

Quantum Matter and Information

The First Annual Scialog Conference
October 16-19, 2025

scialog2025[®]



The Brinson Foundation

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FOUNDATION

RESEARCH CORPORATION
for SCIENCE ADVANCEMENT



KEVIN WELLS

Scialog: Quantum Matter and Information

Objectives

1. Engage in dialogue with the goal of accelerating high-risk/high-reward research.
2. Identify and analyze bottlenecks to advancing fundamental science for understanding quantum matter and information and develop approaches for breakthroughs.
3. Build a creative, better-networked, collegial community that is more likely to produce breakthroughs.
4. Form teams to write proposals to seed novel projects based on highly innovative ideas that emerge at the conference.
5. Most importantly, enjoy the discussions about where this field should go and how we can work together to get there.

Process

Brainstorming is welcome; don't be afraid to say what comes to mind.

Consider the possibility of unorthodox or unusual ideas without immediately dismissing them.

Discuss, build upon and constructively criticize each other's ideas —in a spirit of cooperative give and take. Make comments concise to avoid monopolizing the dialogue.

Conduct at RCSA Meetings

Research Corporation for Science Advancement fosters a welcoming and respectful environment for listening in which the different identities, backgrounds, and perspectives of all participants are valued, and in which everyone is empowered to share ideas as fellow scientists.

RCSA does not tolerate any form of harassment, which could include verbal or physical conduct that has the purpose or effect of substantially interfering with anyone else's participation or performance at this conference, or of creating an intimidating, hostile, or offensive environment; any such harassment may result in dismissal from the conference.

[Read RCSA's Code of Conduct](#)



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Scialog: Quantum Matter and Information

From the President

Dear Scialog Participants,

It is my great pleasure to welcome you to the first year of the Scialog on **Quantum Materials and Information**, cosponsored by the **Research Corporation for Science Advancement**, the **Simons Foundation**, **Kevin Wells**, the **Brinson Foundation**, and the **PCLB Foundation**.



Quantum technologies — spanning computing, sensing, and communication — are advancing rapidly, yet many breakthroughs have come in an Edisonian fashion: a defect that proves to be a robust qubit, or a crystal that unexpectedly hosts exotic states. To accelerate progress, we must move from trial-and-error to predictive design, integrating synthesis, characterization, theory, computation, and device innovation, with AI and machine learning guiding discovery.

As Frederick Cottrell, RCSA's founder, observed, *"Most of the great discoveries have not been made by those who were looking for them, but by those who were ready when they came."* This Scialog challenges us to be ready — to pair creativity with predictive approaches so that when the next breakthrough arises, we will recognize it and be ready to scale.

Thanks to your pre-conference input, our conversations will address the basics of quantum coherence, entanglement and the continuum from quantum to classical behaviors, novel quantum materials, from many-body states to single defects, scalable qubits, precision measurements and sensing, fault-tolerant computation, and new frontiers from twisted heterostructures to quantum biology.

This Scialog series is made possible through the leadership of RCSA Program Directors **Eileen Spain**, **Richard Wiener**, **Andrew Feig**, and **Silvia Ronco**.

Scialog thrives on collaboration across disciplines. The most important outcomes here are not intended to be incremental papers but **new teams with bold ideas** — ideas bold enough to redefine how we think about quantum materials and technologies. This is your chance to share the idea you've been sitting on, to voice the hunch that doesn't yet have data, to take a leap with a concept that feels a little too risky for traditional venues.

Welcome, and thank you for contributing your creativity and vision to this important endeavor.

Sincerely,

Eric Issacs

President & CEO

Research Corporation for Science Advancement

Scialog: Quantum Matter and Information

From the Program Director

Welcome to the first meeting of Scialog: Quantum Matter and Information! You are here among a highly select group of exemplary early career scientists from the U.S. and Canada chosen to participate in a conference unlike any other you may have experienced. Research Corporation's interactive Scialog meetings seek to catalyze new collaborations through dialogue, networking, and pursuit of novel, high-risk discovery research based on blue-sky ideas you develop with new colleagues you meet here.



RCSA and our funding partners chose to focus on Quantum Matter and Information because scientists across a broad spectrum of disciplines are focusing their attention on entanglement and other fascinating quantum phenomena as they push the frontiers of knowledge and technology in new, exciting ways. However, to advance breakthroughs in novel quantum materials, precision measurement, sensing, and quantum information, many basic challenges remain to be addressed. For example, a deeper understanding of entanglement, the transition from quantum to classical behaviors, and non-equilibrium phenomena is essential. Therefore, to fully maximize this opportunity, we need to build a strong network of early career researchers who will be best positioned to make great scientific advances in quantum science over the next several decades. And we need out-of-the-box thinking to ideate high-risk, high-reward collaborative projects.

We have two outstanding keynote speakers, **Rana Adhikari**, California Institute of Technology, and **Xiaoyang Zhu**, Columbia University, to set the stage for breakout discussions. They will be joined by a terrific group of senior scientists to round out the team of facilitators:

Nathaniel Gabor, University of California, Riverside

Stephen R. Leone, University of California, Berkeley

Nancy Makri, University Illinois Urbana-Champaign

Carlos Meriles, The City College of New York

Cindy Regal, University of Colorado, Boulder

Lea Santos, University of Connecticut

Scialog meetings focus on dialogue and team building with the goal of creating novel strategies and collaborative approaches. An important feature is the opportunity for Scialog Fellows to form teams and write proposals to pursue particularly creative ideas that emerge through the dialogue. We hope this competition is exciting, but regardless of which proposals are funded, the primary purpose is to catalyze a deeper and more meaningful exchange of ideas than ordinarily occurs at scientific conferences. Our intent is for this process to help participants gain new insights and connections that significantly advance the quantum science field.

We hope each participant notes the *esprit de corps* in the Scialog experience. Please do not hesitate to provide feedback on how to make the conference better. My fellow Program Directors, **Andrew Feig**, **Silvia Ronco**, and **Richard Wiener**, the RCSA staff, and I are here to help make the meeting a great experience!

Eileen Spain

Program Director

Research Corporation for Science Advancement

Scialog: Quantum Matter and Information

Conference Agenda

October 16-19, 2025

Thursday, October 16

2:00 pm	Registration Opens	Sonoran II Foyer
2:00 – 5:00 pm	Snacks & Informal Discussions	Sonoran II Foyer
5:00 – 6:30 pm	Poster Session and Reception	Murphey/Murphey Patio
6:00 – 6:30 pm	Meeting for Discussion Facilitators	Finger Rock I
6:30 – 7:30 pm	Dinner	Murphey/Murphey Patio
7:30 – 8:30 pm	Welcome Eric Isaacs, President & CEO, RCSA Conference Overview, Outcomes and Proposal Guidelines Eileen Spain, Program Director, RCSA Introductions/Ice Breakers	Sonoran I & II
8:30 – 11:00 pm	Starlight Café	Murphey/Murphey Patio

Friday, October 17

7:00 – 8:00 am	Breakfast	Murphey/Murphey Patio
8:00 – 8:45 am	Keynote Presentation <i>The Angst and Ennui of Measuring Zero</i> Rana Adhikari California Institute of Technology	Sonoran I & II
8:45 – 9:00 am	Breakout Session Overview and Instructions	Sonoran I & II
9:00 – 10:15 am	Breakout Session I	Sonoran I & II, Rincon, Finger Rock I, and Murphey
10:15 – 10:35 am	Report Out	Sonoran I & II
10:35 – 10:45 am	Conference Photo	Stairs – Murphey Patio
10:45 – 11:15 am	Morning Break	Sonoran II Foyer
11:15 – 11:45 am	Mini Breakout Session I (Fellows)	All Spaces
	Facilitator Meeting (Facilitators)	Rincon
11:45 – 1:00 pm	Lunch	Murphey/Murphey Patio
1:00 – 1:45 pm	Keynote Presentation <i>Fractional Charges and Where to Find Them</i> Xiaoyang Zhu Columbia University	Sonoran I & II
1:45 – 3:00 pm	Breakout Session II	Sonoran I & II, Rincon, Finger Rock I, and Murphey
3:00 – 3:20 pm	Report Out	Sonoran I & II All spaces
3:20 – 3:50 pm	Mini Breakout Session II (Fellows)	
3:50 – 5:45 pm	Afternoon Break, Informal Discussions and Leisure Time	Sonoran II Foyer
5:45 – 6:45 pm	Poster Session and Reception	Murphey/Murphey Patio
6:45 – 7:45 pm	Dinner	Murphey/Murphey Patio
7:45 – 11:00 pm	Starlight Cafe	Murphey/Murphey Patio

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Saturday, October 18

7:00 – 8:15 am	Breakfast	Murphey/Murphey Patio
8:15 – 8:45 am	Information on Proposal Writing and Pitches	Sonoran I & II
8:45 – 9:15 am	Mini Breakout Session III (Fellows)	All Spaces
9:15 – 9:45 am	Morning Break	Sonoran II Foyer
9:45 – 11:00 am	Breakout Session III	Sonoran I & II, Rincon, Finger Rock I, and Murphey
11:00 – 11:20 am	Report Out	Sonoran I & II
11:20 – 11:50 am	Mini Breakout Session IV (Fellows)	All Spaces
	Facilitator and Funding Partners Discussion	Rincon
11:50 – 1:00 pm	Lunch	Murphey/Murphey Patio
1:00 – 5:45 pm	Team Formation, Informal Discussions and Proposal Writing	All Spaces
5:45 – 6:30 pm	Reception	Murphey/Murphey Patio
6:30 – 7:30 pm	Dinner	Murphey/Murphey Patio
7:30 – 11:00 pm	Starlight Cafe	Murphey/Murphey Patio

Sunday, October 19

6:30 – 7:30 am	Breakfast	Murphey/Murphey Patio
7:30 – 11:00 am	Presentation of Proposals	Sonoran I & II
	Assessment Survey and Wrap-up	
10:00 – 12:00 pm	Lunch (available to go)	Sonoran II Foyer

Keynote Speakers

The Angst and Ennui of Measuring Zero

Rana Adhikari

Professor of Experimental Physics

California Institute of Technology

Abstract: Looking for weak signals requires exquisite experiments and careful analyses. Ideally, one should co-optimize the hardware and software. For quantum measurements, we would like to use optimal experimental design to maximize something like the Fisher Information under the constraint of finite decoherence. In this talk, I will describe how the random and systematic noise is reduced for gravitational wave detectors (LIGO) and propose better methods for the future.



Bio: Rana Adhikari is a Professor of Experimental Physics at the California Institute of Technology. He has been working on the goal of gravitational wave detection as part of the LIGO project. His focus is on the areas of precision measurement which relate to surpassing the fundamental physics limits in order to discover new phenomena related to gravity and quantum mechanics.

Fractional Charges and Where to Find Them

Xiaoyang Zhu

Howard Family Professor of Nanoscience

Columbia University



Abstract: Quantum states that support fractional charge excitations were originally discovered as the fractional quantum Hall (FQH) effect in 2D electron gases at high magnetic fields. This discovery was celebrated by the 1998 Nobel Prize in Physics to Laughlin, Störmer, and Tsui^{1,2}. Another milestone was reached recently in the discoveries of fractional quantum anomalous Hall (FQAH) effect in the absence of magnetic field, in twisted MoTe₂ bilayers^{3–6} and in multilayer graphene⁷. In addition to providing perhaps the most fascinating demonstrations of many-body quantum mechanics, fractional charge states obey anyon statistics and may find applications in the coveted fault-tolerant quantum computing^{8,9}. Here, I will present time-domain pump-probe spectroscopy as hitherto the most sensitive experimental approach in detecting quantum phases, particularly fractional charge states, at moiré interfaces of 2D van der Waals crystals¹⁰. In this approach¹¹, a pump laser pulse excites across a correlation gap or pseudo-gap, and a probe pulse tracks subsequent melting and recovery dynamics from exciton sensing. This is essentially a background-free technique when the pump photon energy is below quasi-particle gaps and perturbs only the correlated states. I will discuss how such time-lapsed treasure maps may be used to find fractional charge states in the rich moiré systems.

1. Stormer, H. L., Tsui, D. C. & Gossard, A. C. The fractional quantum Hall effect. *Rev Mod Phys* 71, S298 (1999).
2. Laughlin, R. B. Nobel lecture: Fractional quantization. *Rev Mod Phys* 71, 863 (1999).
3. Cai, J. et al. Signatures of fractional quantum anomalous Hall states in twisted MoTe₂. *Nature* 622, 63–68 (2023).
4. Park, H. et al. Observation of fractionally quantized anomalous Hall effect. *Nature* 622, 74–79 (2023).
5. Zeng, Y. et al. Thermodynamic evidence of fractional Chern insulator in moiré MoTe₂. *Nature* 622, 69–73 (2023).
6. Xu, F. et al. Observation of integer and fractional quantum anomalous Hall effects in twisted bilayer MoTe₂. *Phys Rev X* 13, 031037 (2023).
7. Lu, Z. et al. Fractional quantum anomalous Hall effect in multilayer graphene. *Nature* 626, 759–764 (2024).
8. Kitaev, A. Y. Fault-tolerant quantum computation by anyons. *Ann Phys (N Y)* 303, 2–30 (2003).
9. Nayak, C., Simon, S. H., Stern, A., Freedman, M. & Das Sarma, S. Non-Abelian anyons and topological quantum computation. *Rev Mod Phys* 80, 1083–1159 (2008).
10. Wang, Y. et al. Hidden states and dynamics of fractional fillings in twisted MoTe₂ bilayers. *Nature* 641, 1149–1155 (2025).
11. Arsenault, E. A. et al. Two-dimensional moiré polaronic electron crystals. *Phys Rev Lett* 132, 126501 (2024).

Scialog: Quantum Matter and Information

2025 Proposal Guidelines

1. Awards are intended to provide seed funding for teams of two to three Scialog Fellows formed at this conference for high-risk, high-impact projects.
2. The application package should be submitted as a single PDF file. Pages one and two should describe the project and role of each team member. A third page may be used for references. No budget is necessary.
3. Awards will be in the amount of \$60K direct funding per team member, plus a small percentage for indirect costs. Grant duration will be one year.
4. No Scialog Fellow can be a member of more than two teams. If a Scialog Fellow is a member of two teams, other members of the teams must be different. No team can submit more than one proposal.
5. No Scialog Fellow who previously has won a Scialog: QMI Collaborative Award can be a member of more than one team. The other team members must be different from the members of the previously awarded team.
6. Scialog Fellows who have previously won two Scialog: QMI Collaborative Awards are not eligible to be funded members of a team, but they can participate as a non-funded team member.
7. Teams cannot include members who have previously collaborated with one another. If you are unsure of your status (e.g., prospective team members were part of a large collaboration but did not significantly interact), please check for clarification with an RCSA Program Director.
8. Teams are encouraged (but not required) to:
 - a. Include members with different research approaches and methods.
 - b. Include members from different disciplines.
9. Proposals must be submitted electronically by **6:00 a.m. PST Sunday, October 19, 2025**. Instructions for submission will be provided at the meeting.
10. Awards are anticipated to start around **February 1, 2026**.

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Scialog Fellows

Alison Altman aaltman@tamu.edu

Chemistry, Texas A&M University

I am interested in discovering and characterizing novel materials primed for magnetic order. I utilize high-pressure techniques to both access metastable materials beyond thermodynamic limits and expand understanding of their properties.

Fabio Anza fanza@umbc.edu

Physics, Cybersecurity Institute, University of Maryland, Baltimore County

I study "Physics of Information" – applying information theory to many-body systems. Specifically complex quantum systems, geometric quantum mechanics, classicality from quantum dynamics, with applications to the emergence of spacetime from quantum gravity.

Eric Arsenault eric.arsenault@yale.edu

Chemistry, Yale University

I am an ultrafast spectroscopist broadly interested in how electronic-vibrational interactions across length scales influence the behavior of energy and charge in complex nanoscale systems, from proteins to quantum materials.

Mikael Backlund mikaelb@illinois.edu

Chemistry, University of Illinois Urbana-Champaign

The Backlund Lab is an experimental and theoretical physical chemistry group primarily interested in developing and applying quantum sensing platforms for probing molecules and materials.

Eunice Bae yb293@cornell.edu

Chemistry, Cornell University

My group's interest is optically creating, probing and controlling quantum materials.

Kwabena Bediako bediako@berkeley.edu

Chemistry, University of California, Berkeley

My research interests lie at the nexus of solid-state chemistry, condensed matter physics, and electrochemistry. I am interested in realizing new quantum materials to unlock directions in the study of collective electronic phenomena and the manipulation of interfacial reactivity.

Sanjay Behura sbehura@sdsu.edu

Physics, San Diego State University

My research explores the photophysics of quantum materials, focusing on quantum light sources in atomically thin 2D materials and their van der Waals heterostructures. I aim to develop quantum information devices like single-photon emitters, photonic qubits, and quantum sensors.

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Scialog Fellows Continued

Charles Brown charles.d.brown@yale.edu

Physics, Yale University

My research interests lay in many-body quantum physics. Specifically, I am interested in how ideas from geometry and topology alter the motion of interacting quantum particles, and how quantum chaos, scrambling of quantum information and thermalization are interrelated.

Justin Caram jcaram@chem.ucla.edu

Chemistry and Biochemistry, University of California, Los Angeles

I am interested in the design of molecules which robustly maintain coherent properties in "messy" condensed phase environments, and how dense networks of molecules can be entangled for enhanced quantum sensing.

Korey Carter korey-carter@uiowa.edu

Chemistry, University of Iowa

The Carter Group uses f- and d-block coordination chemistry as a means to address fundamental questions relevant to quantum information science, nuclear medicine, radiation sciences, and critical material and nuclear separations.

Yeongsu Cho ycho12@uh.edu

Chemistry, University of Houston

My research aims to accelerate the discovery of novel materials by enhancing the efficiency and accuracy of computational methods for simulating excited state properties of materials, employing methodological advances in quantum chemistry and leveraging machine learning.

Debanjan Chowdhury dc977@cornell.edu

Physics, Cornell University

I am a theorist interested in the emergent properties of both equilibrium and driven quantum matter. My research methodology involves analytical techniques combined with concepts from quantum information, exact numerical simulations, and collaborations with experimentalists.

Simone Colombo simone.colombo@uconn.edu

Physics, University of Connecticut

My research group specializes in experimental Atomic, Molecular, and Optical physics. Our main objective is to understand the universe by observing it with unparalleled precision. Leveraging our expertise, we develop quantum-enhanced sensors and simulators to pursue our goal.

Ceren Dag cbdag@iu.edu

Physics, Indiana University, Bloomington

My current research directions are (i) quantum simulation of many-body systems in and out of equilibrium (ii) many-body quantum chaos, ergodicity, thermalization, and the mechanisms that break ergodicity; and (iii) light-induced phenomena in quantum materials.

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Scialog Fellows Continued

Geoffrey Diederich gdieder2@umbc.edu

Physics, University of Maryland, Baltimore County

My research interests are in the field of ultrafast spectroscopy and optical control of van der Waals quantum materials via pathways such as light-induced strain, optical melting of correlated phases, and ultrafast generation of coherent quasiparticle populations.

Serena Eley serename@uw.edu

Electrical and Computer Engineering, University of Washington

My research team studies superconductivity and magnetism, with an overarching theme of the effects of disorder on the electromagnetic properties of quantum materials and devices.

Ben Feldman bef@stanford.edu

Physics, Stanford University

My research interests lie within experimental condensed matter physics, with a particular focus on emergent quantum phenomena in reduced dimensional systems. This includes fabrication and study of twisted van der Waals heterostructures and nanoscale scanning probe microscopy.

Alex Frañó afrano@ucsd.edu

Physics, University of California, San Diego

My research focuses on quantum materials, neuromorphic computing, frustrated magnetism, topological systems, quantum information, and sensing. I use strain, interfaces, and nanoscale engineering alongside advanced X-ray techniques to unlock and visualize novel phenomena.

James Gaynor james.gaynor@northwestern.edu

Chemistry, Northwestern University

Developing ultrafast coherent multidimensional spectroscopies that directly target, and enable, understanding quantum mechanical superpositions in molecules and materials that determine their properties and behaviors; electron-electron and electron-vibrational correlations.

Elizabeth Goldschmidt goldschm@illinois.edu

Physics, University Illinois at Urbana-Champaign

My research is in quantum photonics with applications in quantum networking with a focus on using coherent emitters in solid-state platforms to generate, store, and manipulate quantum states of light.

Kade Head-Marsden khm@umn.edu

Chemistry, University of Minnesota Twin Cities

My research group is broadly interested in the dynamics of open quantum systems, the stabilization of entangled states, and decoherence in molecules used for quantum information sciences.

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Scialog Fellows Continued

Kazuki Ikeda kazuki.ikeda@umb.edu

Physics, University of Massachusetts, Boston

I'm interested in all aspects of QIS spanning hybrid algs/QAOA, quantum simulations, NV sensing, materials, QML, communication, crypto. Pioneered Quantum Energy Teleportation: demonstration, timelike & charge teleportation.

Adam Jaffe ajaffe@nd.edu

Chemistry and Biochemistry, University of Notre Dame

The Jaffe group develops design principles for tunable hybrid material platforms relevant for quantum information processing or even energy capture/storage. We elucidate how their physical structures dictate electronic and optical behaviors, including under high-pressure.

Luis Jauregui lajaure1@uci.edu

Physics and Astronomy, University of California, Irvine

Quantum materials, topological materials, quantum transport, excitons, superconductivity, two-dimensional materials.

Andy Joe andrew.joe@ucr.edu

Physics and Astronomy, University of California, Riverside

I am interested in realizing novel states of matter for condensed matter physics and quantum information applications in engineered two-dimensional, TMD heterostructure devices. We employ various optical, optoelectronic, and transport techniques to probe novel quantum devices.

Brian Kim briankim@arizona.edu

Materials Science & Engineering and Physics, University Arizona

My research interests lie in using a combination of unique materials and device platforms to better design, manipulate, and understand exotic states of matter in van der Waals quantum materials and heterostructures, thereby enabling their integration into viable quantum devices.

Joonho Lee joonholee@g.harvard.edu

Chemistry and Chemical Biology, Harvard University

Our research group specializes in developing and applying numerical methods and quantum algorithms to complex quantum chemistry problems such as strongly correlated materials and mixed fermion-boson problems.

Jiajia Li jjajia.li@ncsu.edu

Computer Science, North Carolina State University

Quantum many-body problems, tensor networks, high performance computing, parallel algorithms

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Scialog Fellows Continued

Xiaotong Li xli254@ncsu.edu

Chemistry, North Carolina State University

Our solid-state chemistry group focuses on design and synthesis of novel hybrid quantum materials with precise control of the spin direction and spin coherence time, to investigate their structure-property relationships for quantum information applications.

Grace Liang qyliang@purdue.edu

Physics and astronomy, Purdue University

Experimental AMO physicist developing Rydberg-based quantum technologies, such as novel atom-photon interfaces, native interaction-based quantum entanglement transfer, and quantum-enhanced sensing, to bridge lab breakthroughs and practical applications.

Fang Liu fliu10@stanford.edu

Chemistry, Stanford University

Developing reduced-dimensional artificial structures, such as two-dimensional monolayers, nanoribbons and moiré superlattices, to explore the unique interplay and coupling between electrons, lattices, and light at different levels of confinement in low-dimensional geometries.

Xiaomeng Liu xl956@cornell.edu

Physics, Cornell University

Our lab creates novel quantum materials by engineering 2D material heterostructures. We investigate their emergent properties using low-temperature quantum transport and, more uniquely, low-temperature scanning tunneling microscopy.

Yuan Liu q_yuanliu@ncsu.edu

Electrical and Computer Engineering, Computer Science, North Carolina State University

I am interested in leveraging quantum information science to tackle long-lasting challenges in physical sciences and engineering, with a focus on quantum algorithms and simulation, hybrid continuous-discrete-variable quantum computing, and quantum engineering.

Arkajit Mandal mandal@tamu.edu

Chemistry, Texas A&M University

My group is interested in investigating exotic physical and chemical phenomena induced by the quantum mechanical interactions between photons, nuclei, and electrons. We particularly interested in utilizing these interactions for applications in quantum information science.

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Scialog Fellows Continued

Rubem Mondaini rmondaini@uh.edu

Physics, University of Houston

Theoretical investigation in many-body systems supported by numerical simulations. Specializing in collaboration with experimentalists by proposing problems that can be tackled with quantum analog/digital computers: Many-body localization, quantum state transfer, quantum memories

Andres Montoya-Castillo Andres.montoyacastillo@colorado.edu

Chemistry, University of Colorado Boulder

We develop and apply tools to simulate, predict, and control the quantum dynamics of charge, energy, and information flow in the condensed phase. Our goals include enabling precision quantum metrology and leveraging chemistry to direct nonequilibrium energy and information flow.

Maren Mossman mmossman@sandiego.edu

Physics and Biophysics, University of San Diego

Quantum simulation with ultracold atoms with a focus on hydrodynamics.

Nir Navon nir.navon@yale.edu

Physics, Yale University

My research interests focus on the exploration of the behavior of interacting quantum particles using highly controllable experimental platforms. Our goal is to sharpen our understanding of both the equilibrium properties and dynamics of strongly correlated quantum systems.

Aurora Pribram-Jones apj@ucmerced.edu

Chemistry and Biochemistry, University of California, Merced

To develop exact electronic structure formalisms, I examine the interplay of electronic density, temperature, and interaction strength. I also study how infinitely interacting reference points alter entropic, kinetic, and potential contributions to electron-electron interaction.

Yifan Quan yquan@sas.upenn.edu

Chemistry, University of Pennsylvania

My research focuses on Developing Advanced Magnetic Resonance Techniques (NMR & EPR) for Quantum Information Science (particularly Optically Addressable Electron Spins for Molecular Spintronics), Energy Storage Materials, and Biophysics.

Axel Saenz Rodriguez saenzroa@oregonstate.edu

Mathematics, Oregon State University

My ultimate goal is to uncover a universal probabilistic theory for non-equilibrium quantum systems. I'm interested in developing powerful simulations and computations for large quantum systems by leveraging recent advances in theoretical math and physics of quantum spin chains.

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Scialog Fellows Continued

Javier Sanchez-Yamagishi javier.sanchezyamagishi@uci.edu

Physics & Astronomy, University of California, Irvine

Studying quantum sensing and quantum electronic phenomena using van der Waals materials. Ex: We recently demonstrated that vdW materials can be used to create nanoscale vacuum chambers for growing crystals or confining atoms.

Kanu Sinha kanu@arizona.edu

College of Optical Sciences and Department of Physics, University of Arizona

Quantum Optics, Quantum Information and Open Quantum Systems: specific topics of interest include quantum fluctuation phenomena, collective atom-photon interactions, non-Markovian open quantum systems, decoherence, and quantum optical effects in the presence of gravity

Tim Su timothys@ucr.edu

Chemistry, University of California, Riverside

quantum transport in single-molecule junctions; scanning tunneling microscopy break-junction techniques; synthetic molecular chemistry; structure-quantum transport relationships; destructive quantum interference

Sandhya Susarla ssusarl3@asu.edu

School of Engineering of Matter, Transport and Energy, Arizona State University

Develop (operando) cryogenic scanning transmission electron microscopy-electron energy loss spectroscopy (STEM-EELS), and four-dimensional (4D) STEM methods to decipher structure-property relation, specifically, imaging atomic scale chirality, excitons, phonons, and ferrons.

Hendrik Utzat hutzat@berkeley.edu

Chemistry, University of California, Berkeley

My research explores the intersection of quantum optics, materials science, and chemistry. I investigate the material foundations of single quantum emitters and develop entangled-photon spectroscopy, quantum microscopy, and nanoscale metrology techniques.

Lili Wang lili.wang@emory.edu

Chemistry, Emory University

We are interested in understanding and manipulating the excited-state dynamics of functional materials for quantum applications. We employ materials design, ultrafast spectroscopy, and device characterization to extract crucial photophysics in solid-state systems.

Pengjie Wang pengjiew@illinois.edu

Physics, University of Illinois at Urbana-Champaign

My research focused on strongly correlated phenomena in 2D quantum materials and their applications in quantum information. My lab specializes in quantum transport and optical probing of 2D systems under extreme conditions to explore novel quantum states.

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Scialog Fellows Continued

Xi Wang wxi@wustl.edu

Physics, Washington University, St. Louis

Discovery and control of emergent quantum phenomena in low-dimensional materials. I explore how strong correlations, topology, and light-matter interactions manifest in engineered quantum systems, such as moiré superlattices based on 2D materials.

Yao Wang yao.wang@emory.edu

Chemistry, Emory University

My research interests include the theoretical and computational study of quantum many-body problems, strongly correlated materials, and quantum computing. My group explores the experimental correspondence between solid-state materials and quantum information science.

Lilia Xie liliaxie@princeton.edu

Chemistry/Princeton Materials Institute, Princeton University

I am interested in discovering quantum materials at the interface of molecular and solid state chemistry. My group is introducing molecular components into host lattices with low-dimensional inorganic motifs as a route toward quantum materials with unprecedented tunability.

Yonglong Xie yx71@rice.edu

Physics and Astronomy, Rice University

I develop and apply scanning probe microscopy techniques to explore the electronic, magnetic, and thermodynamic properties of quantum materials, especially those that are atomically thin.

Jinjia Xu jxu@umsl.edu

Chemistry and Biochemistry, University of Missouri

Integrating single molecules with 2D materials represents an exciting frontier in nanotechnology and quantum science. We aim to make reliable and repeatable fabrication of single-molecule devices in the field of nanotechnology and quantum devices.

Ruijuan Xu rxu22@ncsu.edu

Materials Science and Engineering, North Carolina State University

Design and manipulation of functional properties and emergent phenomena in complex oxide thin films, heterostructures, and freestanding membranes via atomic-scale epitaxy.

Joe Zadrozny zadrozny.13@osu.edu

Chemistry and Biochemistry, Ohio State University

My group is a physical/synthetic inorganic chemistry group that specializes in studying the magnetic properties of molecules via magnetic resonance.

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Scialog Fellows Continued

Chenjie Zeng zeng@chem.ufl.edu

Chemistry, University of Florida

I am interested in the precision synthesis and assembly of nanomaterials, including metal nanoclusters and semiconductor quantum dots. Achieving atomic-level precision in controlling nanostructures is crucial to enable coherent coupling of photons, electrons, and spins.

Sherry Zhang zhang.xueyue@columbia.edu

Applied Physics and Applied Mathematics, Columbia University

We use qubit-photon interactions to introduce new capabilities, such as high levels of connectivity, into superconducting circuits and solid-state spin platforms by integrating these qubits with microwave waveguides and silicon photonics.

Discussion Facilitators

Rana Adhikari rana@caltech.edu

Physics, Mathematics and Astronomy, California Institute of Technology

Gravity, quantum measurement, thin films, coherent quantum control, reinforcement learning, and optical control

Nathan Gabor nathaniel.gabor@ucr.edu

Physics and Astronomy, University of California, Riverside

Gabor Research Laboratories aim to discover new phenomena - both quantum and classical - that may arise within and at the interface between quantum condensed matter and complex biological systems.

Steve Leone srl@berkeley.edu

Chemistry, University of California, Berkeley

Attosecond dynamics, coherence, entanglement in dynamics, short pulse lasers, x-ray and extreme ultraviolet spectroscopic probes of dynamics.

Nancy Makri nmakri@illinois.edu

Chemistry, University of Illinois Urbana-Champaign

Quantum dynamics

Carlos Meriles cmeriles@ccny.cuny.edu

Physics, The City College of New York, CUNY

Research in the Meriles group explores quantum control and sensing with color centers in solids, developing approaches that link spin, charge, and optical states for quantum information processing and nanoscale magnetic resonance applications.

Cindy Regal regal@colorado.edu

Physics, University of Colorado Boulder

Atomic physics, optical physics, quantum optomechanical systems, quantum computing with trapped neutral atoms, and quantum measurement

Scialog: Quantum Matter and Information

Discussion Facilitators Continued

Lea Santos lea.santos@uconn.edu

Physics, University of Connecticut

Many-body quantum systems, non-equilibrium quantum dynamics, thermalization, quantum chaos, many-body localization, long-range interactions, excited-state quantum phase transition, Kerr parametric oscillators, quantum control, decoherence, quantum-classical correspondence.

Xiaoyang Zhu xz2324@columbia.edu

Chemistry, Columbia University

We use optical pump-probe spectroscopies, time- and angle-resolved photoemission spectroscopy, and terahertz time-dependent spectroscopy to study excitons and carriers in two-dimensional semiconductors, such as transition metal dichalcogenides (TMDCs), ferroelectrics, ferromagnets, and even combination of them. Of particular interest are electron-electron interaction in TMDC hetero/homobilayers, electron-phonon coupling in ferroelectrics, magnon-exciton coupling in antiferromagnets.

Guests

Danny Abrams dmabrams@northwestern.edu

Engineering Sciences & Applied Mathematics, Northwestern University

My interests relevant to this Scialog are focused on how new scientific collaborations are established, and in particular the role conferences may play in that process.

Sreeja Asokan sasokan@sciphil.org

Science Philanthropy Alliance

I provide data-driven insights to philanthropists and foundations, leveraging my scientific training to identify funding opportunities, evaluate impact, and advance high-risk discovery science with a focus on collaboration and innovation.

Jamie Bender jamie.bender@brinsonfoundation.org

Scientific Research, The Brinson Foundation

The Brinson Foundation's grantmaking is rooted in the belief that basic scientific research is critical for deepening our understanding of the universe and advances in science and technology can be harnessed to materially improve the human condition.

Kevin Wells kwells@icloud.com

Independent Philanthropist

Executive director of the Stanford Institute for Theoretical Physics. I am a committed environmental leader and serves as board chair of Environment Now, an activist foundation focused on protecting California's natural environment. BS in physics, an MS in electrical engineering, and an MBA, all from Stanford.

Scialog: Quantum Matter and Information

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