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Wong: ”Contemplating Atoms: What hydrogen teaches us about modified gravity”

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Considering simple systems can often be helpful in elucidating the most important features of a theory. I provide a recent example by revisiting the behaviour of hydrogen atoms in chameleon-like modified gravity, highlighting some recent advancements in our understanding. A careful analysis uncovers additional interaction terms in the Hamiltonian previously unaccounted for, which can dominate the chameleon-induced fine-structure corrections of certain spectral lines. Effects on hyperfine structure and on violations of the Einstein equivalence principle are also presented for the first time. While these developments enable modest updates to chameleon constraints based on atomic precision tests, they remain largely uncompetitive with other experimental bounds. Of greater value are the general insights gained from this study, and their possible implications for future work will be discussed.