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The Dark Side of the Cosmos: Exploring Dark Energy and Modified Gravity

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We are currently witnessing a remarkable era in the fields of cosmology and gravitation, as an ever-increasing amount of observational data continues to be collected. One of the most perplexing questions confronting cosmologists today concerns the mysterious source responsible for the Universe's recent accelerated expansion. The most widely accepted explanations for this phenomenon involve either a dark energy component or a modified theory of gravity. In this talk, we present, on the one hand, several dark energy models, ranging from axion-like scalar fields and kinetic gravity braiding models to 3-form fields. On the other hand, we explore modified theories of gravity, in particular those based on $f(Q)$ gravity, as alternative explanations for the Universe's current accelerated expansion. We also discuss the observational constraints on these models. Furthermore, we examine how they may contribute to a potential resolution of the ongoing H_0 and S_8 tensions.

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