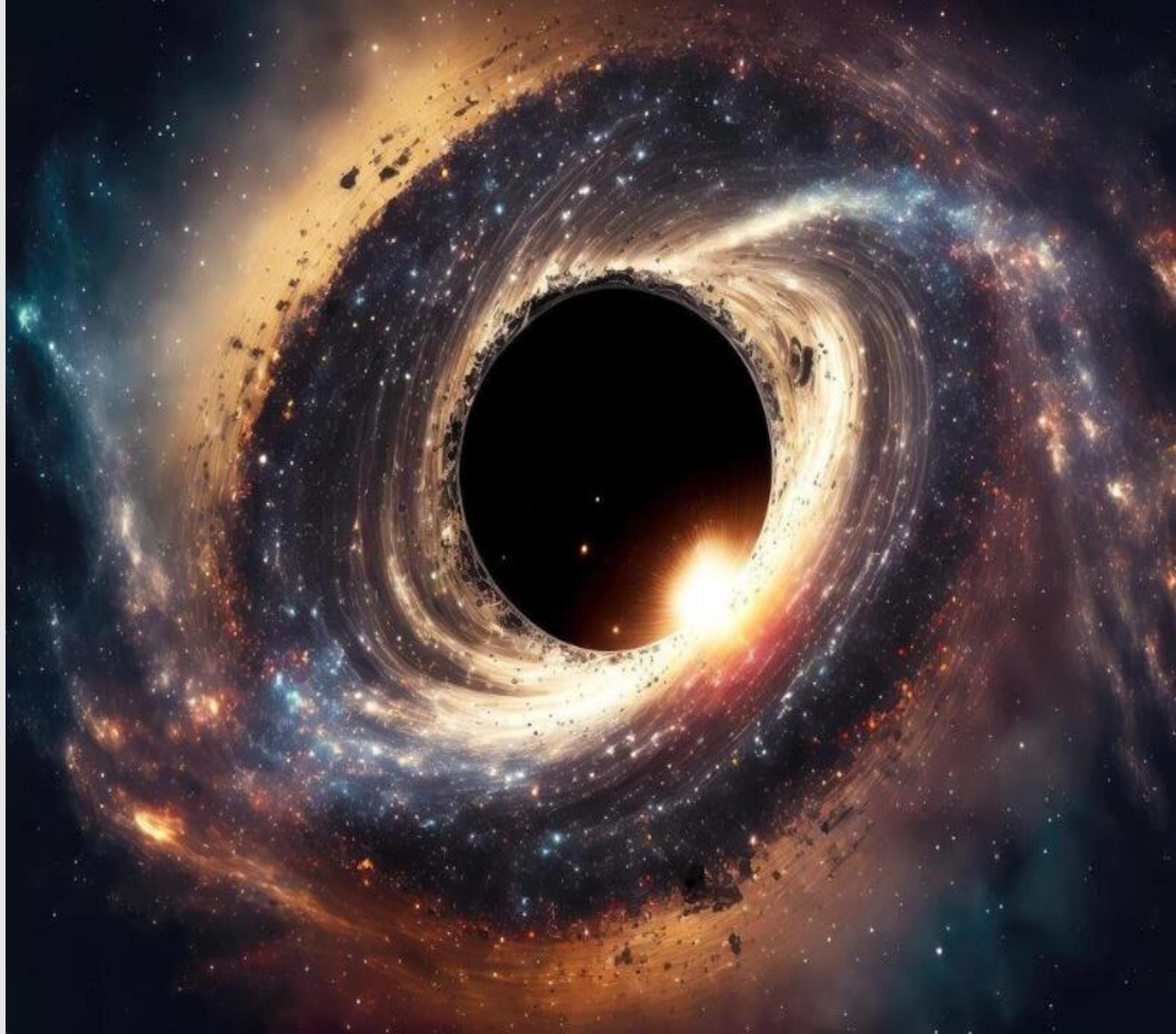


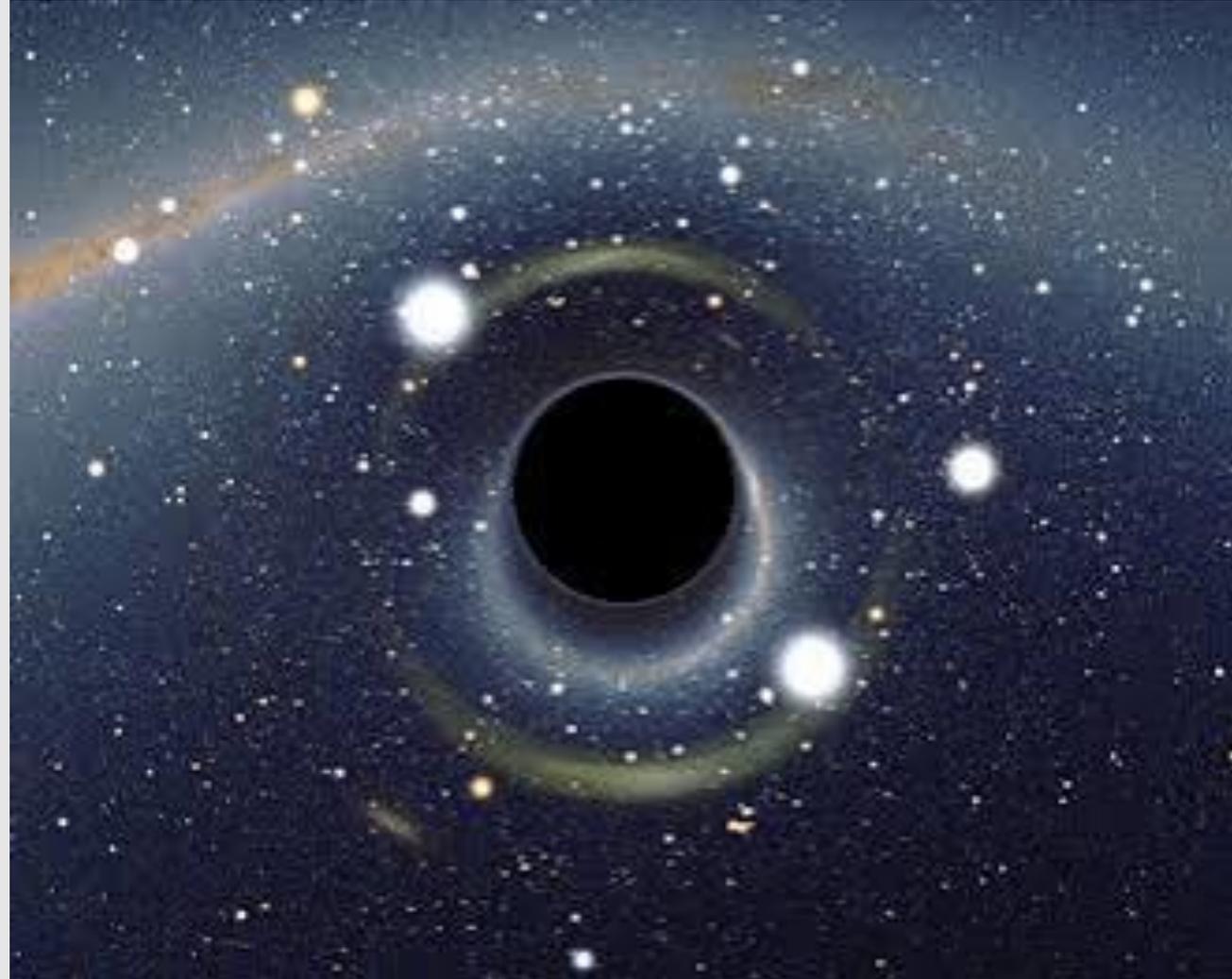
# *The Black Hole Information Paradox*

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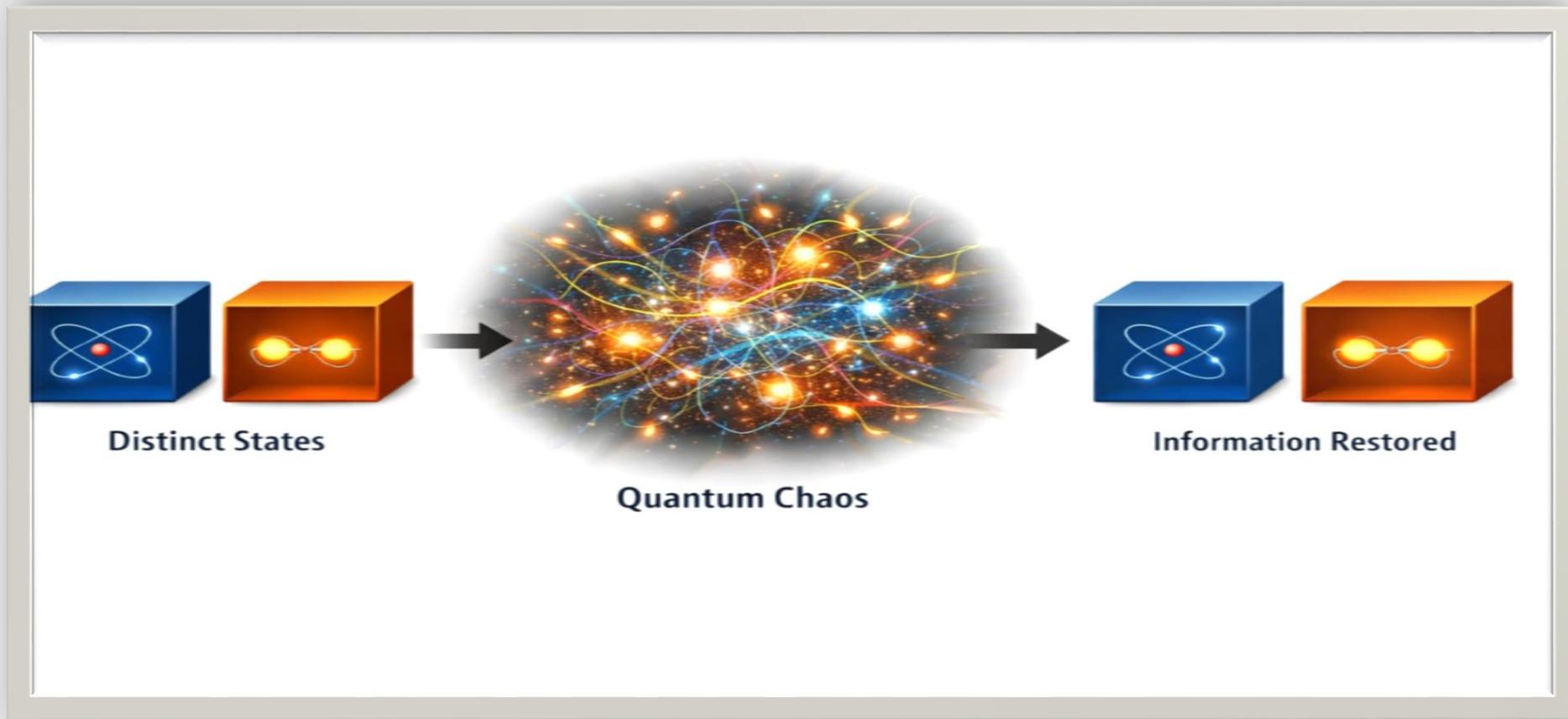
# Introduction

- Black holes are regions in space where gravity is so strong that nothing, not Even light, can escape.
- According to quantum mechanics, information can not be destroyed.
- But black holes seem to erase information when matter falls in, creating a paradox.



# Information in Physics

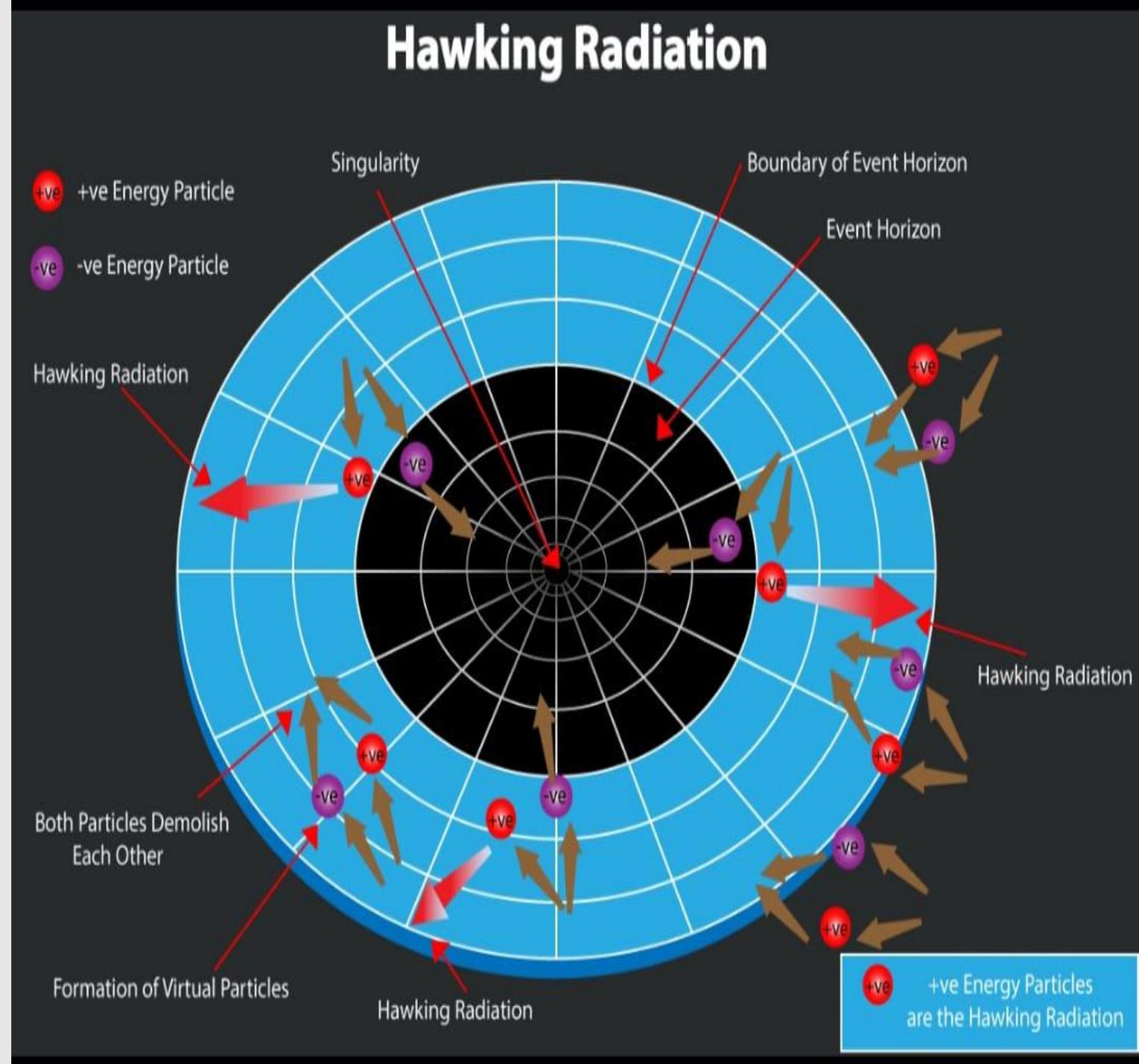
- According to quantum mechanics, information is always preserved.
- The initial state of a system is never completely lost.
- Information may become complex or hidden, but it can not be destroyed.



# Hawking Radiation

1974- **Stephen Hawking** predicted that black holes emit radiation due to quantum effects near the event horizon.

This radiation, called Hawking radiation, implies black holes can gradually lose mass and energy.





## **Roots of the Black Hole Information Paradox**

- If black holes evaporate, what happens to the information of matter that fell in?
- Is information destroyed, violating quantum mechanics?  
Or is it preserved in a complex or hidden form?

# General Relativity – Quantum Mechanics

- Beyond the event horizon, information is seemingly lost and irreversible.
- Information destruction is impossible.
- Complete loss of information would violate fundamental laws of physics.

**What Happens to Information in Black Holes?**



- 1. Original Hawking Idea**
- 2. Information in Radiation**
- 3. Holographic Principle**
- 4. Firewall hypothesis**
- 5. Parallel universes**

# Quantum Memory Matrix (QMM)

QMM is a concept in quantum information theory. Designed to store and manipulate quantum information efficiently. Can help track, preserve, or recover information in quantum systems.

## Future Goals

- Investigate information recovery during black hole evaporation.
- Study quantum gravity models related to the information paradox.
- Develop international scientific collaborations (if possible).



Thank you for your attention.