THE SUPERMASSIVE CENTRE OF OUR GALAXY

ET CETERA

ANGELO LOINGER AND TIZIANA MARSICO

ABSTRACT. We show that the supermassive celestial body at the centre of the Milky Way and the two supermassive celestial bodies at the centre of the distant galaxy NGC 6240 cannot be black holes.

Introduction

Sophisticated observations made by a team of astrophysicists of the M.P.I. for Extraterrestrial Physics have allowed to determine the positions of the star denoted with the symbol S2 in its motion around the Milky-Way’s centre [1]. It has come out that the S2 orbit is a Keplerian ellipse with a period of 15.2 years.

We acknowledge the accuracy of the above research, but we are rather sceptical about the conclusion of the authors according to which the centre around which S2 revolves is a black hole. As far as an “explanation” is an explanation, it is necessary that what is explained is a logical consequence of the premiss and of what is used for explaining. As a matter of fact, the existence of the observed Keplerian orbit can only explain the presence of a punctual supermassive body at the centre of the Milky Way – and not of a supermassive black hole. This conclusion will be corroborated in a detailed way in the following sections.

1. Theoretical considerations

If \( r, \theta, \phi \) are spherical polar coordinates, the solution of the problem of the Einsteinian gravitational field generated by a point mass \( M \) at rest is given by the following spacetime interval [2]:

\[
ds^2 = \left[1 - \frac{2m}{f(r)}\right]c^2dt^2 - \left[1 - \frac{2m}{f(r)}\right]^{-1}\left[\left(dx(r)\right)^2 - f^2(r)\left[\left(dy(r)\right)^2 + \sin^2\theta\left(dx(r)\right)^2\right]\right], \tag{1}
\]

where: \( m \equiv MG/c^2; G \) is the gravitational constant and \( c \) the speed of light in vacuo; \( f(r) \) is any regular function of \( r \).

If one chooses \( f(r) \equiv r \), one obtains the so-called standard form of solution, \textit{erroneously} named “by Schwarzschild”, but in reality due to Hilbert, Droste and Weyl [2].

One has the \textit{original} form of solution given by Schwarzschild in 1916 if one chooses \( f(r) \equiv \left[r^3 + (2m)^3\right]^{1/3} \); Schwarzschild’s \( ds^2 \) holds in the \textit{entire} spacetime, with the only exception of the origin \( r = 0 \): it is “maximally
extended”. Remark that Schwarzschild’s form of solution is diffeomorphic to the part $r > 2m$ of the standard form. For $r < 2m$ this part loses any mathematical and physical meaning - as it was repeatedly emphasized by Einstein and by all the Great Men who developed the general relativity – because the solution becomes non-static, the radial coordinate $r$ becomes a time coordinates, and the $ds^2$ loses its physical “appropriateness”. Now, the invention of the senseless notion of black hole was originated by an odd reflection on the region $r < 2m$. If the treatises had expounded the original form of Schwarzschild in lieu of the standard form, the notion of black hole would not have come forth.

In conclusion, the physical results are those and only those that are independent of the particular choice of the function $f(r)$. But the fictive notion of black hole owes its origin to a misinterpretation of the part $r < 2m$ of a particular form: the standard form.

2. Experimental results and conclusions

Some months ago Schödel and other 22 authors published a paper \cite{1} in which they report “ten years of high-resolution astrometric imaging” that have allowed “to trace two-thirds of the orbit of the star, [denoted with S2], currently closest to the compact radio-source Sagittarius A* [SgrA*].” They write: “The observations, which include both pericentre and apocentre passages, show that the star is on a bound, highly elliptical keplerian orbit around SgrA*, with an orbital period of 15.2 years and a pericentre distance of only 17 light hours. The orbit with the best fit to the observations requires a central point mass of $(3.7 \pm 1.5) \times 10^6$ solar masses ($M_\odot$). The data no longer allow for a central mass composed of a dense cluster of dark stellar objects or a ball of massive, degenerate fermions.”

Schödel et alii \cite{1} interpret their results as an experimental proof of the existence of a supermassive black hole at the centre of our galaxy. Evidently, they are victims of the very diffuse, but erroneous opinion (see sect.1) that the gravitational collapse of a massive celestial body must generate a black hole. On the other hand, the experimentally observed orbit is keplerian, that is described by the (nonrelativistic) Newtonian theory. From the standpoint of logic and experience, one can only affirm that at the centre of Milky Way there is a punctual object with a huge mass. (It is interesting to remark that the fictitious event horizon for a point mass $\approx 4 \times 10^6 M_\odot$ would be situated at a distance of $\approx 26$ light seconds!).

APPENDIX

In a NASA Press Release, dated November 20th, 2002, entitled “A Super Galactic Discovery”, we read: “For the first time, scientists have found proof of two supermassive black holes together in the same galaxy. These black holes are orbiting each other and will merge several hundred million years from now. The event will unleash intense radiation and gravitational waves [...] and leave behind an even larger black hole than before.”
NASA’s Chandra X-ray Observatory spotted the two black holes in the galaxy NGC 6240. The observatory was able to “see” them because the black holes are surrounded by hot swirling vortices of matter called accretion disks. Such disks are strong sources of X-rays.

This is pure science fiction! Demonstration. In primis, as we have seen in sect. 1, the very notion of black hole is a nonsense. In secundis, even if we believed in the existence of the black holes, there would be “no way of asserting through some analogy with Newtonian gravitational theory that a black hole could be a component of a close binary system or that two black holes could collide. An existence theorem could first be needed to show that Einstein’s field equations contained solutions which described such configurations.” In tertius, the eventual formation of an accretion disk, strong source of X-rays, is not linked to a particular choice of the arbitrary function \( f(r) \) (see sect. 1) – in particular to the standard choice \( f(r) \equiv r \).

In conclusion, no black hole has been detected by Chandra X-ray observatory. And never gravitational waves will travel over the world, because they are pure mathematical undulations, completely devoid of any physical reality 2, 3, 4.

“La vérité, l’âpre vérité.”

Danton

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Dipartimento di Fisica, Università di Milano, Via Celoria, 16 - 20133 Milano (Italy)
E-mail address: angelo.loinger@mi.infn.it

Liceo Classico “G. Berchet”, Via della Commenda, 26 - 20122 Milano (Italy)
E-mail address: martiz64@libero.it