



White Holes

Carlo Rovelli

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“Abandon all hope, ye who enter.” (Inferno, Canto III, 9, Devine Comedy)

Carlo Rovelli tells another story of become and perish in the universe.

As a native Italian born in Verona, he loves Dante’s “Devine Comedy” and detected many commonalities between his work as a physicist and Dante’s Poem: Rovelli travels into the abyss of a black hole to transverse through a quantum loop to a white hole to “fly to the other side of space and time to see the stars again” (Dante).

In a thought experiment Rovelli takes you on a trip from the horizon into the inside of a black whole and lets you emerge through a white hole applying Einstein’s relativity field equations combing it with his “loop quantum gravity”, Rovelli developed with his students and colleagues.

Rovellis trick is to change the perspective moving from an outside observation of a black hole to the inside – beyond the horizon. Applying Einstein’s relativity formulas he calculates a narrowing tube in which the swallowed material is building up an ever growing pressure shrinking the volume finally to the size of a Planck-length star. Now we are in a region where Einstein’s space and time equations are not valid anymore. But, instead of assuming a singularity Rovelli theorizes that space becomes “granular” entering the region of quantum physics – and according to Rovelli’s calculations the probability of a “rebound” increases and a *time reversal* (negative time) occurs connecting the two systems with a quantum tunnel creating a white hole, which together with the “Hawking radiation” causes the “swallowed” material to be released (like a movie being played backwards).

This occurs over a billion of years seen from the outside, but only seconds or hours from the inside.

The end result is a tiny white hole (weights less than a hair) without measurable attributes, only with a miniscule gravitational force.

Rovelli speculates that those white holes are around us in abundance but cannot be detected nor measured. According to Rovelli’s interpretation the white holes could be part of the mysterious dark matter which holds our Universe together.

The book is written in a very poetic stile making many amazing references to Dante’s Divine Comedy. According to Rovelli the book was written without scientific details with two reader groups in mind: one having only a minor background in physics therefore would not be interested in details, and one group “into” the matter being familiar with the black hole physics and Einstein’s relativity details already, thus not want to be bored with known details. For the readers “in between”, Rovelli supplies an annex where he presents Einstein’s relativity facts and explains his loop quantum gravity in scientific terms.

I appreciated the book very much – it is easy, yet interesting and understandable reading with a touch of poetry about a complex subject, and I am convinced a new window of understanding of the mysteries of our Universe opened for me.

“The most beautiful thing we can experience is the mysterious. It is the source of all true art and science. He to whom the emotion is a stranger ...is as good as dead: his eyes are closed.”

- Albert Einstein