Bridging Classic and Contemporary Perspectives on Open Quantum Systems – May 4-8, 2026

Events for:
Monday, May 4th - Friday, May 8th

Monday, May 4th

8:30am **Workshop: Breakfast - SCGP Cafe**

Title: Breakfast

9:30am **Workshop: Andy Lucas - SCGP 102**

Speaker: Andy Lucas

Title: High-temperature self-correction in Lee-LDPC codes

Abstract: I will describe our ongoing work on the search for quantum memory in the presence of very high noise rates. We have found a promising candidate for such a code to be a Lee-LDPC code -- these are quantum codes with few-body interactions of low Pauli weight on q-dimensional qudits, with large q. Our ongoing work suggests the existence of simple quantum codes that have very high thresholds against small weight bit/shift errors.

10:00am **Workshop: Yimu Bao - SCGP 102**

Speaker: Yimu Bao

Title: Non-linear sigma model for the surface code with coherent errors

Abstract: In this talk, I consider decoding in the square-lattice surface code with the simplest type of coherent error — single-qubit unitary rotations which create electric anyon excitations. I will derive a non-linear sigma model that governs the decoding in this setting. The sigma model predicts distinct phase diagrams for the optimal decoder, which assumes the knowledge of coherent rotation angles, and the suboptimal decoder that only has imperfect knowledge. Our theory hints at a possible decodable phase up to the maximally coherent rotation angle. We examine the predictions from the sigma model on the decoding fidelity and other physical observables using extensive numerical simulations. I will also discuss how the target space of the sigma model changes when the syndromes live on a non-bipartite lattice.

10:30am **Workshop: Coffee Break - SCGP Cafe**

Title: Coffee Break

11:00am **Workshop: Tim Hsieh - SCGP 102**

Speaker: Tim Hsieh

Title: A unified framework for locally stable phases

Abstract: We propose a unifying framework for characterizing pure and mixed-state phases of matter across equilibrium, non-equilibrium, and metastable regimes. We introduce the concept of locally stable states, defined by the operational property that any local operation (including post-selection) can be reversed by a local channel. We prove that local stability is equivalent to a state being short-range correlated—defined by the decay of both correlations and conditional mutual information. We demonstrate that these properties are invariant under locally reversible channels, thus defining locally stable phases. Furthermore, we prove that local stability implies both the decay of various nonlinear correlators and the decay of correlations in the canonical purification, thus bridging the gap between mixed and pure states. Along the way, we establish two results which may be of independent interest: we show that post-selection on locally stable / short-range correlated states can be implemented via local channels and that quantum Markov chains can be characterized by the local computability of nonlinear observables.

11:30am **Workshop: Cenke Xu - SCGP 102**

Speaker: Cenke Xu

Title: Theory and experiment of strong-weak SSB

Abstract: We discuss recent theoretical and experimental progress of the strong-weak spontaneous symmetry breaking driven by dephasing or measurement. Theoretically we demonstrate that SW-SSB is tightly connected with the emergence of indistinguishability, decodability, and hydrodynamics. We also discuss experimental observation of both the SW-SSB phase and SW-SSB transition, realized in fermi-gas microscope.

12:00pm **Workshop: Lunch - SCGP Cafe**

Title: Lunch

2:30pm **Workshop: Andreas Ludwig - SCGP 102**

Speaker: Andreas Ludwig

Title: Non-perturbative monotonicity theorems for RG flow in systems with broken translational symmetry due to measurements

Abstract: Very general monotonicity theorems exist for translationally invariant systems, identifying quanitities that decrease upon renormalization group (RG) flow: Zamolodchikov's "c-theorem" in 2D (1986), the "F-theorem" in 3D, Cardy's "a-theorem" in 4D (1988), and the "g-theorem" for boundaries (Affleck+Ludwig, 1991). No such monotonicity theorems have been identified for RG flows occurring in systems where translational symmetry is broken by generic spatially uncorrelated quenched randomness, e.g., from "impurity-type" disorder. Here we present two non-perturbative monotonicity theorems in systems where translational symmetry is broken by the randomness of measurement outcomes. The quantities that decrease under RG flow appear directly in the Shannon Entropy of the measurement record. [R.A.Patil, A.W.W.Ludwig, arXiv:2507.07959]

3:00pm **Workshop: Romain Vasseur - SCGP 102**

Speaker: Romain Vasseur

Title: Measurement-induced entanglement in CFTs

Abstract: Local measurements can radically reshape patterns of many-body entanglement, especially in long-range entangled quantum-critical states. Yet, analytical results addressing the effects of measurements on many-body states remain scarce, and measurements are often approximated as forcing specific measurement outcomes. In this talk, I will discuss measurement-induced entanglement (MIE) in Tomonaga-Luttinger liquids, a broad family of 1+1d quantum critical states described at low energies by compact free boson conformal field theories (CFT). Measuring the local charge operator, I will show that the MIE is entirely universal, conformally invariant, and can be computed exactly using a replica trick. I will also discuss recent work on the full distribution of MIE, and comment on the general description of measurements in quantum field theories.

3:30pm **Workshop: Tea Time - SCGP cafe**

Title: Tea Time

4:00pm **Workshop: Meng Cheng - SCGP 102**

Speaker: Meng Cheng

Title: Entanglement negativity in decohered topological phases

Abstract: I will discuss two computations of entanglement negativity: one for general decohered Abelian topological phases within a continuum field-theory framework, and the other for decohered G-graded string-net models. In both cases, we find that the topological correction is given by the logarithm of the total quantum dimension associated with the modular strong one-form symmetry, while the topological mutual information captures the non-modular sector. I will also comment on a discrepancy between the field-theory and lattice results.

4:30pm **Workshop: Xueda Wen - SCGP 102**

Speaker: Xueda Wen

Title: Higher topological structures in local purifications

Abstract: In this talk, I will show that local purifications of density matrix in one-dimensional many-body gapped systems give rise to higher topological structures, going beyond conventional vector bundles. When there is an obstruction of finding local purifications that are globally continuous over the parameter space, the data of local purifications organize into an equivariant gerbe (or equivariant higher line-bundle) structure. Physically, this means there will be a topological pump along the 1d system.

Tuesday, May 5th

8:30am **Workshop: Breakfast - SCGP Cafe**

Title: Breakfast

9:30am **Workshop: Yizhi You - SCGP 102**

Speaker: Yizhi You

Title: LSM in open quatum system: A spacetime duality view

Abstract: Quantum anomalies strongly constrain many-body dynamics. A prime example is the Lieb-Schultz-Mattis (LSM) theorem, which links microscopic symmetry and filling to either gaplessness or degeneracy. Here, we ask how LSM constraints shape dynamical signatures and temporal correlations in open quantum systems. Using a spacetime duality, we show that the time trajectory of a d-dimensional repeated quantum channel with a mixed anomaly between strong S and weak G symmetry can be mapped to a $(d{+}1)$-dimensional mixed-state symmetry-protected topological (mSPT) phase. In this correspondence, the channel's initial and steady states are identified with boundary states of the higher-dimensional mSPT in the presence of bulk measurements. We further introduce the twisted Renyi-N correlator (TRNC) as a probe of temporal correlations in the channel and demonstrate that it is dual to the mSPT strange correlator, providing a direct bulk-boundary route to diagnose long-range temporal order implied by the LSM anomaly. Notably, we identify the Liouvillian singular spectrum, rather than the Liouvillian spectrum itself, as a more precise diagnostic of quantum anomalies, and show that it is dual to the entanglement spectrum of the mSPT.

10:00am **Workshop: Peter Abbamonte - SCGP 102**

Speaker: Peter Abbamonte

Title: Quantum geometric bounds in ionic and covalent insulators measured with inelastic x-ray scattering

Abstract: Widespread interest in topological phases of matter has recently raised awareness of the importance of quantum geometry in solids. The topology of an electronic energy band is quantified by its Berry curvature, which is the imaginary part of a more general quantity called the quantum geometric tensor, T??. Its real part, the quantum metric, characterizes electronic polarization fluctuations and is a measure of the delocalization of valence electrons in a material. These fluctuations can be expressed in terms of the quantum weight, K(q), which is proportional to the quantum Fisher information, a measure of the number of entangled degrees of freedom per unit volume in a quantum system. These relationships imply a deep connection between quantum geometry, entanglement, and the nature of chemical bonding in solids. In this talk, I will present an experimental investigation of these ideas using inelastic x-ray scattering (IXS) from two prototypical insulators, covalently bonded diamond and ionically bonded LiF. Extracting the quantum weight from the IXS data demonstrates that, in diamond, the delocalization of electronic information extends over multiple unit cells, while in LiF it is confined within a single unit cell. In both cases, the quantum weight lies within fundamental bounds recently postulated for insulating states of matter [1,2]. Our results align with the intuitive understanding of covalent and ionic bonding, and demonstrate that energy-loss scattering provides a quantitative probe of wave function geometry in solids. [1] Y. Onishi, L. Fu, PRX 14, 011052 (2024) [2] D. Balut, M. D. Collins, B. Bradlyn, P. Abbamonte, arXiv:2601.19054

10:30am **Workshop: Coffee Break - SCGP Cafe**

Title: Coffee Break

11:00am **Workshop: Itmar Kimchi - SCGP 102**

Speaker: Itamar Kimchi

Title: Global topology from local lattice defects

Abstract: Defects are always present in solid state materials and effectively in many artificial quantum systems without translation symmetry. I will present our group's recent theoretical results showing how quantum-entangled or topological systems can enable local defects to produce surprising global effects.

11:30am **Workshop: Adam Nahum - SCGP 102**

Speaker: Adam Nahum

Title: Bayesian critical points in classical lattice models

Abstract: The Boltzmann distribution encodes our subjective knowledge of the configuration in a classical lattice model, given only its Hamiltonian. If we acquire further information about the configuration from local measurements then our knowledge is updated according to Bayes' theorem. I will argue that the resulting statistical ensembles (conditioned on measurements) show various interesting phase transitions, and will comment on some alternative interpretations of these transitions.

12:00pm **Workshop: Group Photo - SCGP Lobby**

Title: Group Photo

12:10pm **Workshop: Lunch - SCGP Cafe**

Title: Lunch

2:30pm **Workshop: Etienne Granet - SCGP 102**

Speaker: Etienne Granet

Title: Spectral functions on a quantum computer through system-environment interaction

Abstract: Spectral functions are experimentally measurable quantities that provide key insights into the band structure of materials. Their computation on quantum computers poses a number of technical difficulties and typically comes with a large sampling overhead. I will introduce a new approach to measure spectral functions on quantum computers based on modelisation of system-environment interaction and on the use of fermionic quantum Fourier transforms, that provides a significant reduction of sampling overhead and runtime compared to standard approaches. I will present an implementation on Quantinuum's System Model H2 trapped-ion system.

3:00pm **Workshop: Carolyn Zhang - SCGP 102**

Speaker: Carolyn Zhang

Title: Strongly symmetric lindbladians: constraints from LSM anomalies and locality

Abstract: We will show how LSM anomalies appear naturally in the context of Lindbladian dynamics with strong finite symmetries. We will also show how the Lovasz local lemma can be applied to a broad class of strongly symmetric Lindbladians to enforce long range correlations & long mixing time.

3:30pm **Workshop: Tea Time - SCGP cafe**

Title: Tea Time

4:00pm **Workshop: Yichen Xu - SCGP 102**

Speaker: Yichen Xu

Title: Error thresholds of toric codes with transversal logical gates

Abstract: The threshold theorem promises a path to fault-tolerant quantum computation by suppressing logical errors, provided the physical error rate is below a critical threshold. While transversal gates offer an efficient method for implementing logical operations, they risk spreading errors and potentially lowering this threshold compared to a static quantum memory. To date, most available threshold estimates for transversal circuits have been obtained empirically and are limited to specific, sub-optimal decoders. In this work, we generalize the statistical mechanical mapping from static quantum memories to logical circuits with transversal gates. This generalization enables rigorous, decoder-independent error thresholds to be established for fault-tolerant logical computation. We first demonstrate this framework for two toric code blocks undergoing a transversal CNOT (tCNOT) gate, quantifying the impact of two independent error-spreading mechanisms: the spread of physical bit-flip errors and the spread of syndrome errors. In the former case, the stat-mech model is a 2D random Ashkin-Teller model. We use Monte Carlo simulation and finite-size scaling to show that the tCNOT gate reduces the optimal bit-flip error threshold to $p=0.080$, a 26% decrease from the toric code memory threshold $p=0.109$. The case of syndrome errors coexisting with bit-flip errors is mapped to a 3D random 4-body Ising model with a plane defect, yielding a conservative threshold estimate of $p\geq 0.028$---a modest 15% reduction from the memory threshold $p=0.033$. Going beyond the tCNOT gate, we derive stat-mech models for all transversal Clifford gates of the toric code, including the fold-transversal Hadamard and S gates, showing that each gate manifests as a distinct permutation defect of the Ising spins. We further generalize the framework to arbitrary CSS codes with transversal Clifford gates, proving that each transversal gate modifies the stat-mech model only locally in time. Our work opens the door to rigorous threshold analysis of entire fault-tolerant logical circuits via classical statistical mechanics.

4:30pm **Workshop: Nat Tantivasadakarn - SCGP 102**

Speaker: Nat Tantivasadakarn

Title: Coupled-layer construction of quantum product codes

Abstract: I will show how a class of quantum LDPC codes called product codes admit a coupled-layer construction by taking a stack of one code and condensing a set of excitations in the pattern given by the checks of the other code. The construction accommodates both classical and quantum CSS input codes, unifies known physical mechanisms for constructing higher dimensional topological phases via anyon condensation, and naturally extends to non-topological codes.

Wednesday, May 6th

8:30am **Workshop: Breakfast - SCGP Cafe**

Title: Breakfast

9:30am **Workshop: Ruben Verresen - SCGP 102**

Speaker: Ruben Verresen

Title: Realizing, using, and decohering S3 topological order

Abstract: As the smallest non-abelian group, S3 gauge theory provides the minimal example of a topological phase of matter beyond stabilizer Hamiltonians. I will discuss a recent experimental realization of this phase of matter, where anyon braiding and fusion was demonstrated to provide a universal topological gate-set. On the theory side, I will highlight what happens when one tries to decohere such phases with non-abelian anyon noise.

10:00am **Workshop: Tom Iadecola - SCGP 102**

Speaker: Tom Iadecola

Title: Squeezing many-body scar states with weak measurements

Abstract: Quantum many-body scar states provide a mechanism for coherent dynamics in nonintegrable systems and offer a platform for quantum enhanced sensing that is robust to certain interactions. In this talk I will describe how postselected weak measurements can be used to filter the dynamics of non-scarred initial states onto the scarred eigenstates, even in the absence of exact analytical knowledge of those states. The mechanism, a form of squeezing, is robust to fluctuations off of the optimal quantum trajectory, with the degree of postselection determining the amount of squeezing achieved at late times.

10:30am **Workshop: Coffee Break - SCGP Cafe**

Title: Coffee Break

11:00am **Workshop: Alex Kamenev - SCGP 102**

Speaker: Alex Kamenev

Title: Rare events in open quantum systems

Abstract: I will discuss probability of a large quantum fluctuation (a rare event) in stationary states of driven open systems. Contrary to its equilibrium counterpart, this quantity appears to be a non-analytic function of the parameters, specifying the rare event. The formal reason for this phenomenon is related to the existence of more than one instanton solution, leading to the same observable rare event.

11:30am **Workshop: Jong Yeon Lee - SCGP 102**

Speaker: Jong Yeon Lee

Title: Defining non-equilibrium phases of matter

Abstract: In this talk, I will present recent works that establish a systematic framework to study mixed-state phases of matter. This is achieved by identifying three information-theoretic quantities that can play the role analogous to the spectral gap in the study of quantum phases of matter. These three conditions correspond to (i) local recoverability, (ii) no long-range correlations, and (iii) spatial uniformity. States obeying them exactly are fixed points, while only approximately are phases of matter away from fixed points. I will discuss how approximate versions of these conditions provide robust topological data.

12:00pm **Workshop: Lunch - SCGP Cafe**

Title: Lunch

2:30pm **Workshop: Yi-Zhuang You - SCGP 102**

Speaker: Yi-Zhuang You

Title: Measurement-based quantum diffusion model

Abstract: Generative diffusion models learn to reverse an entropy-increasing noise process to synthesize data. I will show how this idea lifts to quantum mechanics, with randomized weak measurements playing the role of noise. The forward process is a measurement-induced stochastic diffusion of pure states; the reverse process is a unitary flow driven by a learned state-dependent Hamiltonian. The key ingredient is a crossed matching scheme that trains the reverse flow from forward measurement data, yielding a data-driven protocol for preparing complex quantum states, with applications to algorithmic cooling and quantum error correction.

3:00pm **Workshop: Peter Lu - SCGP 102**

Speaker: Peter Lu

Title: Mixed-state long-range entanglement from dimensional constraints

Abstract: A many-body mixed state is long-range entangled (LRE) if it does not admit an ensemble decomposition into short-range entangled pure states. Known mechanisms for stabilizing mixed-state LRE typically rely on strong symmetry anomalies or long-range correlations. In this talk, I will introduce a new mechanism for mixed-state LRE based on dimensional constraints. As a primary example, I consider the maximally mixed state within the translation-invariant subspace of a one-dimensional ring of qudits. Despite the absence of both anomalies and nontrivial correlations, this state is LRE due to a mismatch between the dimension of the full translation-invariant subspace and the dimension spanned by translationally symmetric short-range entangled states. I will also discuss several intriguing properties of this state, including its conditional mutual information, signatures of strong-to-weak symmetry breaking, and operator-space entanglement.

3:30pm **Workshop: Tea Time - SCGP cafe**

Title: Tea Time

4:00pm **Workshop: Bowen Shi - SCGP 102**

Speaker: Bowen Shi

Title: Topological mixed states from entangled ground states: a holographic matching of pure and mixed entanglement bootstrap

Abstract: Identifying fixed-point wavefunctions and their equivalence classes via entanglement structure is central to the entanglement bootstrap program for gapped phases. In recent work on mixed-state phases (with Tai-Hsuan Yang and Jong Yeon Lee), we provided a definition of mixed-state fixed points based on three fixed-point conditions, or axioms. In this talk, I show how topological mixed-state fixed points can be systematically generated from pure-state fixed points in one higher dimension. The essence of the argument is a holographic matching between the “pure” and “mixed” versions of the entanglement bootstrap axioms. We further derive several curious emergent properties of the mixed-state fixed points so constructed, some of which I conjecture to be general.

4:30pm **Workshop: Chao-Ming Jian - SCGP 102**

Speaker: Chao-Ming Jian

Title: Symmetry classification of dynamical quantum matter and decoding problems

Abstract: In this talk, I will introduce the ten-fold symmetry classification for fermionic dynamical systems subject to both unitary evolution and measurements. I will demonstrate how symmetry classes govern the universal long-distance entanglement dynamics and the possible non-equilibrium topologies. I will then present a duality between fermionic dynamical systems with measurements and the decoding of surface codes with coherent errors, which enables the symmetry classification of the decoding problems. In particular, I will show that for surface codes on both square and honeycomb lattices, the corresponding decoding problems fall into symmetry classes D and DIII. These symmetry classes govern the general structure of the allowed phases and transitions in the decodability phase diagram, as well as continuum descriptions of the related systems. Finally, I will discuss concrete microscopic coherent error models that give rise to a variety of decodability transitions in the surface codes. These transitions are dual to measurement-induced phase transitions of distinct universality classes in dynamical Majorana systems.

Thursday, May 7th

8:30am **Workshop: Breakfast - SCGP Cafe**

Title: Breakfast

9:30am **Workshop: Abhinav Prem - SCGP 102**

Speaker: Abhinav Prem

Title: Mixed-State and Steady-State Topological Order

Abstract: I will discuss progress in classifying and characterizing intrinsically mixed-state topological order. I will also present an autonomous error correction protocol that exploits erasure errors to stabilize a topological quantum memory in two spatial dimensions.

10:00am **Workshop: Sarang Gopalakrishnan - SCGP 102**

Speaker: Sarang Gopalakrishnan

Title: Strong-to-weak symmetry breaking and classical inference

Abstract: How well can an observer making local measurements learn about global properties of a system, e.g., its charge? I will motivate this question in the quantum setting, and then turn to some results on classical stochastic processes. I will discuss two phase transitions in inference, which are conceptually closely related. First [1], when the stochastic evolution is interrupted by continuous measurements, there is a phase transition as a function of measurement rate between a "learnable" phase at high measurement rate where measurements rapidly fix the charge profile and an "unlearnable" phase where they do not. Second [2], after stochastic evolution for a time greater than some threshold t*, the charge fluctuations undergo a phase transition in local retrievability: beyond the threshold, if one loses access to a region of the system, retrieving the charge in the lost region requires nonlocal information about the rest of the system. I will discuss the critical properties of both of these "learnability" transitions. [1] F. Barratt et al., PRL 129, 200602 (2022); SG et al., PRX 16, 011024 (2026). [2] J. Hauser et al., arxiv:2602.16045

10:30am **Workshop: Coffee Break - SCGP Cafe**

Title: Coffee Break

11:00am **Workshop: Chong Wang - SCGP 102**

Speaker: Chong Wang

Title: Local Diagnostics of (Strong-to-weak) Symmetry Breaking

Abstract: I will discuss a local definition of strong-to-weak symmetry breaking (SW-SSB), which is slightly weaker than the standard formulation. This local definition has two main advantages: it remains well-defined in the thermodynamic limit, and it is more amenable to measurement in large systems. I will show that the key features of SW-SSB, such as stability and the presence of long-range conditional mutual information, persist under this local formulation.

11:30am **Workshop: Jed Pixley - SCGP 102**

Speaker: Jed Pixley

Title: A mean field description of strong to weak symmetry breaking

Abstract: Recent efforts to generalize symmetry breaking from pure to mixed states has led to the discovery of strong and weak symmetry and transitions between them. Most effort has focused on describing this phenomenon exactly in low dimensional models. Here, we consider strong to weak symmetry breaking transitions in the monitored dissipative Bose Hubbard model in three-dimensions. Using the Gutzwiller wavefunction ansatz we construct an efficient mean field description of strong to weak symmetry breaking. We first use this approach to first describe the pure state charge sharpening transition in the limit of no dissipation. In the presence of dissipation, we find this transition becomes a strong to weak symmetry breaking transition that our mean field theory can capture. We find that within this mean field limit the charge sharpening and strong to weak symmetry breaking transitions have the same universal properties.

12:00pm **Workshop: Lunch - SCGP Cafe**

Title: Lunch

2:30pm **Workshop: Tibor Rakovszky - SCGP 102**

Speaker: Tibor Rakovszky

Title: Emergent symmetries in mixed state quantum matter

Abstract: We describe how to construct emergent strong higher-form symmetries in mixed quantum states that act unitarily on Hilbert space. Our construction uses (quasi-)local recovery channels from quantum error correction to some nearby simple (stabilizer or more general commuting projector) model. We prove that when the recovery is done in an appropriate (deterministic) manner, the resulting operators continue to be unitary. When applied to operators acting on topologically non- trivial sub-manifolds (loops, surfaces), the resulting unitaries inherit the logical algebra of the fixed point model. More generally, the unitarity of the emergent symmetries allows one to define emergent excitations whose statistics follow those of the fixed point limit.

3:00pm **Workshop: Vedika Khemani - SCGP 102**

Speaker: Vedika Khemani

Title: The Physics of Computing with LDPC codes

Abstract: ?I will discuss how to understand memory and fault-tolerant gates in LDPC codes from the perspective of many-body physics. As a speciific application, I will introduce constructions for non-Abelian qLDPC codes obtained by gauging transversal Clifford gates using measurement and feedback, and show how this gauging procedures enables magic state preparation via the measurement of logical Clifford gates.

3:30pm **Workshop: Tea Time - SCGP cafe**

Title: Tea Time

4:00pm **Workshop: Trond Andersen - SCGP 102**

Speaker: Trond Andersen

Title: High-fidelity probing of quantum magnetism on a hybrid analog-digital quantum simulator

Abstract: Analog quantum simulation (AQS) offers a promising path toward scientific discovery beyond the reach of classical computers, featuring rapid entanglement growth and efficient low-temperature state preparation. Despite this potential, AQS faces two critical challenges: characterizing the many-body Hamiltonian to understand and reduce control errors is typically more difficult than benchmarking individual local gates, and analog evolution often features less flexibility than universal digital circuits. In this work, we overcome both obstacles in a superconducting quantum simulator: first, we introduce new techniques for Hamiltonian learning and fidelity benchmarking of quantum states at arbitrary temperatures, enabling us to substantially suppress evolution errors compared to previous work. Second, we interleave this high-fidelity analog evolution with digital gates in new flexible hybrid protocols to access observables not available in purely analog settings. We deploy this framework to study magnons in the XY-model, leveraging a suite of analog-digital probes to resolve their intricate dynamics. Our results demonstrate a versatile high-fidelity platform for probing the complex properties of quasi-particles in quantum magnets.

6:00pm **Workshop: Banquet - SCGP Cafe**

Title: Banquet Dinner

Friday, May 8th

8:30am **Workshop: Breakfast - SCGP Cafe**

Title: Breakfast

9:30am **Workshop: Xiao Chen - SCGP 102**

Speaker: Xiao Chen

Title: From Hybrid Quantum Circuits with Ultraslow Dynamics to Classical Plaquette Models

Abstract: TBD

10:00am **Workshop: Matteo Ippoliti - SCGP 102**

Speaker: Matteo Ippoliti

Title: Hardness of observing strong-to-weak symmetry breaking

Abstract: Is it possible to efficiently detect spontaneous strong-to-weak symmetry breaking in general? I will answer this question negatively in the paradigmatic cases of zero-form Z_2 and U(1) symmetries. The proof is based on the cryptographic concept of computational pseudorandomness: we construct pseudorandom mixed states that do not break the strong symmetry, yet are computationally indistinguishable from states that do. This rules out the existence of efficient state-agnostic protocols to detect strong-to-weak SSB. I will compare and contrast this result to recent statements of the same flavor for conventional (strong-to-nothing) SSB, highlighting the unique subtlety of intrinsically mixed phases of matter.

10:30am **Workshop: Coffee Break - SCGP Cafe**

Title: Coffee Break

11:00am **Workshop: Ramanjit Sohal - SCGP 102**

Speaker: Ramanjit Sohal

Title: The Symmetry Taco: Equivalences between Gapped, Gapless, and Mixed-State SPTs

Abstract: Symmetry topological field theory (SymTFT), or topological holography, offers a unifying framework for describing quantum phases of matter and phase transitions between them. While this approach has seen remarkable success in describing gapped and gapless pure-state phases in 1 + 1d, its applicability to open quantum systems remains entirely unexplored. In this work, we propose a natural extension of the SymTFT framework to mixed-state phases by introducing the symmetry taco: a bilayer topological order in 2 + 1d whose folded geometry naturally encapsulates both strong and weak symmetries of the 1 + 1d theory. We use this perspective to identify a series of correspondences, including a one-to-one map between intrinsically gapless SPTs (igSPTs) and certain gapped SPTs, and a mapping between igSPTs and intrinsically average SPTs (iASPTs) arising in 1 + 1d mixed states. More broadly, our framework yields a classification of short-range correlated G-symmetric Choi states in 1 + 1d, provides a route for systematically generating mixed-state SPTs via local decoherence of igSPTs, and allows us to identify a new mixed-state "anomaly". Besides folding in mixed-state phases into the SymTFT paradigm, the symmetry taco opens new avenues for exploring dualities, anomalies, and non-equilibrium criticality in mixed-state quantum matter.

12:00pm **Workshop: Lunch - SCGP Cafe**

Title: Lunch

3:30pm **Workshop: Tea Time - SCGP cafe**

Title: Tea Time