Black holes and relativity physics

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Abstract

Several mathematical constructs of black hole physics are described as misrepresentations, especially in terms of Relativity. The conditions of in-falling bodies reaching and crossing an event horizon are reexamined, and it is argued that matter cannot exist within a black hole. It is concluded that a black hole consists entirely of un-visible "white" light-energy.

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Black hole theory seems to be suffering from an absorption in mathematics at the expense of physics, especially relativistic physics. When for example it is said that an in-falling body will appear to "freeze" (stop) at an event horizon (originally by Oppenheimer & Snyder [1]) there is a misconception: The radiation from such an object will have already fallen far below the visible spectrum of an observer stationed at a safe distance from the horizon, and the quantity of radiation emitted will approach zero as wavelengths approach infinity. What will be seen of a falling object still relatively high above the horizon is a fading and flickering – then nothing. And to be clear, so long as an object is visible, its *acceleration* will be observed to increase (it is falling in an intense gravitational field!) as its *clock* and *emissions* slow.

What is curiously under-remarked about light emitted near an event horizon is that its speed in relation to a distant observer will be close to zero. This would seem to constitute an important addition to the one commonly recognized exception to the constancy of light-speed, that it can be reduced when passing through various media: Light speed also varies with elevation in a gravitational field. Such variation is not *relative* in the same sense as uniform motion, whereby observers will mutually measure each other's clock to go more slowly. In a gravitational field, elevation effects are *relational*, not relative: Observers will measure clocks and lightspeeds at lower elevations to be slower, and at higher elevations to be faster; such observations are inverse and actual, not mutual and relative. (Incidentally, this suggests a universal standard time, calculable if not physically locatable: the clock speed at a location with no gravitational influence.) And to observe a higher level from below is not to watch the future roll by, as is sometimes said; just as with the iconic twins of the so-called paradox, bodies at different levels in a gravitational field merely age at different rates.

A related misconception about the supposed "freezing" effect is the idea that light emitted just above the event horizon will take a near-eternity to reach an observer stationed at a safe elevation. Very little light will be emitted by an in-falling object near the horizon due to its infinitesimal clock-speed, and any that *is* emitted will most likely occur at some significant distance above the horizon, and it will accelerate (relationally) as it elevates, to impinge on an observer at *c* in a finite timeframe.

Regarding black holes themselves, it is thought that they have a material or quasi-material core (a "singularity") and a surrounding region out to the event horizon consisting of captured light and incidental in-falling matter, but otherwise vacant. And the conditions just inside the horizon are generally thought to be less than catastrophic to matter. Some say an astronaut might initially not even realize that she has crossed the horizon (Poisson & Israel [2]).

But the event horizon and its vicinity have not been adequately considered in conventional interpretations. The tidal effects that afflict matter shortly before crossing the horizon (an elevation with conditions so severe that light is rendered almost motionless going up) will already be extreme. The gradient of field-strength between the smallest differentials would rip atoms apart. Matter would be accelerating at *c* at the horizon, and the smallest particle would, if it could endure as matter, have infinite mass falling on anything below. So it is utterly implausible that matter could prevail in such conditions; it would have to be transformed, annihilated, and its rest mass converted to energy at the crossing of an event horizon. Realistically, there can be no material core, no singularity in a black hole, just a nebulous sphere of light compressed to the limit of photon density.

In the extremes of black hole physics, as in no other physical investigation, mathematical equations can be completely undone by conceptual inequities. Let mathematicians calculate upon a new assumption: A black hole is a quenching whole of whiteness.

References

[1] J. R. Oppenheimer and H. Snyder, Phys. Rev. **56**, 455 (1939).

[2] E. Poisson and W. Israel, Phys. Rev. D **41**, 1796 (1990).