

Do black holes exist?

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Do black holes really exist? Do they radiate, as expected on theoretical grounds? Does this radiation contain information about their inner structure, as suggested by Gauge-gravity duality, or not, as implied by Hawking's original calculation? If not, and black holes can evaporate away, what happens to the information stored in it? (Quantum mechanics does not allow information to be destroyed) Or does the radiation stop at some point leaving black hole remnants? Is there another way to probe their internal structure somehow, if such a structure even exists?

While general relativity describes a black hole as a region of empty space with a pointlike singularity at the center and an event horizon at the outer edge, the description changes when the effects of quantum mechanics are taken into account. Research on this subject indicates that, rather than holding captured matter forever, black holes may slowly leak a form of thermal energy called Hawking radiation. However, the final, correct description of black holes, requiring a theory of quantum gravity, is unknown.