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A curious story of quantum gravity in the ultraviolet

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For the past 30 years nearly all theoretical physicists have believed that quantum field theories based on Einstein's general relativity necessarily must be ill-defined in the ultraviolet. This is the well known non-renormalizability problem of gravity. But is it actually true in general? We describe recent calculations that cast doubt on this simple picture and show that quantum gravity is much tamer in the ultraviolet than believed possible. The new calculations make use of enormous advances in our ability to compute scattering amplitudes in quantum field theory. The relationship between gravity and gauge theory also offers a more general promise of simplifying Einstein's Theory of General Relativity, as will be illustrated with black hole solutions.

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