

## Physics & Space Sciences Department Colloquium

### *“MESA & GYRE: Stellar Astrophysics for the People”*

By:

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MESA (Modules for Experiments in Stellar Astrophysics) is a numerical code for modeling the structure and evolution of all types of stellar objects, from brown dwarfs through to the most massive stars in the Universe. It is available to everyone under an open source license, and since its release in 2011 has drawn an impressive following in the stellar astrophysics community.

GYRE (acronym pending) is a complementary open source code for calculating the oscillation frequencies of models produced by MESA and other stellar evolution codes. By comparing these eigenfrequencies against the oscillation spectrum of a real star (observed, e.g., by the Kepler satellite) one can place constraints on the structure of the star -- the technique of 'asteroseismology'. In the past year, GYRE has been integrated into MESA so that this process can be largely automated.

In this presentation I'll give an overview of the physics, numerics and capabilities of MESA and GYRE. I'll discuss the communities of practice that have sprung up around these codes, and describe how these communities are being further nurtured. I'll then present some of the exciting projects enabled by the codes, such as observational signatures of core helium flashes; stellar probes of dark-matter physics; the metallicity dependence of the mass threshold for core collapse; and the generation of new sets of isochrones for use in other branches of astrophysics.

**Friday, March 4, 2016**

**4:00-5:00 P.M.**

**OPS Room 140**

Light Refreshments will be served