



Wednesday
October 12, 2022
3:30 pm

Prof. Dmitri A. Uzdensky

University of Colorado, Boulder

Extreme Plasma Astrophysics

Exotic relativistic astrophysical objects like neutron stars and black holes are surrounded by plasmas with extreme physical conditions that are very different from those in more familiar, traditional heliospheric and laboratory plasma environments. The rich, non-traditional physics of these extreme astrophysical plasmas features special and general relativity, pair-plasma composition, strong interaction of the plasma with high-energy photons, and, in the most extreme cases, QED processes like pair production. Understanding how these “exotic” effects modify fundamental collective plasma processes — waves, instabilities, magnetic reconnection, shocks, turbulence — is the scope of *Extreme Plasma Astrophysics*. I will review the recent impressive progress in exploring this exciting new frontier of modern physics, motivated by spectacular astrophysical discoveries and enabled by recent computational advances like the development of novel kinetic plasma codes incorporating radiation and pair-creation effects, in combination with vigorous, theoretical efforts. Examples will include new breakthroughs in our understanding of radiative magnetic reconnection and turbulence, with applications to accreting black holes and neutron star magnetospheres. I will also outline the future directions of this burgeoning field, including prospects for laboratory studies.

About the Speaker: Dmitri Uzdensky is a Professor of Physics at the University of Colorado-Boulder. He received his undergraduate degree in 1993 at Moscow Institute of Physics and Technology and his PhD in 1998 at Princeton University’s Dept. of Astrophysical Sciences, Program in Plasma Physics. After postdoctoral appointments at the University of Chicago (1998-2001) and at the Kavli Institute for Theoretical Physics in Santa Barbara (2001-2004), he returned to Princeton as an Associate Research Scholar (2004-2009) and then joined the Physics faculty at the University of Colorado in 2009. Prof. Uzdensky’s research interests lie mostly in theoretical plasma astrophysics, with a focus on collective plasma processes, such as magnetic reconnection, in extreme relativistic plasmas around black holes and neutron stars.