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The Black Hole Universe: the perfect cosmological principle

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Most cosmologists today believed that our universe corresponds to a Big Bang homogeneous (FLRW) metric with an age which is only three times larger than the age of Earth. This seems in agreement with most observations and with the cosmological principle which states that spacetime is homogeneous only in space, but not in time. Recent measurements indicate that our cosmic expansion is dominated by a repulsive cosmological constant $\Lambda > 0$. This indicates that we are inside a closed hypersphere, $r < r_\Lambda \equiv \sqrt{3/\Lambda}$, which corresponds to the interior of a Black Hole (BH) event horizon. Our universe expands inside this BH with asymptotic de-Sitter interior. In proper coordinates such universe becomes static. We call this the BH Universe (BHU). The BHU involves two nested FLRW metrics which we show here is an exact solution of classical General Relativity. Our BHU could be part of a much larger and older network of BHUs in a new version of the Steady State Cosmology. This results in an implementation of the perfect cosmological principle, where time and space are in the same footing, as required by the principle of relativity. We argue that observed BHs (or BHs making up the observed Dark Matter, DM) inside our universe could also be smaller BHUs themselves. In such case, BHs and BH mergers, rather than reheating at the end of inflation, could be the source of all matter-energy content in our universe, which resolves the coincidence problem (between the density of DM and Λ today). We discuss other observational features of such a BHU cosmology, such as CMB anomalies and high energy BH ejection.

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