UNL Department of Physics and Astronomy presents:

New Physics with Antimatter Traps and Trap-based Beams

PRESENTED BY
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THURSDAY
FEBRUARY 10
4:00 PM
VIA ZOOM

Refreshments will be served in the JH 1st Floor Vending Area at 3:30

ABSTRACT

Novel positron traps have enabled new investigations with low-energy antimatter [1]. This talk will discuss recent successes and the tools that enabled them. Goals of these experiments are fundamental tests of gravity and symmetries predicted by field theories (e.g., the CPT theorem), understanding astrophysical processes, and the characterization of materials. Unlike electrons, which are copious in our world of matter, their antiparticles (positrons) are scarce (e.g., currents of sub-picoamps instead of amps) and antiprotons are even harder to obtain. The need to keep positrons isolated from ordinary matter motivated the development of techniques to store them in vacuum and to tailor their delivery for specific applications. Examples discussed include the study of antihydrogen; formation of the di-positronium molecule, Ps_2, (the first many-electron, many-positron state, $e^+e^-e^+e^-$), novel Ps atom beams, study of vibrational resonances in positron annihilation, and positron-molecule bound states. Two particularly challenging goals will also be discussed: the creation and study of a positronium-atom Bose-Einstein condensed gas (BEC) and a classical "pair" (i.e., $e^+ - e^-$) plasma.

[1] J. Fajans and C. M. Surko, Plasma and Trap-Based Techniques for Science with Antimatter, Phys. Plasmas **27**, 030601 (2020).