

UNL Department of Physics and Astronomy presents:

# Nanoelectronic Phenomena in Low-Dimensional Ferroelectrics

PRESENTED BY  
**ALEXEI  
GRUVERMAN**  
University of  
Nebraska –  
Lincoln



**THURSDAY**  
**FEBRUARY 2**  
**4:00 PM**  
**IN JH 136**

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

## ABSTRACT

Just over 100 years since the discovery of ferroelectricity, this phenomenon still remains a center of intense research. The electrically switchable polarization, which is strongly coupled to the physical properties of ferroelectrics, determines the multifunctional nature of their responses to the external stimuli and underpins our ability to address a range of technological applications related to future computing.

Over the last decade there has been a remarkable expansion of the already vast family of ferroelectrics due to emergence of polar-ordered phases in two-dimensional variants of traditionally non-ferroelectric materials. In the first part of my lecture, I will discuss a nanoscale insight into the electronic and electromechanical properties of one of the most exciting groups of emerging ferroelectrics -  $\text{HfO}_2$  family of simple oxides. Visualization of time-voltage dependent domain structure evolution reveals the underlying physical mechanisms of unconventional ferroelectric behavior of these materials.

In the second part, I will discuss the emerging electronic phenomena in the hybrid 2D structures comprised of transition metal dichalcogenides (TMD) and ferroelectric films. Incorporation of these materials into the integrated structures provides a novel technological platform for ultra-scaled devices with enhanced functional performance.

Finally, I will discuss emergence of a polar phase in 2D TMD materials and challenges associated with demonstration of their polar behavior and a possibility of tuning their electronic properties via control of polarization.

