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Our warped universe: the power of gravitational lensing for probing the cosmos

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Gravitational lensing epitomizes a maxim of Einstein's General Relativity: space tells energy how to move and energy tells space how to curve. Through lensing, massive objects magnify and distort the shapes of distant objects, likes galaxies and quasars. The connection between the lens's mass distribution and the degree of distortion in the images allows us to observe faint, distant objects, and to infer the matter distribution and cosmic expansion in the nearby universe. Current and future surveys, both ground- and space-based, will provide data sets unprecedented in size and precision with which to probe dark energy, dark matter and the early universe through gravitational lensing. I will discuss recent advances in observations and analysis techniques in both weak and strong lensing, and the burgeoning potential of these techniques to derive important and competitive cosmological constraints from surveys of large-scale structure.