1 Entropy Anchoring: Supermassive Black Holes Define Galactic Structure

Thesis: A supermassive black hole (SMBH) functions as a recursive entropy anchor at the core of each galaxy. Its horizon defines the deepest local entropy minimum, setting the boundary conditions for the galaxy's large-scale structure, curvature, and rotation.

Recursive Collapse and Horizon Anchoring

The SMBH at the galactic center defines the terminal state of recursive entropy encoding:

$$\Psi_{\infty,galaxy}(x) = deepestmemorycollapsesurface$$

This collapse stabilizes the central horizon Σ_{SMBH}, establishing a gravitational entropy well. The surrounding galactic matter aligns with the tension gradient emerging from this surface.

Emergent Potential from Recursive Surface Field

The recursive horizon field defines a gravitational potential sourced by encoded entropy:

$$\nabla^2 \Phi_{galaxy} = 4\pi G \frac{\delta S_{\Sigma_{SMBH}}}{\delta V}$$

Thus, galaxy-wide curvature is not sourced by mass directly, but by the recursive gradient of surface entropy centered on the SMBH.

Flat Rotation Curves Without Dark Matter

The velocity field across the galaxy is governed by the recursive tension gradient:

$$v(r) \propto \sqrt{\nabla \Phi_{recursive}(r)}$$

As the entropy gradient falls off slower than $1/r^2$, this naturally leads to flat rotation curves—a phenomenon typically attributed to dark matter, now emergent from surface recursion.

Mass Scaling Relationship

The surface area of the central horizon determines total entropy:

$$S_{SMBH} = \frac{k_B c^3}{4\hbar G} A_{SMBH} \quad \Rightarrow \quad M_{galaxy} \propto A_{SMBH} \propto M_{SMBH}^2$$

Hence, the galaxy's total baryonic mass scales with the square of the SMBH mass, matching observed empirical trends.

Conclusion

Galactic structure, rotation, and mass scaling emerge as natural consequences of entropy anchoring by a central recursive surface. The supermassive black hole is not merely a gravitational remnant, but a defining informational boundary—the memory anchor around which galaxies self-organize.

Blackhole galactic connection

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2 Introduction