Lab Detection of Dark Matter From the Cosmos

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Abstract:
The nature of dark matter has remained an enduring enigma for over eight decades now, for both cosmology and astroparticle physics. The majority of cosmic mass, over 85%, does not shine in the stars nor exist in atomic form. A continued lack of unambiguous evidence from a direct detection experiment of the traditional Weakly Interacting Massive Particle (WIMP) has led to a major thrust to consider masses both higher and lower than before, driven by many hypotheses/models. I will summarize my work on the LUX (Large Underground Xenon) experiment and its multi-tonne-scale successor, LZ, under construction now underground. I will also discuss the microphysics simulations of NEST (Noble Element Simulation Technique) used to make predictions for signals in a liquid-xenon-based detector, and conclude with new R&D using water to look for dark matter lighter than the canonical WIMP particle. This R&D effort relies critically upon nanotechnology, for water purification.

A short bio:
Dr. Matthew Szydagis received his B.A., M.S., and Ph.D. from the University of Chicago, then worked as a postdoc at University of California Davis. He is now an Assistant Professor at the University at Albany studying experimental particle astrophysics, in particular direct detection of dark matter, as well as general detector development for rare event searches.