

Stephen Hsu – Special HEP Seminar – April 22, 2022  
MSU

Title: Has Hawking's Black Hole Information Paradox Been Resolved?

Abstract: In 1976 Stephen Hawking argued that black holes cause pure states to evolve into mixed states. Put another way, quantum information that falls into a black hole does not escape in the form of radiation. Rather, it vanishes completely from our universe, thereby violating a fundamental property of quantum mechanics called unitarity. I give a pedagogical introduction to this paradox, suitable for non-experts. Then I discuss recent results concerning the quantum state of the gravitational field of a compact matter source. These results demonstrate the existence of quantum hair, violating the classical No Hair Theorems. I then discuss how this quantum hair affects Hawking radiation, allowing unitary evaporation of black holes.