

A First Note to the Short Theory on the Creation and Nature of Black Holes

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The concept of shell in this theory might sound confusing. According to the black hole definition covered in [1] there are two main entities in this system. The first is the mass that is spread all over the surface of the black hole. The second is a massless boundary that marks the beginning of the non-existent space-time. In Figure 1, we attempt to separate them.

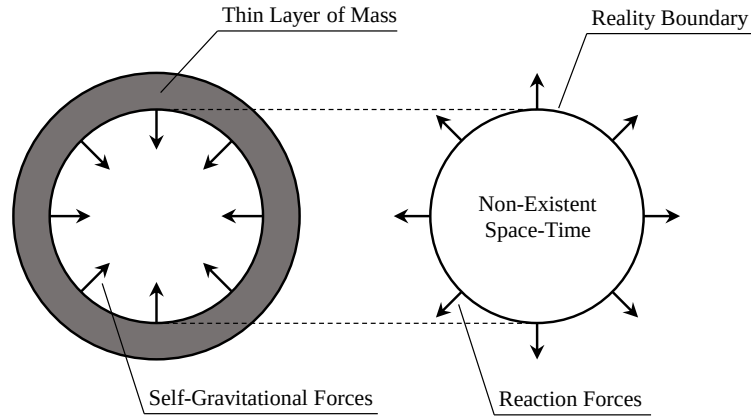


Fig. 1. Diagram of the mass layer (left) and the reality boundary (right) of the black hole.

In this definition of the system, the mass spread on the surface of the black hole has no acceleration. Thus, the self-gravitational forces must be compensated with some reaction forces. The second type of forces, suggest a completely new type of forcefield, whose purpose is to prevent any mass from crossing to the non-existent space-time region, the region where even a point mass would violate the energetic limit. In the analogy of this boundary to a wall, these would be the reaction forces that emerge when we push the wall. We can think of these forces in terms of the pressure exerted on the inner surface of the black hole's layer of mass. To calculate this pressure, p , let us consider a mass m on the layer, subject to the gravitational and the reaction forces, F_{grav} and F_{reac} , as depicted in Figure 2. We will identify g as the gravitational acceleration on the mass, and a as a portion of the entire inner area A .

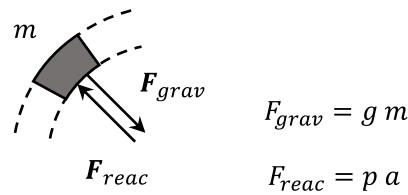


Fig. 2. Mass on the surface of the black hole, subject to the self-gravitational pull and the reaction force.

Then

$$F_{reac} = F_{grav}, \quad (1)$$

$$pa = mg, \quad (2)$$

For this calculation, we assume a perfectly balanced Schwarzschild black hole. Let us redefine g using the Schwarzschild radius, $\frac{2GM}{c^2}$,

$$g = \frac{GM}{R^2} = \frac{c^4}{4GM}. \quad (3)$$

Substituting (3), in (2), we obtain

$$pa = \frac{m}{M} \frac{c^4}{4G}. \quad (4)$$

We assume that the mass is evenly distributed over the surface. Then, the following proportionality holds

$$\frac{a}{A} = \frac{m}{M}. \quad (5)$$

Using (5) in (4) leads to

$$p = \frac{c^4}{4GA}. \quad (6)$$

Expression (6) defines the pressure exerted on the spherical boundary. Should we decided to flatten this surface, such that the forces do not compensate each other, the net force over that area would be

$$F_{net} = pA = \frac{c^4}{4G}. \quad (7)$$

or expressed as a function of the hypothesized energy limit, ε_{max} ,

$$F_{net} = \frac{\varepsilon_{max}^2}{G}. \quad (8)$$

Equation (7) is shocking, since it tells us that the net force exerted on the black hole, and similarly the net reaction force, are not dependent on the size nor the mass of the black hole, they are both constant. In other words, all the Schwarzschild black holes have a net force of approximately 1.21×10^{44} [N]. Which provides an interesting perspective on what this theorized new type of forcefield could be.

References

[1]. Viaña, J. Short Theory on the Creation and Nature of Black Holes. Scholar@UC, 2021. <https://scholar.uc.edu/concern/articles/4f16c456j?locale=en>