Physics colloquium

Testing the Nature of Dark Matter with Strong Gravitational Lensing

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Abstract: In the most widely accepted theory of dark matter, galaxies are believed to exist within extended, dense regions of dark matter known as `halos'. The abundance of these halos provides crucial insight into the nature of dark matter as it depends on the fundamental properties of dark matter such as its free streaming-length in the early universe, and its self-interaction cross section. Traditional probes of the nature of dark matter rely on observing its gravitational influence on stars and galaxies, however at low halo masses it is known that star formation becomes inefficient, thus there may be a large number of dark matter halos which do not contain detectable levels of gas or stars. Strong gravitational lensing is a powerful tool for measuring the abundance of dark matter halos at low masses as it enables the detection of dark matter halos even if they do not contain gas or stars. I will present my novel approach to strong gravitational lensing which enables this tool to be applied to a much larger sample than was previously possible, and discuss future prospects for this method.

Bio: I am a native Californian. I was born in Sacramento, my family moved to the Bay Area when I was 5 and then down to San Diego when I was 14. I received my undergraduate B.S. in physics from UCLA, and my Ph.D. in physics from UCSB in 2014. I love astrophysics because it enables a study of energy and size regimes that are difficult or impossible to recreate on Earth.