdisciplinarity into undergraduate curricula and training, it can benefit from the lessons learned in establishing undergraduate programs in Philosophy, Politics, and Economics (PPE). PPE has exploded in the past decade—there are scores of programs across

the country that are popular with students and administrators alike. PPE programs leverage existing resources within universities to provide integrated interdisciplinary opportunities for students. This presentation will explain standard procedures for setting up and running a PPE program and will explore ways in which these procedures can serve as a blueprint for setting up similar programs to advance SciTS pedagogy at the undergraduate level.

Cultivating Interdisciplinary Competencies at the Graduate Level: An Ethics-based Curriculum for Environmental Team Science
Dr. Marisa A. Rinkus
For interdisciplinary teams to participate effectively across disciplinary and values-based boundaries, they need opportunities to understand the impacts of their methodologies and expertise, and to practice productive dialogue that integrates different disciplinary languages and training. This presentation will introduce participants to the NSF-funded "Values and Responsibility in Interdisciplinary Environmental Science" curriculum. Our curriculum, building on the results of the Toolbox Dialogue Initiative, focuses on four ethically-relevant themes that are a consistent part of interdisciplinary environmental science research contexts: 1) risk and uncertainty, 2) expertise, 3) non-human impacts, and 4) policy constraints. These themes provide a foundation for meaningful discussion of the roles played by values and responsibility in interdisciplinary environmental science contexts, in particular research and policy, and provide useful grounding as graduate learners transition to become professionals in the field. This presentation will also discuss how a curriculum of this nature can help prepare graduate students for a future in team science.

Having the Difficult Conversations: Using Facilitated Dialogue to Develop Values-Oriented Skills
Dr. Chet McLeskey
There is a growing recognition of the role that values play in collaborative work, but the skills and experience needed to reflect upon and discuss those values are often overlooked. Training graduate students to be successful in whatever endeavors lay before them involves the ability to examine, express, and defend the values that drive their work. We at C4I are working to expand responsible conduct of research training to include opportunities for the sort of reflection and discussion that facilities these value-oriented skills. One way we are doing this is by modifying the Toolbox Dialogue Initiative's model for guided discussions to include pedagogical aspects that challenge participants' views and encourage discussion of the values they deem most important in their work. Using a combination of prompts designed to provoke dialogue and careful/purposeful facilitation participants reflect on their own views and learn how their views relate to those of others in the group.

Reward and Recognition for Team-Based and Cross-disciplinary Research
Dr. Holly J. Falk-Krzesinski, Elsevier and Northwestern University; *Dr. Kara L. Hall*, National Cancer Institute, National Institutes of Health; *Dr. Julie Thompson Klein*, Wayne State University and International Research Affiliate, Transdisciplinarity Lab, ETH-Zurich; *Dr. Amanda L. Vogel*, Leidos Biomedical Research, Inc.

Recognition and reward systems, and particularly promotion and tenure policies, are essential factors in performance and evaluation of collaborative research, including cross-disciplinary team science. But, on the whole, promotion and tenure policies have been slow to change to reflect the growth of these approaches. A survey by the US National Academies in 2004 revealed that provosts as well as individuals considered promotion and tenure criteria the top impediment to cross-disciplinary research (Institute of Medicine, 2005). Recommendations and some changes followed. Yet, a decade later the National Research Council report, Enhancing the Effectiveness of Team Science, reported that most US universities continued to lack comprehensive and explicit criteria for evaluating individual contributions to team-based research.

This panel provides an overview of this important topic through a review of recent guidance documents and white papers, a summary of recent empirical research on promotion and tenure policies pertinent to team science, and a synthesis of literature on this topic. It will culminate in interactive discussion with audience members.

Falk-Krzesinski will open the panel with an introduction to this topic, including highlights of a recent report by the Canadian Academy of Health Sciences, entitled, Academic Recognition of Team Science: How to Optimize the Canadian Academic System which outlines 12 recommendations to facilitate appropriate recognition of individual contributions to team science. The recommendations encompass aspects of recognition and reward in the promotion and tenure system and efforts by publishers and expertise systems to recognize the full range of contributions to collaborative, team-based research articles and other types of research output. Additionally, she'll share her experience speaking with university leaders over the last five years about their efforts for institutional change.

Hall and Vogel will then share methods and findings from a rigorous study of promotion and tenure policies from the US National Institutes of Health supported Clinical and Translational Science Award (CTSA) recipient institutions. The CTSA award is the largest NIH award for team-based, cross-disciplinary and translational science, and as such, these institutions represent the leading edge in these scientific approaches. In 2014, new language was included in the annually released funding opportunity announcement (FOA) stating that "CTSA hubs should advance team science and develop academic promotion criteria that help create a viable career path for translational scientists." The presentation will include analyses from data collected at three time points from 124 units (medical schools and central administrations) across 69 research institutions. The presentation will explore the ways in which policy language acknowledges the growing prevalence, value, and importance of team science and interdisciplinary research, provides encouragement and recognition of faculty engagement in team science and interdisciplinary research, specifies criteria for evaluation of team science and interdisciplinary research, contributions, provides guidance for how to document indicators and processes for review, and outlines institutional support for team science and interdisciplinary research. We include examples of institutional support for team science and interdisciplinary research and the specific types of contribution to collaborative work. Additionally, we will highlight how promotion and tenure policies are, and are not, evolving to recognize and reward these scientific approaches, and offer models of effective language to help advance promotion and tenure policies to match the accelerating uptake of these approaches in science.

Klein will follow with findings from a literature review she and Falk-Krzesinski conducted, published in the journal Research Policy. It synthesized findings on promotion and tenure for interdisciplinary and collaborative work. Klein will highlight the importance of creating a culture of recognition and reward for team science that is consistent, aligned, and comprehensive at all stages and levels of evaluation. A systematic and informed approach includes taking preliminary steps, revisiting existing practices and institutional policies, writing new guidelines, preparing a dossier for evaluations, and advancing support of professional organizations. Their accompanying handout will include the table codifying strategies and references for further reading.

The panel will invite the audience to raise questions, contribute their insights from personal experience, and offer action steps for advancing the stature of team science in the academic reward system. The panel will offer the opportunity to learn about the current state of evaluating promotion and tenure with emphasis on contexts of team science, and to gain effective practices for reforming local institutional cultures and revising promotion and tenure policies and procedures.

- How extensive is the literature on evaluation of tenure and promotion for individuals conducting interdisciplinary and cross-disciplinary research?
- What insights emerged from the two surveys highlighted in this panel?
- What are the major barriers and impediments to evaluating individual contributions to team research?
- What are the prominent strategies for appropriate evaluation and related criteria?

SciCom Meets SciTS. Interdisciplinary Teamwork for Science Communication Training

Dr. Jack C. Schultz, University of Toledo; *Dr. Suzanne Burgoyne*, *Dr. Bimal Balakrishnan*, *Dr. Jonathan Stemmle*, *Dr. Shellly Rodgers*, University of Missouri

We train scientists, engineers and physicians to solve complex problems, and increasingly to do so as members of interdisciplinary teams. But the complex problem of how to communicate across disciplines and with the public receives little or no attention in training. As a result, STEM practitioners are often ill equipped to succeed in an environment requiring communication skills not normally

acquired during training. Success in both academic and non-academic settings as well as while interacting with the public requires communication that reaches broader audiences. Researchers are increasingly concerned about communicating the value of science to a broad constituency, and personalized medicine is making personalized communication between physicians and patients ever more important.

This need is now widely appreciated and numerous training programs have appeared, especially aimed at improving STEM practitioners' ability to communicate outside academia. Federal agencies, NGOs, for-profit enterprises and universities all offer science communication (SciCom) workshops and 'boot camps'. Each typically offers a particular approach or point of view to SciCom training, for example emphasizing "storytelling", communication training, or improvisation skills. Instructors and trainees of many of these programs report satisfaction with the results, and there is little doubt that at least some of these programs are helpful. But are the impressions of workshop participants really indicative of progress in communication? Evaluating SciCom training is yet another complex problem we must address. A lack of relevant evaluation means that trainers and trainees alike remain unsure about the effectiveness of training itself, not to mention individual approaches.

We report on an NSF-sponsored project that brings together a highly interdisciplinary team from biology, strategic communication, journalism, theater, visual design, education and statistics to develop a controlled test bed for communication training in STEM graduate programs. The program focuses on oral presentation skills because these are among the most challenging aspects of communication for STEM trainees and are particularly suited to quantitative evaluation. It is innovative in assembling a team that can base training on a deep body of cognitive psychology and communication research, applied theater, and visual design from outside the sciences. It is unique in the using impact of training on audience perception as the ultimate success metric.

Our panel comprises our project's four instructors:
Jack Schultz, PhD (Dr. Emeritus, University of Missouri; Exec. Director of Research Development, Univ. of Toledo) will moderate and outline the structure of the project, emphasizing its unique approaches to training and evaluation. The entire project includes a complex experimental design that triangulates evaluation from both internal and external sources. Schultz will also briefly illustrate the role of cognitive science underlying the training, and show how it links the diverse disciplines and perspectives the 4 instructors bring to the program.

Suzanne Burgoyne, PhD (Curators' Distinguished Teaching Professor; Director, Center for Applied Theatre and Drama Research, Univ. of Missouri) will illustrate the approach she uses to teach trainees to see themselves as playing roles based on their own identities, while identifying specific communication goals and approaches. Using interactive exercises, Dr. Burgoyne encourages trainees to envision interacting with others – their audiences – in creative ways that are appropriate to audience identities (roles). This training has been critical and very successful in giving trainees a feeling of confidence in defining and meeting communication goals.

Bimal Balakrishnan, PhD. (Assoc. Prof, Department Chair and Director of Graduate Studies, Dept. of Architectural Studies, Univ. of Missouri) brings fundamental design principles to our program. His approach is based on his research in design processes and cognition, a perspective that builds upon Schultz's introduction to cognitive aspects of communication. This aspect of the program focuses on uses of visual illustration and tools to provide effective support for oral presentations.

Jonathan Stemmle, MS Journalism (Assoc. Prof. and Chair Department of Strategic Communication; former Director Health Communication Research Center, Univ. of Missouri) focuses on how to assess and interact with audiences. Jonathan has extensive experience in designing effective health related messages for diverse audiences. His extensive research experience on how messaging influences health behaviors and science communication provides real-world, practical evidence about successful strategies. He is able to place the trainees in the situations they will encounter as they address different kinds of audiences and help them tune their messages appropriately.

The team is made effective by regular meetings and joint sessions with trainees to make sure that the different approaches are integrated and common themes are clear. The trainees are exposed to interactions among the instructors in which alternative strategies are discussed and potential conflicts are resolved. Workshop plans are written by each instructor and sessions are evaluated for compliance with the plan. This, too, assures that the team members are all on the same page throughout. And a data analysis evaluation sub-team (not participating in this workshop) provides feedback about whether goals are being met and assesses the end results.

The panel discussion will include what we have learned by working together, the ease (or difficulty) of working this way, issues in STEM communication training that remain to be resolved and suggestions and recommendations for others wishing to develop training.

Identifying the Behaviors and Actions of Facilitators of Successful Teams

Ms. Jill Macchiaverna, *Mr. Dave King*, Exaptive, Inc.; *Dr. Alicia Knoedler*, Independent Contractor; *Dr. Terri Gilbert*, Cohen Veterans Bioscience; *Mr. Victor Soji Ladele*, Health Innovation Lab

Across the team science literature there is a lot of focus on facilitation, but less on the facilitator's specific contributions and the effectiveness of those contributions. What is it about the facilitator that has such an impact on whether teams are effective, or even formed to begin with? What do we know about what facilitators do that catalyzes successful teams? And can those actions be conducted in a virtual environment? Our panel will consider specific examples of facilitator choices, behaviors, and discoveries that have produced success within teams. We'll hear from the moderator and three panelists who each have unique perspectives on facilitating teams in various settings: academia, bioscience foundation, non-governmental organization, and digital/virtual.

Academic Perspective:The Science of Team Science Conference has become a multidisciplinary confluence of researchers and practitioners sharing ideas and strategies regarding work that occurs within teams. Over the past decade, academic institutions have been increasing their investments in personnel who provide support and assistance to these teams, but there is a lack of general knowledge and understanding about how to measure the capabilities and performance of the individuals providing support and assistance to teams. There is evidence that leadership turnover at the dean, vice president/chancellor for research, and provost levels creates the need to train these new leaders in what makes for effective performance for team facilitators and project managers.

Dr. Alicia Knoedler, PhD, who has facilitated and supported the development of academic research teams for nearly 20 years, has been exploring how to most effectively bring knowledge about team facilitators, their behaviors and contributions, to research leadership to reinforce the value that practitioners and facilitators of teams bring to the success and growth of the academic research enterprise.

Bioscience Non-Profit Perspective:In a bioscience research non-profit setting, the feedback loop among researchers can determine whether hypotheses are answered in weeks or years. Bioscientists are fantastic at coming up with great questions and experiments to find evidence. Many times the experimental evidence that is generated comes in the form of huge amounts of data. When it is time to perform analysis on the data, it must be handed off to the bioinformaticians.

Bioscientists are trained in wet biology. Bioinformaticians are trained in data science. Most of the time in science, the scientist can understand the limitations of methods and how far to interpret results, but when a bioscientist hands off their data to the bioinformatician, there are communication barriers due to the lack of cross-disciplinary understanding. There can be weeks between iterative cycles where the bioscientist has given their data and goals over to the bioinformatician and when the bioinformatician (likely running analyses for several scientists at once) can return the analyses and explain the results to the bioscientist.

Dr. Terri Gilbert, PhD, is the Engagement Director for BRAIN Commons at Cohen Veterans Bioscience. She works to bridge that gap between bioscientists and bioinformaticians to reduce the iterative time necessary for quality research. She will share the practices that

have led to successful team development and collaboration in her experiences at Cohen Veterans Bioscience and the Allen Institute for Brain Science.

NGO Perspective:In non-governmental organizations, coordination of rapid response teams during emergencies/humanitarian crises faces a lot of challenges because of its linear design. A hierarchical structure, geographical dispersion, multiplicity of organizations, and disparate technical capacities make it difficult for the best ideas to be generated and a deep level of collaboration is near impossible. Usually what is learned in learned only in retrospect, not during the crisis. This inefficiency is measured in lives lost and increased morbidity.

Dr. Victor Soji Ladele, MBBS, who was a humanitarian aid coordinator for the World Health Organization during the 2014 Ebola outbreak in Liberia, proposes deploying a cognitive network platform during emergencies and humanitarian crises that will facilitate a real time coordination mechanism. The benefits would include but not be limited to:

- Senior decision makers would receive quick feedback from the frontlines and new ideas to enhance effectiveness of the response would be generated.
- Lessons learned in one location would be quickly dispersed throughout the response.
- Native inhabitants would be able to contribute their unique perspective to response activities, and responder teams can build on their very good ideas.
- The right people would be gathered around the table for the right meetings.
- Furthermore, senior managers will see the effectiveness of various types of team composition and more quickly determine the optimal skill mix for different response scenarios based on objective measures.

Digital/Virtual Perspective:Team building is becoming more critical for innovation in every domain and organization. Gone are the days of lone geniuses locked away coming up with the new ideas. Exaptive has created a virtual platform for innovation, the Cognitive City, where teams can connect and collaborate around data. Founder and CEO, Dave King, can demonstrate several cases of what facilitation looks like in a digital platform. Using integrative software allows organizations to capture digital exhaust (data created in the natural occurence of activities like communicating, holding meetings, utilizing digital tools) in a productive way. In the process of interacting with a digital innovation platform, digital markers that indicate facilitation can be quantified and measured over time. Dave King will moderate the panel.

This panel will focus on actionable lessons learned. Facilitation of successful teams is important in every industry, every field, every specialty. When we can determine what the characteristics are of successful facilitators, we can discover the behaviors and activities that are teachable, replicable, and scalable.

INNOVATING WITH TECHNOLOGY
Moderator: Dr. Stephanie E. Vasko, Michigan State Univeristy

Getting Started with Machine Learning and Team Science & Science of Team Science Research
Dr. Stephanie E. Vasko, Michigan State Univeristy

Over the past few years, initial forays into machine learning (ML) applications to the science of team science at the Science of Team Science annual conference have sparked moments of dialogue about new ways to conduct both team science and research on team science. Additionally, during 2018 alone, the National Academies of Sciences published two reports on workshops with a focus on ML, the latter of which has implications for CTSA-based team science practitioners: "Data Matters: Ethics, Data, and International Research Collaboration in a Changing World: Proceedings of a Workshop" and "Artificial Intelligence and Machine Learning to Accelerate Translational Research: Proceedings of a Workshop—in Brief." (National Academies of Sciences, 2018a and 2018b). These forays have already found themselves into the commercial sector, with Amazon applying ML to their teams working on complex problems (Machine Learning Center of Excellence) and Google partnering with universities and to push advances in science through university-company partnerships focused on ML (Google AI). These initial SciTS talks, NAS reports, and industry drivers spark the need to unpack the landscape of ML applications and techniques.

In this talk, I will present expanded findings on two case studies where commercial and custom ML algorithms have been applied and explored: 1) a science of team science case where authors are interested in predictions on dialogue from research teams participating in Toolbox Dialogue Initiative workshops (Vasko, et al, in progress) and 2) a team science case on agricultural disease identification using a combination of image data and ML. These examples will be used to compare and contrast the implementation of commercial, open-source, and homebuilt approaches to ML and team science research and research on team science. I will explore the hype around ML, unpacking promises and looking at realistic applications of techniques, the types of machine learning that can be used to approach different types of questions in the science of team science field, and potential costs associated with ML for applications in this field. This talk will also explore examples of bias in ML and the implications this can and has had in other research fields before turning to a) the implications of bias on the science of team science and b) the ways in which this bias can be combatted from the outset of research. I will also touch on implications of ML for team science and team science research for data management, workforce development (NSF, 2018) and career pivots for masters and PhD students. Finally, attendees will leave this talk with a list of options (including programming languages and packages) for using each of these types and a list of ways to gain skills in these areas.

Collaborative Data Design: A Tool for Multisector Alignment
Dr. Kathleen Pine, *Dr. Michael Shafer*, *Dr. Margaret Hinrichs*, *Ms. Kailey Love*, *Dr. George Runger*, *Dr. William Riley*, Arizona State University

Fragmentation and lack of coordination between systems represents a significant barrier to improving health, well-being and equity in our country. The fragmentation present in the behavioral health care delivery system leads to disruptions in continuity of care, lack of coordination, lack of systems-level solutions, and siloed datasets. The Systems for Action (S4A) project on behavioral health in metro Phoenix utilized an interdisciplinary framework to create knowledge infrastructure aimed at facilitating data-driven behavioral healthcare delivery decision making, policy development, policy implementation, and policy evaluation across multiple sectors core to the behavioral healthcare delivery system in Phoenix, Arizona.

Three sectors comprising multiple organizations are key to behavioral health care delivery in Phoenix: health (e.g. provider organizations, crisis response organizations), local government (e.g. county public health office, county manager's office), and public safety (county sheriff's department, correctional health department). Our interdisciplinary team utilized a participatory approach to increase alignment between these sectors. Our approach consisted of multisector data sharing, complex interactive data visualizations, and a participatory design approach which entailed ongoing "convening" sessions of researchers and participants from key organizations in each of the three key sectors.

Through an ongoing series of meetings held at the ASU Decision Theater, participants identified datasets for integration into a comprehensive behavioral health dataset. Participants then collaborated with researchers to collect these datasets, navigating political and organizational barriers. Once datasets were integrated into a central repository, researchers developed a set of interactive data visualizations focused on the health care delivery system. Multisector participants then took part in a series of five "data design" meetings with the research team in which they collectively explored and critiqued the data visualizations, discussed behavioral health priority areas, and engaged in thought exercises about what questions could be asked of the data visualizations and how the dataset and visualizations could be mobilized to solve specific problems.

To evaluate the participatory data sharing and data design process, the research team utilized a qualitative approach including observations and semi-structured interviews. Our qualitative study revealed that five mechanisms emerged from our process to increase alignment between different sectors. These mechanisms were: 1) Data sharing (including both the social and technical apparatus of sharing data); 2) Convening (recruiting a diversity of participants from appropriate sectors and engaging in repeated interaction); Relationship Building (creating shared communication context and coming to know one another within that context); 4) Shared Information Tool (creating visualizations with effective data characteristics—actionable, poignant, efficient, and authoritative); 5) Perspective Taking (taking the perspective of different participants/sectors and developing an overview of systems problems from the view of these different entities). Our study further revealed that these five alignment mechanisms resulted in four distinct alignment outcomes: 1) improved multisector systems awareness; 2) strengthened relationships between specific sectors; 3) increased acknowledgement of the importance of data sharing and transparency; and 4) augmented decision making.

CohortGen: Promoting Collaboration Through Automatic Cohort Generation
Dr. Charisse Madlock, *Mr. Billy Barnett*, University of Tennessee Health Science Center

In recent years there has been a significant focus on increasing collaboration within the biomedical community 1. Investigators need projects around which to collaborate as they are unlikely to reach out to without a need. Our system presents users both a generated cohort from an Electronic Medical Records (EMR) system and potential collaborators at the same time. This system gives users both a research direction along with prospective co-investigator identification so the need for the collaborators may be more apparent. We use the Unified Medical Language System (UMLS) to summarize and link EMR data to a social network of researchers to facilitate dataset discovery and collaboration. Many healthcare organizations have built enterprise data warehouses (EDW) that gather electronic data from multiple sources into a single data model that can be used to facilitate analysis, reporting and strategic decision making2. The Cerner Healthfacts © database which the University of Tennessee Health Science Center faculty and students have access to includes de-identified patient records from approximately 70 million patients and spans from 2001 to 2017. This data warehouse contains a deluge of complex healthcare information, and it can be difficult for researchers to find useful information that relates to their fields of study and interest.

Our purpose is to provide a more personalized experience for viewing the contents of a large-scale EMR data warehouse. Our system generates graphical summaries and hierarchical structures that summarize the data that is relevant to researchers — thus providing potential collaborative possibilities with others who work in similar areas.

Our presentation will detail the development pipeline and user workflow for our system, CohortGen. We first extracted ICD codes from Healthfacts © and articles for UTHSC employees for the past ten years from Scopus. We used the ctakes clinical text analysis engine to tag articles with UMLS concepts. We used those UMLS concepts to create a crosswalk between the Cerner Healthfacts © database and UTHSC research articles using the International Statistical Classification of Diseases codes.

We created a website using Oracle's Apex system which provides users with a way to explore potential datasets and potential collaborators based on UMLS concepts shared across researcher profiles generated by our system. Several reports, charts, and graphs are produced by our system which allowed a researcher or data analyst a quick insight into the contents of the data warehouse. Once users have completed their exploration, they can request access to the dataset that matches the ICD diagnostic codes identified by our system. We believe that our tool will not only help increase collaboration across our campus but also increase the use of a complex available dataset by UTHSC research faculty.

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Do More, Faster: Utilizing Advanced Computational Resources in Your Research Team
Dr. Dirk Colbry, Michigan State University

The use of technology in research is becoming ubiquitous as low cost programmable sensors and advanced computing (e.g., AI and big data) emerge in nearly every domain. Out of necessity, many scientists and domain experts have become Technology Users: individuals who need to employ advanced technology in their research, but who do not have broad expertise in topics such as engineering and programming. Modern laptop and desktop computers are extremely powerful, and most scientists can accomplish 90-95% of what they need with a computer in their office. However, much of today's cutting edge science needs bigger, stronger and faster computers. High Performance Computing (HPC) systems (aka supercomputers) are designed to take science to the next level. Universities and national funding agencies (NSF, NIH, DOD, DOE, etc.) provide researchers access to large scale computing resources, often free of charge. The most common barrier to scientists who want to utilize these resources is knowledge: that these tools exist, and how to get started using them.

This talk will introduce the world of large scale computing. We will discuss how to gain access to both local and national resources, the common types of problems that can be solved using these resources, and training programs specifically designed to help new researchers leverage these technologies and use them effectively in their own research.

Dr. Dirk Colbry is a Cyberinfrastructure Professional with many years of expertise in developing and facilitating both technical and professional skills training materials. With a background in Artificial Intelligence, Pattern Recognition, High Performance Computing and Computational Science, Dr. Colbry has worked with dozens of researchers at three universities (University of Michigan, Michigan State University and Arizona State University) and in many disciplines (zoology, biology, physics, chemistry, psychology, engineering, math, linguistics, health sciences, and others) on projects related to computational sciences and cyberinfrastructure. Dr. Colbry served as the Director of the MSU High Performance Computing Center and as a Computational Consultant at the MSU Institute of Cyber Enabled Research prior to assuming his current role in the Department of Computational Mathematics, Science and Engineering (CMSE) at Michigan State University.

Supplanting Institutionalized Science of Science Data Collection with Big Data Methods `in the Wild'
Dr. Ioannis Pavlidis, *Mr. Mohammed Emtiaz Ahmed*, University of Houston

ABSTRACT: The international research community has been increasing in size and connectivity by leaps and bounds. Accordingly, policy makers need accurate, up to date indicators to help them craft and adjust policies for a rapidly evolving ecosystem. The UNESCO Science Report series is the definitive tool in this direction. The conventional process of creating such a report, however, is time consuming and requires significant manpower. To minimize the cost and improve the rapidity with which science of science indicators are produced for global and local policy makers, we introduce a new method based on big data and analytics. Specifically, we use the Google Scholar database (~2 million profiles) as an extensive sample of the worldwide research population. After performing quality control, we analyze these data, showing that they produce results on par with the data in the UNESCO Science Report.

METHODS: We collected all the available profiles in the Google Scholar repository as of June 2018. Each profile includes the researcher's full name, university affiliation, total citations, research areas, and rank. In parallel, we collected the worldwide university list annotated with country codes. This way we were able to associate each research profile with a specific country.

RESULTS: After data cleaning, we performed exploratory data analysis finding that the United States has the highest number of researchers, and the average US researcher has the highest mean citation among all countries. This is in agreement with other reports in the literature. Importantly, we found that the Google Scholar data are highly correlated with the UNESCO Science Report data.

CONCLUSION: Conventional collection of global science of science data is part of a sophisticated UNESCO operation involving the cooperation of nearly all the governments in the world for years at a time. It appears that a science of science dataset amassed from Google Scholar in a few days via scripting, provides essentially the same information and insight as the UNESCO dataset. Big data, automated analytics, and open sources promise to change the information model that feeds science policy makers.

SPATIALLY SITUATED CASE STUDIES
Moderator: Kevin Bugin*, Center for Drug Evaluation and Research, US Food and Drug Administration

Building Climate Resilience in Africa & South Asia: Lessons on Membership, Organization & Collaboration from Four Transdisciplinary Research Consortia
Dr. Bruce Currie-Alder, International Development Research Centre; *Lucia Scodanibbio*, University of Cape Town; *Katharine Vincent*, Kulima Integrated Development Solutions; *Anjal Prakash*, Teri School of Advanced Studies; *Nathalie Nathe*, Overseas Development Institute

More than one billion people live in deltas, semi-arid lands, and glacier-dependent river basins in Africa & South Asia, hotspot regions that are the most vulnerable to climate change. During 2014-2018, the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) sought to build resilience in these hotspots by supporting four transdisciplinary research consortia involving more the forty institutions across fifteen countries. The intention was to inform adaptation policy & practice by supporting science at a scale commensurate with the problem, linking local actions across similar landscapes. Drawing on the experience of these four consortia, this paper identifies lessons in membership, organization & collaboration for team science.

On membership, each of the participating institutions brought in complementary skills, expertise, & competencies bridging research, policy & practice, including connections with stakeholders and academia. Each of the CARIAA consortia consisted of up to five core institutions, with additional participants taking on distinct roles such as in-country activities, outreach, or engagement. Intellectual leadership was vital and benefited more from fewer full-time positions rather small shares of time among many people. Consortia had to mediate power differentials within and between members, working across cultures and time zones, and the entry and exit of members over time. Trust among members was facilitated by clear roles, often formalized through partnership agreements and periodic 'health checks'. Consortia identified the different incentives that motivated participants, and intentionally provided opportunities for a range of career paths spanning academics & practitioners.

On organization, there is no perfect model for a research consortium. Despite common terms of reference, each consortium was unique in terms of work packages, distribution of responsibilities, and geographical coverage. Each produced a unique mixture of outputs, reflecting their memberships and seeking to reach diverse audiences. Bigger is not always better, as transaction costs of administering and coordinating the consortium increase with size and complexity. Consortia facilitated working across disciplines, by establishing agreement on units of analysis, ontology, methods, and research questions. CARIAA consortia permitted some tailoring of methods and datasets between work packages or regional nodes, which limited data comparability and aggregation. Consortia required mechanisms to hold participants to account for the work done. Internal communication served to ensure transparency & sense of belonging among members, helping to include participants that were less able to travel to in-person meetings.

On collaboration, CARIAA encouraged consortia through the provision of extra resources & budget to support cross-consortia work. Opportunistic collaboration arose from specific synergies once consortia were into their research, notably research on gender & migration, which proved more dynamic and successful than thematic topics identified at the beginning of the programme. Collaboration within and across consortia was driven by relationships between individuals rather than institutions, and require time for these relationships to flourish over time. Annual learning fora encouraged consortia to "up their game" in a spirit of friendly competition, rather than merely seeking to satisfy the funder's expectations.

These lessons are feeding into the design of a new climate resilience research framework programme being designed during 2019.

A Scholar-Practitioner's Guide to Global Virtual Teams
Ms. Lejla Bilal-Maley, Antioch University

The relationship between scholarship and practice is a reciprocal one. The scholarship supports the practitioner's experience, and the practitioner lens often informs the research and its identified problems in practice. Theory and practice go hand in hand to create engaged scholarship (Van de Ven, 2007). This presentation will offer both perspectives from a scholar-practitioner in regard to working on and leading global virtual teams (GVTs.).

The demands of leading in an era of escalating globalization are fast and furious. GVTs help manage and coordinate a global market, which is very diverse in nature. Culturally diverse work teams are increasingly common in the workplace (Gibson and Cohen, 2003; Stahl et al., 2010; Zimmermann, 2011). Because these teams consist of individuals with very different cultural backgrounds, assumptions and approaches to work, organizations must be well equipped to create structures and processes that promote their success, which will include growing awareness of the challenges they face, and how best to support their productivity.
Since the start of the 21st century, organizations were predicted to rely more heavily on globally dispersed new product development teams versus collocated and solely virtual teams with moderate physical dispersion, approximately 20% (McDonough, Kahn & Barczak, 2000). Such teams have potential to provide companies with more practical and economical services. The economic potential also includes a cost savings for organizations. Research shows that GVTs with a flexible and configurable infrastructure save valuable resources, resulting in increased productivity (Anderson et al., 2007).

The obvious advantages are however accompanied by some challenges. Given the increased challenges of teams working virtually across time and space, their effectiveness suffers and requires special attention. Global virtual teams (GVTs) rely on computer-mediated communication technology due to their geographic dispersion. Being globally scattered suggests a culturally/nationally diverse makeup that can also contributes to miscommunications. In addition, there are different workstyles and learning styles (Kolb, 1984) or learning needs (Lingham, 2010, 2018) when humans engage, all of which must be addressed using technology, as face-to-face may not be an option for team building and conflict mitigation.

My experience working on and leading a GVT is accurately expressed in literature. My team spans multiple countries and national cultures and time zones. All communication is mediated through technology, and although English is the common language, it is not the first for the majority of team members, creating added challenges and the need for negotiation when it comes to appropriate communication media selection. This presentation aims to shed light on the expected challenges working with GVTs, but also to provide lessons learned and tools and approaches grounded in theory and practice to encourage team success in a virtual environment. Such suggestions include a shift from a task-based focus approach to a more relational, shared leadership approach that invites opportunities for innovation and creative problem solving. These approaches help to combat sub group formations and empower individuals as contributors to team success.

Using Team Science to Identify Important and Innovative Questions for Cancer Research
Ms. Rachel Chown, *Dr. Sarah George*, *Ms. Pip Peakman*, *Dr. Robert Bristow*, Manchester Cancer Research Centre

The Manchester Cancer Research Centre's (MCRC) approach to Team Science (TS) is focused on enabling multidisciplinary groups to join forces towards a shared goal – building upon excellence in basic and translational cancer research to ultimately improve patient outcomes.

To identify important and innovative new research questions in different cancer specialties we hold Town Hall meetings at MCRC. Each meeting focusses on a specific tumour type (e.g. breast cancer, melanoma, prostate cancer) and is open to all professionals involved in cancer research, including clinicians, academics, PhD students, nurses, clinical trials professionals, research managers and importantly, patients. The nuances of each disease group mean that each meeting has a unique set of participants and desired outcomes.

The goal of each Town Hall meeting is to catalyse discussions to formulate an exciting research project that harnesses our unique strengths and opportunities in Manchester, and can result in an exciting, game-changing headline in 3 years' time. The group starts by identifying one or more such projects and then back-fills the scientific research that would be needed. This requires input from all disciplines represented in the room. Several ideas are pitched and our Director (Prof Rob Bristow) chairs an interactive session, until one idea is selected. The work should present an opportunity for added value via a new team approach rather than repeat anything already happening or done before.

Key questions for disease groups:
- What is best and what is unique about your disease group's research in Manchester? What could we do here that no one else could do?
- What would be an enabling Mancunian-driven, high risk, high impact idea that could be accomplished in 3 years?
- What would the 3-year headline in a newspaper be that would represent the accomplishment?

Underpinning all projects is a 'One Manchester' approach: the project needs to use team members from across the city, across our NHS (hospital) trusts, and the University of Manchester. An already established team should not carry out the project, and the new team should look to uplift more junior fellows and scientists to take on leadership roles.

The winning idea undergoes international peer review to assess the innovative and novel nature of the proposal; including whether it is likely to result in a high impact publication, and if the Manchester environment has sufficient capabilities to execute it. Pump-priming funds of approximately £100-150,000 are provided to kick-start the project as well as the promissory of access to real-time outcomes, health economics and biobanking resources, and genomics for 40-50 patients. Groups are strongly encouraged to also seek additional disease group donations and charitable, donor or grant funding where possible.

Within this oral presentation we will showcase our methodology and successful case studies from our TS approach in Manchester using Town Halls. We will discuss some of the challenges, including geographical dispersion, organisational barriers, differences in disease team approaches, working cultures, change management and communication. This ethos is factored into our long-term aim of co-locating cancer teams and aligned disciplines in our new £150million cancer research building.

COLLABORATION READINESS

Moderator: Kennan Kellaris Salinero, ReImagine Science

The Experience and Confidence of Researchers and Research Support Staff in Conducting Cross-disciplinary Research
Dr. Yan Ding, Dr. Justin Pulford, Dr. Imelda Bates, Liverpool School of Tropical Medicine

Background Previous experience, confidence and the span of disciplines represented within a project have been identified as contributing to collaborative readiness during the initial stages of cross-disciplinary research projects. This paper explores previous experience and confidence of researchers and research support staff in an African health multidisciplinary research programme (IMPALA), to identify actions for further improvement and to provide baseline information in tracking changes during the programme lifetime.

Methods Between May-September 2018, a novel online survey based on required competencies from literature in conducting cross-disciplinary research was administered to respondents from the IMPALA programme. The survey carried personal information, previous experience, and confidence in conducting cross-disciplinary research. A four-phase model of cross-disciplinary research was the main analytical framework. It comprises development (establishing a shared understanding of scientific/societal problem space of interest); conceptualization (developing research questions and a research design); implementation (launching, conducting and refining the planned research); translation phases (applying research findings); and a cross-cutting component (contributing to the goals of the four phases). The researcher respondents were grouped according to academic ranks and primary academic fields, to compare the

percentages of having previous research experience and their confidence in conducting cross-disciplinary research. Data from the research support staff were divided according to whether at least half of the respondents had previous experience of cross-disciplinary research and were "extremely confident" or "confident".

Findings 43/56 researchers (grouped as professors/senior researchers/early-career researchers as well as in Humanities & Social Sciences/Medicine & Clinical Sciences/Others groups) and 8/10 research support staff completed the survey. The researchers had mainly a Medicine & Clinical Sciences background (64%), followed by Humanities & Social Sciences (26%), and 74% had a multidisciplinary background. At each phase, the professors and the Humanities & Social Sciences group had the highest percentage of previous cross-disciplinary research experience. Overall, researchers had less cross-disciplinary research experience at the translation phase. At the development and translation phases, there was a lower level of confidence in doing cross-disciplinary research. There were no differences in confidence between the Humanities & Social Sciences and Medicine/Clinical Sciences groups, whereas the early-career researchers had a lower level of confidence compared to professors and senior researchers except in the implementation phase. The research support staff potentially could provide additional support for cross-disciplinary research by extending collaboration networks, interacting with non-academic stakeholders, incorporating cross-disciplinary research outcomes into technical outputs, presenting research in non-technical language, disseminating cross-disciplinary findings to policymakers, and advocating for cross-disciplinary research.

Interpretation Overall, researchers had the least previous experience and confidence in the translation phase of cross-disciplinary research. The programme could focus on creating opportunities for cross-fertilization among IMPALA researchers, especially for early-career researchers, increasing researchers' translational skills, and engaging research support staff for additional support in conducting cross-disciplinary research.

Building the Collaboration Readiness Framework for Ad-interim Evaluation of Transdisciplinary Collaborations
Dr. Eva Kalmar, *Dr. Maarten van den Sanden*, *Ms. Ingrid van Marion*, TU Delft

The challenges of our modern world are getting more and more multi-dimensional, integrating not only technological but social, environmental and politically sensitive issues. The complexity of these problems requires the involvement of multiple actors in the research and innovation processes, the engagement of scientists with non-scientists by bridging disciplinary and sector-based boundaries.

The collaborating partners share their human capital, risk and resources, join complementary skills and capacities in the course of joint work. These collaborations, often called as collaborative networks create new expectations, alter roles and shift communication practices for its members. The partners have to adjust to new social, organizational and management settings and adapt to the new collaboration-facilitating technologies. Organizations that lack the ability to share and collaborate have a huge potential to resist these adjustments and adaptation processes and limit the effectiveness of the collaboration as a whole. This could lead to the failure of the join work.

We claim that next to the technology readiness levels, collaboration readiness levels of research teams, organizations or companies can be measured and needs to be used within innovation processes. Much has been studied regarding the success factors of collaborations, or the collaboration readiness of distinct partners working together, but still, the evaluation of such collaborations are yet done at the last phase and are generally based on the number of produced research publications and patents. Our goal is to build a Collaboration Readiness framework that can be used to measure the collaborative status of collaborative networks even during their formation to support them in reaching their utmost potential.

Blockchain, the distributed ledger technology is a disruptive innovation, with potential uses in healthcare, food industry, energy, smart industry, logistics, and government. Blockchain entails an entirely new way of identification, transacting, trading and regulation. Blockchain is best seen as a technology that is co-created with multiple stakeholders. The heterogeneity of the actors involved in its development implies that these stakeholders are likely to have very different backgrounds and interests and as a result, they are also

likely to have very different understandings of Blockchain regarding (for example) what it is and what it should do. This can both hamper collaboration among these stakeholders and reduce widespread support for Blockchain.

A pilot study was performed on the Dutch Blockchain Coalition in 2017 to map how different internal stakeholders collaborate, how they perceive the technology, how they reach out, and how these issues could determine the success of Blockchain innovations. The aim of the pilot study was dual. First, to check the theoretical framework of collaboration readiness generated by the authors based on theoretical input as the first step in the design-based research approach. The results of the pilot were used to give feedback on issues that should be changed by the coalition to become more effective. The report on our findings was used to implement several organizational changes. This presentation summarizes the collaboration readiness framework, the pilot research, and draws the silhouette of the further research.

Perceptions of Competence of Social Scientists and Natural Scientists
Ms. Caitlin Kirby, *Ms. Patricia Jaimes*, *Dr. Amanda R. Lorenz-Reaves*, *Dr. Julie C. Libarkin*, Michigan State University

Interdisciplinary scientific research teams must often work across the boundaries of social science and natural science in developing solutions for complex scientific issues. However, perceptual barriers across these boundaries may prevent the formation of interdisciplinary teams or cause tension during interdisciplinary collaboration. Competence is one of the primary dimensions on which individuals judge others, and is a particularly important perception in the workplace. We explored the perceptions of competence of natural science and social science through the development of a survey. The purpose of this work was to develop and validate these competence measures. The survey was taken by a population of earth scientists (n = 449) from a range of career experiences. Resulting competence scales included three factors that we labeled as Perceived Respect (PR), Perceived Methodological Rigor (PM), and Perceived Intelligence (Pi). Scales were validated using confirmatory factor analysis, with all items on each scale having factor scores >0.32. Earth scientists' scale scores for the three competence measures PR, PM, and Pi were analyzed for both social science and natural science. A Mann-Whitney U test revealed that earth scientists perceived social science/scientists as significantly less competent than natural science/scientists. To test the impact of various demographics on earth scientists' competence perceptions of social and natural science, we conducted a multivariate multilevel analysis. Women perceived social scientists as more intelligent than men did. Having experience working with a social scientist improved scientists' competence perceptions of social science/scientists. Holding an earth science PhD lowered earth scientists' competence perceptions of social science/scientists. Overall, our study indicated that competence in scientific disciplines is a multidimensional construct with components related to respect, methodological rigor, and intelligence. Our survey results from earth scientists indicated that perceptual barriers towards other scientific disciplines related to competence exist and may be related to exposure to other disciplines. Future research could expand upon these competence constructs, and gather larger samples of scientists' competence perceptions across disciplines.

Does a Shared Understanding Blind Groups to Surprise?
Ms. Michal Russo, U of M School of Environment & Sustainability

Change and uncertainty is ubiquitous in environmental resource management. To be effective, decision makers must not only master knowledge about current and past conditions, they must have the capacity to quickly and effectively adapt their understanding to changing conditions. However, large and complex environmental decisions are not made by individuals, but rather diverse and often contentious groups. The capacity to adapt is influenced by the group's cognition – i.e. their shared understanding of the problem and solution space. While past research has explored the role of group cognition in the context of stable and directed goals, little empirical work has focused on dynamic and ambiguous problem-sheds characteristic of wicked problems. This research asks - does the process of working towards an agreement make advisory groups better or worse at detecting and responding to future surprises? I propose that understanding the relationship between decision making processes, group cognition, and adaptive capacity is essential to enhancing the facilitation of long term resource management and ultimately the resilience of socio-ecological systems. As an initial step, I suggest that scholars and practitioners need a robust and flexible instrument for assessing changes in group cognition, and relating those measures to decision making outcome metrics. In my research, I propose a mixed methods approach that centers on an experimental role play simulation.

"I'm Ready, Are You Ready?" How Do You Know if Your Team is Ready?

Dr. Jennifer Cross, *Dr. Bailey Fosdick*, *Dr. Hannah Beth Love*, *Dr. Meghan Suter*, *Ms. Dinada Egan*, *Dr. Ellen Fisher*, Colorado State University

Is your team ready to be a team? The Science of Team Science (SciTS) literature has established that teams go through phases of development (Hall et al., 2012), and it takes time for a team to develop and perform. How do you know if a team is ready to apply for a grant, write publications, and conduct research? Frequently, teams 'fail to launch.' They have a good idea that requires team science, but they fail to coalesce as a team. 'Failure to launch,' can leave a 'bad taste' for future research and collaboration. What if the team and their sponsors knew in early stages if they were "ready?" What if there were tangible markers that teams could "check-off" before moving to the next stage of development.

At Colorado State University, from 2015-2019 we conducted a mixed-methods study of three cohorts of interdisciplinary research teams to examine the processes of team development. We conducted non-participant observation, social surveys, and social network analysis to understand team dynamics and development. We used the data in an iterative and recursive process to improve and enhance the OVPR program through developing new trainings, establishing stage gates, modifying the funding structure, and supporting teams through multiple stages of development.

This session will explore the processes of team development, describe evidence-based interventions to accelerate team development, and provide metrics and criteria for understanding what interventions are best suited for different stages of development.

The session will:
- Provide detailed case studies of teams at several stages of development,
- Define specific metrics and data collection tools for assessing teams across the stages of development,
- Identify interventions for advancing teams to higher levels of readiness, and
- Outline recommended stage gates (and associated metrics) for university programs or other funders supporting large transdisciplinary teams based on team readiness.

Participants will leave the session with an enhanced understanding of how they can accelerate development of their own scientific teams, what interventions are most appropriate for various stages of development, and what tools can help administrators and funders assess team readiness.

References: Hall, K. L., Vogel, A. L., Stipelman, B. A., Stokols, D., Morgan, G., & Gehlert, S.(2012). A four-phase model of transdisciplinary team-based research: Goals, team processes, & strategies. Translational Behavioral Medicine, 2(4),415–430. https://doi.org/10.1007/s13142-012-0167-y

TOOLS FOR TEAM SCIENCE AND THE SCIENCE OF TEAM SCIENCE
Moderator: Dr. Ike Iyioke, Michigan State University

11 Best Practices for Successful Team Science: A series of Motivational Videos

Ms. Nicole Exe, University of Michigan, MICHR; *Ms. Laura Denton*, University of Michigan, Faculty Development; *Ms. Meg Fairchild*, *Mr. Jordan Hahn*, *Dr. Vicki Ellingrod*, University of Michigan, MICHR

As Team Science is an ever growing emergent field, one of the key issues that must be addressed is how to engage researchers to learn about team science and the skills needed to successfully participate in or lead a multi-disciplinary team. At last year's Science of Team Science conference, we heard from many other institutions that they were providing team science training but were having difficulty motivating people to attend. Based on the Top 10 Take Aways from the Collaboration and Team Science: A Field Guide (1), we are creating short motivational videos to encourage researchers to learn more about various topics related to team science and seek out further training to do it well. The ten topics include: trust, vision, self-awareness and emotional intelligence, leadership, mentoring, team evolution and dynamics, communication, recognition and sharing success, conflict and disagreement, and navigating and leverage networks and systems.

Another motivating factor to develop these videos was the University of Michigan's diversity, equity, and inclusion (DEI) initiative that was rolled out in fall 2016. It involved the creation of a five-year DEI strategic plan for all campuses and we felt that this initiative would dovetail nicely with our Team Science video project since we know from the research that diverse teams are more productive and innovative. Thus, we added an eleventh topic of "diversity" to the original Top 10 Take Aways. These eleven videos will be paired with resources such as other readings, webinars, and tools that the viewers can further explore. While video creation is ongoing, we do have a sample of completed videos that can be demonstrated during the session.

Video creation consisted of identifying underlying sub-themes for each overarching topic. These were then translated into interview questions for a mix of experts and team science practitioners. The interviewees are comprised of both faculty and staff from the University of Michigan as well as other thought leaders in these respective domains. Some of the interviewees touched on several of the key topics while being interviewed, thus we were able to use clips in a number of the videos which help tie them together for a cohesive series. The interviewees were informed of the motivational nature of the videos as opposed to more in-depth educational videos that already exist. The plan was to have each video be no more than three to four minutes in length. Each interview is expertly edited with live on-screen content for emphasis of the key sub-themes. The videos and accompanying resources will be available on a website for both internal and external research community members to access.

Reference: National Cancer Institute. "Collaboration and Team Science: A Field Guide". May 18, 2018. https://www.cancer.gov/about-nci/organization/crs/research-initiatives/team-science-field-guide.

Infrastructuring a Federated Research Network Node
Dr. Marcelline Harris, Lisa Ferguson, Airong Luo, University of Michigan

Introduction The contemporary research environment is dynamic, and challenged to support what is broadly described as data-intensive science. The need for new models of collaboration and infrastructure is recognized; federated research networks (FRNs) are one such model, intended to address research 'at scale'. FRNs are collaborations among independent partners who, through coordination at overarching network levels, bring together resources and services to enable more efficient research. In healthcare, there are speculations that all 5500+ US hospitals may be connected to FRNs in the near future (Weber). While there is emerging research literature exploring infrastructure at the FRN network level, insights into developing and sustaining infrastructure at local participating institutions (node level) is nascent despite known challenges.

Adopting infrastructuring as an analytical lens, our research questions address the general question of what infrastructuring is required within an institution to support its participation in FRNs, what are the required infrastructural components, how are the components assembled to meet research goals?

A sociotechnical perspective of infrastructure encompasses multiple dimensions including a) the technical infrastructure; b) the human infrastructure, and, c) the institutional systems and policies. The terms "infrastructuring" and "the infrastructuring of work" define "the tentative, flexible and open character of the activity of designing and developing infrastructure". Infrastructuring involves aligning and leveraging relationships among people, organizations, and technologies to make them productive and functional (Bietz). However investigators have observed that the work of infrastructuring is often invisible and marginalized; attention is typically directed toward technical infrastructure only (Bowker, Ribes).

Method A participant observation was conducted at one healthcare institution; findings were validated through interviews with three other institutions in the same FRN. Jointly, these institutions could contribute data from > 4 million patient records to network studies. We first categorized infrastructural components and the processes to assemble components, then graphically represented the infrastructuring work using a mind mapping tool, and iteratively refined our analysis based on stakeholder feedback obtained through interviews.

Results and Discussion Infrastructuring work includes governance of the node, meeting network requirements, provisioning the local technical infrastructure, providing core services to study teams, and evaluation of node functioning. Across these five work efforts, 26 'sub'-efforts and 148 specific tasks were identified. Fewer than half of discrete work efforts (43%) were directly focused on the technical infrastructure; more were devoted to coordinating and assembling resources, services and expertise within the institution and

across the FRN. All sites agreed that embedding the infrastructuring work within existing institutional systems and procedures was essential to achieve research goals and institutional commitment to sustained engagement. It was commonly noted that FRN infrastructure could be reused to serve other research projects and other FRNs, but this requires careful planning, organization and commitments within the institution. Future work will further examine the properties of the sociotechnical infrastructures in FRNs, their sustainability and reuse, and embeddedness as an organizing structure for assessing research infrastructure maturity at academic institutions.

It's Not All Fun and Games: Building Multiplayer Worlds to Explore, Learn and Expand.
Mr. Benjamin Green, *Ms. Georgina Moulton*, *Ms. Victoria Turner*, University of Manchester

A megagame is a complex system, tabletop simulation. The term megagame refers to experiences with a purely entertainment focus, many of the core ideas underlying them are common within military, political and industrial exercises more commonly named as wargames, which tend closer to training and analysis. Despite this the terms can largely be used interchangeably.

Megagames tend to have at least 20 players, usually many more and involve asymmetric player interactions (most commonly surrounding player role). A further key ingredient is the 'controller', a human rules moderator that is empowered to modify the game on the fly, to reward player ingenuity or invention, or to fix broken mechanics or direct the actions of players. Consequently this class of game is unusal because its rules are semi-formalised but still, from player perspectives, apprear to be consistent enough to not affect immersion.
In 2018 we designed and twice ran the megagame "EnTRUSTed" to informally observe a megagame's ability to convey perspective, to understand better the process and considerations of megagame creation, and to informally assess their reception within groups with limited gaming experience.

The situation that EnTRUSTed was created to represent was that of the acute aspects of British NHS Hospitals. Roles included Anaesthetist, Board Member (such as CEO), Directorate Officer, Medical Consultant, Nursing Manager, and Surgical Consultant. Each role had vastly different focuses and despite the central mode of cooperation, commonly, responsibilities spanned two or more roles, leading to conflict and challenges that players needed to overcome to succeed.

We refer to the game as a simulation because it was designed to accurately render the decision space of each represented role within the hospital environment. We aimed to create conditions, such as cliques, hierarchies, policies and competing drives that elicited true to life behaviours (judged ostensibly by an observer with significant experience of working in a hospital).

While EnTRUSTed is intended to accurately depict the decision space, the operational mechanics, the actual work that players undertake, was deliberately a low granularity abstraction of actual medical practice. This was to reinforce the perspective of players as hospital managers and senior professionals.

The process of design was informed by an extensive knowledge and experience of working within a British NHS hospital and it was further supported by a leading expert in megagame creation and delivery.

Throughout, a significant concern was that of attendance. To mitigate this, we targeted a number of key barriers hoping to remove or reduce them in order to increase the likelihood of attendance. For example, we delivered the experience over an evening (set aside for teaching the various rules demonstrations) and the following day (used exclusively to run the game) to avoid the common complaint of megagames, that rules are inaccessible and often not explained.

We consider these games to be ideal context specific platforms to test ideas or innovations, analyse systems or situations, and communicate a range of perspectives. However, it was anecdotally suggested that games of any type may only be attractive to those who play games.

Repertoires as Blueprints and Frameworks for the Doing of Science
Dr. Rachel Ankeny, University of Adelaide; *Dr. Sabina Leonelli*, University of Exeter

In this paper, we propose a general framework for analysing the emergence, development, and evolution of particular ways of doing science, which we call repertoires, in which the successful alignment of conceptual, material, logistical and institutional components (including specific skills and behaviours by participants in scientific efforts) results in a blueprint for how to effectively conduct, finance and support research in the longer term. The framework is grounded in our analysis of the specific characteristics of the system of conceptual commitments, practices, technologies, institutions, and norms used within certain case studies taken from the life sciences, although we contend that it can be fruitfully applied much more widely to other types of research. We believe that it is important for philosophers of science to be able to trace and analyse the material, social, and epistemic conditions under which individuals join together to perform projects and achieve common goals, in ways that are relatively robust over time despite the broader landscape and other features evolving and changings, as well as how these can be transferred to and learnt by other groups interested in similar goals.

We use a series of three case studies to illustrate how the repertoires framework facilitates philosophical analysis and explanation of critical questions around the functioning, flexibility, durability, coherence, and longevity of research groupings and their outputs, including the formation of research communities, thus helping to account and understand the epistemic implications and significance of different research practices, and related constellations of actors, technologies, and institutions. The framework thus functions as an overarching approach to the study of scientific change, and especially of the role that a specific type of system of practice – the repertoire – has acquired over the course of the last century, with significant implications for what kind of science is regarded as most visible, influential, and topical in any one period. This perspective has implications for various research practices including credit attribution and supports a highly distributed model of how science is done.

TRAINING AND PROFESSIONAL DEVELOPMENT
Moderator: Dr. Heather Billings, Mayo Clinic College of Medicine and Science

Reflecting on Transdisciplinary Team Science Training
Dr. Stephen Fiore, University of Central Florida; *Dr. Troy Hartley*, *Dr. Linda Schaffner*, College of William & Mary Virginia Institute of Marine Science; *Dr. Karen McGlathery*, University of Virginia; *Dr. Deborah DiazGranados*, Virginia Commonwealth University

Solving today's most challenging societal problems requires innovative, integrated breakthroughs and novel solutions that transcend individual disciplines, reaching a deeper level of knowledge integration. However, achieving such integration through team science is challenging due to the lack of adequate training to develop such outcomes. This talk describes an approach and preliminary research findings from an NSF funded Innovations in Graduate Education grant awarded to the Virginia Sea Grant, the Virginia Institute of Marine Science, and the University of Virginia, in collaboration with the University of Central Florida, and Virginia Commonwealth University.

We bring together a multi-disciplinary team of faculty coaches to guide a class of diverse doctoral and master's students from the natural and physical coastal, marine and environmental sciences, engineering, design, and social and economic sciences. A series of workshops has been developed to train students on the fundamentals of team science as well as collaborative knowledge building on complex transdisciplinary problems. These are integrated through an intervention focusing on reflection in teamwork processes. Our aim is to introduce students to the principles of team science, collaborative problem solving, and effective self-reflective tools and strategies to improve teamwork. Further, by working closely with coastal community partners (e.g., municipalities, NGOs), this community-based climate-resilience project enables students to practice team science research and use reflective practices to improve their competencies with various stakeholders. Assessment of team processes, along with reflections on teamwork and taskwork will be used iteratively in order to highlight areas of collaboration needing improvement.

Our project is designed to improve understanding of how to nurture self-reflective competencies in the short-term and build capacity for team science research that will enhance students' careers over the long term. Specifically, our goals are to: (1) give a new generation of scientists and policy-makers the knowledge and critical skills they need to work together effectively to find solutions to complex

coastal issues that are important to the citizens of Virginia, the nation, and coastal communities around the globe; (2) provide an opportunity for graduate students to work with stakeholders on complex interdisciplinary collaborative problem solving and learn how to work as a team across disciplines; and, (3) provide collaborative institutions an unprecedented opportunity to partner and bring together multi-disciplinary faculty teams to train students using innovative workshops focused on community-based coastal resilience issues. Initial findings from our workshops will be reported, including differences between reflections on teamwork and on taskwork, and the particular challenges graduate student participants faced when working on complex problems.

Evidence-based Team Development: Pre-post Assessment of Team Experiences with Team Coaching

Dr. Tony Lingham, Antioch University; *Dr. Bonnie Richley*, Interaction Science, LLC

Across the globe, with the increasingly complex and volatile work environment organizations are recognizing the importance of developing their leaders and employees to increase internal capacity to innovate and enhance performance. A major shift in structural design to meet this need is to incorporate teams across all levels of organizations. Despite this trend of becoming more team-oriented structurally, few programs focus on developing teams in their actual work environment although numerous offsite team-building programs exist. It is quite evident that in very recent articles, very few team training programs focus on developing teams in their organizational context with even less that provide evidence based training for teams. Today, many individual focused leadership-training programs exist to help develop individuals but evidence-based training programs to develop teams are still very much in its infantile stage. In a review of the training and development literature since 2000 show very little evidence based training and development at the team level. Based on extant literature it is clear that team training and development is crucial to organizations and this need inspired us to contribute to team training involving team assessment, team coaching and team development. As suggested by researchers and practitioners, our paper involves assessing experiences of teams in their work context; a structured team coaching process; and a longitudinal assessment to demonstrate evidence of team development. We used a longitudinal quantitative case study method to test the difference of teams' assessments from Time1 and Time 2 and controlled for organizational culture variance by using teams that attended a leadership-training program that included team development. We present the team development program that we designed and delivered for a Midwestern university staff leadership training and present the findings from 64 teams that went through the 6-month program from 2009 to 2014. Fifty-four teams that went through the program and completed assessment over the two time periods and engaged in the team coaching process were used in this longitudinal case study. We tested six hypotheses of which three were supported, one partially supported and two not supported. Using paired t-tests, our major results show that the gap between the Desired and Actual Experiences in Time 2 is smaller than in Time 1 (Mean = -.11, p =.068) indicating team development; linear regression shows that this reduction in the gap does impact the internal evaluation from the team members (beta = -.31, r2 = .097, p<.05). We believe this study provides evidence that team development can be demonstrated and that further work could be done to contribute to this stream so as to meet the crucial need of team development in organizations and educational institutions. We hope the design and results of this study would contribute to this stream of work by: 1) using an evidence based assessment so as to capture team experiences; 2) proposing a programmatic and approach to team coaching; and 3) showing evidence of team development from the team-training program.

Developing Competencies for Team Science

Dr. Deborah DiazGranados, Virginia Commonwealth University; *Dr. Heather Billings,* Mayo Clinic; *Dr. Allan Brasier,* University of Wisconsin; *Dr. Dan Lackland,* Medical University of South Carolina; *Dr. Wayne McCormack,* University of Florida*; Dr. Maritza Salazar,* University of California, Irvine; *Jennifer Sprecher,* University of Washington; *Dr. Beth Tigges,* University of New Mexico; *Dr. Kevin C. Wooten,* University of Houston Clear Lake; *Dr. Dayan Ranwala,* Medical University of South Carolina; *Dr. Gaetano Lotrecchiano,* George Washington University

The promotion of team science in grant applications has been increasing over the last decade. One such example is the funding announcement for the clinical and translational science awards funded by the National Institutes of Health (NIH). However, standardization of competence, which is required to inform effective team science skills, is still lacking, particularly to guide training and development as well as evaluation efforts. While there is a plethora of research within the social sciences literature that can inform our understanding of team science effectiveness, the problem still remains in communicating a universal set of competencies that drives effective team science performance to stakeholders.

The value of defining competencies has been recognized (Shippmann, et al., 2000; Begg et al., 2014; Lotrecchiano and Misra, 2019). Specifically, the act of defining competencies will allow for the explicit recommendations for practice in the area of team science, which will clarify some of the vagueness that currently exists. With the specific charge by several funding agencies to "increase knowledge and awareness of what works best in team science" (PAR-18-940, NIH, https://grants.nih.gov/grants/guide/pa-files/PAR-18-940.html) there is an apparent need for clearer definitions of identified competencies. Moreover, our work in mapping the defined competencies to other relevant competencies (e.g., Translational, TL1 and KL2 competencies) will benefit educational and workforce development programs as they target the development of team science skills. It is our intent to disseminate the developed framework to the community who holds value in training and evaluating team science (i.e., INSciTS community).

This presentation will draw from the work of the Team Science Affinity work group, which has systematically identified competencies specific to team science applicable to clinical and translational teams as well as teams from other sectors. Our work is designed to inform training programs, funders, evaluators, and investigators about the competencies, which are crucial to engaging in collaborative team science. Specifically, our goals in this presentation are to: (1) identify observable distinct competencies that will result in effective collaborative team science, and (2) provide a framework which can inform training and development programs of faculty, students and research staff as well as the assessment efforts of team science competencies. The initial framework of competencies will be presented and discussed. Attendees of this session will be provided time to engage in discussion and debate about the presented framework.

Team Science Bootcamp: Annual Trainings to Improve Team Performance
Dr. Brenda Zierler, *Dr. Erin Blakeney*, *Ms. Jennifer Sprecher*, *Ms. Nicole Summerside*, University of Washington

The Team Science Training Team (TSTT), a core group of the University of Washington's (UW) Institute for Translational Health Sciences-ITHS (CTSA) offers an annual 1.5 day team science training "Bootcamp" to ITHS-affiliated research teams in the Washington, Wyoming, Alaska, Montana, and Idaho (WWAMI) region. The purpose of the Bootcamp is to improve team performance and productivity. Research teams affiliated with UW's ITHS are invited to bring an interdisciplinary team to Seattle to participate in the 1.5 day training. The approach to the annual Bootcamp includes a baseline assessment of team composition, team structure, and team challenges. Prework requires all participants to complete a Personal Styles Inventory (PSI), the Thomas Kilmann Conflict Mode Instrument (TKI), draft a Lean-based team project charter, and read an article "What Google Learned from its Quest to Build the Perfect Team." Team size for the training ranges from 3 to 7 members and the registration is capped at 60. The teams must be interdisciplinary and all members of the research team are invited, regardless of role. The TSTT has been conducting team trainings for educators, healthcare teams, and students for more than 10 years at the UW. In 2018, we added research teams when the CTSAs were required to add team science in their grant applications.

We initially piloted the research team focused Bootcamp in February 2018 with ITHS program teams (n= 53 attendees comprising 14 teams). An online post-training survey found that 79% of participants indicated that the training moderately to greatly enhanced their knowledge of Lean-R and team science, 69% indicated that psychological safety in their teams improved. 70% of respondents indicated that they agreed or strongly agreed that the PSI and TKI were helpful in preparing for the Bootcamp. Survey comments included: "I didn't know anything about Team Science before this boot camp, & the knowledge gained was very helpful"; "It was a good use of time. I think it helped the overall ITHS team and our team got some new ideas."

The overall objectives of the Bootcamp are to provide skills to manage their research projects, clarify team member roles, establish team processes, identify the value of working in teams and create awareness of what characterizes high performing teams, provide tools to increase team performance and the opportunity to apply tools real time, develop awareness of how PSI and mode for dealing with conflicts (TKI) affect team functioning. The TSTT utilizes interactive approaches to training including the use of Liberating Structures, and short didactic theory bursts followed by application of content.

The second annual Bootcamp with research teams will be held in February 2019 and we will share results and lessons learned from both the 2018 and 2019 trainings during the SciTS conference. Our evaluation approach has changed and in addition to formative and summative evaluations of the overall content and approach, we will measure the impact of the team science training at 6 and 12 months after training on the team challenges identified by each team.

Mastering Complex Communication
Dr. Katy Colbry, *Dr. Dirk Colbry*, Michigan State University

This highly interactive workshop examines the leadership – and listening – skills that are essential to effective communication. You'll learn about the components of complex communications and build skills for both leading and participating in problem-solving conversations. This engaging workshop will teach you how to reduce complexity and avoid confusion during technical conversations, and give you practical tools to increase understanding and foster strong working relationships. (This session is adapted from materials and resources developed with support from the National Science Foundation, Award #1730137.)

Participants will develop skills for improved communication during complex, technical conversations. Through interactive exercises, participants will learn and immediately practice communication techniques for reducing complexity, increasing understanding, and strengthening professional relationships. More specifically, participants will be able to:
1. Describe attributes of effective communication
2. Identify methods to improve communication skills
3. Demonstrate speaker techniques to initiate a conversation and communicate a problem
4. Demonstrate listener techniques for understanding and contributing to problem solving

Working effectively in interdisciplinary teams requires strong communication skills. Participants in this workshop will practice concrete communication skills in the context of problem-solving within interdisciplinary teams. The training covers both technical and interpersonal communication skills, and uses interactive rehearsal activities to provide the opportunity for participants to immediately practice the skills as they are learned.

SOCIOENVIRONMENTAL TEAM SCIENCE
Moderator: Dr. Marisa Rinkus, Michigan State University

Interlinking Open Science to Team-based Action Research for Socio-environmental Cases
Dr. Yasuhisa Kondo, Research Institute for Humanity and Nature; *Mr. Akihiro Miyata*, University of Tokyo; *Dr. Ui Ikeuchi*, University of Tsukuba; *Dr. Satoe Nakahara*, Research Institute for Humanity and Nature; *Dr. Ken'ichiro Nakashima*, Hiroshima University; *Dr. Hideyuki Onishi*, Doshisha Women's College of Liberal Arts; *Dr. Takeshi Osawa*, Tokyo Metropolitan University; *Dr. Kazuhiko Ota* Research Institute for Humanity and Nature; *Dr. Kenichi Sato*, Kyoto Sangyo University; *Dr. Ken Ushijima*, Hokkaido Research Organization; *Dr. Bianca Vienni Leuphana*, University of Lüneberg; *Dr. Terukazu Kumazawa*, Research Institute for Humanity and Nature; *Dr. Kazuhiro Hayashi*, National Institute of Science and Technology Policy; *Dr. Yasuhiro Murayama*, National Institute of Information and Communications Technology; *Dr. Noboru Okuda*, Research Institute for Humanity and Nature; *Dr. Hisae Nakanishi*, Doshisha University

This paper discussed how open science, consisting of top-down open research data policies and bottom-up citizen science movements, can be interlinked with team-based action research for socio-environmental cases. Through the case studies of (1) waterweed recycling in the catchment of Lake Biwa, (2) participatory monitoring of alien species in Aso-Kuju, Oita, and (3) small-scale water supply management in Hokkaido, Japan, the authors found that team-based action research is often disrupted by socio-psychological boundaries, generated by asymmetric information, knowledge, value, socio-economic status, and power among actors, while such boundaries between actors can be spanned by sharing information, knowledge, and wisdom through appropriate visualization and dialogue. It also revealed the importance of inclusive and trans-sectoral knowledge-action networking in all three cases. Based on these notions, the authors are developing a methodology to interlink open science to team-based action research which consists of the following approaches, addressing socio-environmental issues. First, boundary spanning can be achieved by transcending, or discovering and sharing the goals that actors with different interests can tackle together, while carefully considering the ethical equity with special attention to empowering marginalized (or "small voice") actors. Ethical equity is associated with fair data visualization, motivated by the FAIR (findable, accessible, interoperable, and reusable) data principles, and dialogue for solution. Civic Tech, or an open governance approach in which civic engineers develop a solution for local issues by using open government data and information and communication technologies, can be applied as a holistic approach.

To implement these concepts to technical operation of transdisciplinary research, open science is regarded as a movement of an open scientific knowledge production system rather than open scientific knowledge only. Open research data is implemented to the process as an input resource. As a method to engage societies to research experts, Civic Tech is applied to the team-based knowledge production, action, and networking to co-create a solution as outcome, which is then fed back to the resource to be used for next projects. This working hypothesis is being tested and further improved through the ongoing case studies. Through this process, open science and transdisciplinary theories will be integrated into a methodology of Open Team Science as a new research paradigm.

Adopting a Community Science Model of Team Science for Addressing Environmental Inequities

Dr. Jennifer Carrera, *Dr. Kent Key*, Michigan State University; *Ms. Karen Calhoun*, University of Michigan, MICHR; *Dr. Sarah Bailey*, Community Based Organization Partners, All Faith and Health Alliance; *Dr. Joseph Hamm*, Michigan State University, Environmental Science and Policy Program, School of Criminal Justice; *Dr. Courtney Cuthbertson*, Michigan State University Extension; *Ms. Yvonne Lewis*, National Center for African American Health Consciousness, Healthy Flint Research Coordinating Center*; Dr. Susan J. Woolford*, University of Michigan; *Ms. E. Hill DeLoney,* Community Based Organization Partners, Flint Odyssey House Health Awareness Center; *Ms. Ella Greene-Moton*, Community Ethics Review Board, Community Based Organization Partners; *Ms. Kaneesha Wallace*, Healthy Flint Research Coordinating Center; *Mr. DeWaun E. Robinson*, Community Based Organization Partners, Artistic Visions Enterprise; *Mr. Ismael Byers,* Michigan State University, College of Human Medicine; *Ms. Patricia Piechowski-Whitney*, University of Michigan, MICHR; *Mr. Luther Evans*, Community Based Organization Partners; *Ms. Athena McKay*, *Dr. Don Vereen*, University of Michigan, MICHR; *Ms. Arlene Sparks*, Community Based Organization Partners, Date2Dream

A team science model is generally used in academic, government, and industrial research settings to address large and complex problems. While the transdisciplinary approach within team science assumes the creation of new methods to tackle difficult problems, the institutional foundation of team science limits the degree to which power can adequately be addressed. We build on the team science model by reappropriating the term 'community science' in order to emphasize the significance of community members within the research team but also to diffusely connect the research team to the community in which it is engaging. Our project responds to silences created in the Flint water crisis narrative by using a community-driven research study aimed explicitly at elevating the frame of Flint residents in and around the Flint Water Crisis. This paper describes the coming together of the research team and lessons learned over three interrelated research projects. The three sub-projects include 1) a qualitative analysis of community sentiment provided during 17 recorded legislative, media, and community events, 2) an analysis of trust in the Flint community through nine focus groups across demographic groups (African American, Hispanic, seniors, and youth) of residents in Flint, and 3) an analysis of the role of the faith-based community in response to public health crises through two focus groups with faith based leaders from Flint involved with response efforts to the water crisis.

The purpose of this paper is to describe a case analysis of the use of collaborative, community engaged, team science as a mechanism of community response to a crisis. The key contributions of this paper include a community based participatory research (CBPR) approach to interpreting what a process of resiliency means for a community during and after a crisis. Through a CBPR approach to team science, we propose a new definition for team science that incorporates the transdisciplinarity of team science with the formal and informal educational experiences of community members in the bridged concept of "community science." Throughout the process of research we have been deliberate in our transdisciplinary approach and have felt that the nature of the work in the Flint community in the context of the water crisis drives the development of new methods of engagement, collaboration, and research analysis. We offer a model for community-based analysis of data for expressing community voice. Finally, we suggest community science as a potential model for rebuilding trust in the scientific community in the context of violation by experts in a crisis situation. We define community science as this collaboration collectively operating through a team science model (while also extending beyond this model to emphasize a community orientation over an [academic] institutional frame) to address community member questions, analyze community-based study findings, and share an intentional community framed perspective on the interpretation of the research. We aim through this framework of community science to achieve true resident control in the conduct of research on communities.

Leading Large Interdisciplinary Research Teams: Lessons from LAGOS
Dr. Patricia Soranno, Dr. *Kendra S. Cheruvelil*, Michigan State University

Research to address large, complex, and interdisciplinary problems require scholars to work together as part of teams that include a variety of disciplines and perspectives, many of which are also distributed with a large number of people spread across institutions and nations. Although such large, interdisciplinary research teams have the capacity to accomplish a great deal, team leaders are also faced with challenges both philosophical and logistical in nature. In this presentation, we describe our experiences co-leading two large interdisciplinary research teams associated with the LAGOS project (www.lagoslakes.org) that studies environmental research problems at the scale of the continental US. We focus on three areas that are especially important for science teams: (1) balancing individual and collaborative research modes; (2) identifying research questions that engage experts in multiple disciplines, thus advancing more than one discipline; and (3) keeping busy, productive, and creative scientists engaged when all are not at the same institution. We will present literature-based practices that we implemented to address these three important leadership challenges for our teams, share some recommended future research directions for science of team scientists, and share recommendations for other science team leaders.

Managing Interdisciplinary Teams: Lessons Learned from Coupled Natural & Human Systems Modeling in Lake Catchments
Ms. Reilly Henson, *Dr. Kelly Cobourn*, *Dr. Cayelan Carey*, Virginia Tech; *Dr. Kathleen Weathers*, Cary Institute of Ecosystem Studies; *Dr. Kaitlin Farrell*, *Ms. Nicole Ward*, *Ms. Weizhe Weng*, Virginia Tech; *Dr. Jennifer Klug*, Fairfield University; *Dr. Michael Sorice*, Virginia Tech

Interdisciplinary team science is increasingly common in fields such as ecology, where it is used to investigate the multifaceted and reciprocal interactions between humans and their environment. Bringing together multiple disciplines allows researchers to examine ecological systems in a more holistic way, which is necessary to understand system behavior and forecast environmental outcomes. However, the increased effort and flexibility required to conduct interdisciplinary team science can pose significant roadblocks for many projects.

Here we present lessons learned from a coupled natural and human systems (CNHS) modeling project focused on freshwater lake catchments. Our project brings together more than 20 researchers from disciplines such as economics, hydrology, agronomy, and social psychology. These team members span more than six institutions that are distributed geographically across the eastern and Midwestern United States. Furthermore, the team includes scientists from a diversity of career stages, including undergraduate students all the way to professors emeritus.

Two separate threads of the scientific literature examine the science of team science and address the factors that support project management. However, little exists at the intersection of these two lines of inquiry, which defines the practical, day-to-day aspects of conducting interdisciplinary research. Given that the study of CNHS in particular involves a suite of activities and characteristics that can compound team science related challenges, operational guidelines for approaching these projects are likely to be beneficial for similar teams. Our objective is to use our case study to develop best practices for CNHS research including a blueprint for potential risks and challenges as well as a set of strategies for dealing with them.

Over the past three years, our team has grappled with large team size, geographically distributed researchers, complex interdisciplinary integration, and more. Drawing on established frameworks from the science of team science and project management literatures, we delve into the lessons we have learned to support CNHS research in general. Examples of questions we address include: How do we build QA/QC into the process of moving datasets between sub-teams by establishing metadata standards, platforms for dataset sharing, and versioning control? How do we formalize our expectations for collaborative manuscript writing, while allowing for the flexibility to incorporate new types of research products and disciplinary publication standards? Which management techniques and meeting strategies have been most successful in driving forward coupled modeling efforts?

Our answers to these questions contribute to the growing body of science of team science knowledge. They highlight the types of challenges that arise in interdisciplinary team science in the field of ecology, and identify potential strategies teams may use to address them. Insights from our experience provide a starting point that may be adapted to support projects that share some similarities to ours, whether in content or structure. Ultimately, we seek to support effective and efficient collaborative team science in order to advance the

state of CNHS modeling. Such advancement will help the scientific community move toward developing a holistic understanding of complex freshwater systems and support policy development and management of these scarce resources.

TEAM SCIENCE EVALUATION
Moderator: Dr. Elias Samuels, University of Michigan, MICHR

Indicators for Measuring the Contributions of Individual Knowledge Brokers

Dr. Sabine Hoffmann, Eawag, Switzerland; *Dr. Simon Maag*, Parliamentary Services, Swiss Parliament; *Dr. Robert Kase-Pasanen*, University of Applied Sciences and Arts Northwestern Switzerland; *Dr. Timothy J. Alexander*, Eawag, Swiss Federal Institute of Aquatic Science and Technology

Environmental research often aims at achieving a broader impact on society and the environment. However, the impact of such research on policy and practice tends to fall short of expectations. This is partially due to a lack of productive exchange across the interface between research, policy and practice. Researchers are sometimes not sufficiently informed about the concerns of decision makers and hence produce knowledge that is barely relevant for them or poorly timed. On the other hand, decision makers are not always sufficiently aware of available research knowledge or its implications for both policy and practice.

Given these limitations, an increasing number of knowledge brokers work at the interface between research, policy and practice. Their specific function is to facilitate processes to foster productive exchange and mutual learning among research, policy and practice. The ultimate goal of such processes is to catalyze positive change in society and the environment. However, empirical evidence on the effectiveness of the various processes facilitated by knowledge brokers remains incomplete. While frameworks exist for assessing research impact, few are available for evaluating the contributions of individual knowledge brokers at the interface between research, policy and practice.

In this presentation, we respond to this gap by presenting a set of indicators to measure the quantity and quality of contributions of individual knowledge brokers to projects, programs, and platforms at the interface. We focus on indicators related to the processes facilitated by individual knowledge brokers ('process indicators') and indicators related to the process results on which knowledge brokers are likely to have a decisive influence ('attributable results indicators'). For both indicators, we provide metrics as regards the quantity and quality of the contributions.

The set of indicators is based on two sources: the existing literature and the practical experience of a group of knowledge brokers organized as a Community of Practice at the Swiss Federal Institute of Aquatic Science and Technology (Eawag), including the co-authors of this presentation. The insights gained from these two sources are integrated, synthesized and refined in an iterative process. The set of indicators is primarily intended to support knowledge brokers in self-assessing their contributions. It can help them to (a) identify ways to improve the effectiveness of their daily work, (b) demonstrate the benefits of their work, (c) reflect on processes of knowledge brokering and the desirable characteristics of process results, and (d) to sharpen their professional profile and clarify their roles and responsibilities vis-à-vis their employers and other stakeholders. The set of indicators is flexible enough to be applied even where available resources are limited.

"Innovation Happens at the Intersections of Disciplines."Transdisciplinary Research Outcomes Based on the Transdisciplinary Research on Energetics and Cancer (TREC) II Initiative Experience

Ms. Sarah D. Hohl, University of Washington, Fred Hutchinson Cancer Research Center; *Dr. Sarah Knerr*, University of Washington; *Dr. Sarah Gehlert*, University of South Carolina; *Dr. Marian Neuhouser*, *Dr. Beti Thompson*, Fred Hutchinson Cancer Research Center

Public health problems are influenced by multiple and interacting biologic, social, behavioral, and environmental factors. The dominant strategy to addressing these problems relies on monodisciplinary methods. Dynamic research approaches in which transdisciplinary teams of scientists collaborate beyond traditional disciplinary, institutional, and geographic boundaries have emerged as promising strategies to address pressing public health priorities. Transdisciplinary research is conceptualized as yielding unique outcomes given its novel and collaborative nature where research teams develop and use new methods outside their immediate area of expertise.

However, little prior work has attempted to identify and characterize the outcomes of transdisciplinary research undertaken to address societal issues. We used a multistage mixed methods framework to identify and explore outcomes of transdisciplinary research using the Transdisciplinary Research in Energetics and Cancer (TREC) II initiative as a case example. A survey of TREC II investigators and trainees identified nine initial transdisciplinary outcomes that were further refined using interviews and focus groups. The final transdisciplinary research outcomes, whose relevance to addressing complex societal problems we describe using the TREC II experience, included: 1) new transdisciplinary team and consortia formation; 2) integrated theoretical framework development; 3) multi-level intervention model development and testing; 4) development and adaptation of relevant statistical models; 5) translation of findings across levels of influence; 6) public policy influence; 7) transdisciplinary manuscript publication; 8) transdisciplinary grant awards; and 9) training the next generation of transdisciplinary researchers. Although the outcomes identified were similar to those expected from non-transdisciplinary approaches, they are distinguished by their involvement of team members representing diverse disciplines, reliance on integrated theoretical frameworks, and a social-problem-oriented focus. These transdisciplinary outcomes could guide inquiry about the value added to research by using a transdisciplinary approach.

A New Methodology for Evaluating Research Integration
Ms. Bethany Laursen, Michigan State University; *Dr. Nicole Motzer*, National Socio-Environmental Synthesis Center (SESYNC)

A defining feature of interdisciplinary research (IDR) is that it integrates disparate disciplinary contributions into new IDR insights (National Research Council, 2005). As such, "integration is widely regarded as the primary methodology of interdisciplinarity" (Klein, 2012) and, by extension, interdisciplinary team science. Yet, evaluating integrative team science processes and outcomes in transparent, comparable, and reproducible ways remains elusive. We therefore present a new methodology for evaluating the nature and extent of integration in research products such as peer-reviewed articles.

Gathering and evaluating evidence of integration is difficult. Our literature review revealed no fine-grained methodologies for evaluating integration in research products, and also that related evaluations have primarily relied upon expert judgment to assess integration. However, expert judgment is (1) not a transparent method and therefore does not increase understanding, (2) makes cross-case or cross-product comparisons difficult, and (3) not reproducible as it depends on the life experiences of the experts. Thus, while valuable, expert judgment is not sufficient for evaluating integration.

Through a collaboration between Michigan State University and the National Socio-Environmental Synthesis Center (SESYNC) - catalyzed by MSU's Engaged Philosophy Internship Program (itself a new form of team science) - we developed and piloted an innovative methodology to fill this need. This is a mixed methods evaluation that falls under the general umbrella of "discourse analysis." The main methods deployed within this approach are argument analysis and integration analysis, with both methods reflecting quantitative and qualitative aspects. Together, these methods contribute to an overall "Synthesis Signature" for a given research product. The Synthesis Signature descriptively and numerically represents, respectively, in what ways and to what extent a given research product is integrative/interdisciplinary/synthetic.

The keystone of our methodology is the IPO model of integration developed by O'Rourke and colleagues (2016), demonstrated in team discourse at SciTS 2017 by Laursen and O'Rourke. The IPO model theorizes integration as a generic input-process-output (IPO) activity, in which the number of outputs is fewer than the number of inputs. The process transforming inputs-to-outputs is known as an integrative relation. We have adopted this IPO model to guide integration evaluation. In doing so, we become the first scholars to operationalize this framework not only for evaluative purposes, but for any purpose beyond theory.

We piloted the methodology on five research articles supported by SESYNC, whose primary goal is to address pressing socio-environmental challenges through interdisciplinary, team-based, socio-environmental (S-E) synthesis research. Pilot results help improve understanding and decision-making for not only SESYNC but for other research centers and funders similarly engaged with and committed to S-E synthesis.

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Evaluation of Centers and Institutes: Developing a Framework from Complex Systems and Team Science

Dr. Gwen C. Marchand, University of Nevada Las Vegas; *Dr. Jonathan C. Hilpert*, Georgia Southern University

There is a gap between research infrastructure goals of large scale centers and institutes and traditional evaluation efforts and reporting requirements. Although there has been a shift in funding from individuals to large scale collaboratives, there has not been an equivalent shift in evaluation efforts focused on collaborative center/institute functioning. The science of team science (SciTS), and related complex systems approaches to research, can fill this gap by providing direction for evaluation methods and outcomes/indictors that address the evaluation needs of centers and institutes. The purpose of this presentation is to provide our evaluation framework and illustrative examples of its use for the evaluation of centers and institutes.

Research collaboratives, such as those represented by funded centers and institutes, are complex systems (Borner et al., 2010). They are characterized by behavior that is (a) complex – behavior at macro levels of the system that is not reducible (Gell-Mann & Lloyd, 1996; Mitchell, 2009); (b) dynamic – microprocesses amongst systems components that change over time (Koopmans, 2015); and (c) emergent - microinteractions of system components give rise to novel macrosystem behavior (Holland, 2006). Research teams range in complexity based on tasks, goals, size, proximity, and diversity (Fiore, 2015). Evaluation approaches must be multi-level and mixed-methods to adequately represent the ecology of team science (Fiore, 2015) and specifically, relationships that are bound by context and discipline (Borner et al. 2010).

Evaluation of team science and collaborative knowledge production, underscored by the use of mixed methods approaches to network analysis, has begun to emerge as a promising avenue for evaluation of federally supported centers/institutes (Hilpert & Marchand, 2017; Luke et al., 2015; Marchand & Hilpert, 2018). SciTS approaches (e.g. Fiore, 2012) allow evaluators to produce evidence regarding the development of research infrastructure, collaborative scholarly productivity, and the development of shared vision around a culture of research. Team science outcomes are often more meaningful in the context of a multidisciplinary center/institute than traditional evaluation approaches because they provide multiple forms of evidence for the cohesion of collaborative activity over the trajectory of a research collaborative (Luke et al., 2015).

Evaluation efforts focused on the development of team science outcomes provides the best evidence for productive ways forward for research collaboratives. We share an evaluation framework organized around a comprehensive set of team science outcome objectives that can be used to design evaluation data collection and analyses. The framework allows for the integration of outcome objectives and the production of knowledge around scientific advancement. The objectives are to provide evidence of the following outcomes:

1. Collaborative scholarly productivity
2. Planned and emergent research infrastructure
3. Shared vision and culture of research
4. Mentoring and advancement of scientists
5. Leveraging of resources to promote growth

Taken together, these outcomes can provide information that goes beyond traditional forms of evidence about the cohesion of a research collaborative. The evidence can be used to develop grant proposals, provide evidence for annual reporting, and to formulate resource requests.

Evaluating Transdisciplinary, Sustainability-Focused Higher Education Programs: Using Transdisciplinary Orientation as a Performance Measure in Three NSF-Funded Program Contexts

Dr. Shirley Vincent, Vincent Evaluation Consulting; *Dr. Deana Pennington*, University of Texas at El Paso; *Dr. Robert Chen*, University of Massachusetts at Boston; *Dr. Alan Berkowitz*, *Dr. Aude Lochet*, Cary Institute of Ecosystem Studies

Evaluation of transdisciplinary, sustainability-focused higher education programs is a nascent and evolving field. The National Science Foundation (NSF) has funded interdisciplinary education programs for many years, but best practices for evaluating the performance of these programs have not been determined. This presentation will focus on the use of the Transdisciplinary Orientation (TDO) Scale

(Misra et al. 2015) as a performance measure in three NSF funded program contexts. TDO is defined as the values, attitudes, beliefs, conceptual skills and knowledge, and behavioral characteristics important for effective collaboration in interdisciplinary teams. Scholars reporting higher levels of TDO produced scientific outputs judged to be more transdisciplinary in nature and to have greater translational, policy and practical relevance. Since experience in transdisciplinary research is positively and significantly correlated with higher levels of TDO, we predicted that training in convergence learning and transdisciplinary problem-solving will result in development of higher levels.

There are two dimensions of TDO: The Values, Attitudes and Beliefs Dimension (VAB) and the Conceptual Skills and Behaviors (CSB) dimension. The VAB dimension is associated with an intellectual and personal orientation towards interdisciplinary research and includes valuing collaboration and understanding the importance of including diverse disciplinary perspectives in solving complex problems. The CSB dimension is associated with the conceptual skills and behaviors required for effective interdisciplinary integration of multiple disciplinary perspectives and methods.

TDO scores are obtained using a validated 12-item scale. We documented TDO scores pre- and post- program in three program contexts: a 9-week summer undergraduate research experience delivered by the Urban Water Innovation Network: Transitioning Toward Sustainable Urban Water Systems program (NSF SRN), an intensive 2-week doctoral student training summer workshop offered through the Collaborative Research: Employing Model-Based Reasoning in Environmental Science program (NSF NRT-IGE), and a 2-year interdisciplinary graduate student training program provided by the Coasts and Communities: Natural and Human Systems in Urbanizing Environments program (NSF IGERT) at the University of Massachusetts at Boston. The first two programs recruited students from diverse higher education institutions.

Four cohorts in two of the three programs (30 UG and 25 PhD students) had consistently significantly higher levels of TDO after their participation in the education program (paired t-tests). Undergraduate increases were tilted toward more change in the VAB dimension and PhD students toward the CSB dimension. Results were mixed in one cohort in the 2-year graduate training program with some students reporting higher TDO and a few lower levels (7 GR students). A second cohort has completed the scale pre-program and will complete post-program in May. An additional NSF-funded graduate education program (NSF NRT) will also be using the TDO scale as a performance measure. Differences in the TDO scores for UG and GR students and in programs that may influence the development and student reporting of higher TDO levels will be discussed. TDO is only one measure of program performance with TDO results included in an array of evaluation measures, but it shows promise as a means for evaluating programs designed to develop convergence learning and transdisciplinary research competencies.

TEAM PROCESS

Moderator: Dr. Deborah DiazGranados, , Virginia Commonwealth University

Teamwork Process Indicators: Learning from the Source Materials of Teams
Dr. Laura Anderson, IBM Research - Almaden

Building an understanding of effective teamwork, and how to foster it, continues to be an important topic to both the academic and professional communities. The social dimension of teams, with a focus on the human aspect of both individuals and their networks, has been recognized in previous research as an important factor but has been a difficult target for systematic data gathering and study. In the course of performing their work, teams produce a wide variety of digital artifacts and traces. This primary data can also be used by researchers in the study of teams and teamwork to gain insights into the dynamics of a team, such as the interpersonal climate, patterns of information sharing, web application activity, and the team composition. The ultimate goal of this research program is to enable automated analysis of teams and teamwork "in the wild" to understand what is happening in a particular team, and to provide insight to the team members for their reflective use. This work utilizes 1. IBM's Watson Tone Analyzer to examine sentiment analysis of technical discussions, 2. social network analysis (e.g., Gephi) to look at patterns of information sharing between team members, 3. log analysis for insights into usage and activity of computer web applications, and 4. mapping of disciplines to explore the implications of team composition. A grounding theoretical framework is provided by activity theory, with a focus on human motivation, human activity,

and the externalization of human ideas and objectives into something tangible in the world, provides the lens for a systemic visualization and abstraction of complex systems. The activity system provides a framework for understanding the interactions and interplay among people (subjects), the human objective of the activity (object), the tools and mediating artifact, and the outcome in a larger social, historical, or work context. It also enables a multi-focal unit of analysis, with the capability for a granular examination of the situation of an individual person, as well as larger multi-person groups and organizations. Activity system analysis using source team data from the research will be presented. A review of the empirical data and analysis will discuss what can be learned from these methods, and the limitations of today's methods and tools. What can be learned about factors related to collaboration and situation awareness, in particular, will be discussed, and future research directions in this area will be highlighted.

Exploring Narrative Mapping as a Lens into the Relationship of Team Member Attachment Styles with Team Psychological Safety

Mr. Jonathan Silk, Pepperdine University Graduate School of Education and Psychology; *Ms. Michele Norton*, Texas A&M University Department of Teaching, Learning, and Culture

This mixed method study explores the connection between a team leaders attachment style and the teams overall level of psychological safety. In today's high stake, fast-paced landscape the interpersonal processes and functions of member exchanges on work teams have become increasingly important as organizations compete at an accelerating rate. Attachment science (Bowlby, 1973), the concept of team psychological safety (Edmondson, 1999), and Leader-Member Exchange (Graen &Bien, 1995) provide a lens in which to analyze the interactions of team members in organizations. As more organizations become reliant on the collective power of teams, the ability of a workgroup or team to learn, adapt and innovate rapidly becomes increasingly important. Team Psychological safety has been recognized as a key component of a team's ability to learn and improve performance (Edmondson, 1999). Leaders and team members have a role in establishing team psychological safety. They serve as attachment figures for their followers and members and can provide a secure, stable, safe environment for growth and development, or they can provide a sense of insecurity which restrains learning (Popper & Mayseless, 2003). There are significant gaps in current conceptions of the relationship between leader attachment styles, leader-member exchange, and team psychological safety and how they impact various team behaviors (Kafetsios, Athanasiadou, & Dimou, 2014).

How leaders and members present themselves as attachment figures, the quality of member to member exchanges, and how those exchanges are monitored in the team all contribute to the team climate and level of psychological safety. To explore the connections among those components, the researchers used a mixed-methods approach to narrative mapping of the teams (Koeslag-Kreunen, Van den Bossche, Hoven, Van der Klink, & Gijselaers, 2018). Data was collected from a survey on attachment styles and team psychological safety. This data was then analyzed to gain preliminary insight into the individuals on the team and their perceptions of the team's psychological safety. Using insights from the survey, the researchers conducted semi-structured interviews to gain qualitative insight into the member to member exchanges and team climate. For analysis, the researchers constructed narrative maps of the team, based on their quantitative data from the survey and the qualitative data from the interviews. Preliminary results from this exploratory study show the mixed-method approach to narrative mapping provided useful insights into the team climate, especially in identifying the individual's attachment styles and the resulting member to member interactions that seem to impact psychological safety. This research extends attachment theory, team psychological safety theory, and leader-member exchange theory, by exploring the relationship between leader attachment styles and the level of team psychological safety. The topic is relevant for team dynamics as the ability to effectively manage relationships in a team context is crucial in establishing a safe climate for workgroups and teams to explore, learn, and innovate.

An Evaluation of Researcher Motivations and Productivity Outcomes in International Research Teams at a U.S. Research-Intensive University.

Dr. Jane Payumo, Michigan State University; *Dr. Danna Moore*, Washington State University; *Dr. Prema Arasu*, North Carolina State University

This paper examines factors that influence faculty at a research-intensive U.S. public land grant university to engage in international research teams and partnerships. We investigated using a mixed-mode (web, mail and telephone) survey, and collected data from 764 researchers from a US university to provide a baseline and current context of demographic characteristics, motivations, barriers, and academic outcomes in relation to international research partnerships and collaboration. Our results suggest that funding, reduced organizational and institutional barriers, effective institutional support, previous global experience and tangible research outcomes can encourage faculty to engage in forming and maintaining international research teams. We also found that faculty involved in international research teams, on average, exhibit higher productivity and a positive correlation with scholarly output, especially through joint publications and student training. The results of this study may provide a reference for national organizations and higher education institutions interested in optimizing their internationalization agendas and examining their policies, research evaluation strategies and messaging to increase faculty engagement in international team science formation.

Can We Really Use Bibliometrics to Form Research Teams?

Mr. Timothy Gawne, *Ms. Kathryn Knight*, *Dr. Moody Altamimi*, Oak Ridge National Laboratory; *Dr. Jane Payumo*, Michigan State University

Bibliometrics is widely used as an evaluation tool for research performance, and prospective decision making related to research and development (R&D). In many R&D organizations, bibliometric analysis complemented with other important information, is used to assess research performance and productivity of individual researchers and the organization as a whole. In this paper, we examine whether bibliometric information can be used to setup research teams and collaboration. We identify which types of bibliometric measures can be useful in building and enhancing a research team. We also present here some of the important gaps and challenges we encountered, including some strategies when using bibliometric data for forming teams and enhancing the research network in specific disciplines. Finally, we offer some guidance around providing bibliometrics data and insights for research teams formation at the individual, group, and organization levels.

Multiple Team Identities: A Person-By-Team Interaction Perspective

Dr. Tammy L. Rapp, Ohio University

It is increasingly common that employees simultaneously work on multiple teams (i.e., MTM, multiple team memberships). Although scholars recognize that individuals may develop identities with multiple teams (O'Leary et al., 2011) and agree that individuals often develop distinct identities with multiple targets, (organization, department, team; Ashforth & Mael, 1989), little research explores the notion of multiple simultaneous team identities. Research demonstrates that identifying with a team has powerful effects on individual team members' behavior, attitudes, and performance (Ashforth & Mael, 1989). Yet, we know little about identity-related phenomena when individuals belong to multiple teams.

Drawing from social identity theory, we utilize logic grounded in identity motives (Vignoles et al., 2006) and motive-feature match (Riketta, 2008) to argue that the strength of individuals' multiple team identities will be a function of the match between individuals' cognitive-motivational orientations and features of their teams. First, we offer a set of cross-level, direct effect hypotheses regarding the relationship of team-level characteristics and individuals multiple team identities. More specifically, we examine the role that three team-level factors (team cohesion, team efficacy, and team prestige) play in determining multiple team identities in a MTM context. These represent team characteristics that align with three of the primary drivers of social identity (Vignoles et al., 2006) – belongingness (cohesion), efficacy (team efficacy) and distinctiveness (team prestige). We argue that these factors serve to make some team memberships more compelling aspects of one's identity, thereby influencing their identification per team membership. Second, we adopt a person-by-situation perspective and apply the social identity concept of motive-feature match (Riketta, 2008) to argue that individuals' cognitive-motivational orientations will interact with team characteristics to influence their multiple team identities.

A core tenet of motive-feature match theory is that individuals' social identities will be strongest when individual motives and contextual (e.g., team) features match. Accordingly, we argue that individuals' cognitive-motivational orientations will interact with team features such that team identities will be the strongest when there is a match between individual and team features.

To test our hypotheses, we utilize data collected from an information technology firm. The sample included 96 individuals who were members of 82 teams, and were assigned to an average of 3.33 teams. We adopted an unconventional perspective by viewing multiple teams as nested within an individual. Because individuals were not cleanly nested in teams in the conventional manner, these data are best characterized as cross-classified (i.e., individuals' per team memberships are cross-classified by individuals and teams). To properly accommodate this dual nesting we employed cross-classified random effect models to conduct our analyses. Results largely support our hypotheses.

This study contributes to MTM literature in a several ways. First, we provide initial evidence that team features drive individuals' multiple team identities in MTM contexts. Second, we demonstrate the identities individuals develop with their multiple teams are a complex function of individual and team characteristics. This study answers calls to investigate multiple identities in MTM arrangements and offers a foundation for future work to uncover the complex drivers of multiple team identities.

ARTISTIC AND HUMANISTIC APPROACHES TO TEAM SCIENCE
Moderator: Dr. Stephen Crowley, Boise State University

Poetry, Space, and Embodiment: A Case Study in Transdisciplinary Collaboration
Dr. Ellen Moll, *Dr. Nancy DeJoy*, Michigan State University

Theories of transdisciplinarity have often emphasized the need for transdisciplinary collaborations to address complex "real world" problems, such as climate change and sustainability (for example, see Jahn, et al. 2012). Klein (2014) has shown that the emphasis on problem-solving in discourses on transdisciplinarity has at times been influenced by a desire to address "'real problems of the community' and the demand that universities perform their pragmatic social mission," and to find transdisciplinary formations that effectively address "wicked problems"; Klein also interrogates the assumptions and histories that underlie this emphasis. In this paper, we will use the case study of MSU's Sidewalk Poetry Project to theorize about what constitutes a "real world," "pragmatic," and "wicked" problem within the context of transdisciplinary collaboration, and to suggest that such collaborations can challenge the boundaries between theoretical and real-world knowledge. Particularly, we show how team science can reveal that the boundary between theoretical and real-world problems, and between simple and complex problems, are politically laden distinctions.

MSU's Sidewalk Poetry Project solicited original poetry from the university and local community, and engraved selected poems in sidewalks around Michigan State University's campus. The collaboration involved multiple forms of academic and non-academic expertise poets, scholars, concrete work specialists, landscape designers, and campus planning and facilities professionals working together. This team made decisions based on forms of expertise related to poetry and aesthetics, community values, new techniques for concrete engraving, ADA compliance, decades-long knowledge of the physical characteristics of each spot on campus, and others.

Public poetry, and sidewalk poetry in particular, raises questions that might be considered highly theoretical within arts and humanities disciplines: What is the purpose of poetry? What does it mean for poetry to reflect and contribute to a community? How does the appearance, texture, and location of a poem shape different community members' experience of the poem? What does it mean to physically move through the space of a poem, and how does this motion relate to what it means, more generally, for diverse bodies to move through institutional spaces? This paper argues that such questions are indeed "real world," pragmatic, and even wicked problems, and that they therefore are best answered in local contexts through transdisciplinary teams that put diverse forms of disciplinary and community knowledge practices into practice. Drawing on interviews with collaborators and personal narratives, we show how technical, community, aesthetic, political, legal, and design expertise work together to build new community-based knowledge about poetry, bodies, and space.

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Connecting an Art-Science Practice to Collaborations

Dr. Edgar Cardenas, Michigan State University

The complexity and interconnectedness of sustainability issues has led to the joining of disciplines. This effort has been primarily within the sciences with minimal attention given to the relationship between science and art. The exclusion of art is problematic since sustainability challenges are not only scientific and technical; they are also cultural, so the arts, as shapers of culture, are critical components that warrant representation. In addition to contributing to the production of culture, arts have also been credited as catalysts for scientific breakthroughs; thus it stands to reason that understanding art-science integration will benefit sustainability's focus on use-inspired basic research. This study focused on understanding a) how teams collect information, generate responses, and validate their ideas; b) how artists challenge or accept scientists' ideas (and vice versa); and c) how teams go about generating and picking ideas, and how they negotiate disagreements. In other words, I address the question "What does it take to develop high functioning artist-scientist collaborations?"

To answer this question, I used a multipronged approach to increase the explanatory power of an in-vivo study aimed at understanding of what art-science synthesis offers sustainability and how it functions. I conducted a small group study of three-person artist-scientist teams tasked with developing interpretive signage for the Tres Rios constructed wetland site. I collected survey, ethnographic, and Sociometric badge data (wearable sensors that collect speaking, movement, and interaction data). These three methods helped triangulate how team members believed they and their team performed, how I believed they performed, and how wearable technologies can provided high-resolution datasets that allow for deeper quantitative analyses of speech dynamics. The objective of this data collection was to establish a rich understanding of individual and group factors that hinder or foster group creativity.
In addition to discussing methods, this presentation will cover the following findings: 1) successful art-science practices require significant energy and time investment. 2) Although art-science is most intensive in an individual practice where the person must become "fluent" in two disciplines, it is still challenging in a group setting where members must become "conversational" in each other's work. 3) Successful art-science syntheses appear to result in improved communication skills, better problem articulation, more creative problem solving, and the questioning of personal and disciplinary mental models.

Integration as a Non-Reductive Team Virtue

Dr. Stephen Crowley, Boise State University; *Dr. Brian Robinson*, Texas A&M University-Kingsville; *Dr. Chad Gonnerman*, University of Southern Indiana

"A champion team will always beat a team of champions." Success at an elite level in team sport requires as much individual level excellence as an organization can acquire but by itself such excellence is not enough. The individuals need to come together in some fashion that makes them more than a mere collection of individuals: they need to become a team.

In the context of team science, our story suggests that creating 'champion' teams requires insight into
a) The nature of individual excellence in question
b) The nature of collective excellence in question
c) A story about how a) and b) interact.

There is much great work already on all of a-c. The work of Lotrecchiano and colleagues [1] on collaboration readiness tells a great deal about the character and motivation of scientific collaborators. Longino's work on how scientific knowledge arises out of the 'democratic' structures of scientific communities is a model of how to think about collective excellence for knowledge making teams [2]. We think that by taking philosophical work on epistemic virtues and extending it to character of successful teams, we can enrich our theoretical understanding of 'champion' teams in ways that are both illuminating and ultimately fruitful.

Two recent developments in epistemology directly bear on knowledge production efforts by science teams. Social epistemology is the growing field of study that emphasizes the ways in which knowledge is molded, or perhaps even constituted, by social and collective relationships and institutions [3]. Since team science relies upon collective efforts to generate and convey knowledge, the relevance of social epistemology to the science of team science has not gone unrecognized [2].

Meanwhile, within virtue epistemology, a recent focus has been on what intellectual character traits count as excellences of a knower by enabling or fostering knowledge production or dissemination [4]. To date, virtue epistemology primarily focuses on epistemic virtues of individuals. While this focus can help us to analyze what epistemic virtues makes one a good member of a scientific team (topic a above), it has not yet addressed the larger social dimensions of team-based knowledge production (topics b and c above).

In this talk we will combine the threads of social epistemology and virtue epistemology, building on Lahroodi's account of collective epistemic virtues. Specifically, we argue for non-reductive team virtues [5]. If scientific teams can produce new knowledge that no individual person can and knowledge production requires epistemic virtues, then it follows that there are virtues possessed by the teams or communities that produce them. We further claim that these are excellent traits of a group of people that arise from the group structure, dynamics, or the relation between the epistemic virtues of individual group members. Nevertheless, these team epistemic virtues do not reduce down to the virtues of individual group members such that individual team members can be said to possess this virtue. The primary example of a non-reductive team virtue we suggest is integration.

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TDI Structured Dialogue + Pedagogy of the Oppressed

Dr. Anna Malavisi, Western Connecticut State University

Paulo Freire, Brazilian educator and philosopher used a critical pedagogical methodology to teach literacy to poor Brazilian people, which later extended to many other Latin American countries. He believed that people would take responsibility for their own situation only when they understand it. This understanding came about from a process of concientizacion through a dialogical approach. In this paper I explore the possibility of bringing some aspects of Freire's critical pedagogy to the structured dialogue used in TDI, particularly for working in the aid sector. It seems that professionals working in the aid sector would also benefit from a process of concientizacion to better understand the lives of the people with whom they are working with, but also the structural issues which perpetuate global injustices. This process can be set in motion by the TDI approach.

Teams of development professionals working with the oppressed in richer developed countries or poorer, disadvantaged countries in the south are often confronted with highly challenging issues such as: trying to address the needs and priorities of vulnerable communities, but at the same time respond to the demands of their donors. This creates a tension, that is often not confronted, or is done so in a rather token way. And while development teams may have the best intentions, often times, due to structural issues, these best intentions prove to be insufficient and inadequate to generate the transformative action that is required.

The Toolbox Dialogue Initiative (http://toolbox-project.org), an example of engaged philosophy offers an innovative, concrete, and tangible approach to critical dialogue that can help in two ways. First, it can generate a space for critical dialogue within global development teams about issues that matter to them; second, it can enable discussion and analysis of specific concerns such that afflict development teams and organizations, such as conflicting assumptions, power dynamics, implicit biases, ethical issues, and

epistemic injustice. Rooted in philosophical analysis, Toolbox workshops enable cross-disciplinary collaborators to engage in a structured, reflexive dialogue about tacit assumptions that constitute the worldviews which frame their practice.

Freire's work emphasizes the importance of reflection-action, that is, to work with the dialectical tension of theory and practice. This is crucial for development teams. Paulo Freire taught that the rhetoric and the praxis needed to go together. Pure activism brought chaos together with poor planning and therefore poor results. Pure rhetoric on the other hand brought abstract theorizations, nebulous hypotheses and likewise poor results, something that has been observed over the years in the aid sector. Dialogue for Freire cannot be reduced to the depositing of ideas from one to another, nor a simple exchange of ideas. Dialogue could only take place in the absence of domination of one over the other, and in the presence of humility. How can TDI through its structural dialogue process ensure that these principles are upheld? Is TDI compatible with Freire's ideas? This paper is an attempt to answer some of these questions.

ORGANIZATIONAL & MANAGEMENT FACTORS

Moderator: Dr. Andrew Ritcheson, Deloitte Consulting LLP

Principles of Community in Team Science

Dr. Ellen Fisher, *Dr. Jennifer Cross*, *Dr. Hannah Love*, *Dr. Bailey Fosdick*, Colorado State University

Science of Team Science (SciTS) frequently involve a combination of research, teaching, training, and administration. Less frequently discussed is how team science embodies institutional values and responsible conduct of research (RCR). In 2017, Colorado State University (CSU) adopted The Principles of Community, a values statement that supports the institutional mission and vision of access, research, teaching, service and engagement. As members of the CSU community, the Office of the Vice President for Research (OVPR) has built the principles of community into its strategic plan, including support for team science.

At CSU, we are examining how transdisciplinary scientific teams form and develop in a university setting. This mixed-methods, developmental evaluation has been tracking three cohorts of teams funded by the OVPR. We administered a longitudinal social network survey to understand team development and dynamics, a social survey to ask about specific collaboration practices, and conducted participant observation, interviews and focus groups to understand group processes, assess turn-taking, and gain insight into group norms. These data helped reveal how best practices in team science are connected to CSU's principles of community as well as the responsible conduct of research.

First, effective team science embodies principles of community. CSU has developed five principles of community: inclusion, integrity, respect, service, and social justice. These principles of community have been incorporated into the OVPR hiring and evaluation processes, discussions of what these words mean to individuals (i.e. creating common language and understanding), and development of new opportunities within the research community. They also align with best practices for teams which include even turn-taking, gender inclusivity, diversity on teams, and engaging in a team development process.

Second, team science mandates the responsible conduct of research (RCR). When scientists work as a member of a team there is a feeling of responsibility for the success of the whole team. This sense of responsibility, also known as collective cognitive responsibility, gives rise to each member of the team taking ownership in the knowledge created by the team and feeling accountable for team outcomes. This naturally requires that team members trust the integrity of data produced and that all team members are upholding ethical practices in the research of the group. Responsible conduct of team science necessitates development of various forms of trust, consistent communication, understanding of roles and relationships, and recognizing differences in research fields.

This presentation will address methods for integrating institutional values such as CSU's principles of community as well as assessing the adoption and demonstration of these values as well as collective cognitive responsibility within academic teams. We will also discuss how to conduct trainings that provide development opportunities for teams in the context of institutional/team values and RCR principles. Finally, team science cannot be fully implemented without institutional support and culture change. Thus, it is important for

administrators to be aware of best practices for team science, institutional values, and research ethics to fully support teams and create meaningful change at in the academy.

Overload, Stress, and Higher Order Cognition in Emergency Managers

Dr. Shalini Misra, *Mr. Matthew Rhodes*, *Dr. Patrick Roberts*, Virgnia Tech

Studies of public management over the past decade have built upon the insight that there is a "collaboration imperative" (Kettl, 2006). Public sector managers face increasingly complex wicked problems that span boundaries, while at the same time coping with dwindling or static resources. Emergency managers may be particularly susceptible to these problems (Waugh & Streib, 2006). Collaboration across organizational silos is seen as the best way to meet the challenges of wicked problems in an age of limited public sector resources (O' Leary, Girard, & Blomgren Bingam, 2006). While scholars of public sector decision making have increasingly looked "inside the black box" of collaboration through studying how the organizational and political environment influences collaboration (Thomson & Perry, 2006), the relationship between information technology and knowledge sharing in teams (Kim & Lee 2006; Wang & Noe 2010), social media as a space to enhance collaboration (Bryer & Zavattaro 2011), very few studies of public managers delve into the black box of the manager's head, examining cognitive factors that influence collaboration.

At the same time, public managers routinely need to process large amounts of information and communication from a variety of sources, be able to prune relevant information, identify misinformation, frequently switch between disparate tasks, contend with quicker delivery of constantly updated indicators, more interruptions, and greater complexity, when the stakes are high and goals are often conflicting. The potential for information overload is especially acute in emergency and crisis management. Emergency managers have periods of slack time in which they consume large amounts of ambiguous information under conditions of uncertainty. During a crisis, the volume of information increases rapidly, and the potential consequences for lives and property are more severe.

The research reported in this paper investigates whether and how emergency managers experience information overload in an environment of digital technology and uncertainty and its relationship to rational thinking and information processing, two aspects of higher order cognition that influence managers' collaborative capacity. We use a sequential mixed method research design, including a survey of 273 county-level emergency managers from 44 out of 50 states, and in-depth semi-structured interviews with 20 emergency managers to investigate these questions. Above and beyond the effects of age, education, experience, and time spent on emergency managerial work, higher levels of perceived information overload from digital sources were significantly associated with higher levels of perceived stress. Holding the same variables constant, higher levels of perceived stress were linked with lower levels of analytical thinking and higher levels of intuitive thinking. Cyber-based overload was linked to a higher propensity for intuitive thinking at a marginally significant level. Further managers who reported higher levels of critical thinking reported lower levels of stress. While we cannot imply causation, our qualitative analysis supports and enriches the survey findings by highlighting problems of digital overload in managerial environments, the potential for stress, and a lowered capacity for analytical thinking among emergency managers. We propose solutions that have worked in other contexts to bolster the capacity for critical and reflective thinking.

Co-designed Strategic Planning and Agile Project Management in Academia: Case Study of an Action Research Group

Mr. Enric Senabre Hidalgo, Dimmons Research Group, Internet Interdisciplinary Institute, Universitat Oberta de Catalunya; *Dr. Mayo Fuster Morell*, Berkman Center for Internet and Society, Harvard University

Our study explores the novel phenomenon of strategic planning in academic research. In particular, we approach the phenomenon through two main questions: how strategic planning in research can be supported by co-creation methods, and which impact it might have on research groups. Articulated around a specific case study, the methodological approach is twofold. The methodology to address the first question, regarding co-creation applied to strategic planning, is based on participatory design, applied to conceptualize and prototype strategic planning according to co-creation principles. The methodology to address the second question, on the impact of the co-created strategic planning on the group's day-to-day management, is based on content analysis of the online tools used for coordinating teamwork. We describe and analyse the collaborative elaboration of the long-term strategy of Dimmons, an action research group specialised in the collaborative economy, outlining its integration in the group's novel agile project management (APM). Our paper explains the rationale for the different co-creation stages, in dialogue with literature about strategic planning, action research

and project management. Results coincide with existing literature about the need to understand strategic planning as a dialogic and emergent process. In this regard, we contribute to the field of research management by analysing the benefits and coherence of co-creation approaches in action research settings, specifically in terms of engagement with strategic vision, as well as its impact improving communication and coordination mechanisms. On the other hand, we establish a common framework from a theoretical perspective between participative strategic planning and participative design. Additionally, our study offers a detailed description about how co-creation for strategic planning in research could be applied, which could be of practical interest for scientific institutions in their project management practices.

Created in 2016, Dimmons (http://dimmons.net/) is one of the eleven research groups of the Internet Interdisciplinary Institute (IN3), the research center of the Open University of Catalonia (UOC) based in Barcelona. The group is focused on transdisciplinarity and action research for the study of the collaborative economy from the perspective of the Commons and public policy innovation. As a requirement based on the need to connect during the implementation phase strategic plans with managerial practices (Poister, 2010), the combination of co-design techniques and AMP practices for the strategic planning of the Dimmons research group was based on the importance of design features and social mechanisms for strategic planning success (Barzelay & Jacobsen, 2009), as well as decentralised approaches for higher engagement and performance in dynamic environments (Andersen, 2004). Aimed at benefiting from design thinking methodologies (Kimbell, 2012) that have proven to improve participant engagement in research (Senabre et al., 2018), the process established different visual and discussion techniques at each stage for effective participation in scientific context. For this, the basic principle for the co-design adoption was the concept of participation as ecosystem (Fuster Morell, 2010a), considering the Dimmons research group as a "research ecosystem" that holds several forms and degrees of involvement.

Building Capacity and Capability in Greater Manchester Through Peer to Peer Support and Development: The Research Programme Managers' Network (RPMN)

Ms. Charlotte Stockton-Powdrell, *Ms. Alison Littlewood*, *Ms. Sarah Ashton*, The University of Manchester; *Ms. Hayley Brooks*, Manchester University NHS Foundation Trust; *Ms. Cara Afzal*, Health Innovation Manchester (HInM); *Dr Dieter Weichart,*The Christie NHS Foundation Trust

The Research Programme Managers' Network (RPMN) is a continually expanding and diverse network created by its members, for its members; a working example of Team Science in action! The RPMN was founded in 2013 by 2 research programme managers, Alison Littlewood and Cara Afzal who identified a need for peer support in this highly skilled yet often under-recognised and under-valued role. Since 2013, the RPMN has grown and now has more than 200 members from The University of Manchester and several National Health Service (NHS) Hospital partner organisations across Greater Manchester and the North West of England. The RPMN provides peer to peer support for its members as well as networking and training and development opportunities. The nature of research project management in the UK means that many members are on fixed term contracts. It is therefore vital that we develop strategies to train and retain this wealth and breadth of experience to maintain the excellent standards of research delivery in our area.

In 2016, a sub-group of RPMN members, led by Charlotte Stockton-Powdrell, started to create a development framework for its members. The development framework took 2 years to finalise, underwent a pilot testing phase, and has been endorsed by the Health Innovation Manchester (HInM) Senior Leadership Team, an organisation that brings together research institutions across Greater Manchester. The development framework enables members to understand their current level of skills and knowledge and also highlights areas they may wish to develop. The RPMN provides several training sessions per year for its members, and all training links directly to the development framework, ensuring members are being appropriately skilled. This enables us to build capacity through motivating and retaining key staff, and capability by offering the relevant skills required for these roles.
It has been shown that employing dedicated programme and project managers ensures delivery on recruitment targets, time targets and budgetary targets due largely to consistent management of the projects. This is beneficial to current projects and also increases the likelihood of securing funding to future projects.

The RPMN has been nominated for The University of Manchester Distinguished Achievement Award and the Northern Power Women Awards Innovation category, as well as successfully achieving an Investing in Success Award from the Faculty of Biology, Medicine

and Health in 2018. These nominations, as well as numerous letters of support, demonstrate the added value that the RPMN offers to its members and the research community in Greater Manchester and beyond. Furthermore, the RPMN has been recognised as a valuable network beyond Greater Manchester already and we have been asked to share our model with the Newcastle Joint Research Office in the North East of England. This successful example of Team Science can be replicated beyond the UK and we are delighted to be part of the nascent Team Science Network (TSN) created by our colleagues Ruth Norris, Claire Smith and Amanda Lamb from the University of Manchester and Rachel Chown from The Manchester Cancer Research Centre who are trail-blazers in this emerging field.

Multiagent Systems in an Agile Environment
Dr. John Turner, University of North Texas; *Mr. Nigel Thurlow*, Toyota Connected; *Dr. Rose Baker*, University of North Texas; *Mr. David Northcutt*, Toyota Connected; *Ms. Kelsey Newman*, Emory University

Purpose – The purpose of this paper is to highlight a collaborative effort between academia (University of North Texas, Team Sciences) and practice (Toyota Connected (TC)). This study concentrated on current problems that had been experienced by TC: How to structure and manage multiteam systems (MTSs)?

Design/methodology/approach – This research study utilized a realist systematic review to address an existing problem by working collaboratively with TC and academia. This collaboration involved problem identification, the development of research questions and a full systematic review guided by the research questions.

Findings – This realist systematic reviewmerged the literature with current practices at TC in an effort to gather evidence to support the best method of structuring and managing MTSs. The findings include a leadership structure that incorporates both shared leadership (bottom-up) and existing hierarchical structures (top-down).

Practical implications – The MTS models presented in this study provide new models for organizations/manufacturers/industries to use as a guide when structuring their MTSs.
Originality/value – This study provides an example of a collaborative research effort between practice and academia using a realist systematic review. The paper also provides some multiteam system models that could be implemented and tested in different organizations. Also, new responsibilities and roles for scrum and MTSs are presented as a new method of achieving Agile.

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COLLABORATIVE NETWORKS
Moderator: Dr. David Lebow, HyLighter

Finding Colleagues and Emerging Subdisciplines via Systematic Network Analysis of Funding Awards
Dr. Steve Elliott, *Dr. Kimberly A. Scott*, *Elizabeth Wentz*, Arizona State University

Scientific teams often expand by connecting researchers interested in similar topics from across institutions or disciplines. Expansion can be especially important when teams look to pursue funding by which to scale previous work into research centers or hubs. For researchers in nascent subdisciplines or in remote institutions, however, finding potential colleagues can be difficult and overly dependent on chance, stalling the growth of subdisciplines and privileging those at large urban universities. In this paper, we present protocols for systematically finding potential colleagues based on publicly available funding awards. As a proof of principle, we focus on the US National Science Foundation's award database, and in particular on it's Broadening Participation (BP) portfolio, a collection of awards each of which aims partly to increase the number of underrepresented minorities in STEM fields. We focus on the emerging sub-discipline of BP education programs for grades K-12. From the lens of the funding agency, we demonstrate the scope of that subdiscipline, its primary players, and we indicate the extent to which those awards reveal collaboration networks. Those in the subdiscipline can use the results to systematically find potential collaborators and tap into extant networks. This work is based on computer assisted, but relatively low-tech, techniques to create large databases, find a subset of awards relative to research questions,

find research outputs, and visualize collaboration networks. The protocols used to conduct this work can be redeployed to address many questions about funding agencies portfolios.

Patterns of Newly Formed Interdisciplinary Collaborations Over Time During an Immersive Training Experience
Dr. Bonnie Spring, *Mr. Phillip Rak*, *Mr. H. Gene McFadden*, *Mr. Leland Bardsley*, Northwestern University Feinberg School of Medicine; *Dr. Mark Hansen*, *Dr. Vivek Shetty*, University of California, Los Angeles*; Dr. Angela Fidler Pfammatter*, Northwestern University

Background: Understanding how team and disciplinary communication patterns predict work quality could help interdisciplinary project teams to optimize their performance. We continue to examine the evolution of project-related communication among newly formed interdisciplinary teams embedded for one week at the annual NIH mHealth Summer Training Institute. The aim is to characterize communication in new interdisciplinary teams and to explore how patterns might predict performance outcomes.

Objective: To characterize communication trajectories over time both within and between teams and within and between disciplines engaged in mobile health. Based on 2017 findings, we hypothesized that (1) greater within team communication early in the week would predict better oral presentations; (2) greater between team communication later in the week would predict better written capstone projects; and (3) data scientists would emerge as the most central cross-disciplinary connectors.
Methods: 2018 fellows (n=29) were split into Teams (n=5) and assigned mentoring faculty from different universities and disciplines (data science [computer science/engineering/informatics]; medicine/nursing; behavioral science; public health). Teams were given an immersive training experience and charged with developing a capstone project to address a health challenge. Requirements were to produce a final oral presentation and written grant proposal evaluated by independent reviewers. At the end of days 1, 3, and 5 of the 5-day training, fellows (nodes) indicated with whom they discussed their project (edges) since the prior assessment. Team and disciplinary network density were calculated as the ratio of observed edges to potential edges within and outside the team and the discipline. Internal and external network densities were examined to characterize emergent communication patterns and to explore predictors of oral and written project evaluations.

Results: As the week progressed, and teams approached the project deadline, the density of project-related communication increased both within and between teams and within and between disciplines. Whereas 2017 teams with the best rated oral and written presentations showed distinctive evolution of project-related communication, emergent communication patterns were more homogenous in 2018. An exception was that the poorest performing team showed a mid-week decline in project-related communication both within and between teams. Finally, examination of disciplinary interactions showed that data scientists again served as essential hub connectors in 2018, closely followed by medical professionals.

Implications: In both 2017 and 2018, the density of project-related communications increased both within and across teams and disciplines as project deadlines neared. Greater homogeneity in network communication trajectories among 2018 teams made it challenging to discriminate high- from low-performing teams, failing to reproduce 2017 predictors of project performance. Data scientists emerged as key integrators of communication across interdisciplinary mHealth teams in both years. Here, we demonstrate a feasible methodology for collecting and analyzing team communication networks. Prediction of interdisciplinary team performance would benefit from a larger sample of teams, data collection in other contexts, and exploration of other potential predictors.

Network Improvement Communities and Organizational Change: Considerations in Developing and Leading NICs
Dr. Marilyn Amey, *Alexander Gardner*, Michigan State University

Scholars from multiple fields and knowledge domains have been called to work together by National Science Foundation (NSF) and other funding agencies to address some of the most complex challenges facing society. Network improvement communities (NIC) are recently identified as a means to champion these efforts. Funders of cross-unit collaborations are interested in knowing how to bring diverse faculty together to address challenging problems including how to form scholarly communities, break down structural barriers to working across boundaries, construct rewards and incentives to support these efforts, foster organizational change, and consider longer-term sustainability – which is especially pertinent if an initiative is funded. Outcomes generated through collaborative alliances such as network improvement communities (NICs) are prominent areas of research, but the process by which these groups are formed

is largely understudied, especially at the postsecondary level. This presentation focuses on two research questions – (1) How do postsecondary NICs form, and (2) In what ways does the NIC assist members in facilitating change efforts on their campuses?

Data were gathered from an NSF funded NIC that is in its third year of existence. As the evaluation team of the NIC, data was collected through participant observation, survey, and individual participant interviews. As evaluators, we are specifically studying the evolution of the NIC as an organization, including ways in which trust, communication, shared norms and goals are developed, how dissonance and failures are accounted for, and how learning occurs at both the individual member and NIC level. As the NIC continues to evolve, we better understand its role in facilitating organizational change on member campuses even while it is not actually the agent of change. Although there appear to be some barriers at the institutional level (in the network under study) that remain unchanged by the NIC, the NIC does act as a centralized learning hub that advances and expedites the learning process of the group, which can result in institutional change. The information presented during this presentation identifies specific processes and elements to success and sustainability such as leadership, strategy, communication, engagement, institutional infrastructure, data collection and analyses, building capacity and the possible emergence of network capital that can assist in developing protocols to support institutional change for NICs. It also shows some of the pitfalls of human resource organizations, such as NICs, that must be addressed in order to be truly more than resource shells and "group work." Consideration is also given to the NIC as a learning organization.
Beyond providing current knowledge from an evolving network improvement community, the presentation intends to encourage discussion about the utility of NICs as facilitators of change as well as to raise questions for future research that deepen our understanding of these emerging collaboratives.

Investigating Collaborative Processes of Research Teams Through Social Network Analyses
Dr. Jonathan Hilpert, Georgia Southern University; *Dr. Gwen C. Marchand*, *Dr. Kristine Bragg*, University of Nevada Las Vegas

In the evaluation of team science, questions may arise as to which team members or groups of members have access to and control information, as well as if collaborations among team members produce increased scholarly productivity. Network analyses within a social network analytic framework offers one method for mapping influence and scholarly productivity within a team project. We present the results of a brokerage analyses and exponential random graph modeling (ERGM) from an evaluation of an NIH-funded multidisciplinary, cross-institutional biomedical research center. The evaluation assessed whether groups within the center were functioning according to their primary intended role (i.e., administrative, research) to facilitate research and promote the sustainable development of the center, as well as if collaborations among team member produced increased evidence of scholarly productivity in the form of publications and presentation of scientific work. Data on collaborative processes were collected annually from questionnaires administered to all members of the center. Three years of evaluation data are presented. Cross sectional brokerage and longitudinal ERGM analyses provided evidence for team functioning.

Social network analyses were performed to address the following research questions:
1. What is the emergent community network structures of collaborative engagement among center members?
2. What brokerage processes between core center areas drives the emergence of the observed center community structure?
3. How do these brokerage processes align with the predefined roles of center cores areas?
4. Does collaboration among people from different core areas produce increased scholarly productivity among center members?

The evaluation team designed a survey to gather information about team work patterns. This information was used to identify (a) how information flows amongst members of a research center, (b) whether organizational structures within the center functioned to control information, and (c) if the roles of individuals and organizational structures shifted over time and lead to increased scholarly productivity.

First, modularity analyses were conducted on bipartiate network graphs to determine if community clusters self-organized around a priori organizational structures. Next, brokerage analyses were conducted at the group level. A brokerage score for a given node is the number of ordered pairs having the appropriate group membership brokerage relationship. Aggregate scores can be computed for defined groups within a network as well as at the network level. Expectations and variances of brokerage scores given the size and density of a network were also be computed. Analyses were conducted for 3 years of census networks and compared descriptively

over time. These data were then analyzed using longitudinal ERGM's to determine if increased ties between members with different core function in the collaborative lead to increased productivity on behalf of individuals. The results provide insight into the emergent structure of the research collaborative and the influence of structural relationships on scholarly productivity and knowledge production.

Understanding Scientific Collaboration Through the Sequence of Authors in the Publication Bylines and the Diversity of Collaborators

Mr. Yi Bu, Indiana University Bloomington (USA); *Mr. Yong Huang*, School of Information Management, Wuhan University, Wuhan (China); *Dr. Cassidy R. Sugimoto*, School of Informatics, Computing and Engineering, Indiana University (USA); *Dr. Zaida Chinchilla-Rodríguez*, Spanish National Research Council (CSIC) (Spain)

In science of team science, it is critical to investigate the patterns of scientific collaboration and how these patterns result in different impacts. In this research, we investigate the relationship among (a) scientific collaboration, (b) the sequence of authors in the publication bylines, and (c) the diversity of their collaborators. The diversity of collaborators is quantified with two dimensions, namely topic and impact diversities. Using the ArnetMiner dataset containing ACM-indexed publications in computer science, we find that the following two patterns tend to lead higher-impact scientific publications: (1) greater topic diversity of collaborators plus more tendency to work as leading authors (including first and/or corresponding authors); and (2) less topic diversity of collaborators plus less tendency to work as leading authors. Meanwhile, from the perspective of impact diversity, the results of our empirical study show that authors who work as more leading authors and collaborate with less impact diversity researchers have tendencies to receive more citations than those with collaborators with greater impact diversity.

EDUCATION & TEACHING TEAM SCIENCE
Moderator: Dr. Anna Malavisi, Virginia Commonwealth University

Co-development of Interdisciplinary Engineering Innovation in Health Course by Engineering and Team Science Faculty to Accelerate Health Innovation from Bench to Bedside

Dr. Soyoung Kang, University of Washington; *Dr. Erin Blakeney*, *Ms. Nicole Summerside*, *Dr. Brenda Zierler*, UW School of Nursing; *Ms. Jennifer Sprecher*, Institute of Translational Health Sciences; *Ms. Katrina Henrikson*, *Dr. Jonathan Liu*, *Dr. Eric Seibel*, *Dr. Jonathan Posner*, UW Mechanical Engineering

The Engineering Innovation in Health (EIH) program at the University of Washington (UW) promotes interdisciplinary collaboration between engineering and the health sciences with the goal of developing technical solutions to pressing challenges in health care. Undergraduate and graduate engineering students partner with health care professionals to solve unmet health challenges identified by clinical partners and their teams. EIH follows a need-based design philosophy that begins with an unmet health need and examines stakeholders, market opportunity, intellectual property, FDA regulations, and reimbursement. The program results in patent submissions, data for research papers and proposals, and medtech startups. Students receive degree credits and develop skills working in interdisciplinary teams. By partnering with the UW Institute of Translational Health Sciences (ITHS) and the CTSA Team Science initiative, EIH teaching faculty aim to accelerate health innovation from bench to bedside by improving team dynamics, communication and program participant satisfaction. Close collaboration between engineering faculty and ITHS Team Science faculty is bringing tailored highly-interactive team science training to student-clinician teams. Starting in Fall 2018, team science content has included facilitated team formation and development of team agreements using Liberating Structures, completion of a team Welcome Letter, and introduction of a structured approach to giving and receiving feedback.

To track the impact of the co-developed Team Science modules, different EIH student cohorts have been surveyed annually since Fall 2017. The 2017 cohort did not receive any purposeful team science training so their survey results serve as a baseline to which subsequent survey data are compared. The most notable improvements, based on survey responses, have been seen in questions related to psychological safety and beliefs about the EIH project team. For example, students were asked to rate their level of agreement to statements such as, "Our project team has a climate of collaboration and trust," and "Communication with my team members outside of class was easy," to which the rate at which students responded "Strongly agree" increased more than 20% compared to the baseline year. Students also report finding the Welcome letter to be useful—for example a Fall 2018 student stated:

"The Welcome Letters (to their clinician partners) was useful for laying foundations for team dynamics and team expectations. It also helped the clinician get on-board with meeting the team and understanding course/project expectations."

The UW ITHS Team Science Core is providing tailored team training to the student-clinician teams with the express goals of measurable improvement in team dynamics, communication, and program participant satisfaction, as well as increasing the number of program deliverables, such as patent applications, startup formation rates, device clinical evaluations, and research papers. Initial results are positive and are providing a foundation from which to develop best practices for team science training with newly formed interdisciplinary teams.

Closing the Collaborative Skills Gap: Assessing the Effectiveness of a University-Wide Course Designed to Teach Students How to Collaborate in Diverse Groups

Dr. Kathryn Plaisance, *Mr. Christopher Lok*, *Ness Lamont*, University of Waterloo

As anyone working on the Science of Team Science knows, collaboration is an essential skill for solving complex problems. Not surprisingly, then, collaborative skills are in high demand by employers. According to a survey by the National Association of Colleges and Employers (NACE), the "ability to work well on a team" was tied for the #1 skill employers look for. Yet, many students are not explicitly taught how to collaborate. At a previous talk at the Science of Team Science (2016), the author and her student collaborators presented data demonstrating the lack of formal education around collaborative skills – a so-called collaborative skills gap – at their own institution. Here, we present the next two phases of the project: (1) a new university-wide course designed to close the collaborative skills gap by teaching students how to work in diverse groups, and (2) an empirical assessment of the effectiveness of the course in terms of students' attitudes and collaborative capabilities.

The course (INTEG 210: Making Collaboration Work) was co-designed by undergraduate students working on their Bachelors of Knowledge Integration. (Knowledge Integration is an interdisciplinary program at the University of Waterloo that teaches students critical and creative thinking, real-world problem-solving, and how to collaborate across disciplines.) Notably, many students in Canada do not have the opportunity to study or engage with other students from different disciplines, as university education tends to be more specialized. Incoming students are typically required to apply to a specific program and are often discouraged from taking too many courses outside their program, resulting in university education that is highly siloed. Furthermore, although many students are expected to work in groups, few report having received explicit instruction on effective collaboration. INTEG 210 was designed to address this problem: first, by inviting students from across the university to take the course, and second, by explicitly teaching students collaborative theories and best practices, including those that will help them work well in diverse groups. The course was first offered in Fall 2018. It drew students from all six Faculties, and course evaluations indicate that students found it very useful.

We conducted pre- and post-course surveys to determine how the course affected students' attitudes, confidence, and capabilities with respect to collaborating in diverse groups. (Notably, students were placed in groups that were diverse in terms of gender, ethnicity, personality, program of study, and year in program. They had two such group experiences, with a significant project to be completed by each group.) We also asked students to complete three reflections: one at the beginning of the course, one after their first group experience, and one after their second group experience. In this talk, we will present the results of this study, focusing on the survey data and highlighting some of the qualitative findings from the reflections. We will also share a new web resource that is currently under development, called "Making Collaboration Work," that is designed to share collaborative theories and best practices with both students and instructors.

The Development of a Competency-Based Team Science Training Program: A Case Study of TeamMAPPS

Dr. Kevin C. Wooten, University of Houston Clear Lake; *Dr. Maritza R. Salazar*, University of California Irvine; *Dr. Theresa K. Lant*, Pace University; *Dr. Eduardo Salas*, Rice University; *Ms. Cynde Ferris*, Ms. *Lori A. Wiseman*, The University of Texas Medical Branch

Objective: Responding to the National Research Council's (2015) call for the identification and translation of knowledge, skills, and attitudes for successful team science, we present a case review of the development of an evidence-based competency model for team science training built around a previously-developed model (Wooten, Salas, Lant, Salazar, Sarraj, Brasier, & Wiseman, 2017). We

review the refinement of the model, learning objectives, use of an evidence-based approach to ensure transfer of training, and the application of instructional development techniques.

Method: Using the model shown in Table 1, we have developed a five-module training program inclusive of: 1) Overview, 2) Facilitating Awareness and Information Exchange, 3) Promoting Psychological Safety, 4) Self-Correction and Adaptation, and 5) Application and Synthesis. We have built the modules such that they 1) address known issues in team science, 2) are evidence-based, 3) can be described behaviorally, 4) can be used for either development or evaluation, 5) can be applicable to nascent or advanced teams, and 6) can be used as a training model or as a diagnostic. These modules have been developed to be facilitated face to face, or completely asynchronous as a web program. In the instructional development we have utilized adult learning theory (Merriam,2001), transformational learning theory (Travis, 2006), options for a flipped classroom (McLaughlin, Roth, & Glatt, 2014), video-based behavioral modeling (Taylor, Russ-Eft, & Chan, 2005), and gamification (Dominguez, Saenz-de-Navarrete, de-Marcos, Fernández-Sanz, Pagés, & Martínez-Herráiz, 2013). Content and methods will be reviewed by team science educators, and ultimately field tested using knowledge checks as well as perceptions of self-efficacy around the competencies.

Table 1
Training Modules, Targeted Competencies, and Citations

Training Module	Competencies	Relevant Citations
Facilitating Awareness & Exchange	Sharing unique information/promotive voice	Liang, J., Farh, C.I.C., & Farh, J. (2012). Salazar, M.R., Lant, T.K., Fiore, S.M., & Salas, E. (2012).
	Inquiring/probing	Huber, G.P., & Lewis, K. (2010). Marks, M.A., Mathieu, J.E., & Zaccaro, S.J. (2001).
	Reframing and integrating	Van Der Vegt, G.S., & Bunderson, J.S. (2005). Klein, J.T. (2005). Interdisciplinary teamwork:
Promoting Psychological Safety	Perspective seeking	Edmondson, A. (1999).
	Acknowledging and including others	Edmondson, A. (1999).
	Addressing issues and resolving conflict	Edmondson, A. (1999).
Self-Correction & Adaptation	Monitoring/debriefing	LePine, J.A. (2003). Tannenbaum, S.I., & Cerasoli, C.P. (2013).
	Reflecting/Analyzing	Tannenbaum, S.I., & Cerasoli, C.P. (2013).
	Creating change/ development plans	LePine, J.A. (2003).

Summary of Findings: Development of real-life scenarios for application exercises has proven to be the most difficult instructional challenge. Use of gamification in the development of a "Design Your Own Experience" applications provide the most robust opportunity for student engagement and transfer of training. Additional effort is required to provide a capstone experiential to integrate all the competencies illustrated in Table 1. Further plans include providing additional modules for community constituents and patient advocates to provide skill-based training to optimize participatory research designs.

Significance of Study: When successfully pilot tested and reviewed, the TeamMAPPS program can provide significant training support for individuals and institutions needing behaviorally based team science training.

Training and Development on Interdisciplinary Scientific Teams
Ms. Hannah Beth Love, *Dr. Jennifer Eileen Cross*, *Dr. Bailey Fosdick*, *Dr. Susan VandeWoude*, *Dr. Ellen Fisher*, Colorado State University

Read (2016) claimed in Ecosphere that team science is needed to answer the complex problems of the 21st century. Despite the need for team science, the knowledge base on how to train and develop scientific teams is still in nascent stages. This article presents an exemplary case study of a scientific team that is functioning as a training and development team. The methods of data collection included: social network surveys, participant observation, focus groups, interviews, historical social network data, and turn-taking data.

The team is unique because they created an internal structure to train and develop the next generation of scientists to take on new roles in the team, and answer the next set of research questions. Through this process, the team grew and evolved over 12-years. This presentation will answer questions about the structure and process of the team including: how does the team train and develop scientists? How do the PI's interact with team members to train and develop them? How do team members collaborate and influence each other? How do the daily practices support the goals of the team? In addition, using social network data the presentation will answer what is the structure of the team network, what is the ideal structure, where are different types of people (i.e. PIs, and postdocs) in the network and how does the network change overtime?

The team's history of collaboration and model of training and development has worked to propel forward new ideas, collaborations, and research. Their narrative emphasizes that good science isn't just about having the next big idea or scientific discovery. Science is also about mentoring, development and forming interpersonal relationships.

Read, E. K., O'Rourke, M., Hong, G. S., Hanson, P. C., Winslow, L. A., Crowley, S., ... & Weathers, K. C. (2016). Building the team for team science. Ecosphere, 7(3), e01291.

DIVERSITY ON TEAMS
Moderator: Lejla Bilal-Maley, Antioch University

The Impact of Gender Composition and Leadership on the Productivity and Authorship Practices of Interdisciplinary Research Teams
Ms. Jacalyn Beck, Michigan State University; *Ms. Sheila Brassel*, University of Michigan; *Ms. Ellie Phillips*, *Ms. Jordan Fornier*, Michigan State University; *Dr. Robert Montgomery*, *Dr. Kevin Elliot*, *Dr. Kendra Cheruvelil,* Michigan State University; *Dr. Isis Settles*, University of Michigan

Gender diversity has been shown to have positive effects on team productivity across a variety of disciplines. Within scientific research teams, productivity is often measured by the number of peer-reviewed journal articles published by a team over time. However, it is unclear what role the gender composition of teams, specifically that of team leadership, plays in the resulting publications and their practices for co-authorship. We surveyed 229 researchers from 61 National Science Foundation-funded interdisciplinary environmental science teams on matters relating to team gender composition, inclusivity, leadership, and authorship. We collected information on ~2,400 articles published by these teams between 2006-2018, including author gender and number of co-authors. While most survey participants were satisfied with the authorship credit they were given in their team's publications, more women than men felt the credit they received was inappropriate (6.6% vs. 2.3%, respectively). And while many participants were satisfied with the number of coauthors on their team's publications, more women tended to feel that there were too many or too few coauthors (38.9% vs. 31.1% of men). This may be indicative of the disproportionate gender ratios within team leadership: on average, teams had 4.1 men PIs or coPIs and only 1.5 women PIs or coPIs. Results of this study have implications for the management of productive and inclusive interdisciplinary research teams.

Explorations of Temporal Diversity, Temporal Conflict, and Temporal Leadership
Dr. Susan Mohammed, Penn State University

Team research has frequently been criticized for neglecting the role of time (e.g., Kozlowski & Bell, 2003; Mathieu, Tannenbum, Donsbach, & Alliger, 2014). In response, recent research has explored temporality in team diversity, cognition, and leadership. With regard to diversity, individuals not only differ in demographic characteristics and personality traits, but also differ in their temporal orientation (Mohammed & Harrison, 2013). Some individuals are chronically hurried whereas others are relaxed (time urgency; Conte, Landy, & Mathieu, 1995). Some people complete work early while others wait until the last minute (pacing style; Gevers, Mohammed, & Baytalskaya, 2015). Some people prefer to focus on a single task at a time, whereas others prefer to work on several activities concurrently (polychronicity; Bluedorn, 2002). What happens when individuals with different orientations toward time have to work together interdependently in a team context? Does diversity of time-based individual differences contribute to dysfunctional conflict or facilitate complementary performance?

One study found that the mix of time-urgent and time-patient team members heightened temporal disagreements (Mohammed, Alipour, Martinez, Livert, & Fitzgerald, 2017). However, other research reveals that the answer to these questions depends on several moderating conditions. For example, the effect of time urgency and pacing style diversity were more positive when team temporal leadership (team leader behaviors that help to coordinate the pacing of task accomplishment) was high (Mohammed & Nadkarni, 2011). In addition, shared temporal cognition (common understanding of the time-related aspects of executing collective tasks) attenuated the negative effects of polychronicity diversity on team performance (Mohammed & Nadkarni, 2014). Recently, Gevers, Rispens, and Li, 2016) found that the relationship between pacing style diversity and team collaboration was positive only when both action planning and temporal familiarity (knowledge of members' temporal traits) were high.

In sum, individuals often enter teams with diverse, deeply ingrained temporal orientations. A growing number of studies across diverse samples have begun to demonstrate that time-related dispositions of members are potentially crucial in teams and have important implications for team processes and performance. (e.g., Gevers et al., 2016; Mohammed & Angel, 2004; Mohammed & Nadkarni, 2011, 2014; Mohammed et al., 2017). How can this research be leveraged to enhance team functioning?

Unfortunately, the practical implications of this research have yet to be unpacked. In response, the focus of this presentation is to inform evidence based practice regarding temporal diversity, temporal conflict, and temporal leadership. Practitioners will be alerted to consider differences in members' time urgency, pacing style, and polychronicity in forming and monitoring team progress. Explicitly discussing expectations regarding deadlines and pacing as part of the development of a team charter can structure this dialogue. Although temporal diversity can be a disruptive influence in teams, the interventions of temporal leadership, shared temporal cognition, action planning, and temporal familiarity can mitigate the negative effects of temporal diversity on team performance. Thus, important implications include encouraging leaders to actively coordinate the work of the team toward meeting deadlines and facilitating the process by which team members reach agreement about temporal milestones.

Strategies for Promoting "Teaminess" with a Focus on Diversity and Inclusion
Dr. Binyam Nardos, *Dr. Letisha Wyatt*, *Dr. Damien Fair*, Oregon Health & Science University

Research institutions are often encouraging and supportive of collaborative team science because they recognize that team science is more impactful and efficient relative to independent research by a single investigator. A primary reason for this observation is attributed to the increased creativity and diversity of ideas that team science affords. Needless to say, if diversity of ideas is to be enhanced within research, the teams and universities should be composed of a diverse group of investigators from different backgrounds. The OHSU Fellowship for Diversity and Inclusion in Research (OFDIR) is a program with a mission to do just that – i.e., to enhance diversity of ideas in OHSU research teams by actively working to recruit and retain postdocs and junior investigators from underrepresented communities (e.g., primarily racial minorities, persons with disabilities, and from underserved communities). To grow a diverse scientific workforce at Oregon Health & Science University (OHSU), OFDIR focuses on supporting the career development of diverse talent and creating a national network of OHSU-connected underrepresented scientists. Our Fellows report that attractive components of the OFDIR program include financial support (salary, relocation and research enrichments funds), mentorship on grant and manuscript writing, and professional development opportunities for career advancement. Coordinating efforts with programs targeting

undergraduates and post-baccalaureates at OHSU, such as NIH-funded BUILD EXITO and PREP, respectively, allows OFIDIR Fellows and research mentees invaluable mentoring and informal teaching experiences. These interactions also enhance relationships and community for underrepresented individuals across OHSU's interdisciplinary teams. Sense of community is typically very important to diverse candidates, and as such, OFDIR works with Fellows to ensure they feel welcome and connected both professionally and personally via programs such as our monthly presentation series and frequent socials at OHSU and within the greater Portland area. Since the establishment of OFDIR in 2012, the program has accepted 14 underrepresented Postdoctoral Fellows across departments and programs ranging from Cancer Biology, Dentistry, Neuroscience, and Engineering while coming in considerably under budget and outpacing recruitment goals. Several postdocs have continued their fellowship in their host lab or taken their next career step at OHSU, including Faculty positions. When surveyed on a five-point likert scale, all Fellows consistently report being "likely (4)" or "highly likely (5)" to recommend the program. We see an increase in the number that report "strongly agreeing" with continuing in science when asked about their investment in pursuing a scientific career while comparing pre- and post- OFDIR experiences. In the future, we will extend OFDIR Postdoctoral Fellowships to other areas of OHSU through collaboration with similarly aimed programs in Family Medicine and the School of Public Health. We hope that other groups focused on team science will make concerted efforts to embed inclusivity and support of diverse individuals in their efforts to account for the successes of Team Science.

Team Climate Mediates the Effect of Diversity on Science Teams

Dr. Isis Settles, *Ms. Sheila Brassel*, University of Michigan; *Dr. Patricia Soranno*, *Dr. Kendra Cheruvelil*, *Dr. Georgina Montgomery*, *Dr. Kevin Elliott*, Michigan State University

Background: The scientific community is striving to become more demographically diverse and promote the advancement of groups that have been underrepresented in the sciences. At the same time, scientific research is increasingly conducted in teams. However, creating successful diverse teams is not a simple matter of recruiting more individuals from underrepresented groups. In fact, diverse teams can struggle with allocation of credit, differences in perspectives, and unequal power dynamics. We propose that a critical factor for addressing these challenges and promoting the success of diverse science teams is team climate, or the perceived set of norms, attitudes, and expectations on a team. Although industrial/organizational psychologists have examined climate and its associations with teamwork and job satisfaction in traditional business workplaces, there are surprisingly few studies on the associations between diversity and climate within science teams. In this study, we sought to address this gap by examining how individual and team diversity are related to team climate, satisfaction, and perceptions of team functioning.

Method: In a sample of 266 researchers working in NSF-funded interdisciplinary science teams, we conducted a path analysis to examine whether team climate (measured as procedural justice, collaboration, and inclusion) mediates the associations between individual and team demographic diversity and three outcome variables: team members' overall satisfaction, satisfaction with team authorship practices specifically, and perceptions of the frequency of data sharing on their team.

Major findings: Regardless of one's own characteristics, researchers on more diverse teams reported a more positive climate than those on less diverse teams, which was associated with more positive outcomes. In contrast, we found that researchers from underrepresented groups reported more negative perceptions of team climate, which was associated with more negative outcomes. Thus, overall, team diversity is associated with a more positive climate and better outcomes. However, the individuals who contribute said diversity – the team members from underrepresented groups – report more negative climate and outcomes.

Implications: Our findings about the positive effects of team demographic diversity are aligned with the literature indicating that diversity can have a number of beneficial effects on team outcomes. Demographic diversity might improve team climate because team members from traditionally underrepresented groups may be particularly likely to identify concerns about power dynamics and unfair or exclusive practices on these teams. However, we also found that individuals from multiple underrepresented groups (e.g., women, people of color, LGBTQ team members) perceived team climate more negatively than their socially dominant counterparts, and as a result reported more negative outcomes. The less positive outcomes for these individuals may be the result of "token effects," which occur when group members experience stresses such as performance pressure and social isolation because they have characteristics that are unique within their teams. Thus, our results support ongoing efforts within the scientific community to incorporate more

individuals from underrepresented groups in scientific teams, but we add the important caveat that it is critical to provide these individuals with adequate support and recognition, and to study additional ways to improve team climate for all team members.

SCAFFOLDING IN ACADEMIC SETTINGS
Moderator: Dr. Deborah Rocha, Indiana University

Developing Team Science Capacity at a Technological University
Dr. Kathleen E Halvorsen, Michigan Technological University

Many universities struggle to develop team science capacity finding it difficult to bridge disciplinary and departmental boundaries. This paper focuses on describing how Michigan Technological University developed inter/transdisciplinary scientific research skills and networks in the area of environmental sustainability. This development started with a few key faculty across the university interested in developing interdisciplinary environmental sustainability research.

A National Science Foundation IGERT grant on sustainability spurred the faculty to develop research projects, co-advise graduate students, create a cross-university graduate certificate, and put in place a research institute to connect faculty and facilitate interdisciplinary research. This institute was critical in identifying some funding opportunities, helping develop interdisciplinary teams to pursue them, and assisting with proposal development. This in turn led to successful funding awards from multiple federal science agencies.

As a core of environmental sustainability researchers across social, natural, engineering, and computational sciences worked together to pursue various proposals and carry out funded grants, a core of experienced senior researchers developed skills in developing and managing inter/transdisciplinary scientific teams. Success in this research focus eventually began to attract more, higher caliber faculty and students in this area facilitated by a serious of university-wide faculty hiring initiatives in sustainability-related fields.

The result has been the development of a "deep bench" of scientists skilled in working together across boundaries who can trade-off leadership responsibilities and pivot to take advantage of new opportunities. It has institutionalized norms and training (formal and informal) for new faculty and students. At this point in time, Michigan Tech is poised to expand this team science skill base to develop new areas of research going beyond the initial environmental sustainability core.

365: A Year Implementing a Team Science Movement in a British University
Ms. Ruth Norris, *Dr. Claire Smith*, *Dr. Amanda Lamb*, *Ms. Charlotte Stockton-Powdrell*, *Ms. Rachel Chown*, The University of Manchester

The author and co-authors have informally applied components of the Team Science (TS) model to research at the University of Manchester for 10 years. Their particpation in SciTS 2018 was the catalyst for 365 days of change: empowering a knowledge-rich team with the toolkit required to formalize, spread and operationalize a TS approach across the University of Manchester, with the objectives of:
- Increasing the quality and quantity of research outputs and impact
- Improving diversity and inclusion in research
- Creating frameworks that reward and recognise contributions of non-traditional roles

The approach combines complementary methods to proliferate and embed TS in the research ecosystem:
- Training and Development: creating evidence-based, innovative opportunities to support new ways of working and develop team science specialists.
    - Development of a formal TS network to advocate, support and advance the practice and research into TS across the University and sister networks. (Chown, Norris, Smith)
    - Events:

- Workshop, July 2018: Interdisciplinary Translation Workshop led by Andi Hess, ASU (Hess, Norris, Chown, Smith) [35 attendees, second event planned for 2019]
- Health Programme Evaluation Methods: December 2018 (Lamb, Smith, Steeles)
- Proliferation & Dissemination: utilizing existing and new networks to raise TS profile, acceptance and adoption
  - Invited Talks:
  - Joint University and NHS Research & Innovation Hub, Newcastle University. Invited to speak to their network. (tbc). [Norris, Stockton-Powdrell]
  - OneHealthTech: Created a TS event "Taking the I out of IT" to improve diversity in academia and industry. (December 2018, 100+ members) [Norris]
  - Research Programme Managers Network: (October 2018, 200+ members). [Norris]
  - Centre for Health Informatics, University of Manchester (November 2018 c.70 staff) [Norris]
- Sponsorship: use relationships with influencers and agents of change to champion the creation of a TS network, embed principles within research; and advocate for operational and policy change to support a TS model.
  - Adoption of TS approach within the NIHR BioMedical Research Centre. TS principles are now weaved into this £28m translational health research programme's objectives, with KPIs. These actively support the cross-disciplinary nature of this strategically important programme). [Norris, Bruce]
- Leadership: creating an empowered, credible team, with the theoretical and applied knowledge to lead the organization to TS adoption at scale
  - CPD: Personal development plans for the TS Network Leadership team:
- Providing individuals with professional and interpersonal training and development to empower them with the psychological safety to lead, advocate and spread the TS model.

Development of a Research Management Development framework
In conclusion, the journey to TS implementation across a British university was catalysed by attendance at the SciTS conference 2018. This initiative has begun at pace using several complementary activities and workstreams,and has gained significant enthusiasm and traction from key senior academic and operational leadership figures; plus interest from external partners across the United Kingdom for adoption.

The depth, breadth and sustainability of this movement, and its positive effect on research, will depend on advocacy and sponsorship; operational and cultural change; and continued application of theory and methods to practice.

Assessing the Propensity to Collaborate in the Life Sciences
Dr. Kyuseon Lee, Dr. Steve Miller, Dr. Philip G. Pardey, University of Minnesota

Collaboration among researchers is increasing, but among all possible pairs of researchers few actually work together. It is thus natural to ask what information signals do researchers use in selecting research partners from among a large pool of potential collaborators. This study has addressed that question for life sciences researchers focusing on three particular types of signals: perceived research productivity, knowledge complementarity, and professional familiarity. We investigate the collaboration consequences of these signals by using academic publication data published by life sciences faculty at the University of Minnesota (UMN) from 1999 to 2014, focusing on papers in which all of the authors are affiliated with UMN.

We have found perceived research productivity is positively associated with the initiation of first collaboration while complementary knowledge is not. For continuing collaborations, however, knowledge complementarity becomes significant as well as the recency of first collaboration and the frequency of past collaborations. While complementarity is noted as a key driver of repetitive collaborations, researchers are more likely to collaborate with coauthors who have moderate differences in research profile. This suggests that the factors researchers consider when choosing coauthors vary with respect to the types of collaboration. This study contributes to the empirical literature on research team formation and to university administrators seeking to promote more collaboration among researchers.

Societal Impact of Research on the Complexity of Language in France
Dr. Audrey Mazur-Palandre, University of Lyon; *Dr. Gerald Niccolai, Dr. François Pellegrino, Dr. Kristine Lund*, CNRS: Centre National de la Recherche Scientifique

In 2010, the Advanced Studies on LANguage complexity (ASLAN) "Laboratory of Excellence" obtained funding for ten years. Primarily mobilizing the laboratories DDL (Dynamics of Language) and ICAR (Interactions, Corpora, Learning, Representations), it has now been one of the 12 LabEx funded by the University of Lyon during 2011-2019. By considering language as a complex dynamic system, ASLAN proposes to examine all facets of language use and acquisition, as well as language diversity and history. This approach addresses all language components (from phonemes to gestures, from grammar to interaction) as well as how biological, cognitive and social factors and language reciprocally influence each other. Although public sector researchers who willingly contribute to the resolution of societal issues is not new, ASLAN's goal is to develop a collective approach, still lacking in the mid 2000s in France, especially in the Human and Social Sciences (HSS).

To meet this challenge, ASLAN put together a policy of innovation, dissemination and exploitation of research results in order to respond institutionally to societal issues. In addition to three scientific axes structuring research activities, ASLAN has also included three societal challenges, two transversal scientific approaches, and axes dedicated to training, inreach, and outreach activities.

A team responsible for the communication and enhancement of ASLAN was set up to rethink and increase the societal value of ASLAN's perimeter, while working closely within the scientific axes and approaches. Since 2012, ASLAN has developed a program aimed at facilitating multi-inter-transdisciplinary collaboration as well as real expertise in adding societal value to research results in language sciences, educational sciences and psychology. We have done this by reflecting on the concepts of inreach, outreach, and dissemination of research in HSS (Ogilivie Hendren & Ku, forthcoming). Our experience has led us to redefine the value of HSS research. This was facilitated by our decision to give responsibility for the development and animation of inreach, outreach, and dissemination to staff who are trained and practicing researchers (Scholz, 2017). This dual position - researcher and in charge of the development of inreach, outreach, and dissemination – allows for excellent knowledge of ASLAN's disciplinary fields. Such knowledge enables a quick understanding of research projects, and ease in identifying partnerships and new academic possibilities. Finally, awareness of different stakeholders' constraints (e.g. difference in the public and private sector timescales) facilitates finding solutions that satisfy different partners.

In light of this background, our presentation will have a twofold objective. We will (1) illustrate that what is defined by societal value is extremely rich and goes beyond the creation of market value, especially in HSS and (2) show examples from ASLAN that can be transferred or adapted to other societal issues in HSS research. Our work will soon be available in the form of a white paper.

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Deep Knowledge Integration Across Disciplines: The EMBeRS Method
Dr. Deana Pennington, University of Texas at El Paso; *Dr. Kate Thompson*, Griffith University; *Dr. Shirley Vincent*, Vincent Evaluation Consulting, LLC; *Dr. David Gosselin*, University of Nebraska at Lincoln

Deep knowledge integration across disciplines has been identified as one of seven key challenges confronting interdisciplinary team science. Deep knowledge integration depends on identifying and linking relevant conceptual frameworks in multiple disciplines that could contribute synergistically towards research on a shared problem; yet which frameworks are relevant depends on the problem that is going to be addressed, which can itself be framed in a multitude of ways. Such "ill-defined" problems are known to be inherently complex, requiring different skills than needed for addressing well defined problems. Common approaches for tacking ill-defined problems depend on effective team processes that facilitate participation and knowledge sharing. Yet in interdisciplinary teams, such processes are inadequate because of extreme differences in vocabulary and epistemology. Facilitating team interactions that enhance

participation does not address the issue of team members not understanding the deep knowledge that is being shared by their colleagues from other disciplines.

The EMBeRS project (Employing Model-Based Reasoning in Socio-Environmental Synthesis) is investigating the challenge of deep knowledge integration across disciplines as a learning problem. Team members must learn enough about each other's research and the basic concepts that are fundamental to understanding it to be able to generate an internal mental model of each colleague's research and connect those with their mental model of their own research. This must happen on-the-fly during teamwork and is an example of experiential learning. Once team members have learned enough to generate such connections across mental models, they have the capacity to generate a synergistic shared mental model of the problem. These connections and a shared mental model of the problem contribute towards development of a distributed cognitive system, from which a shared vision of research emerge. Shared vision is known to be a key factor determining the outcomes from team work.

This presentation will summarize the EMBeRS method for learning across disciplines to purposefully identify potential conceptual linkages between team members and converge through time on a shared mental model of the problem. The presentation will briefly summarize learning theories on which the method is based; provide a heuristic model for practices that facilitate learning in science teams derived from synthesizing those theories; describe the PhD workshops that are being used to test the EMBeRS method; and present results from qualitative and quantitative analysis of data collected during the workshops. Results show promise for development of a set of generic activities that can be used in interdisciplinary science teams to intentionally and purposefully integrate deep knowledge across disciplines, leading to development of a shared mental model of the problem and a path towards identifying a shared vision of synergistic research.

HIGH LEVEL THEORY
Moderator: Dr. Julie Thompson Klein, Wayne State University, Emeritus

Towards a Theory of Replications, Open Science, and Reproducibility
Dr. Bert Baumgaertner, *Dr. Berna Devezer*, *Dr. Erkan Buzbas*, University of Idaho; *Dr. Luis G. Nardin*, Brandenburg University of Technology

The literature on the reproducibility crisis presents several putative causes for the proliferation of irreproducible results, including p-hacking and publication bias. Without a theory of reproducibility, however, it is difficult to determine whether these putative causes can explain most irreproducible results. Drawing from an historically-informed conception of science that is open and collaborative, we identify the components of an idealized experiment and analyze these components as a precursor to develop such a theory. Openness, we suggest, has long been intuitively proposed as a solution to irreproducibility. However, this intuition has not been validated in a theoretical framework. We use probabilistic arguments and examine how openness of experimental components relates to reproducibility of results. We show that there are some impediments to obtaining reproducible results that precede many of the causes often cited in literature on the reproducibility crisis. That is, even if, for example, p-hacking never took place, publication bias was absent, and other erroneous individual- or system-level practices were corrected, reproducibility is not ensured.

Foxholes, Not Silos
Dr. James Foster, University of Idaho

It has become de riguer, beyond even cliché, for academics to pejoratively describe the state of the Academy in terms of silos. The point of the metaphor is to decry narrow minded overspecialization and to encourage disciplinary specialists to interact more with specialists outside of their discipline. But in general, the silo metaphor for the modern university is worse than wrong. It is sterile. I propose a more accurate and useful metaphor for our situation, a framing that leads more naturally to possible solutions: foxholes.

Metaphors matter. Framing a subject can either hamper or facilitate discussion, shaping our ability to understand an issue and to deal with it. Statistician George E. P. Box's observation about statistical models applies equally well to metaphors: "All models are wrong, but some are useful." A useful metaphor illuminates, prodding us to deeper understanding, hopefully even suggesting solutions. In other words, good metaphors stimulate our imagination, rubbing imagery against reality with an eye to improving the latter.

I maintain that the academic "siloization" metaphor (I have heard otherwise literate people use that term) is neither accurate nor useful if we want to understand and improve the Academy. The foxhole image leads more naturally to useful analogies. The foxhole metaphor suggests solutions. Foxholes provide different perspectives, which might help us understand where the threats really lie. Most significantly, soldiers in foxholes are comrades, not enemies.

Transdisciplinary Knowledge Producing Teams (KPTs): Typology, Features, and Communication Skills
Dr. Gaetano Romano Lotrecchiano, George Washington University; *Dr. Shalini Misra*, Virginia Tech

Transdisciplinary Knowledge Producing Teams (TDKPTs) are groups of stakeholder participants tasked with producing knowledge across disciplinary, sectoral, and ecological boundaries. This paper accesses literature from the Science-of-Team-Science (SciTS), complexity theory, and systems theory to construct a typology of the features of TDKPTs. First, we conduct a descriptive analysis of features of TDKPTs from a systems perspective. We distinguish between interactive systemic complexities (arising from interpersonal interactions in TD team settings) and structural systemic complexities (arising from characteristics inherent to the make of the team). We analyze the characteristics of TDKPTs (such as complex problem solving, stakeholder involvement, methodological pluralism), elucidate how they parallel various complex adaptive systems factors (such as non-linearity, open systems, interactions between systems components), and present case examples of both structural and interactive system complexities. Additionally, we identify concrete skill building aspects needed for TDKPTs to be successful. We align each skill building foci with specific outcomes related to supporting effective communication in TDKPTs.

As TDKPT members are required to engage in theoretical, epistemological, and methodological reflections to elucidate the dynamic nature of TD knowledge producing teams, understanding how conflict, dissonance, and reciprocal interdependencies contribute to knowledge generation are key areas of team effectiveness and call for continual research and inquiry. This paper provides a framework by which team functioning can be considered and enhanced within TDKPTs. The features of TDKPTs developed and described in this paper inform the development of the requisite skill set for better team communication and functioning. This offering attracts researchers of TD teams and TD team members alike to reconsider the development and study of TDKPTs.

CTSA
Moderator: Dr. Karen Demby, University of North Carolina

Using Instructional Design Principles to Engage Citizen Scientists as Clinical Research Partners
Ms. Janet Brishke, *Ms. Christy Evans*, *Dr. Elizabeth Shenkman*, University of Florida College of Medicine

Background: Citizen Scientists help bridge the gap between researchers and community members. These stakeholders provide input on many aspects of clinical research studies, from general consensus feedback such as selecting a logo for a fitness app, to providing suggestions on how to recruit patients more effectively. Citizen Scientists bring fresh perspective to research studies and offer insights typically overlooked by research staff. Depending on their prior experiences within the health care system or in their professional lives, Citizen Scientists may initially not understand fundamental elements of the research process. This knowledge gap can create a communication barrier between the stakeholder and researchers, and limit actionable feedback for implementation.

Methods: Working with experts in educational research and instructional design, a curriculum was created to train new community stakeholders. The curriculum consists of seven modules with different themes relevant to clinical research. The modules each contain didactic lessons with video tutorials presented by subject matter experts. The curriculum was created using pedagogical best practices such as use of an instructional design model to guide the process, interactive assessments with color-coded feedback, learning objectives, and multimedia content delivery. The Citizen Scientists worked with the research team to help create the materials, from reviewing assessment language to starring in the videos. The curriculum was pilot tested with IRB approval among Citizen Scientists between July 2017 and January 2018 using the Canvas learning management system.

Results: Citizen Scientists were divided into two groups: established members and new members. The cumulative score for both groups across all modules was 81%, ranging from 76% for the clinical and translational science module to 98% for the stakeholder engagement module. Notable differences were observed in the cultural competency module, where younger participants scored higher than older participants (90% vs 77%), and in the orientation to citizen science module, where established Citizen Scientists scored higher than new members (93% vs 81%). Participants also completed an evaluation that asked questions about comprehension, video quality, and assessment clarity. Most (75%) participants felt it was easy to understand the information in the videos. The majority of participants (62.50%) felt the assessment items matched the learning objectives and 75% felt the assessments were comprehensive. The evaluations asked for unstructured comments as well, and participants used this to offer concrete feedback for future iterations of the curriculum.

Conclusion: After completing the course, Citizen Scientists received sustained engagement certification and are now using this knowledge on new research projects. The Citizen Scientist curriculum was a well-received approach to educating community stakeholders in aspects of clinical research. When community stakeholders are knowledgeable about research terminology, their ability to collaborate with researchers, and provide a community perspective while remaining cognizant of how research works, is enhanced. Having a more in-depth understanding of the research process fosters collaborative efforts and improved communication between the stakeholder and researchers. Through an understanding of how clinical research works, community stakeholders are better able to offer critical feedback to help advance health care.

An Integrated Approach to Promoting Team Science Principles Across a CTSA
Dr. John (Jack) Kues, Dr. Jackie Knapke, Dr. Saundra Regan, Dr. Jennifer Molano, Dr. Rebecca Lee, Ms. Laura Hildreth, Elizabeth Heubi, University of Cincinnati

The application of the principles of team science have been an important part of the CTSAs almost from the inception of the program. Implementation of this mandate has been largely left to the discretion of individual centers. As we developed our approach to integrating team science into our CCTST we identified the need for a comprehensive model included multi-level training, team consultations, rewards for successful collaboration and creation of high-functioning teams, mechanisms to overcome institutional barriers to collaboration, and a shift in the institutional research culture that currently accepts dysfunctional and sub-optimal teams as the norm.

We have been building a cross-institutional, comprehensive approach to transdisciplinary research to create a sustainable impact on the quality of research teams, collaboration and the culture of our CTSA partners. Our approach includes initiatives in the following areas:

Administration: The director of the Center for Improvement Science (CIS) sits on the CCTST Executive Committee. He also consults directly with the University of Cincinnati Sr. VP for Research and our health systems. This high-level administrative network allows the CIS to understand broad-based institutional needs and propose cross-institutional solutions to common problems.

Education: The CIS provides on-going, multi-level education in the form of workshops (from team science basics to specialized topics), a graduate-level course in Team Science and Collaboration, on-demand education (one-hour events, grand rounds, workshops, and community workshops). These are broadly advertised to CCTST members (over 4,000) and through institutional training announcements. We typically have over 15 events per years with approximately 500 participants. We are currently co-sponsoring workshops with the university's Staff Success Center.

Consultation: The CIS provides consultations for individual investigators, teams, and administrative units. Time periods vary from a single session to on-going relationships that include team assessments, customized training, and "touch base" meetings. We are averaging over 12 consultations per year.

The Collaboration Network: The CIS operates a weekly collaboration session Web-Ex. The purpose is to help investigators connect with potential collaborators and to learn more about colleagues and resources across the CCTST. We have monthly "member spotlight"

sessions and quarterly "special topic" sessions that are well advertised across all CCTST institutions and the community. Our most recent quarterly meeting on Aging included over 50 people from the CCTST and community partners.

Integration Committee: This is a group of top investigators and core directors from the CCTST. We invite new and mid-level investigators to present their current research and challenges. The purpose of the meeting is to offer career advice, connect investigators with collaborators and resources, and to provide regular follow-up contact to support their needs. This has been in place for over five years. We currently follow over 75 investigators.

Monitoring and Evaluation: We have been gathering data on individual investigators, teams, and funding programs to assess progress in promoting a collaborative research culture, educating and supporting investigators, and increasing the effective use of team science principles. As part of this presentation, we will provide the latest evaluation data that measure progress and effectiveness of our efforts.

Implementing a Continuous Quality Improvement Intervention in a Clinical and Translational Research Network

Ms. LaKaija Johnson, *Ms. Gwenndolyn Porter*, *Ms. Jolene Rohde*, *Dr. Mary E. Cramer*, *Dr. Paul A. Estabrooks*, University of Nebraska Medical Center

Purpose: To determine strengths and areas for improvement for the Great Plains IDeA Clinical and Translational Research (GP CTR) network and develop insight into these needs through key informant interviews of Network Steering Committee members over two years.

Background: Clinical and translational research networks have been funded and developed to provide infrastructure to support breakthroughs in disease treatment, prevention, and health promotion. There is a growing body of literature on the effectiveness of scientific teams across and within these networks, but limited information on the use of systems thinking tools for continuous quality improvement (CQI). Measures such as the Internal Coalition Effectiveness© (ICE), a validated instrument designed to aid community coalitions with identifying organizational strengths and areas for improvement, can be used to collect longitudinal data for reflection and action planning.

Methods: This project examined the implementation of a mixed methods CQI framework designed to identify strengths and areas for improvement across domains measured by the ICE: Shared Social Vision, Efficient Practices, Knowledge and Training, Relationships, Participation, and Activities, across the GP CTR network. The ICE instrument was adapted to measure the internal governance of the network, and then used to develop an interview protocol. A convergent parallel mixed methods design was used to: (1) Administer the ICE to GP CTR Steering Committee members and grant-funded faculty/staff (n=36); (2) Conduct semi-structured interviews with GP CTR steering committee members (n=6). ICE survey data and interview data were analyzed and compared. We hypothesized the proposed framework is an effective method to identify opportunities for changes that will facilitate the translation of research evidence to improve population health outcomes.

Results: A mix of facilitators and barriers were identified from survey and interview responses. ICE survey respondents rated network effectiveness positively in all domains (mean= 5.30). The highest rated construct was Knowledge and Training and the lowest rated construct was Participation. Key informant interview responses validated the survey results regarding the positive responses across ICE domains. A new code emerged as unique "Accomplishments" were highlighted, including comments around professional development for pilot and scholar awardees, the quality of the annual GP CTR scientific meeting, and improvements in quality and number of applications across network-specific funding calls. Participation emerged as a predominant category with respondents indicating a need for continued focus on transparency, engagement in decision making, and sustained communication. Additional recommendations included continuing to facilitate networking opportunities and strengthening support mechanisms across GP CTR institutions.

Conclusions: A mixed methods CQI framework may be a useful method for transdisciplinary research networks to identify structures and processes that facilitate or inhibit the implementation of transdisciplinary research activities. We supported our initial hypothesis

and identified feedback garnered from the ICE survey and the key informant interviews that can be used to inform changes in governance to promote advancements in translational science across the GP CTR network. Clinical and translational research network members enjoy the knowledge sharing and training opportunities that come with network membership and are looking for opportunities to contribute to the development and achievement of the network's vision.

The Relationship Between Disciplinary Diversity, Team Composition, Time-workload Pressures and Quality of Interactions During Patient-reviews in Multidisciplinary Tumor Boards

Dr. Tayana Soukup, King's College London, London UK; *Mr. Ben W Lamb*, Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK; *Mr. James SA Green*, Whipps Cross University Hospital, London, UK; *Dr. Nick Sevdalis*, King's College London, London UK

Background: The functional perspective of groups highlights the importance of understanding the relationship between internal factors that emanate from within a group (e.g. diversity and composition); external circumstances that are intractable (e.g. workload and time pressures); and the quality of interactions between team members during a given task. This premise has not yet been explored in the context of patient-reviews in multidisciplinary tumor boards (MTBs). We have therefore set out to gain better understanding of how external circumstances and internal factors relate to the quality of interactions in the disciplinary diverse group of health professionals that constitute a MTB.

Methods: Breast, colorectal and gynecological tumor boards from across 3 academic hospitals in the UK were video recorded over 12-weekly meetings, encompassing 822 patient-reviews over 55h of MTB real-time work. Quality of interactions for each of the 822 patient-reviews was assessed using a validated instrument, namely, Bales' Interaction Process Analysis, that captures frequency of task-oriented and socio-emotional interactions during a team task. We also measured the following items:
- Group size (number of core team members present at any one patient-review),
- Disciplinary diversity (number of core disciplines present at any one patient-review),
- Disciplinary distribution (number of core members present per core discipline), and
- Gender balance (more males, more females, equal number of males and females)
- Time and workload pressures (ratio based on the time left to review patients on the MTB agenda divided by the number of patients left to be reviewed).

The relationship between the variables was assessed using partial correlation analysis controlling for team/tumor type and the complexity of the patient reviewed (using a validated tool, MeDiC).

Participants were senior specialist physicians and nurses across the 3 MTBs (N=41 team members in total) including;
- 6 radiologists with on average 12 years' experience,
- 5 histopathologists with on average 11 years' experience,
- 12 surgeons with on average 8 years' experience,
- 6 oncologists with on average 6 years' experience, and
- 12 cancer specialist nurses with on average 7 years' experience

Results: Disciplinary diversity and group size were significantly associated with reduced task oriented interactions such as sharing of patient related information ($r=-.08$, N=833, $p<.05$; $r=-.14$, N=388, $p<.05$; respectively), and increased seeking of such information from the team ($r=.13$, N=833, $p<.05$; $r=.08$, N=833, $p<.05$; respectively). Group size and more male team members present during patient-reviews were also associated with increased seeking of clinical opinions into care planning ($r=.18$, N=833, $p<.05$; $r=.21$, N=833, $p<.05$; respectively), while the opposite pattern was evident with more females present ($r=-.16$, N=833, $p<.05$).

Negative socio-emotional reactions such as antagonism were heightened with disciplinary diversity ($r=.08$, N=833, $p<.05$) and tension also increased with team size ($r=.11$, N=833, $p<.05$; $r=.249$, N=833, $p<.05$, respectively). Patient-reviews with more male team members present were associated with significantly more tension ($r=.01$, N=833, $p<.05$) and fewer disagreements ($r=-.11$), while the

opposite relationship was evident when more females were present i.e. more disagreements (r=.10, N=833, p<.05) and less tension (r=-.11, N=833, p<.05).

Time-workload pressure was associated with reduced task-oriented interactions in particular providing fewer specialist opinions during patient-reviews (r=-.15, N=833, p<.05), and reduced positive socio-emotional interactions between team members such as solidarity (r=-.14, N=833, p<.05) and agreeableness (r=-.08, N=833, p<.05).

Discussion: Disciplinary diversity, team composition and time-workload pressures are important elements to take into consideration when evaluating MTBs since we found that they affected the quality of team interactions in multiple different ways. It is arguable that smaller size teams with only core disciplines present and streamlining workload to reduce time-workload pressure on MTBs may be strategies to apply in order to ensure better team functioning and service quality in these clinically important specialist teams.

DISCIPLINARY DIVERSITY – THEORY AND PRAXIS
Moderator: Dr. Don Takehara, University of Illinois at Urbana-Champaign

Assessing the Effectiveness of Various Funding Strategies to Foster Disciplinary Diversity in Research Teams
Mr. David Campbell, *Mr. Brooke Struck*, Science-Metrix Inc.

Diverse funding strategies aimed at fostering disciplinary diversity on research teams have been established by a wide range of national and international funders (e.g., HFSPO, US-NSF, NSERC, European Commission). Through the recombination of knowledge pieces outside the context in which they emerged, such strategies aim to uncover innovative solutions to the increasingly complex challenges faced by 21st century societies.

The Human Frontier Science Program Organization (HFSPO) was one of the early adopters of such strategies, and the Human Frontier Science Program (HFSP) currently integrates multiple strategies in support of disciplinary diversity. Science-Metrix recently completed a review of HFSP for the 2009–2018 funding period. The review was overseen by HFSPO's Independent Scientific Review Committee, which provided methodological advice and approved all project deliverables.

In performing the HFSP review, Science-Metrix approached disciplinary diversity through two lenses: multidisciplinarity and interdisciplinarity. The term multidisciplinarity is used to refer to research teams that integrate members from various disciplines, while the term interdisciplinarity is specifically used to refer to the integration of expertise and approaches from different disciplines into a research paper. In the former case, the Rao-Stirling index was used to quantify diversity in the disciplinary background of a paper's authors, whereas in the latter case, it was used to quantify diversity in the scientific subfields of a paper's references. These two dimensions may be independent: a multidisciplinary team may yet produce quite monodisciplinary research, while a monodisciplinary team may yet produce highly interdisciplinary research.

This dual view on disciplinary diversity was in part motivated by the composition of HFSP's funding portfolio. For example, the Cross-Disciplinary Fellowships (CDFs) fund postdocs from outside the life sciences to conduct biology-related research abroad for the first time. Such a funding scheme, while it will generate some disciplinary diversity within research teams (i.e., a postdoctoral fellow from outside the life sciences [e.g., in physics, chemistry] working with a supervisor in the life sciences), appears quite suitable to also ensure strong knowledge integration across disciplines (i.e., a postdoctoral fellow from outside the life sciences [e.g., in physics, chemistry] working on a problem within the life sciences). HFSP also includes the Research Grants (RGs) scheme, which funds multidisciplinary teams to conduct research that could not have been undertaken by individual labs. While this funding scheme is likely to ensure disciplinary diversity within research teams (i.e., multidisciplinarity), it might not translate into a level of knowledge integration that is as strong as for the CDFs (i.e., interdisciplinarity).

This presentation will compare the multidisciplinarity and interdisciplinarity of the research papers resulting from different HFSP funding schemes to provide empirical evidence on the relative effectiveness of different strategies aimed at promoting disciplinary diversity in research. A comparison between career stage will also be presented to test the hypothesis that early-career researchers might be

bolder in taking novel approaches to research, whereas established researchers may be playing a role in stimulating that daring among young colleagues.

Measuring the Division of Labor in Interdisciplinary Science
Dr. Phillip Honenberger, University of Nevada-Las Vegas; *Dr. Evelyn Brister*, Rochester Institute of Technology

Team science is the new norm and interdisciplinary collaborations have become more common. How labor is divided on scientific teams—who does what, in what proportion, and for what credit—varies across projects. This paper investigates common patterns of division of labor on disciplinary and multidisciplinary research teams using data from the contributor sections of 11,743 articles published in PNAS in a five year period (2013-2017; 70% of all PNAS articles published in that period).

Journal article contributor sections report what type of labor each author performed—they identify, for instance, who designed experiments, performed experiments, analyzed data, or wrote the paper. Contributor sections have become increasingly common in science and medical journals as a way of designating credit and discouraging ghost and gift authorship.

Larivière et al. (2016) analyze contributor sections for PLOS articles, introducing a metric of evenness for how evenly labor is distributed between authors of papers in different disciplines. Our study extends those findings by tagging author contributions by their individual disciplinary affiliation rather than discipline of the paper, and by using the link between authors' disciplinary identities and types of labor performed to study common patterns of interdisciplinary division of labor in research teams.

First we refine the evenness measure and examine its implications. On our analysis, a team with a more even division of labor is one that has a higher percentage of authors contributing to several tasks. In contrast, a team with a "parceled" division of labor is one where contributors have distinct tasks, as on an assembly line. The evenness of the division of labor can be reported as the average of the number of tasks of its contributing authors. We demonstrate a significant correlation between team size and average evenness, and we report on both team size and average evenness according to article subject category. Applied mathematics and computer science, for instance, have smaller team sizes and greater average evenness, while genetics and immunology have larger team sizes and a more parceled division of labor. Our analysis also compares the evenness scores for papers in different subject categories when team size is taken into account.

We then use novel automated processes to study the division of labor in multidisciplinary teams. From our initial dataset, we hone in on two subsets: 1) those with teams including both biologists and engineers, and 2) those with teams including both social scientists and non-social scientists. Controlling for team size (see above), we draw out implications from our data for the understanding of division of labor in teams that fit these interdisciplinary profiles. Existing metrics of interdisciplinary integration (e.g. Porter & Rafols 2009) report the degree to which a corpus of articles in a research area cite outside their research area and how far away they cite. Our procedures shows how linking affiliation data with contributor data can supplement these metrics to provide a picture of common patterns of division of labor in teams meeting various interdisciplinary profiles.

Do Interdisciplinary Researchers Tend to Join Teams?
Dr. Kevin M. Kniffin, Cornell University; *Dr. Andrew S. Hanks*, The Ohio State University

Interdisciplinary researchers can be reasonably characterized as conducting work that spans the boundaries of traditional disciplines. It is an open question, though, whether interdisciplinarians themselves are prone to span boundaries interpersonally by participating in teams. While substantial bibliometric work has been completed on the pathways of interdisciplinary research products (as reviewed by Kniffin and Hanks, 2017), we will focus on the people conducting research to explore the degree to which interdisciplinarians are more or less likely to participate in teamwork.

Teamwork is interesting to examine in relation to whether someone conducts interdisciplinary research since there is evidence of countervailing trends. In our own research, for example, we have found that STEM doctoral graduates who participate in teams tend to

earn significantly higher salaries (Kniffin and Hanks, 2018) while our analysis of near-term outcomes for all doctoral graduates in the United States from 2010 suggests that interdisciplinarians are penalized in the labor market for at least the year after earning the PhD.

In order to address our focal question, we looked at the 2006 National Science Foundation's (NSF) Survey of Doctorate Recipients (SDR) – a longitudinal panel that is matched with responses to the NSF's Survey of Earned Doctorates (SED) – since the 2006 wave uniquely asked respondents to indicate the degree to which they participated in teamwork with others. We find (with N = 2,748) that people who conducted interdisciplinary dissertations were – controlling for discipline and demographic variables as well as employment sector (industry, education, and government) – significantly more likely to be part of teams with (a) others who are part of different organizations in the United States or (b) others who are part of an institution outside of the United States. In contrast, interdisciplinary dissertators were not significantly more likely to be part of teams on-site or across units within their own organizations.

Our research provides important baselines for future studies that will examine the question of whether interdisciplinary researchers tend to have – over longer career spans – more varied outcomes than mono-disciplinary researchers. For example, bibliometric research suggests that interdisciplinary research products are more likely to be "sleepy beauties" or "late bloomers" (e.g., Ke et al., 2015) while our research will help inform whether a comparable pattern exists for the individuals who conduct early-career interdisciplinary research.

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Spectacles of Inquiry: Perspective-Taking and Interdisciplinary Values
Dr. Lisa Osbeck, University of West Georgia

The talk is organized around discussion of perspective taking as an epistemic activity or practice, one especially important in interdisciplinary communities. I first distinguish several senses of perspective that have emerged in contemporary scholarship: disciplinary perspective, perspective as framework within a discipline, and perspective as personal or cultural identification. I suggest that controversies surrounding the idea that knowledge is perspectival stem in part from a conflation of different senses of perspective, as well as from the assumption that a researcher is hopelessly locked within a given perspective and unable to transcend it. As a corrective, I offer a view of perspective-taking as an intentional effort to transcend a given epistemic vantage point and to imaginatively occupy a different vantage point, by means of which the researcher can trade one set of epistemic constraints or limitations for another set. As an intentional act of this kind, problem-solving is valuable in innovative interdisciplinary science communities because it encourages the ability to navigate strategically between viewpoints for in the interests of a given problem-solving goal and in response to the complexity and demands of a phenomenon. Second, at the level of interaction, perspective-taking can facilitate communication between researchers from different disciplinary backgrounds and enable anticipation of what is needed for effective collaboration.

I will offer an illustration of the importance of perspective taking in interdisciplinary science settings with reference to an analysis of interview transcripts with bioengineering scientists, in the context of a multidisciplinary investigation of cognitive and learning practices in four different research laboratory contexts, on which I collaborated with the ethnographic study's principal investigators. One finding from the study was that researchers from divergent science backgrounds (e.g., engineering and biology) or different skill sets (e.g., experimenting and computational modeling) expressed different views about priorities in problem-solving and revealed implicit hierarchies, with some practices viewed as more consistent with a researcher's view of "good science." On the other hand, our team found that researchers also displayed the ability to adopt perspectives different from that with which they started through concerted effort and targeted educational experiences.

After offering these illustrations, I emphasize that a proper understanding of perspective taking is one that establishes it as a practice that functions to enhance knowledge of complex phenomena and facilitate innovative strategies in collaborative problem-solving. I will end by exploring what is required to cultivate perspective-taking in interdisciplinary settings.

A Team Science Approach to Advance the Understanding of Low Back Pain

Dr. Jacek Cholewicki, Michigan State University; *Dr. John M. Popovich*, Jr., MSU Center for Orthopedic Research, MSU College of Osteopathic Medicine; *Ms. Angela S. Lee*, MSU Center for Orthopedic Research, MSU College of Osteopathic Medicine; *Mr. Payam Aminpour*, Community Sustainability, College of Agriculture & Natural Resources, Michigan State University*; Dr. Steven Gray*, Community Sustainability, College of Agriculture & Natural Resources, Michigan State Univeristy; *Dr. Paul W. Hodges*, School of Health & Rehabilitation Sciences, The University of Queensland

INTRODUCTION: Among health disorders contributing to the global burden of disease, low back pain (LBP) is a leading cause of disability. Like other persistent pain conditions, LBP is increasingly recognized as a multifactorial problem involving biological, psychological and social factors. It is difficult to fully appreciate the complexity of LBP because the knowledge necessary to do so spans many areas of expertise. Indeed, perspectives differ between LBP experts and diverse treatments, supported with variable evidence, are offered. This is not surprising, considering theoretical foundations and emphases vary among disciplines, and these experts (e.g., researchers and clinicians) may have different "mental models" of what and how various factors relate to LBP. A novel way to integrate the interdisciplinary knowledge shared among various stakeholders is a team science approach using collaborative modeling. This study used this approach with a multidisciplinary team of experts to build a model to enhance understanding of the LBP problem.

METHODS: Participants who have contributed significant knowledge to the area of LBP (e.g., publications, contributions to societies, etc.), were selectively recruited for this study. Each participant underwent a structured one-on-one interview to construct a fuzzy cognitive map (FCM) (Mental Modeler software, www.mentalmodeler.org) representing his/her understanding of how factors related to LBP interact and affect patient outcomes (pain, disability and quality of life). This process involved nomination of factors contributing to patients' outcomes and the weighting of the connections (strength of the effect) between these factors. All individual FCMs were then integrated into one meta-model (Gephi software, www.gephi.org). Factors in the meta-model were grouped into 10 categories: Nociceptive Detection & Processing, Behavioral/Lifestyle, Tissue Injury/Pathology, Social/Work/Contextual, Psychological, Comorbidities, Biomechanical, Individual Factors, Outcomes, and Treatment. To determine the importance of each factor expressed in the meta-model, centrality was computed as: Centrality = sum|weight of connections in|+sum|weight of connections out|, where the weight determines the strength of the connection. Based on this definition, centrality is proportional to the number of connections to and from the specific factor in the meta-model, as well as by the weighting of these connections.

RESULTS: From 38 invited experts, 29 (76%) agreed to participate. They represented nine disciplines and eight countries (Basic Science (n=3), Chiropractic (n=4), Orthopedic Surgery (n=2), Physical Medicine & Rehabilitation (n=2), Physical Therapy (n=10), Psychology (n=2), Exercise Science (n=1), Biomechanics (n=3), and Epidemiology (n=2)). The meta-model, that integrated the understanding of LBP of all participants, consisted of 145 factors and 2,233 connections representing interactions among these factors. "Psychology" emerged as the most central category in the meta-model, followed by "Biomechanics" and "Social/Work/Contextual" categories.

DISCUSSION: The integration of 29 FCMs, representing diverse participants' views of LBP dynamics, resulted in a meta-model that was extremely complex, but still feasible to produce meaningful interpretations. This approach could provide the framework for a larger, community-wide platform for further development and refinement of this meta-model. Such a meta-model could then be used to simulate other "what if" scenarios, to identify gaps in knowledge, and to inform new essential research directions to ultimately improve patient care and outcomes for LBP.

CREATIVE APPROACHES TO SUPPORT TEAM SCIENCE IN ACADEMIA
Moderator: Dayan Ranwala, Medical University of South Carolina

Using Collaborative Design to Align Institutional Incentives and Interdisciplinary Team Expectations: The Case of Reappointment, Tenure, and Promotion
Dr. Veronica Stanich, Mr. Gabriel Harp, Alliance for the Arts in Research Universities (a2ru)

As universities increasingly encourage interdisciplinary collaboration and team-based science, Reappointment, Promotion, and Tenure (RPT) policies must be retooled to better align with shifting practices and institutional values.

The Alliance for the Arts in Research Universities (a2ru) supports the integration of the arts, humanities, and design into the interdisciplinary, collaborative research fabric of universities. A2RU built a two-day workshop, grounded in insights derived from 600 interviews with faculty and administrators at 38 research universities, to support faculty and academic leaders who are charged with RTP policy.

This workshop transforms a2ru research insights into a unique, immersive experience that builds knowledge in three ways: 1) Participants acquire understanding and new frameworks to guide their work on their own campuses. 2) Workshop teams co-create tangible, portable tools that become vehicles for the dissemination of better RTP practices. 3) a2ru observations of workshop processes, coupled with participant feedback, inform future workshop iterations as well as further research. Critical elements of the workshop's research-based content and design enable all three types of knowledge creation.

For example, consistent with previous scholarship, we find a recurring theme in the need to render explicit the unspoken expectations, assumptions, and definitions involved in the RTP process. With the user in mind, the workshop experience strategically organizes such relevant research insights according to the approach to RTP (institutional or individual), the key players (administrators and/or faculty), and the stage of the RTP process. In the resulting matrix, users can identify their own situations and thereby connect to germane issues.

The choice to mobilize research insights in a workshop format allows for the benefits of experiential learning, as well as knowledge-sharing among a community of peers. Structural choices for the workshop amplify these positive outcomes. Rather than positioning participants as passive recipients of information, the workshop is structured as a design sprint. This format augments the research-in-translation-to-practice experience, engaging participants as "makers."

In addition to shaping participants' experience of the workshop, the design sprint inherently results in creation—each small group of participants collaboratively creates a practical tool to support the RTP process. Such tools can be shared and disseminated, thereby extending workshop insights to a broader community of impact. a2ru actively supports this process, producing and distributing the best of these team-developed tools such as "What's Next?" a card deck to facilitate personal research planning as well as mentor-mentee dialogue. Likewise, a2ru makes available the "Implicit/Explicit" card deck used in the workshop to surface unspoken understandings of RTP policy and indicate next steps.

a2ru research team members act as participant-observers at workshops and actively gather feedback from participants, gleaning new insights from the process.

Mcubed: A Token-Based Seed Funding Program with No Formal Scientific Review
Dr. Valerie Johnson, *Dr. Mark Burns*, University of Michigan

Founded by faculty at the University of Michigan in 2012, Mcubed stimulates innovative research and scholarship by distributing real-time seed funding to transdisciplinary faculty trios, or "cubes." Teams can secure $15,000 or $60,000 right away, keeping pace with the rapid information flow in today's research environment. Through the program's prior two cycles, a six-year, $27 million investment from U-M and its faculty members has yielded nearly $130 million in external funding, more than 320 publications, roughly 50 artistic and scholarly products and 20 invention disclosure reports or patents. To date, Mcubed has distributed funding to 648 faculty teams, with more cubes forming each month in its current (and third) cycle. For the first time, Mcubed now includes all three University of Michigan campuses—Ann Arbor, Dearborn, and Flint—with 7000 faculty members in its online platform.

MCubed has been featured in venues such as Science (website), The Washington Post, and The Chronicle of Higher Education, and Reuters has twice recognized the University of Michigan system as one of the most innovative university in the world, in part due to the Mcubed program. What's distinctive about Mcubed, and what enables its speedy distribution of team funding, is its substitution of a token-based online peer review system for traditional scientific review. While the lack of a formal scientific review process might appear risky, this departure actually de-risks institutional investments. As recent studies have shown, review panels are typically challenged to distinguish the excellent proposals from the passable ones. Mcubed eliminates this step. Instead of investing in only a handful of proposals determined to be the "cream of the crop" from a lengthy proposal submission and review process, it spreads a smaller level of funding out among teams of researchers self-selected in a novel, real-time peer-to-peer review process. The result is an excellent return on investment and a much healthier research climate.

In this presentation, we will share strategies for the program's implementation across the three U-M campuses, discuss the impact of the program, and explore implications for evaluation and funding of transdisciplinary teams in the broader research landscape.

Working with your Research Development Office to Support Team Science
Dr. Betsy Rolland, University of Wisconsin-Madison; *Dr. Holly Falk-Krzesinski*, Elsevier

As team science expands in size and scope, investigators struggle to build teams and write proposals that implement the principles of team science and take advantage of what we know about making teams work. Outside of the NIH-supported Clinical and Translational Science Award (CTSA) institutions, few universities have resources specifically devoted to fostering and facilitating interdisciplinary research teams or writing proposals that give more than perfunctory attention to how the team will function. As funding agencies integrate team-science review criteria into their funding opportunities, the burgeoning field of Research Development seeks to fill this gap by helping Principal Investigators develop a deeper understanding of the published funding announcements and these special review criteria, while also distilling the field of team-science research into actionable goals and objectives, personnel, and institutional infrastructure to support complex proposals.

The goal of this session is to help team-science leaders understand how best to work with their institutional Research Development teams to submit winning proposals that will result in high-functioning teams. Drawing upon our experience facilitating team science and creating institutional team science services and resources, we will cover:
- What is Research Development and how can RD professionals play a role in facilitating Team Science?
- What services do RD professionals offer?
- What are the key praxis concepts from the Science of Team Science that can help you foster and support multidisciplinary research team?
- How are funding agencies assessing your proposal's team-science components and using special review criteria to encourage inclusion of team-science support in proposals?
- What types of research infrastructure should institutions offer to support complex teams?

Agbioscience: transdisciplinary collaboration and the land-grant university mission in the 21st century
Dr. Julie Aldridge, The Ohio State University

Agbioscience is identified as a significant source of scientific innovation and economic opportunity at land-grant state agricultural experiment stations (SAES) throughout the United States. The impact of agbioscience has been the subject of multiple analyses and reports from private research entities, but a search for the term in online databases produces few to no results. The goal of this study was to use an accepted and established research method to investigate agbioscience for the perspective of experts who are involved in the activity. This study used the Delphi method to develop a definition for agbioscience, explore the differences between agbioscience and agricultural science, identify agbioscience research needs and priorities, and provide insight on how to better prepare future contributors to the field. The expert panel for this study consisted of leadership from SAES and university extension's agriculture and natural resources (ANR) program. Participants represented the Southern, North Central, and 1890's land-grant university regions. In addition to consensus on an agbioscience definition, the panel emphasized the need for transdisciplinary, collaborative approaches to real-world problem solving and identified a skills deficit in agricultural science program graduates and practitioners. Students need to learn through practice how to collaborate beyond the land-grant system's existing disciplinary boundaries. Practitioners need professional development programs to help them develop these skills. Another major theme to emerge is the need to communicate the value of agbioscience research with the public. Agbioscience generalists would have the potential to not only break through academic boundaries, but also to reconnect science-based agriculture with society at large. Currently, students and practitioners are locked inside an academic discipline model created in the mid-nineteenth century. As one Delphi panel expert stated, "the status quo is self-fulfilling".

Rethinking Science as a Vocation: 100 Years of Bureaucratization of Academic Science
Dr. John P. Walsh, Georgia Institute of Technology*; You-Na Lee*, National University of Singapore

Science has long been characterized as a craft practice, and even as a vocation. However, science is increasingly becoming a team activity. We argue that scientific teams are becoming bureaucratized with larger size: characterized by division of labor, standardization, hierarchy and decentralization. Furthermore, we develop this argument to show how this structural change can affect the training and careers of scientists at the individual level and also performance at the team level. We will discuss the training and careers of scientists, the role of new data analytics technologies, the relations between bureaucratization and institutional environment, particularly competition for funding, and the implications for scientific creativity, and for pathologies in science.

We then review a series of empirical studies we have conducted in this area to show the degree of bureaucratization and its effects on the work, careers and products of science. We find that larger size is associated with greater bureaucratization in the team and that over the last several decades there has been an increase in supporting scientists (those who are never lead authors). We find that division of labor is associated with greater productivity in the lab for those doing applied research, but less productivity for those doing basic research. Furthermore, we find that division of labor is associated with greater novelty in the publications, but also with greater likelihood of retractions. Hence, we can see the two faces of the bureaucratization of scientific teams.

We conclude with a discussion of the implications of these theories and findings and develop a set of policy recommendations and outline a research agenda designed to develop science policies and a sociology of science that match this shift from vocation to bureaucracy in science. In particular, we argue that PIs need to decide the extent to which they will encourage "cross-training" in their teams, versus specialization. And, similarly, the extent to which the lines of communication will be hierarchical versus more cross-cutting. Concerns about productivity may push labs toward more bureaucratic structures, including early specialization of graduate students, and more hierarchical structures where students report to post-docs and post-docs report to PIs. But, university labs have the dual function of producing science and producing scientists. There may be tradeoffs in these two goals, and PIs may want to think about the tradeoffs when organizing their research teams. Similarly, university career structures need to change in order to accommodate the growth of supporting scientists, with new positions, new career paths and new evaluation and reward structures that are matched to the changing organization of scientific work.

1. Improving Human-Lion Conflict Research Through Interdisciplinarity

Ms. Jacalyn Beck, *Dr. Maria Claudia Lopez*, *Mr. Tutilo Mudumba*, *Dr. Robert Montgomery*, Michigan State University

Wicked socio-ecological problems are inherently complex and require an interdisciplinary approach to mitigate. Here, we investigated the many drivers of human-lion conflict in East Africa and present a novel conceptual model illustrating the intricate interactions within and between the five main dimensions of conflict. We highlight the importance of broadening research efforts to include these multiple dimensions at all stages of the research process as well as to incorporate higher levels of diversity into research teams. We offer examples and recommendations on how to approach human-lion conflict from a more interdisciplinary perspective. However, challenges exist and will continue to arise as diverse interdisciplinary teams form. We address several main barriers to interdisciplinarity and encourage researchers and institutions to support a team science approach to solving wicked ecological problems like human-lion conflict.

2. Measuring Interdisciplinary Skills Acquisition

Dr. Stefanie Blain-Moraes, *Dr. Christopher Moraes*, McGill University; *Dr. Rob Gorbet*, University of Waterloo

Across North America, educators are experimenting with different approaches to educating interdisciplinary scholars. This is driven by factors such as increased demand for interdisciplinary research to support policy decisions, and the growing need for individuals with the skills necessary to analyze and address complex societal problems which demand the contribution of several disciplines (i.e., "wicked" problems). However, despite broad recognition of the importance of interdisciplinarity, there is no consensus on the specific skill set required to achieve interdisciplinary thinking, and how to teach and assess these skills.

Considering the fact that different disciplines subscribe to different knowledge paradigms leads us naturally to identify one high-level skill required of an "interdisciplinarian" as that of knowledge integration—the ability to integrate across knowledge paradigms. To do this, especially in a collaborative interdisciplinary team, requires appreciation, understanding, and comfort with differences in language, methods, evidence, and beliefs. Learning the skills of knowledge integration has more to do, then, with exercising empathy, humility, and valuing other viewpoints than it does intellectual growth. We use Bloom's Affective Taxonomy as a framework to create a concrete and effective tool to identify associated learning objectives and assess students' progression in this key interdisciplinary skill.

3. The CyberAmbassador Training Program

Ms. Astri Briliyanti, *Dr. Dirk Colbry*, *Dr. Katy Luchini Colbry*, *Dr. Julie Rojewski*, *Mr. TJ Van Nguyen*, Michigan State University

Our project aims to provide training for CI professionals, with the goal of developing "CyberAmbassadors" who are prepared to lead multidisciplinary, computationally-intensive research at their home institutions. It has the following objectives: (1) Develop Curriculum that focuses on professional skills (communications, teamwork, leadership) within the context of large scale, multi-disciplinary computational research; (2) Pilot, Evaluate and Revise the curriculum; (3) "Train the Trainers" by collaborating with external partners.

During our first year, we have focused on curriculum development. We launched our first curriculum, and explored different training modalities: face-to-face vs. online; short vs. longer sessions. Using a Kirkpatrick model of evaluation, we focused on participants' reaction and learning. Our initial result shows that participants were highly satisfied with our curriculum. Their understanding and skills regarding the specific topics that we taught increased. Additionally, we found that the Video Conferencing method had more advantages compared to the face-to-face method to participants. They suggested that such a mode is more convenient for busy people, enables the trainers to reach a wider base of people, and provides a more relaxed environment. Our participants have indicated that online learning can be as effective as in-person meetings.In this poster, we introduce our curriculum and offer preliminary research data from our ongoing evaluation efforts. We will also discuss how this feedback is shaping changes we are implementing in the curriculum.

4. Cross-disciplinary Integration in FDA Team Science

Mr. Kevin Bugin, George Washington University

The Food and Drug Administration (FDA) is responsible for assessing the safety and effectiveness of new drug products before they can be legally marketed and used in clinical practice. This is a critical translational activity on the biomedical research continuum. In order to conduct these assessments, the FDA forms teams of varying degrees of cross-disciplinarity, ranging from multi-disciplinary to trans-disciplinary. A knowledge gap exists regarding how these cross-disciplinary teams operate, specifically their integrative capacity and processes, which hampers the FDA's ability to develop practical guidelines to promote the team effectiveness of its assessments and evaluate the success of interventions to promote cross-disciplinary integration. To address this gap, a mixed-methods, comparative case study design will be used to explain cross-disciplinary integration of FDA teams. This study will leverage the theoretical framework of integration postulated by O'Rourke, Crowley and Gonnerman in 2015, which includes evaluable parameters related to the integration process, both quantitative and qualitative. Characterizing the cross-disciplinary integration process using this framework permits the purposeful selection of FDA teams with high and low integration for a comparison of the skills, abilities and practices at the team level that can be used to inform practical guidelines to promote effective cross-disciplinary integration.

5. Strategies to Promote Effective Student Research Teams in Undergraduate Science Labs

Dr. Kendra Spence Cheruvelil, *Ms. Angela De Palma-Dow*, Michigan State University; *Dr. Karl A. Smith*, Purdue University and University of Minnesota

Many science labs make use of student teams. However, many students resist working in teams, often for good reasons based on prior experiences. Although instructors struggle with how to help student teams be effective, effective teams in science labs are achievable. We increased student learning and satisfaction when working in research teams by: 1) including a teamwork learning objective in the syllabus "to practice effective teamwork and team management, including modeling behaviors of inclusion and ethics, and using leadership skills to foster problem solving, team communication, conflict management, consensus building, and idea generation" and 2) designing and implementing exercises that teach students why they should work in a team and how to be part of an effective student team (e.g., developing shared expectations, norms of behavior, and team culture; building awareness of why team conflict is important and likely student responses to such conflict). We also used individual and team reflections of team functioning following formal team assessment. We will presents pre-/post-test data demonstrating student attitudes and beliefs regarding teamwork and the details of our curricular innovations. These changes resulted in improved student satisfaction and success and reduced instructor guesswork and stress regarding student teams.

6. Motivation, Threat, and Engagement Intensity in Cross-Disciplinary Health, Biomedical, Policy, and Education Teams: Pilot Analysis

Ms. Patricia Deyo, Ms. Ellen Cook, Mr. Kevin Bugin, Ms. Melissa Gentry, Ms. Landria Sheffey, Ms. Leocadia Conlon, Dr. Gaetano R. Lotrecchiano, George Washington University

This is a second phase mixed methods study that follows original research to test a psychometric tool, the Motivation Assessment for Team Readiness, Integration, and Collaboration (MATRICx) (Lotrecchiano et al., 2016; Mallinson et al., 2016), that assesses motivations and threats collaboration in health and biomedical teams. The aim of this study is to investigate the relationship between motivations, threats, degrees of engagement, and satisfaction of human need among team members working in established knowledge producing teams.

A mixed methods comparative analysis study is being conducted. The qualitative method being used is semi-structured in-person interviews with individual members of knowledge producing teams. Following the interview, participants are asked to complete the MATRICx instrument, which utilizes quantitative methods. Data from the qualitative interviews will be triangulated with the quantitative survey data to support further interpretation of the meaning of the constructs of the MATRICx. An initial pilot of one teams qualitative data was completed in spring 2019.

Based on preliminary analysis from coding of the initial four interviews, several findings can be deduced. A total of 85 codes were identified across one team. Three codes were identified across all four participants which included collaboration, role definition, and collegial. Prioritization, meeting schedules, and team identity were also frequently used codes across three of the four interviews. There were an additional 39 codes that were only used one time across the interviews. Additional analysis will be conducted to determine if these individual codes should remain independent or recoded through the iterative coding process.

Since this study has only analyzed a subset of data, data collection and analysis will continue as the research team continues. Coding will continue as an iterative process following the methods outlines for the study to ensure intercoder reliability and continuation of thematic analysis as more data is analyzed. Once qualitative data is analyzed and quantitative data is collected, merging and integration of the data will occur.

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7. The Economics of Collaboration at a Regional University

Dr. Stephen Crowley, *Ms. Marisa Richter*, *Mr. Archer Ward*, Boise State University

University leadership promotes the value of both collaboration and interdisciplinary research. Despite these efforts interdisciplinary collaborative research remains the exception rather than the rule at many universities. If the claims advanced are correct there is a 'gap' (call it the collaboration gap) between what leadership wants and what researchers do. Here we provide an initial report on our attempts to analyze the collaboration gap at one regional university.

We report the results of interviews with both leadership and faculty regarding interest in and incentives for interdisciplinary and collaborative scholarly activity and attempt to make sense of the feedback we have received. We suggest that an 'economic' model of faculty decision making that tracks 'return on investment' (for resources such as time and pay-offs such as publications) makes better sense of the collaboration gap (at the institution we studied) than accounts based on some form of ignorance (concerning incentives for collaboration) amongst faculty.

8. NDNQI®: Using Big Data to Advance the Science of Interprofessional Teams

Dr. Nancy Dunton, *Dr. Teri Kennedy*, The University of Kansas Medical Center

Interprofessional practice and education is viewed as the holy grail to achieve the Quadruple Aim in healthcare: improved patient, population, price, and practitioner outcomes. A 2014 scoping review found that research had not yet demonstrated the impact of IPE, citing the need for systematic research to strengthen the evidence base for interprofessional team-based care.

The National Database of Nursing Quality Indicators (NDNQI) ® Survey, completed by 240,000 RNs in 2018, includes interprofessional relationship measures between RNs and physicians, APRNs, pharmacists, therapists, and social workers. RNs rated relationships on conflict management skills; respect; assignment of blame for adverse events; shared accountability; and understanding roles, knowledge, and skills of RNs.

RNs rated "respect for the contributions of RNs" most highly and gave the lowest rating to "colleagues understand the roles, knowledge and skill of RNs." Interprofessional relationships were highest on critical care units, followed by ambulatory care. Ratings were lowest in the operating room and perioperative units. RNs rated their relationships with social workers more highly than with other professions. Ratings were lowest for physicians.

These results highlight areas for improvement in interprofessional healthcare and demonstrate the promise of big data to advance the science of interprofessional teams in healthcare.

9. Engagement Models of Science Communication: Working Tools for Team Researchers at the Micro Level

Ms. Soraida Garcia, *Dr. Laurel Weldon*, *Dr. Rosalee Clawson*, *Ms. Allison Roberts*, Purdue University, PPRI

It is widely agreed that early involvement with stakeholders, and building thick relationships between researchers and communities of interest, dramatically improves public impact and relevance of scientific research. Much of science communication follows a marketing model for dissemination of results rather than an engagement model, offering techniques to attract audiences to a completed research project, rather than outlining strategies for early engagement at the individual researcher level. Even the most innovative models of science communication- focusing on social media, the arts, or game playing- often treat scientific results as a product to be sold rather than a process in which to participate. Also, in those bodies of scholarship that are focused on engagement, actionable models at the micro-level for individual researchers are hard to find. Instead, it tends to focus at the macro-level of administrative policy or university-wide supports and enabling structures. We offer a template for an engagement model of science communication that emphasizes relationship-building and early connections with communities of interest, at the stage of problem formation and question development. We provide several concrete examples of interdisciplinary research on grand challenges to illustrate how models for science on different places in the continuum work.

10. The role of transdisciplinary healthcare teams and tollgates in quality improvement processes

Dr. Courtney Goetz, *Dr. Sukhesh Sudan*, *Dr. Judy Arnetz*, *Dr. John vanSchagen*, Michigan State University; *Dr. William Baer*, *Susan Hoppough*, Mercy Health St. Mary's; *Dr. Bengt Arnetz*, Michigan State University

Despite substantial attention, healthcare systems face severe and recalcitrant quality challenges, like hospital-associated infections and 30-day readmissions. This suggests that the multidisciplinary teams traditionally used to address and implement quality initiatives are not sufficiently effective. We purport that there needs to be a structured process for implementation that promotes inter- and transdisciplinary team processes. In order to achieve the formation of such high-performance quality improvement teams in healthcare systems, we propose the use of tollgates. Tollgates are process checkpoints that facilitate an iterative process used to identify unit-level drivers of, and barriers to implementation, allowing for accurate adaptations to be made. For each proposed intervention, teams examine high- and low- performing units and identify drivers and barriers, which can then be statistically verified for sensitivity and specificity. The accurate, comprehensive identification of these factors requires effective collaboration, best achieved via transdisciplinary healthcare quality teams. We hypothesize that inter- and transdisciplinary teams will be able to identify drivers and barriers more accurately, resulting in higher sensitivity and specificity in proposed interventions, as well as better implementation outcomes. We plan to study the relationship between team maturity (multi-, inter-, transdisciplinary) and the effectiveness of tollgates at driving quality improvements.

11. A conceptual model to guide planning, implementation, and evaluation of transdisciplinary research

Ms. Sarah D. Hohl, *Dr. Sarah Knerr*, University of Washington, Fred Hutchinson Cancer Research Center; *Dr. Shirley Beresford*, University of Washington; *Dr. Marian Neuhouser*, *Dr. Beti Thompson*, Fred Hutchinson Cancer Research Center

This work describes a conceptual model of determinants and outcomes of transdisciplinary research. The model offers the public health research and practice community tools to bolster evaluation capacity, advance knowledge, and inform efforts to conduct transdisciplinary research to confront complex public health problems. The model was developed based on theoretical literature of transdisciplinary research and the evidence generated from transdisciplinary initiatives in the United States. The model includes four major components: problem focus, institutional resources and organizational structure, collaboration characteristics, and transdisciplinary outcomes. The model posits that the problem focus i.e., the topic area that a research endeavor aims to address, and institutional resources and organizational structure influence collaboration

characteristics, which, in turn influence outcomes of transdisciplinary research. Improved population health benefits from collaborative efforts to address the interacting biological, social, behavioral and environmental factors that influence public health problems and their outcomes. The conceptual model presented here may facilitate systematic planning and implementation of transdisciplinary projects, assist in evaluating transdisciplinary research, determining if a transdisciplinary approach is suited for a research question, and, perhaps most importantly, assess the value of transdisciplinary approaches to resolving complex public health problems and promoting gains in public health.

12. Determining Depth of Collaboration Potential

Dr. Alicia Knoedler, Independent Contractor; *Mr. Dave King, Ms. Jill Macchiaverna*, Exaptive, Inc.

A funding agency wants to identify and invite investigators to a convening around a topic relevant to their work. Undergraduate students wants to locate faculty with openings in their research programs to include undergraduate researchers. Team leaders want to become knowledgeable about the current topics in their field to develop new teams to pursue leading research efforts. These and many other connection challenges occur on a daily basis in the domain of research development. Beyond just finding people, what are some ways that research development professionals can assess the collaboration potential within a research community? This Idea Showcase presentation will highlight concepts, methods and tools to help research development professionals' increase their awareness and knowledge of information and factors that can influence research collaboration.

13. Successful Process Evaluation Provides Insight into Team Development and Goal Attainment

Ms. Hannah Love, *Dr. Bailey Fosdick*, *Dr. Jennifer Eileen Cross*, *Dr. Meghan Suter*, *Ms. Dinada Egan*, *Dr. Ellen Fisher*, Colorado State University

It is becoming more common for scientists to break out of their academic silos and combine knowledge to solve pressing scientific questions as members of teams. What makes an interdisciplinary scientific team successful? Often success is measured using classic metrics like publications, grants, and invention patents. However, these products may take years to amass. What if you needed to know 'in the moment' if a team was engaging in a meaningful way to meet their goals and achieve success? A process evaluation study examines various aspects of team interactions as indicators of long-term success. At Colorado State University, from 2015-2017 we conducted a mixed-methods evaluation on eight interdisciplinary research teams to investigate the processes of team development. Using a rank correlation, our results report which process metrics correlated with classic team outcomes. More specifically, successful teams are gender inclusive, serve on student committees together, and more!

14. Using structured dialogue to break down disciplinary silos within global development teams

Dr. Anna Malavisi, Western Connecticut State University; *Dr. Marisa Rinkus*, *Dr. Michael O'Rourke,* Michigan State University

The theory and practice of sustainable development gives rise to many challenges, not least, how to achieve effective communication among the various disciplines within global development teams. The absence of effective communication can lead to a lack of mutual understanding. We might wonder whether different team members share an understanding of the concepts of development and sustainability? Do they coordinate their thinking about the impact on the communities that are the principal beneficiaries of their work? We submit that structured dialogue about these and other issues that undermine deep, mutual understanding within global development teams can improve the effectiveness of sustainable development efforts.

There is a need to generate a space for critical reflection and dialogue about the values and beliefs that influence development decisions. The Toolbox Dialogue Initiative offers an innovative, concrete, and tangible approach to critical dialogue that can help in two ways. First, it can generate a space for critical dialogue within teams about issues that matter

to them; second, it can enable discussion and analysis of specific concerns that afflict those working in the practice of sustainable development, such as conflicting assumptions, power dynamics, implicit biases, ethical issues, and epistemic injustice.

15. ICPSR Virtual Data Enclave as a Collaboratory for Team Science

Dr. John Marcotte, *Ms. Sarah Rush*, *Ms. Sara Britt*, University of Michigan

A challenge of managing access to restricted-use data is to ensure adequate protections and at the same time break down barriers to team science. Security requirements for restricted-use data often present obstacles to team science. For example, requiring the use of a non-networked computer thereby prevents file sharing and collaboration. The trend in security for restricted-use data is moving towards providing access through computing enclaves. Such enclaves can provide collaboration space for research teams and enhanced security over other options for restricted-use data access. Since this collaboration space is within the computing enclave, the shared disk space meets security requirements for restricted-use data.

As compared with non-networked computers, computing enclaves offered two important security enhancements: (1) Prohibiting the download of restricted-use data; and (2) Vetting of output for disclosure risk. Computing enclaves are accessible through encrypted network connections and prevent researchers from downloading or uploading restricted-use data and derivatives. Moreover, these enclaves enable third party review of output for compliance with disclosure protections such as minimum cell sizes and embargoed variables.

ICPSR has deployed one these enclaves. The ICPSR Virtual Data-Enclave (VDE) is accessible through encrypted network connections and two-factor authentication. The VDE facilitates team science for the analysis of restricted-use data archived with ICPSR. Because researchers access the restricted-use data virtually, physical proximity is no longer a barrier to collaboration. The VDE enables researchers in different disciplines and at different organizations to work together.

In this paper, we illustrate how the ICPSR VDE (and computing enclaves in general) promote team science by serving as a secure online Collaboratory.

16. U-LINK: The development and evaluation of an innovative program to support high-impact interdisciplinary research

Dr. Susan E. Morgan, Dr. Ali Mosser, Dr. Soyeon Ahn, *Dr. Tyler Harrison*, *Dr. Jue Wang*, Ms. *Ashley Reynolds*, Ms. *Qian Huang*, Ms. *Bingjing Mao*, *Dr. John Bixby,* University of Miami

The University of Miami has developed an innovative program, called U-LINK (**U**niversity of Miami's **L**aboratory for **IN**tegrated **K**nowledge), designed to foster high-impact interdisciplinary research and education. In addition to its focus on societal grand challenges, U-LINK has five unique (unusual?) qualities: 1) a 2-phase structure that provides protected time for team development and vision refinement during Phase I; 2) strong, meaningful partnerships with the Graduate School (which funds the participation of a doctoral student on each Phase II team), the Clinical & Translational Science Institute (which financially supports one Phase I team), and the Libraries (which support the participation of librarians as U-LINK team members); 3) dedicated meeting space in each of 3 campus libraries helps to ease geographic barriers; 4) embedded librarians on each U-LINK team; and 5) sustained team science training and education based on empirically supported best practices for interdisciplinary collaborations. The success of U-LINK will be evaluated on several metrics, including team success (ROI from external funding, publications and citations) relative to non-U-LINK collaborative teams, as well as organizational impacts including future interdisciplinary collaborations by awardees, and greater levels of faculty satisfaction and commitment to the organization. Early outcomes of the U-LINK initiative are reported.

17. Maintenance of a Multi-disciplinary Team to Study Preoperative Anxiety in Spine Surgery: A Two-Year Case Study

Mr. Arif Musa, Wayne State University; *Dr. Jeffrey C Wang*, *Dr. Frank L Acosta*, *Dr. Rana Movahedi*, University of Southern California; *Ms. Adana Melkonian*, Western University of Health Sciences; *Mr. Alan Shahbazi*, Touro College; *Dr. David Safani*, University of California; *Mr. Syed F Hussain*, Wayne State University; *Dr. Gligor Gucev*, University of Southern California

Multi-disciplinary teams are attractive in clinical research for a variety of reasons including varied expertise, resource efficiency, and potential for creative solutions. This case study describes the activity of a multi-institutional and interdisciplinary taskforce over a two-year time course and documents methods used to maintain the team in the face of changes following its initial development. The Spine Preoperative Anxiety Research Taskforce (SPARTA), a team of students from the University of Southern California, University of California Irvine, and Western University of Health Sciences and faculty in the fields of psychiatry, anesthesiology, neurosurgery, and orthopedic surgery, was developed to investigate preoperative anxiety – an under-studied phenomenon. Team members were chosen based on their expertise, interest in studying preoperative anxiety, and previous team building experience among other factors. The team obtained Institutional Review Board approval and was awarded the Nation Institutes of Health Southern California Clinical and Translational Science Institute (NIH SC CTSI) Team Building Award. After two years of activity, SPARTA produced research leading to two podium presentations, six poster presentations, and one peer-reviewed publication. As a result, the goals of SPARTA have shifted from development to maintenance of the multi-disciplinary team following the relocation of students to medical school and influx of new members, which presented several challenges. Solutions included reallocation of responsibility such as by assigning the Department of Anesthesiology at the University of Southern California the role of managing grant funds on behalf of the team. Outsourcing account management allowed members of SPARTA to redirect resources to the development of future research projects and to disseminate findings to the greater scientific community via conference travel. Previously, the team was local to southern California, but over the course of the second year, integral team members relocated to two different states. This led to further reliance on electronic means of communication such as by text messaging, online video calls, and electronic mail. The addition of new members also required reallocation of responsibilities and review of each team member's role in SPARTA. Further plans were made for obtaining additional funding to maintain team activities and for developing follow-up studies. The presentation of this two-year case study analyzes the activities of a multi-disciplinary clinical research team and efforts to maintain those activities despite logistical challenges.

18. R2D2: A Team Approach to Bridging Research in Medicine and Public Health

Dr. Harold W. Neighbors, *Dr. Ike Iyioke*, Michigan State University

The purpose of this poster is to present an innovative NIH-funded developmental research program titled, "Research to Reduce Disparities in Disease" (R2D2). R2D2 develops the research skills of medical students at the Michigan State University College of Human Medicine (MSU-CHM). R2D2 prepares medical students from underrepresented groups to address racial/gender health disparities by developing a transdisciplinary research education program that combines medicine and public health. R2D2 prepares medical students to conduct the transdisciplinary research necessary to achieve health equity in cardiovascular diseases by providing mentored research internship opportunities to bridge the artificial boundary between medicine and public health. To accomplish these important goals, R2D2 created a trans-disciplinary team consisting of faculty from Public Health, Medicine, Psychology, Philosophy (bioethics), and Health Informatics. Medical doctors play an important role in the nation's health by treating the sick. Public health complements medicine by focusing on population health. Medicine and public health are natural allies. However, professional differences in training and perspectives have led to a false impression that public health works "upstream" on prevention while physicians work "downstream" on patient care. R2D2 medical students will combine medicine and public health by bringing biology into the community and the community into the clinic.

19. Education in Maximizing Team Performance for Early-Career Biomedical Research Faculty

Dr. Barbara Nicklas, *Dr. Holly Brower*, *Dr. Amy Wallis*, *Dr. Michael Nader*, *Ms. Lyndsay Trost*, Wake Forest University

Early-career biomedical research faculty are often isolated by department or discipline and are not provided training opportunities in team science. To address this, the Wake Forest Clinical and Translational Science Institute Team Science Program developed "Maximizing Team Performance" education modules as part of a broad "Translational Scholars Academy". Scholars are early-career research scientists and the modules are delivered by team science faculty experts from the Wake Forest School of Business. The curriculum includes three sessions where scholars learn team development norms and best practices and develop skills to effectively lead teams. For program development, a mixed methods needs assessment was conducted consisting of a research scholar survey (n=42) and semi-structured individual interviews (n=8). Responsive training modules were constructed based on the popular classical model of team development (Tuckman, 1965) involving stages of forming, storming, norming and performing. Participants engage in case analyses, problem solving, lectures and class discussions about the value and process of developing team charters, engaging all members of a team, resolving conflict, planning and managing effective meetings, and follow-through. Scholars reported 93% high satisfaction; evaluation of new team formation and team effectiveness is on-going.

20. Applying Team Science Principles to Biomedical Publications Teams: Understanding Team Effectiveness

Ms. Quentin O'Brien, Dr. *Gaetano Lotrecchiano*, George Washington University

The Science of Team Science is a relatively new interdisciplinary field of study that aims to investigate the factors that hinder or facilitate team-based research and practice, with a focus on how these factors impact scientific innovation and translation. Teams and their interactions are complex, making measurement of teams' characteristics and outcomes challenging. There is a myriad of methods used in the Science of Team Science that aid in measuring the effectiveness of biomedical teams. Bibliometric analysis is one method by which researchers have attempted to measure team effectiveness. In bibliometric studies of team effectiveness, journal, article, and author level data have been used as a proxy for assessing the value of science teams in producing new and/or integrated knowledge. This method, however, is not without its flaws, as co-authorship does not necessarily equate to collaboration and teamwork. Bibliometrics are solely quantitative and leave much to be desired regarding the qualitative interactions between teams working together on biomedical publications. These quantitative metrics cannot provide sufficient insight into the factors that facilitate team functioning, effectiveness, and quality of experience. Given this gap, this case study aimed to assess a biomedical publications team using both quantitative and qualitative methods. Bibliometric data were collected and analyzed by the author. Additionally, a team teleconference with the biomedical publications team occurred in Fall 2018, and qualitative and quantitative coding of the discussion were used to evaluate team interactions. These methods revealed that scientific impact measured by bibliometrics was relatively equal between authors, with only one author having an h-index of at least 20, suggesting no significant differences between authors' publication impacts. Coding of discussions between team members revealed positive sociopsychological dynamics and high levels of cohesion, as well as robust information sharing among team members leading to knowledge transfer and progression toward project goals. Conflict was least prominent among all types of communication, and when it did occur, it was resolved quickly. Preliminary findings from this study suggest that high levels of positive social interactions and cohesion are necessary to assembling functional publications teams. These findings point to the need to further understand optimal team factors when assembling biomedical publications teams. In future studies, more emphasis on the use of qualitative methods may help to provide further insights into the characteristics of teams and their members that facilitate effective functioning and positive team experiences.

21. Team-Based Approaches to Opioid Misuse in Mid-Michigan

Mr. Payam Aminpour, *Dr. Madhur Chandra*, *Ms. Suzanne Neefus*, *Dr. Michael O'Rourke*, *Dr. Stephanie E. Vasko*, Michigan State University

Opioid misuse is a complex multifaceted problem with social, economic, biological and behavioral dimensions. We will employ an interdisciplinary team science approach to investigate the factors underlying the misuse of prescription opioids in Clare and Gladwin in order to integrate the knowledge and perspectives shared by various stakeholders. In the background of the problem is a policy shift in laws pertaining to prescription opioid use and a concomitant drain on hospital resources as perceived by community partners. Our methodology encompasses a combination of structured survey questions and qualitative interviews to elicit mental models that will help identify differential stakeholder perspectives on the issue. Our study will thus help enhance understanding of the larger opioid crisis as experienced by the community.

22. Evaluating Translational Research - Tell Us What You Think

Ms. Kristi Pettibone, National Institute of Environmental Health Science

The National Institute of Environmental Health Sciences (NIEHS) published a translational research framework that builds on previous models (Pettibone et al., Environmental Health Perspectives 2018). The framework defines five categories or rings of translational research that parallel the traditional translational research categories and new category names recognize the contribution of non-clinical work to the translational process. The model also incorporates nodes along these rings that represent the types of activities that might be conducted within these categories of translational research. Finally, the model recognizes movement from node to node as well as from ring to ring as translational. The framework can also be a helpful tool for reflecting on and demonstrating the value of team science in translational research. NIEHS is now using the model to evaluate translational research efforts, including the contributions of team science to translational work. This poster will provide an overview of the framework, will highlight the benefits of the framework, and will describe the strategies we are using to evaluate translational research. This poster will be designed as an interactive opportunity for participants to provide input on key evaluation questions that will shape how we ultimately use the framework to assess translational research efforts.

23. Function, information and contributions – an evaluation of national multidisciplinary team meetings for rare cancer types

Ms. Linn Rosell, *Dr. Jessica Wihl*, Lund University; *Mr. Oskar Hagberg*, *Dr. Björn Ohlsson*, Regional Cancer Centre South; *Dr. Mef Nilbert*, Danish Cancer Society Research Centre

Background and Objective: Following centralized treatment for rare cancer types in Sweden, virtual national multidisciplinary treatment meetings (MDTM) have been established. We assessed function, information, participants´ contributions and views of the national MDTMs for rare cancer types.

Methods: Data on participants' views were collected using an electronic survey distributed to participants in six national MDTMs. Data from structured observations were obtained from the MDTMs for penile-, anal-, and vulvar cancer using the standardized observational tools MDT-MOT and MDT-MODe which assess information presented and participants' contributions to the case discussion.

Results: Participants' rated the national MDTMs favorably with high scores for development of competence and consideration of patients comorbidity. Areas that received lower scores included stuctured evaluations of MDTMs functionality, technology and guidelines for communicating treatment recommendations. Application of the observational tools rated case histories, leadership and teamwork as well-functioning, whereas patient-centered care, consideration of comorbidities, psychosocial aspects and involvement of care professionals received low scores.

Conclusion: National virtual MDTMs are feasible with well-functioning leadership and teamwork. Weaknesses identified related to limited consideration of patient-centered aspects and suboptimal contribution to the case discussions from care professionals. Increased attention to these factors could further optimize treatment recommendations from national, virtual MDTMs.

24. The Bio-CS Bridge: A Transdisciplinary Team Approach to Integrating Biology and Computer Science in High School Curricula

Dr. Elizabeth Ryder, *Dr. Carolina Ruiz*, *Ms. Shari Weaver*, *Dr. Robert Gegear,* Worcester Polytechnic Institute

To learn to solve today's complex biological problems, high school students need to integrate scientific practices such as experimental design and hypothesis testing with computational thinking and skills such as modeling, simulation, and systems approaches to biology. However, it is difficult for educators to create integrated 'STEM+C' curricula, because teachers of biology and computer science have little understanding of the terminology, key concepts, and approaches that each side has to offer.

To address this problem, we created a transdisciplinary (TD) team consisting of university specialists in biology, computer science, and education, graduate and undergraduate students, and high school teachers and students.   The curriculum we are creating involves students in real research – a citizen science project addressing pollinator decline – while they learn scientific practices and use computational approaches. The TD team approach allowed us to build a shared vision for the project, and an understanding of teachers' needs in the classroom. In addition, teacher feedback helped us to make better choices in developing our computational tools, which in turn has allowed more varied and modular curriculum. We will present our ongoing progress in team development, as well as a sample of the curriculum itself, which our teachers are currently piloting.

25. Adoption of the scrum framework for agile project management in a research network

Mr. Enric Senabre Hidalgo, Internet Interdisciplinary Institute

This poster describes the process of adoption of agile methods for the online coordination of collaborative research. It's based on a case study at the Centre for the Evaluation of Complexity Across the Nexus (CECAN), a research network hosted by the University of Surrey, for testing and promoting innovative policy evaluation approaches. The study addresses the extent to which key principles and tools usually used in scrum, a specific set of agile principles and practices for self-organizing cross-functional teams in software development projects, can contribute to the collaborative management and coordination of tasks in research processes. The responses from interviews with 17 researchers, as well as participant observation and analysis of online activity, are examined and presented in this case study. Results indicate that integrating agile methods and principles for interdisciplinary collaboration can have a positive influence on team dynamics and efficiency, but it also requires a high degree of flexibility and a "learn by doing" approach.

26. Advancing Team Science Principles through Interprofessional Team-Based Education

Dr. Sarah Shrader,The University of Kansas,; *Dr. Teri Kennedy*, The University of Kansas Medical Center

Interprofessional team-based care addresses the needs of complex patients and connects with the Quadruple Aim in healthcare for improved patient, population, price, and practitioner outcomes. Safety-net clinics serve high-need patients experiencing health disparities who benefit from coordinated team-based care.

The University of Kansas Medical Center developed an academic/community partnership between health professions educators and safety-net clinics serving patients in Kansas City and Leavenworth, Kansas. Interprofessional practitioners at these sites were provided with two educational interventions that employed team science principles spanning over 9-months.

Pre- and post- survey data was collected using the Assessment for Collaborative Environments (ACE-15), a rapid 15-item assessment tool measuring practitioners' perceptions of interprofessional "teamness," suitable for a range of health professionals and clinical sites. The tool was administered to healthcare team members at baseline and 9-months (n=28) later following the educational team science intervention. Means were compared using an unpaired t-test.

Practitioners exposed to team education had improved scores on all 15-items. Seven of the items reached statistically significant improvements in "teamness"(p-value < 0.01). The largest improvement was the item stating "all voices on the team are heard and valued." This intervention demonstrates the potential of interprofessional team-based education to advance team science principles.

27. The Collaboration Kit: Research Insights Transformed into Practical Support for Interdisciplinary Collaboration

Dr. Veronica Stanich, *Mr. Gabriel Harp*, Alliance for the Arts in Research Universities

The Collaboration Kit is a physical toolkit that allows users to create for themselves the Alliance for the Arts in Research Universities (a2ru) two-day workshop on interdisciplinary collaboration. The workshop experience, and the Kit, represent a particular phase in a2ru's research-to-practice cycle, which comprises data collection and analysis, derivation of insights, translation of insights into experiences, and finally collecting data from these experiences. For the Collaboration Workshop, we used data from our interviews at 38 research universities to surface characteristics of effective collaboration. Building on those characteristics, we designed the framework for a hands-on workshop experience. In this poster, we highlight individual activities in the workshop, identifying the research basis for each component and explaining how insights were translated into activities. We also unpack the workshop's recursive design, wherein participants engage on two levels: acquiring information, skills, and best practices about collaboration even as they immerse themselves in a simulation activity that requires collaboration with other participants. By translating our research insights into hands-on activities, we mobilize all the benefits of active learning. We also use the experience as an opportunity for further research, completing the research-to-practice cycle.

28. Data Science and Data Analytic Learning Environments at Small Liberal Arts Institutions

Dr. John Symms, *Carroll University*

On March 29 and 30, Carroll University hosted an NSF funded workshop with the goal being to form a consortium of small liberal arts colleges that would work together to expand the usage of and development of next generation digital learning environments (NGDLE's) for teaching data science and data analytics (DSA). The workshop was attended by 55 people from 11 different institutions. Randomly assigned to teams based on interests, eight teams of participants worked on team building and content goals. Content consisted of NGDLE's, DSA, learning science, and team science. Given the importance on working across institutions, team science was a central theme throughout. The consortium is working on six work stream goals, designed around four fundamental research questions: (1) How will NGDLE's prepare students for employment that requires DSA? (2) How will the design of DSA NGDLE's account for the variability of learners? (3) How will NGDLE's be assessed to measure student DSA competency? (4) How will a national consortium for digital learning at small liberal arts institutions form and function to sustain and expand the workshop outcomes? We will report on results thus far, as well as report on post-workshop team activities. (NSF Grant No. 1824727)

29. The ECHO Transdisciplinary Team Science Model

Dr. Leslie Thompson, *Dr. Christina Park*, *Dr. Matthew Gillman*, NIH/ECHO

Determining how a broad array of early environmental factors influence child health across the lifecourse is challenging. NIH's Environmental influences on Child Health Outcomes (ECHO) program, whose mission is to enhance the health of children for generations to come, addresses this challenge within a complex multidisciplinary consortium of over 1000 investigators. ECHO espouses a team science framework to cultivate investigator collaboration and novel approaches that transcend disciplinary boundaries, which we call transdisciplinary team science (TDTS). Based on observations within the

first two years of ECHO and supporting literature, we developed a preliminary causal model for achieving TDTS. It involves two interrelated pathways, one via team science principles and the other via solution-oriented research practices. The purpose of this structured literature review is to refine the model and identify team member attitudes that promote these pathways. Early findings suggest that program and peer leadership can strengthen team integration by implementing best-practices for team science, like shared mission, language, and goals, and thereby fostering positive team-oriented attitudes. Motivation for conducting actionable science that involves early stakeholder input may enrich team-level stakeholder engagement and, subsequently, solution-oriented research. Though teams may achieve integration and solution-oriented research independently, we propose that together they catalyze TDTS.

30. Team-Based Approaches to Arts Participation in Mid-Michigan

Dr. Stephanie E. Vasko, *Ms. Vy Dao*, *Mr. Scott Jarvie*, *Mr. AJ Rice*, *Dr. Michael O'Rourke*, Michigan State University; *Ms. Debbie Mikula*, Arts Council of Greater Lansing

Our study investigates arts participation of diverse populations in our community. Working with the Arts Council of Greater Lansing, we asked, what do arts experiences look like in these communities, and in what ways and spaces do these groups participate in the arts? Using both qualitative methods to collect narratives from diverse community members, and quantitative methods to measure the economic impact of the arts, our team considers the ways that arts and culture exist and matter to members of these communities, and how it might inform arts programming. As a transdisciplinary team with extensive backgrounds in arts-based education and African American and African Studies, we share a deep concern for exploring the relationship between the arts and justice. We are particularly interested in how the results of this inquiry could be used to direct resources to the spaces and programs that most effectively contribute to the economic development of the Greater Lansing area.

31. The AAAS Center for Scientific Collaboration and Community Engagement (CSCCE) – a research and training institute to support scientific community building.

Ms. Lou Woodley, *Dr. Rebecca Aicher*, AAAS

The AAAS Center for Scientific Collaboration and Community Engagement (CSCCE) was established in late 2018 as a research and training institute to support the individuals who nurture scientific communities and teams. Community engagement managers (CEMs) may be found in a range of scientific communities – from those convened by professional associations to large-scale collaborations between multiple research institutions. They may also possess a broad range of job titles – from program directors to project administrators and community managers. CSCCE's activities combine research and practice to deliver an evolving set of resources and support a new community of practice of scientific CEMs, wherever they are found.

CSCCE has three synergistic areas of focus: i) The AAAS Community Engagement Fellowship Program, which trains and connects scientific CEMs through a year-long professional development fellowship; ii) on demand training and online resources for scientific CEMs, including workshops, reports and webinars and; iii) research into the roles of scientific CEMs including defining the skillsets of community professionals, and the impact of CEMs on communities focuses on broadening participation in STEM.

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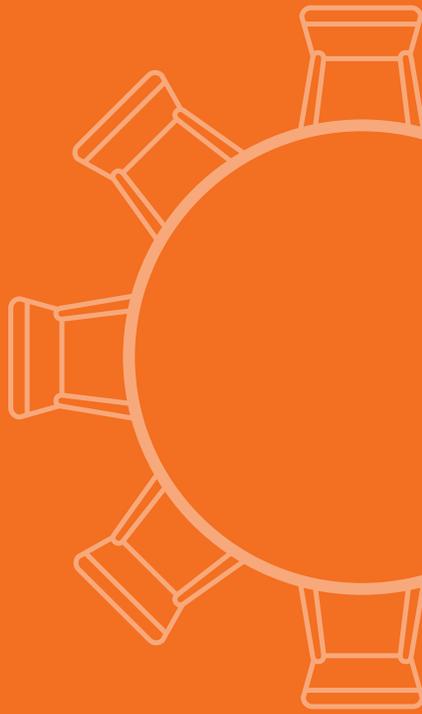
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The SciTS Meritorious Poster Awards recognize posters that demonstrate excellence in communicating scholarly or practice-based content and cover topics of significance to the field of team science. This year's poster awards will be voted on by the community during the poster session.

The SciTS Outstanding Presentation Awards acknowledge presenters whose demonstrate skills in conducting rigorous, innovative scholarship are matched by their ability to engage an audience and communicate their ideas with clarity.

Poster and Presentation Awards will be awarded to individuals the following categories:
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- Established Career, Practice or Applied Focus

Join us in congratulating this year's awardees, to be announced at the meeting!

Unconference Details

Have you ever met people at a conference and wanted to start a project, but not had he structure or opportunity to capitalize on that? Have you heard a talk you want to follow up with? Do you need to meet up with current collaborators for a focused work sprint?

This year at SciTS 2019, you'll have the opportunity to engage in new collaborations, talk to old collaborators, and do deeper dives through an unconference. The unconference will be on Wednesday, May 22nd, from 2:15 - 4:45 p.m. Dr. Stephanie E. Vasko will lead you through an icebreaker, explain the charge of the afternoon, and then you can break off into work groups. We'll come back together for series of flash talks about our unconference experiences at the end. In the spirit of preplanning, connecting, and sharing ideas about projects for the unconference, we've set up a Slack at inscits.slack.com, with a channel called #unconference, that you can use. If you need an invite to Slack, have questions about the Slack process or about the unconference, please contact Dr. Vasko at vaskoste@msu.edu

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Please take 2 minutes to complete this brief but valuable post session evaluation. Responses are anonymous and will be used to improve future programming.

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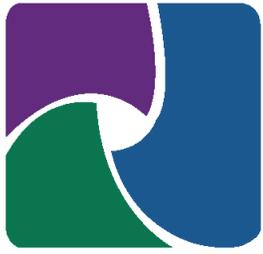
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