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Constraints from Nuclear Physics on Non-Minimally Coupled Gravity SARAH FISHER, ERIC CARLSON, Wake Forest University — Non-minimally coupled gravity, where the gravitational action takes the form $\int d^4x\sqrt{-g}\,\{f_1(R) + f_2(R)\mathcal{L}_m\}$, where f_1 and f_2 are arbitrary functions of the Ricci scalar R, has been considered as an alternative to dark matter and dark energy. We argue that the best constraints on many types of theories come not from cosmology or even astrophysics, but from systems with large gradients of the stress-energy tensor. Nuclei, particularly the ^{4}He nucleus, can produce especially strong constraints. In the case $f_1(R) = \frac{R}{16\pi G}$ and $f_2(R) = 1 + \lambda R$ we find constraints on λ that are thirty orders of magnitude stronger than astrophysical constraints. We argue that such nuclear constraints on modified gravity should be applied to a wide variety of non-minimally coupled gravity theories, as such constraints might invalidate the choice of parameters required to produce the desired cosmological effects.

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