

Black Holes, Unicorns, and All That Jazz

By
Stephen J. Crothers¹

22nd July 2008

The notion of black holes voraciously gobbling up matter, twisting spacetime into contortions that trap light, stretching the unwary into long spaghetti-like strands as they fall inward to ultimately collide and merge with an infinitely dense point-mass singularity, has become a mantra of the astrophysical community, so much so that even primary-school children know about the sinister black hole, waiting patiently, like the Roman child's Hannibal, for an opportunity to abduct the unruly and the misbehaved. There are almost daily reports of scientists claiming that they have again found black holes again here and there. It is asserted that black holes range in size from micro to mini, to intermediate and on up through to supermassive behemoths. Black holes are glibly spoken of and accepted as scientific facts and it is routinely claimed that they have been detected at the centres of galaxies. Images of black holes having their wicked ways with surrounding matter are routinely included with reports of them. Some physicists even claim that black holes will be created in particle accelerators, such as the Large Hadron Collider, potentially able to swallow the Earth, if care is not taken in their production. Yet despite all this hoopla, contrary to the assertions of the astronomers and astrophysicists of the black hole community, nobody has ever found a black hole, anywhere, let alone 'imaged' one. The pictures adduced to convince are actually either artistic impressions (i.e. drawings) or photos of otherwise unidentified objects imaged by telescopes and merely asserted to be due to black holes, *ad hoc*.

The alleged signatures of the black hole are an infinitely dense point-mass singularity and an event horizon. Scientists frequently assert that the escape velocity of a black hole is that of light in vacuum and that nothing, not even light, can escape from the black hole. In fact, according to the same scientists, nothing, including light, can even leave the black hole. But there is already a serious problem with these bald claims (black holes are also alleged to have "no hair"). If the escape velocity of a black hole is that of light, then light, on the one hand, can escape. On the other hand, light is allegedly not able to even leave the black hole; so the black hole has no escape velocity. If the escape velocity of a black hole is that of light in vacuum, not only can light both leave and escape, material objects can also leave the event horizon, but not escape, even though, according to the Theory of Special Relativity, they can only have a velocity less than that of light in vacuum. This just means that if the black hole has an escape velocity then material bodies can in fact leave the black hole and eventually stop and fall back to the black hole, just like a ball thrown into the air here on Earth with an initial velocity less than the escape velocity for the Earth. So the properties of the alleged black hole event horizon are irretrievably contradictory.

What of the infinitely dense point-mass singularity at the heart of the black hole? It is supposed to be formed by irresistible gravitational collapse so that matter is crushed into

¹ thenarmis@gmail.com

zero volume, into a 'point', a so-called 'point-mass'. One recalls from high school that density is defined as the mass of an object divided by the volume of the object. If the mass is not zero and the volume is zero, as in the case of a black hole singularity, one gets division by zero. But all school children know that division by zero is not allowed by the rules of mathematics. Nonetheless, black hole proponents divide by zero! Furthermore, black holes are allegedly obtained from Einstein's General Theory of Relativity. It is called the General Theory because it is a generalisation of his Special Theory of Relativity. As such, General Relativity cannot, by definition, violate Special Relativity, but that is precisely what the black hole does. Special Relativity forbids infinite densities because, according to that Theory, infinite density implies infinite energy (or equivalently that a material object can acquire the speed of light in vacuo), which contradicts the fundamental postulate of Special Relativity. Therefore General Relativity also forbids infinite densities. But the point-mass singularity of the black hole is allegedly infinitely dense, in violation of Special Relativity. Thus the Theory of Relativity actually forbids the existence of a black hole.

What else of the event horizon of the black hole? According to the proponents of the black hole it takes an infinite amount of time for an observer to watch an object (via the light from that object, of course) to fall down to the event horizon. So it therefore takes an infinite amount of time for the observer to verify the existence of an event horizon and thereby confirm the presence of a black hole. However, nobody has been and nobody will be around for an infinite amount of time in order to verify the presence of an event horizon and hence the presence of a black hole. Nevertheless, scientists claim that black holes have been found all over the place. The fact is nobody has assuredly found a black hole anywhere – no infinitely dense point-mass singularity and no event horizon. Some black hole proponents are more circumspect in how they claim the discovery of their black holes. They instead say that their evidence for the presence of a black hole is indirect. But such indirect "evidence" cannot be used to justify the claim of a black hole, in view of the fatal contradictions and physically meaningless properties associated with infinitely dense point-mass singularities and event horizons. One could just as well assert the existence and presence of deep space unicorns on the basis of such indirect "evidence". It is also of great importance to be mindful of the fact that no observations gave rise to the notion of a black hole in the first place, for which a theory had to be developed. The black hole was wholly spawned in the reverse, i.e. it was created by theory and observations subsequently misconstrued to legitimize the theory. Reports of black holes are just wishful thinking in support of a belief; not factual in any way.

Another fatal contradiction in the idea of the black hole is the allegation that black holes can be components of binary systems, collide or merge. Let us, for the sake of argument, assume that black holes are predicted by General Relativity. The black hole is fundamentally described by a certain mathematical expression called a line-element (which is just a fancy name for a distance formula, like that learnt in high school) that involves just one alleged mass in the entire Universe (just the alleged source of a gravitational field), since the said distance formula is a solution for a spacetime allegedly described by Einstein's static equations in vacuum (or, more accurately, in emptiness), namely $Ric = 0$. One does not need to know anything at all about the mathematical

intricacies of this equation to see that it cannot permit the presence of one black hole, let alone two or more black holes. The mathematical object denoted by Ric is what is called a tensor (in this case it's Ricci's tensor, and hence its notation). The reason why $Ric = 0$ is because in Einstein's General Theory of Relativity all matter that contributes to the source of the gravitational field must be described by another tensor, called the energy-momentum tensor. In the case of the so-called static vacuum field equations the energy-momentum tensor is set to zero, because there is no mass or radiation present by hypothesis. Otherwise Ric would not be equal to zero. So the alleged black hole can interact with nothing, not even an 'observer'. $Ric = 0$ does not describe a two body problem, only, allegedly, a one body problem (and hence quite meaningless). One cannot just introduce extra objects into a given solution to Einstein's field equations because his theory requires that the curvature of spacetime (i.e. the gravitational field) is due to the presence of matter and that the said matter, all of it, must be described by his energy-momentum tensor. If the energy-momentum tensor is zero there is no matter present. Einstein's field equations are non-linear, so the 'Principle of Superposition' does not apply. In other words, one cannot obtain a solution to Einstein's field equations for some specified configuration of matter and thereafter just insert additional lumps of matter into the spacetime for that solution. All configurations of matter each require an associated energy-momentum tensor particular to it and a solution to the field equations for each configuration. Before one can talk of relativistic binary systems it must first be proved that the two-body system is theoretically well-defined by General Relativity. This can be done in only two ways:

- (a) Derivation of an exact solution to Einstein's field equations for the two-body configuration of matter; or
- (b) Proof of an existence theorem.

There are no known solutions to Einstein's field equations for the interaction of two (or more) masses, so option (a) has never been fulfilled. No existence theorem has ever been proved, by which Einstein's field equations even admit of latent solutions for such configurations of matter, and so option (b) has never been fulfilled either. Since $Ric = 0$ is a statement that there is no matter in the Universe, one cannot simply insert a second black hole into the spacetime of $Ric = 0$ of a given black hole so that the resulting two black holes (each obtained separately from $Ric = 0$) mutually interact in a mutual spacetime that by definition contains no matter! One cannot just assert by an analogy with Newton's theory that two black holes can be components of binary systems, collide or merge, because the 'Principle of Superposition' does not apply in Einstein's theory. Moreover, General Relativity has to date been unable to account for the simple experimental fact that two fixed bodies will approach one another upon release. So from where does the matter allegedly associated with the solution to $Ric = 0$ come, when this is a statement that there is no matter present? The proponents of the black hole just put it in at the end of their calculations, *a posteriori* and *ad hoc*, in violation of their starting hypothesis that $Ric = 0$, and to top it off, they do so by introducing a Newtonian relation.

Curiously it is frequently claimed that Newton's theory of gravitation also predicts a black hole. What is actually alluded to is the theoretical Michell-Laplace Dark Body, which has an escape velocity equal to or greater than the velocity of light in vacuo, but which is nonetheless not a black hole. The basis for the claim resides in the fact that the critical radius for the Michell-Laplace Dark Body is given by the same mathematical expression as that for the so-called "Schwarzschild radius" of a black hole. But this is not surprising, because this "radius" was effectively inserted into the distance formula for $Ric = 0$ (called the "Schwarzschild solution"), along with matter, *a posteriori* and *ad hoc*. However, in the space of Newton's gravitation, the radius of the Michell-Laplace Dark Body is the radial distance from the centre of mass of the object, but in the space of the "Schwarzschild solution" the "Schwarzschild radius" it is not a radial distance at all, by reason of the non-Euclidean geometry of Einstein's gravitational field. Furthermore, the black hole is allegedly produced by irresistible gravitational collapse, but the Michell-Laplace Dark Body does not involve irresistible gravitational collapse; the black hole irresistibly collapses into an infinitely dense point-mass singularity but the Michell-Laplace Dark Body does not (its density is finite); no light and no material body can even leave the black hole let alone escape, but light and material bodies can leave the Michell-Laplace Dark body, and at its critical radius light can escape from it; the black hole has an event horizon but the Michell-Laplace Dark Body has no event horizon; the black hole has no escape velocity whereas the Michell-Laplace Dark Body has an escape velocity; no observer, no matter how close to the event horizon, can see a black hole, but there is always a class of observers that can see the Michell-Laplace Dark Body (an observer only needs to be close enough to it); there is no upper limit to the speed of an object in Newton's theory, but no material body can acquire the speed of light in vacuo in Einstein's theory; in the case of a black hole for $Ric = 0$, such as the "Schwarzschild" black hole, an observer can't be present in its spacetime which is by definition empty, but an observer can always be present in the space of the Michell-Laplace Dark Body because its space is not empty by definition; the 'Principal of Superposition' applies in the case of the Michell-Laplace Dark Body but does not apply in any case of a black hole; and the centre of mass of a body is not a physical object in Newton's theory nor Einstein's theory. So the Michell-Laplace Dark Body does not possess the tell-tale signatures of the alleged black hole, and so it is not a black hole. Thus, Newton's theory also does not predict black holes.

Finally, although the fundamental solution to $Ric = 0$ is usually called the "Schwarzschild solution", despite its name, it is not in fact Schwarzschild's solution. Schwarzschild's actual solution forbids black holes. The frequent claim that Schwarzschild found and advocated a black hole solution is patently false, as a reading of Schwarzschild's papers on the subject irrefutably testify. False too are the claims that he predicted an event horizon and that he determined the "Schwarzschild radius" (i.e. the alleged "radius" of the black hole event horizon). Schwarzschild actually had nothing to do with the black hole, but attaching his name to it lends the notion an additional façade of scientific legitimacy.

1. Karl Schwarzschild, *On the gravitational field of a mass point according to Einstein's theory*, Sitzungsber. Preuss. Akad. Wiss., Phys. Math. Kl, 189, 1916, www.sjcrothers.plasmareources.com/schwarzschild.pdf

2. Karl Schwarzschild, *On the gravitational field of a sphere of incompressible fluid according to Einstein's theory*, Sitzungsber. Preuss. Akad. Wiss., Phys. Math. Kl., 424, 1916,
www.sjcrothers.plasmaresources.com/Schwarzschild2.pdf
3. G. C. McVittie, *Laplace's alleged 'black hole'*, The Observatory, v.98, 272, 1978,
www.sjcrothers.plasmaresources.com/McVittie.pdf
4. Stephen J. Crothers, *A Brief History of Black Holes*, Progress in Physics, v.2, 54-57, 2006,
www.ptep-online.com/index_files/2006/PP-05-10.PDF