

## **CSU Department of Physics Seminar:**

### **Gravitational Waves, Pulsar Astrophysics, and the Long- Wavelength Array Swarm Telescope**

**Dr. Timothy Dolch**  
**Hillsdale College**



**Thursday, March 24, 11:30-12:30am Location: WH118**

The North American Nanohertz Observatory for Gravitational Waves (NANOGrav) collaboration is an NSF Physics Frontiers Center working toward detecting gravitational waves (GWs) from merging supermassive black hole binaries. GWs are ripples in spacetime that propagate at the speed of light, first detected in 2015 by the Laser Interferometer Gravitational-wave Observatory (LIGO). Using the Green Bank Telescope in West Virginia and other radio observatories, NANOGrav observes over 70 pulsars at least twice a month. Pulsars are rapidly rotating compact stars producing pulsed radio emission. The line-of-sight to each pulsar acts as a detector arm for measuring pulse time-of-arrival perturbations due to GWs, akin to LIGO's ground-based detector arms. A common signal has been detected in NANOGrav's 12.5-year dataset, which may be a hint of GWs. The spatial correlations of GWs uniquely predicted by Einstein's theory of general relativity are likely in a future data release. Meanwhile, the Long-Wavelength Array (LWA) Swarm, a continent-spanning expansion of the current LWA radio telescope, will additionally contribute to GW and pulsar astrophysics. The first 64-antenna LWA-Swarm mini-station is under construction at the Very Large Array (VLA) North Arm in New Mexico. Mini-stations engage students in the construction and operation of the instrument.