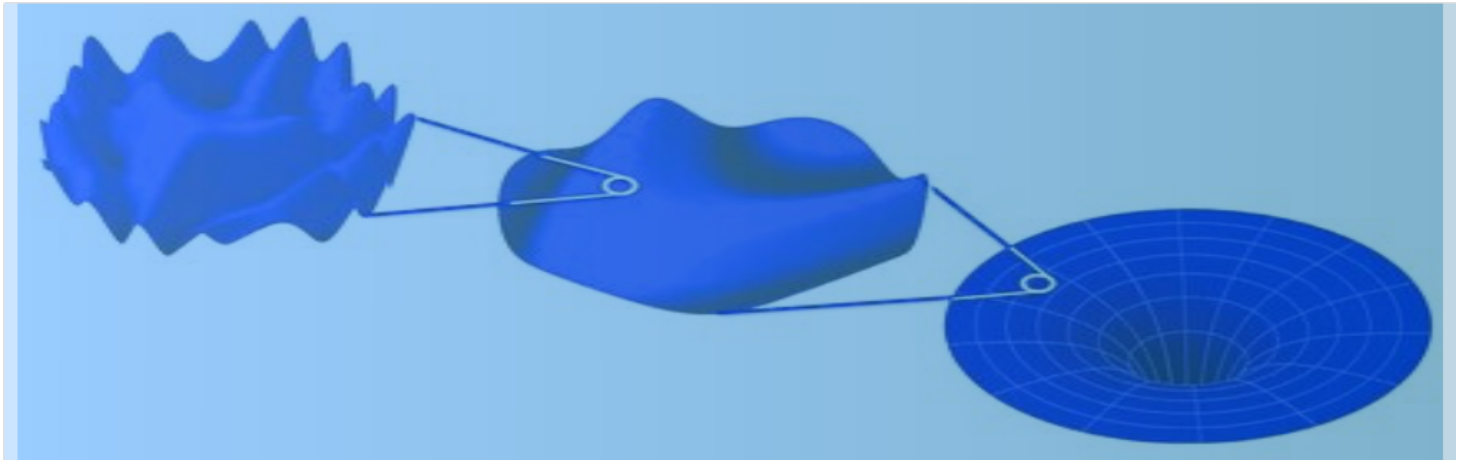

QS&RN 2023

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- Functional renormalization Group (FRG) approach to QG owing to model and background- independence very promising for extending our knowledge of gravity both in UV and IR but needs to make contact to behaviour of gravity at different scales and coupling regimes (BH, cosmology, galactic dynamics).
- I propose to the RG&QS community three questions motivated by recent research on black holes and IR behaviour of gravity.

BLACK HOLES

- We have learned to construct nonsingular black holes or mimickers (GR coupled with anisotropic fluids, fuzzballs ..). We can have AF BH with de Sitter core (also AdS for quantum stars) and with a SuperPlankian quantum hair, whose value can be already constrained by orbits on SgrA, BH imaging by EHT and in the near future third generation GW detectors. I understand that quantum spacetime description is a quite involved question (see Renata Ferrero talk on monday) but :

Could asymptotic safe fixed points predicted in FRG be related to some effective description of BH interior in terms of smooth manifolds such as de Sitter (or AdS) spacetimes?

- Wide classes of charged, string inspired, nonsingular BHs have extremal configuration in which , the near horizon geometry factorizes as $AdS_2 x S_2$, which are very promising for solving the BH information puzzle (AdS/CFT, Page curve goes down, ER=EPR) and could give AdS_2 QG.

Could FRG generate fixed points related to some effective spacetime description in terms of two-dimensional AdS?

- **Hint: Lauscher and Reuter (2001), UV fixed point gives 4→2 dimensional reduction, see also Becker's talk**

IR BEHAVIOUR OF GRAVITY

Evidence from emergent and corpuscular gravity that galactic dynamics could be explained as IR modification of gravity without postulating DARK MATTER. Also some evidence of emergence of conformal symmetries in the IR.

Could FRG produce an IR behaviour of gravity compatible with galactic rotation curves and eventually an IR fixed point?

- **Hint: Reuter and Weyer (2004), Running newton constant and rotational curves**