GR 10: Scalar-tensor and non-local gravity theories

Time: Thursday 17:30–18:00 Location: H9

GR 10.1 Thu 17:30 H9

Core collapse in scalar-tensor theory with massive fields — •Roxana Rosca-Mead — FSU, Jena, Germany

Though General Relativity has been successfully tested so far, concepts such as dark energy and string theory suggest the need of modifying it. Scalar-tensor theory is one of the most popular alternatives discussed. The key motivation for looking at the ones with massive fields is that they are far less constrained by binary pulsar observations, in contrast to the massless case. In this talk, I will demonstrate studies in stellar core collapse in spherical symmetry, that were performed by adapting the numerical code GR1D to the case of massive scalar-tensor gravity. The addition of a mass term allows, within present constraints, much stronger gravitational wave emission than in the massless case, while the dispersion in the propagation of the scalar leads to a quasi-monochromatic signal, potentially detectable by LIGO /Virgo with existing analysis pipelines.

GR 10.2 Thu 17:45 H9

Topological defects and regularity in non-local gravity — •Jens Boos — William & Mary, Williamsburg, United States

Non-local gravitational theories with infinitely many derivatives may solve the gravitational singularity problem without introducing ghost-like degrees of freedom that one typically encounters in higher-order gravity. However, due to the complexity of the non-linear non-local field equations, so far only the linear regime is understood well. In this talk I will focus on cosmic string solutions obtained in weak-field non-local gravity. These have an interesting feature: non-locality regularizes the curvature defect at the location of the cosmic string. Since spacetime is now simply connected one might assume that the angle deficit vanishes, but this is not true: asymptotically one recovers the string solution of General Relativity. Non-locality hence challenges the way we think about topological defects in connection with topological properties of spacetime. If time permits, I shall also comment on similar effects regarding Aharanov–Bohm phases in non-local quantum mechanics, and their possible observational signatures.