

THEORY LECTURE SERIES: What can ultracold $SU(N)$ matter teach us about strongly correlated systems?

KADEN HAZZARD

June 10, 2025 to June 19, 2025

10:00 to 12:00

Blue Lecture Room and online (Teams)

ABSTRACT:

$SU(N)$ symmetry appears throughout physics, from the standard model to solid-state materials. This large symmetry leads to a rich variety of new phenomena, including a vast array of symmetry broken states, excitations, and topological order. Remarkably, ultracold matter such as alkaline-earth atoms realize $SU(N)$ symmetric systems with N tunable from $N=2$ to as large as 10 for strontium.

This lecture series will discuss what $SU(N)$ symmetry is, how it arises in ultracold matter, and how ultracold $SU(N)$ -symmetric matter can provide a new window into strongly correlated matter with insights unavailable from more common $SU(2)$ -symmetric systems. I will introduce conceptual ideas and theoretical methods to understand exciting phenomena including Mott insulators, quantum magnetism, strange metals, and more. I will especially highlight the accomplishments of ultracold atom experiments and suggest where the field can impact major open questions of strongly correlated matter.

BIO:

Kaden Hazzard is an Associate Professor at Rice University, where he studies the theory of interacting quantum matter, especially in ultracold quantum systems. He studies experimentally-motivated problems in these systems, often motivated by connections to condensed matter and quantum information with a mix of analytic and numerical techniques. He also studied fundamental issues underpinning such systems, for example using mathematical physics techniques to understand the consequences of locality and -- recently -- constraints on particle statistics. He was elected as an APS Fellow (2023) for his work on ultracold matter.

He studied at Ohio State (BS), Cornell (PhD, 2010), and did a postdoc at JILA/NIST/CU-Colorado before joining Rice University as faculty in 2014. Prof Hazzard also serves as the director of the Rice Quantum Initiative and Chair of the Graduate Program in the Department of Physics and Astronomy.



DATES: June 10th, 12th, 13th and 19th

Hosted by: Academic Affairs