

The Quantum Space-Time Seminar

Charting the shape of theory space: a condensed matter perspective.

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Date and time: 11 AM, 17 Nov 2025 (Mon)
Venue: A 304

Zoom link will be sent separately.



One of the most enduring mysteries of every-day condensed matter physics is first order phase transition between the liquid and gas phases. These are not genuinely distinct phases of matter and can be connected without encountering any thermodynamic singularities. Nonetheless, they are present in various phase diagrams and are extremely stable, being accessible by tuning a single parameter, just like any genuine transition, say between the liquids and solids. In this talk, I will make the argument that such terminating critical surfaces arise due to the non-trivial topology of the space of states making up the phase of matter. This leads to the presence of non-contractible loops and spheres in the space of states and such critical surfaces are obstructions to this contraction. I will demonstrate that the non-trivial topology results in textures in the phase diagram and the presence of robust boundary modes due to a novel 'anomaly in the space of coupling constants'. I will use a combination of field theory and renormalization group, microscopic models and math results.