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Title: GW190521: Crafting an impossible black hole

Abstract:

GW190521 is the most massive gravitational wave event to date, and its primary mass has astrophysicists scratching their heads: it lies in the middle of the upper mass gap, expected from the theory of pair instability. Uncertainties on massive star evolution (e.g., rotation, envelope undershooting, convection, nuclear rates and envelope collapse) still leave some ground for a deep revision of the mass gap. Alternatively, multiple mergers and runaway collisions of massive stars in metal-poor star clusters might facilitate the formation of massive (~ 60 - $400 M_{\text{sun}}$) black holes with possibly large spins. In the absence of a natal kick, these oversized black holes remain in the parent cluster and can easily pair with other compact objects.