

**Prof. Lorin Swint Matthews**  
**Baylor University**

## **Breaking Newton's Law: Using Dusty Plasma to Investigate Anisotropic Forces**



**Wednesday**  
**January 21, 2026**  
**3:10 pm**  
**Room 1003 EECS**

The stability of structures and transport of energy are affected by the forces acting between elements in the system. We are used to thinking of forces in terms of Newton's third law: for every action there is an equal and opposite reaction. However, there are some systems where the forces appear to be non-reciprocal; the objects exert different forces on each other. Such an interaction is possible when the interaction is anisotropic. In this case, the force between two particles depends on their relative orientation. Anisotropic interactions are known to arise in some of the most interesting complex systems, including proteins, electrorheological (ER) fluids, and liquid crystals. Here, we study anisotropic interactions in a complex, or dusty, plasma. We use numerical models of the interactions between ions and dust to learn the form of the anisotropic interaction potential. We can then use this potential to model the dynamics of interacting dust particles without modeling the ions. We compare the results of our models to experimental data collected in laboratory experiments conducted here on earth and on the International Space Station.

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**About the Speaker:** Lorin Swint Matthews is a Professor and Chair of the Department of Physics and Astronomy at Baylor University and Associate Director of the Center for Astrophysics, Space Physics, and Engineering Research. She received her Ph.D. in Physics from Baylor University in 1998. She worked for Raytheon Aircraft Integration Systems from 1998-2000 as a multi-disciplined engineer in the Flight Sciences Department, where she worked on NASA's SOFIA (Stratospheric Observatory for Infrared Astronomy) aircraft. In 2000, she joined the faculty at Baylor University. Her areas of research include numerical modeling and experimental investigations of the charging and dynamics of dust in astrophysical and laboratory plasma environments, for which she received a National Science Foundation CAREER Award in 2009. She is a Fellow of the American Physical Society.