

UCLA Department of Physics & Astronomy

# COLLOQUIUM

Thursday, February 15th, 2023 at 4 p.m.

PAB 1-434

## What's inside a black hole?

Geoffrey Penington  
U.C. Berkeley



In the 1970s, Hawking showed that black holes are finite-temperature objects that radiate energy and eventually evaporate away entirely. However, his calculations suggested something very weird: that, unlike any other physical system, this radiation contained no information about the initial state of the black hole. Information that fell into the black hole appeared to be lost forever. This contradiction between Hawking's calculations and the ordinary rules of quantum mechanics has been a driving force behind much of the research in quantum gravity over the ensuing decades.

In the last few years, we have begun to understand where Hawking's calculation went wrong, and to derive precise predictions, consistent with unitary quantum mechanics, for the information content of Hawking radiation. However, the new calculations, which involve weird spacetime topologies called 'spacetime wormholes', still leave many unanswered questions.