

Overlooked Twin Paradox in Oppenheimer-Snyder Theory – Greatest Oversight and Risk of History

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Abstract Black hole horizons can be reached or left in finite proper time (Oppenheimer and Snyder 1939). But they cannot be reached or left in finite outside time. The implied gravitational twin paradox was overlooked. Nonevaporation, unchargedness and absence of information paradoxes are corollaries; the LHC experiment becomes unsafe.

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In 1939, Oppenheimer and Snyder described a surprisingly short proper infalling time into a stellar black hole of the order of one day [1]. A second fact also first calculated by them – that watched from the outside, the free-falling traveler takes up an infinite amount of time appearing “frozen” – seemed dwarfed in comparison. This traditional conclusion is misleading: Both facts possess an equal status.

Proof: We assume that the infalling astronaut rebounds from the black hole’s horizon due to the assumed presence of a trampoline there. How long will the return trip take him? One day again owing to time-reversal symmetry. But the same roundtrip lasts infinitely long in the eye of an observer who stays aloft (note that even light takes infinitely long for the same down-up roundtrip [2]). Thus, an extremal case of Einstein’s famous twin-clocks paradox applies in this gravitational context: by the return of the two days older twin, the stationary twin has grown infinitely old.

What does the new result mean? The answer is obvious: it implies an infinite slow-down of the traveler’s clock. This is the only way how an infinite outside time can be bridged in finite proper time. Yet this simple fact got overlooked by the scientific community. Simultaneously, the famous “information paradoxes” and “singularity theorems” erected on the first half of Oppenheimer and Snyder’s finding also lose their correspondence with physical reality. For with an infinitely slowed clock, you can in principle reach any unphysical – for example infinitely far-away – place in finite time. The horizon and its interior hence become “effectively unreachable” in the same sense as a point at infinity is. The conventional use of infinitely re-scaled coordinates contributed to the oversight.

Thus, a seven-decades old belief in the horizon as a finitely-accessible element of physical reality suddenly represents an equally old globally accepted scientific error. Two consequences stick out:

- 1) Black holes are different. They cannot evaporate in finite time since nothing can leave the horizon in finite time. And they are uncharged since in-falling charges suffer a redshift-proportional attenuation. These two predictions alter the behavior of potential miniblack holes generated in an earth-based experiment. CERN’s prestigious “safety report” therefore loses its grip. At the same time the accident which halted the LHC launch acquires the ring of a godsend.
- 2) The scientific community has lost face. Sophisticated formulae masked a logical error. And an experiment was launched against cautioning with the confidence of a dogmatic believer risking a planet. How can the loss of status and vision be repaired? Installation of “Lampsacus hometown of all persons on the Internet” by CERN could be a gesture of good will.

To conclude, a tiny little overlooked fact (infinite clock-slowdown) led the whole scientific community astray. A planned experiment – second ignition of the LHC – appears in a new light. For J.O.R.

References

- [1] Oppenheimer, J.R. and Snyder, H., On continued gravitational contraction. *Phys. Rev.* **56**, 455-459 (1939).
- [2] Foster, J. and Nightingale, J.D., *A Short Course in General Relativity*, 3rd edn. New York: Springer-Verlag 2006, p. 130.