the general science journal

Hawking Radiation and Intra Event Horizon Electromagnetic Wave Dynamics Reveal Black Holes' Histories

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ABSTRACT. Hawking radiation is introduced as it relates to black holes. The dynamics of electromagnetic waves from inside the event horizon of a black hole are discussed. Characteristics of freed electromagnetic waves and what they correspond to is examined. It is shown that this information provides a history of an evaporating black hole due to the slow shrinking of the event horizon.

Hawking radiation is a theoretical type of black hole mass reduction developed by the great physicist Stephen Hawking. Particle-antiparticle production from zero point energy is responsible for the, as of yet unobserved, phenomenon. One particle is created just outside the event horizon and is allowed to escape while the other particle falls into the black hole. The particle that falls into the black hole has negative energy (it is antimatter). When the antimatter collides with regular matter of the black hole's core, annihilation occurs. This causes the black hole to lose mass and gravity. If the pair production and resulting shrinkage of the black hole exceeds the amount of matter pulled into the black hole, then the black hole will eventually dissipate in mass and its event horizon will shrink and eventually disappear.

The amplitudes of electromagnetic waves diminish with distance traveled. However, the amplitudes of the electromagnetic waves inside a black hole will remain interpretable, as we can detect objects billions of light years away or just look up at a starry night sky. A large amount of the same amplitude of electromagnetic waves being liberated continuously from a shrinking black hole indicates a large luminous mass (a star that has been pulled into the black hole). An analysis of how massive a black hole is and how far away it is, put together with the frequencies of electromagnetic waves liberated from it, tell us how long the electromagnetic waves have been in the black hole (higher frequencies will be from more near the center of the black hole since spiraling closer to the center of gravity produces higher frequency because electromagnetic waves gain energy/frequency as they go towards a gravitational source). That, put together with the amplitudes, tells us how bright the stars were that went into the black hole, as the event horizon slowly shrinks and lets out electromagnetic waves that have been in the black hole longer. Stars are classified into seven categories. In descending amplitude/luminosity/brightness, the types are: O, B, A, F, G, A, K, and M. So as a black hole evaporates, and liberates electromagnetic waves, ***we can see the types of stars*** the black hole swallowed, ***the order in which they were acquired*** and ***how long each acquisition lasted*** by the black hole.

Just like the rings of a tree stump tell us about the life of the tree, or how layers in a rock formation tell us about the past geologic activity in that area, the above analysis tells us about what went into the black hole (what formed it). Furthermore, this information will come in the same way as cutting into a tree trunk. The most recent electromagnetic waves will be released first, with the oldest released last. The electromagnetic waves that have spent more time in the black hole will have spiraled more to the center of the black hole's core and will be liberated last.

This can tell us many things about the history of the universe, regions in it, and their dynamics. It is amazing to be able to look back decades or more using these analytical techniques.