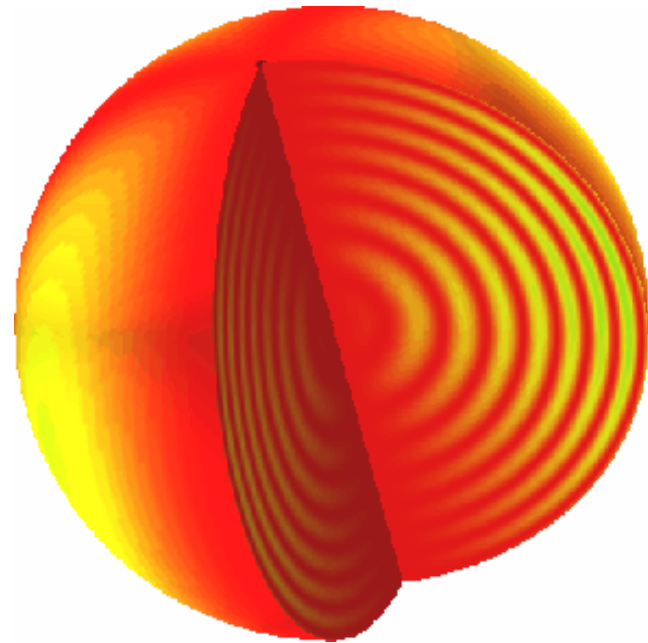
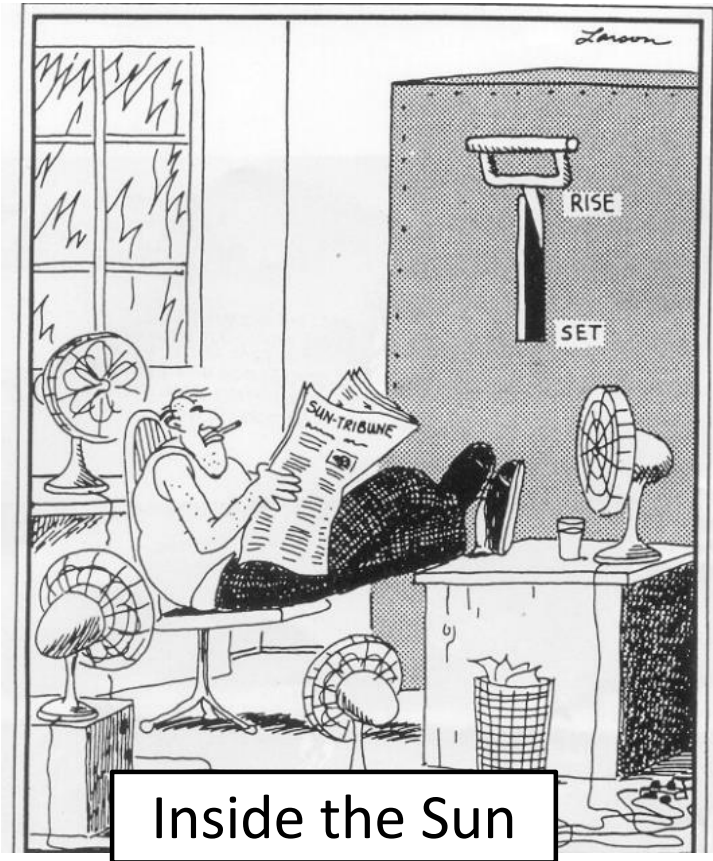
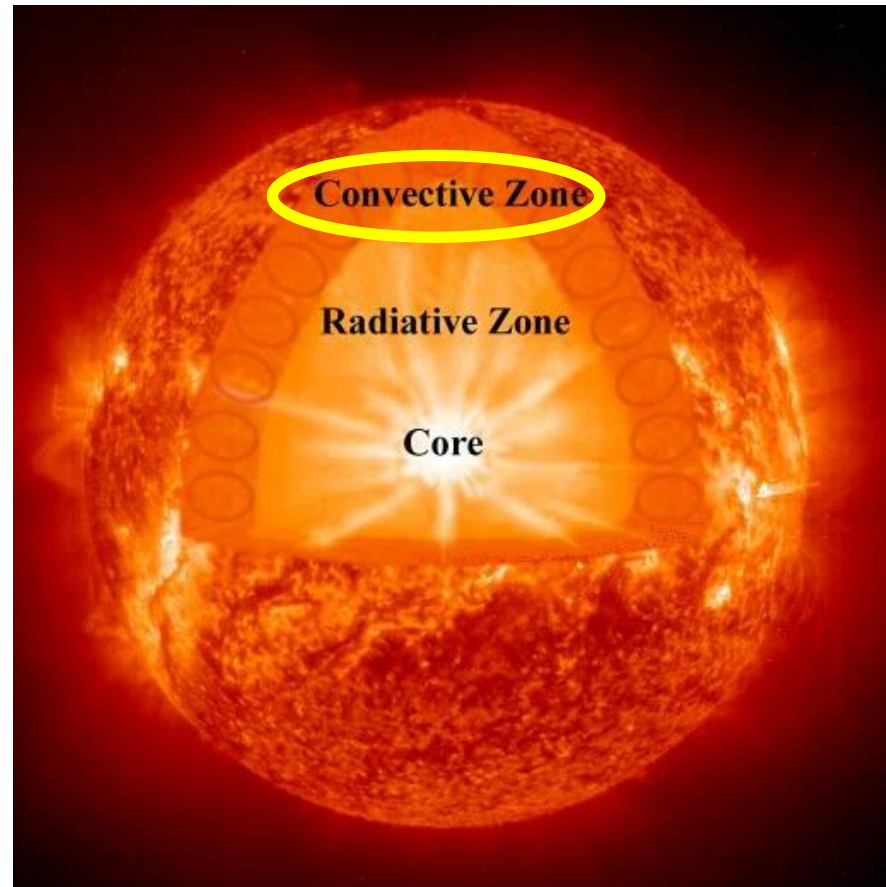


Using stellar oscillations to probe their interiors

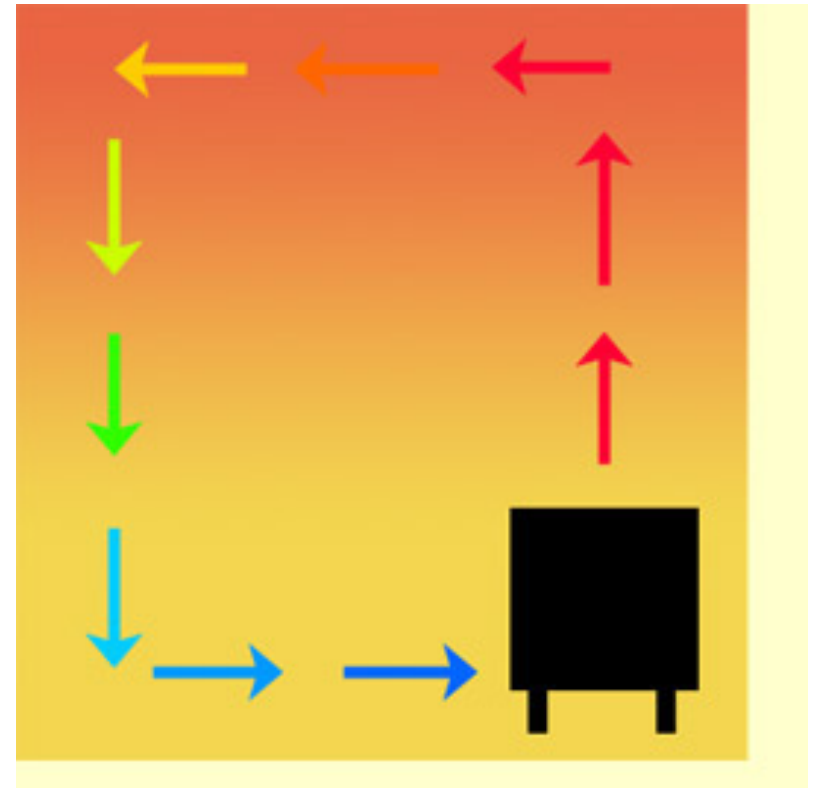
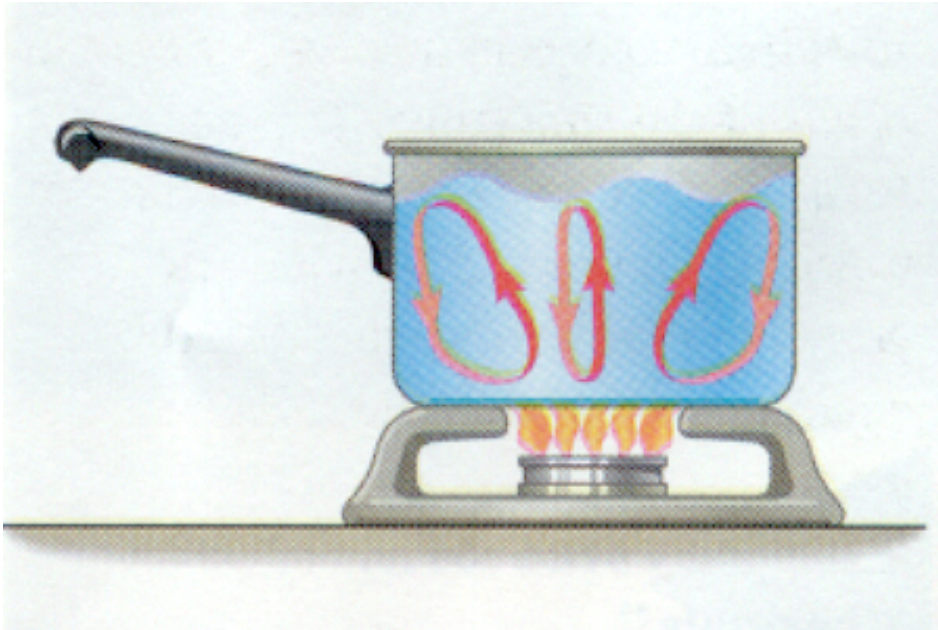
Prof. Tim Bedding (University of Sydney, Australia)



1. What causes stars to oscillate?



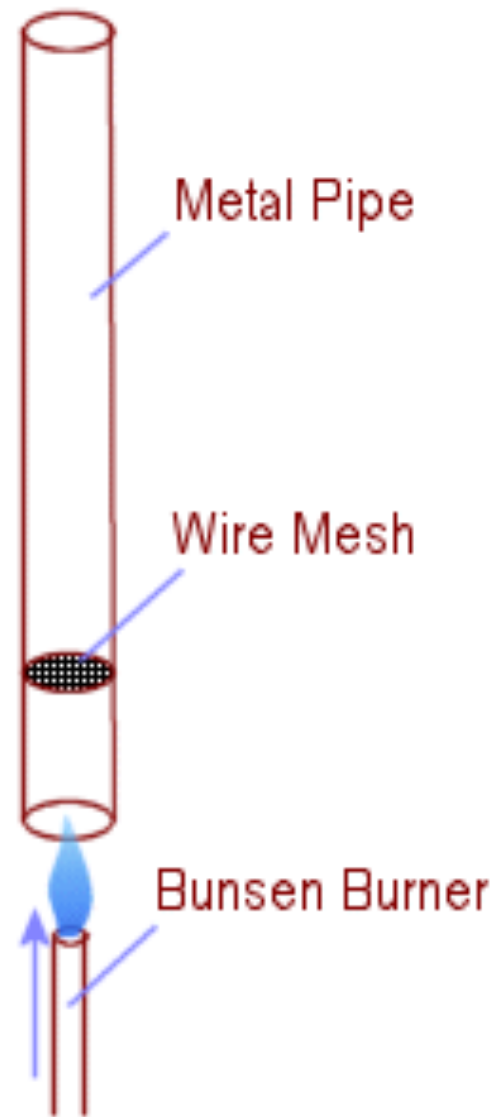
Convection excites the oscillations
by shaking the star



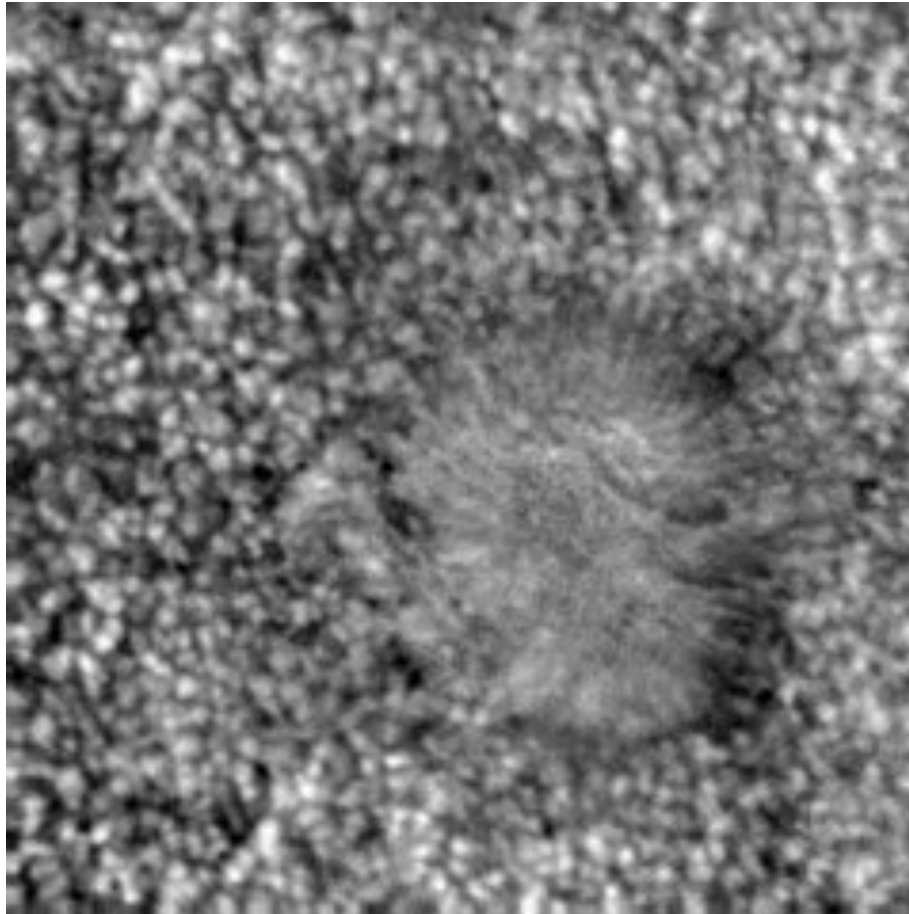


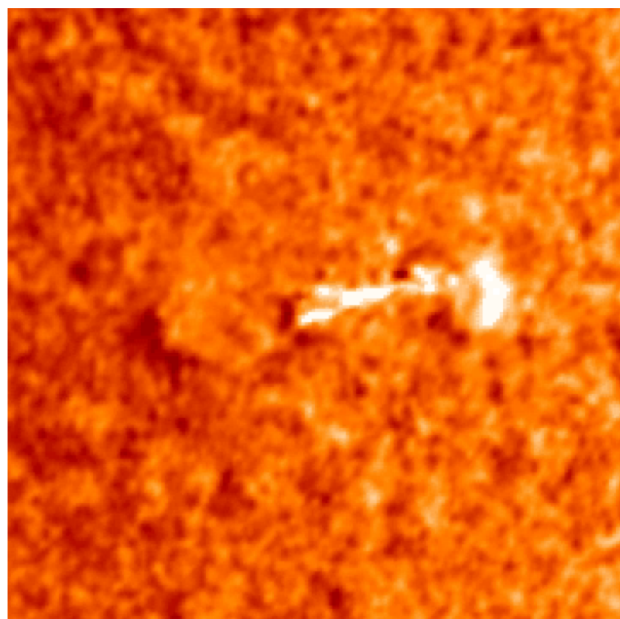


Rijke tube



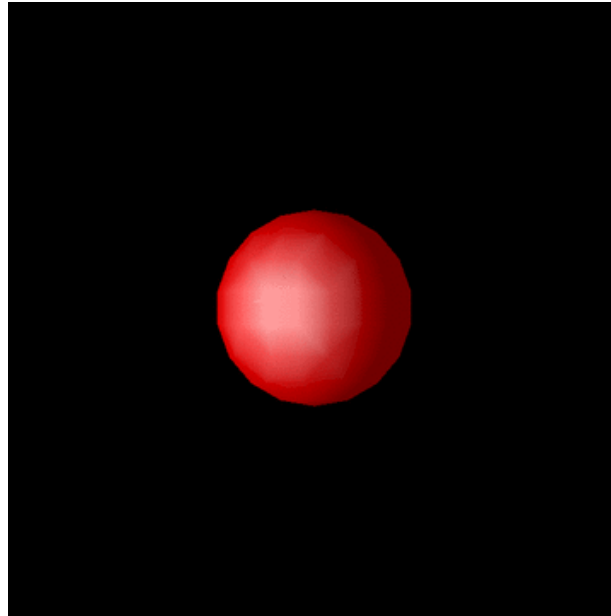
Convection at the surface of the Sun





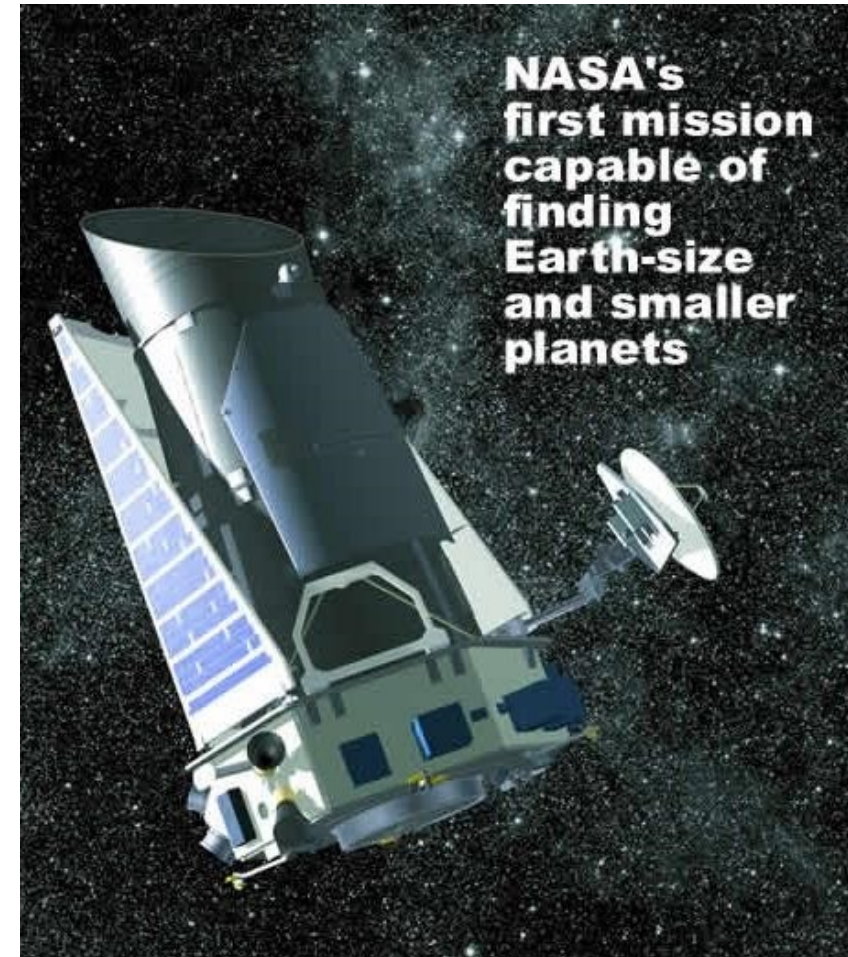
2. How do we measure stellar oscillations?

Method A: brightness variations



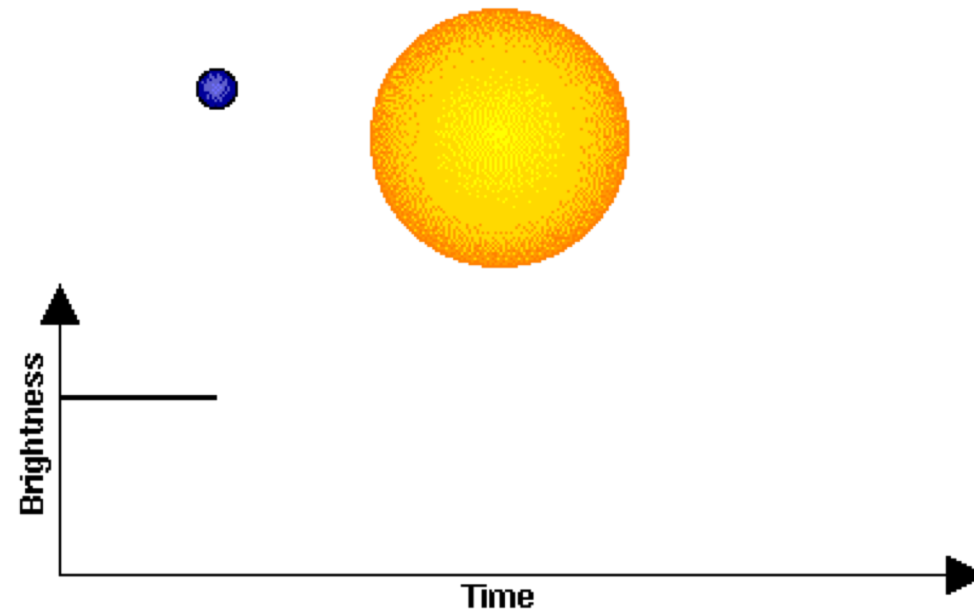
NASA *Kepler* Mission

launched March 2009

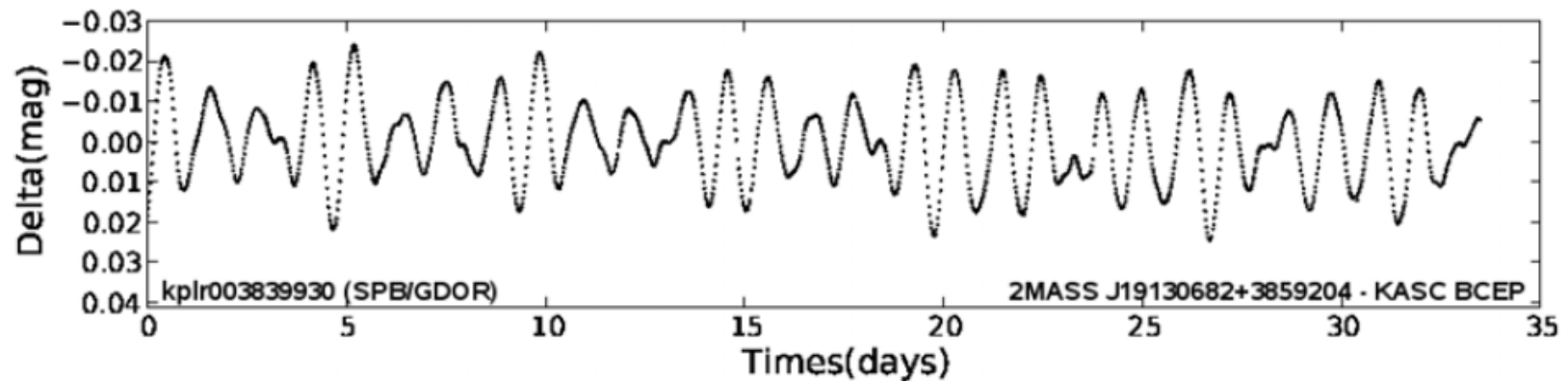
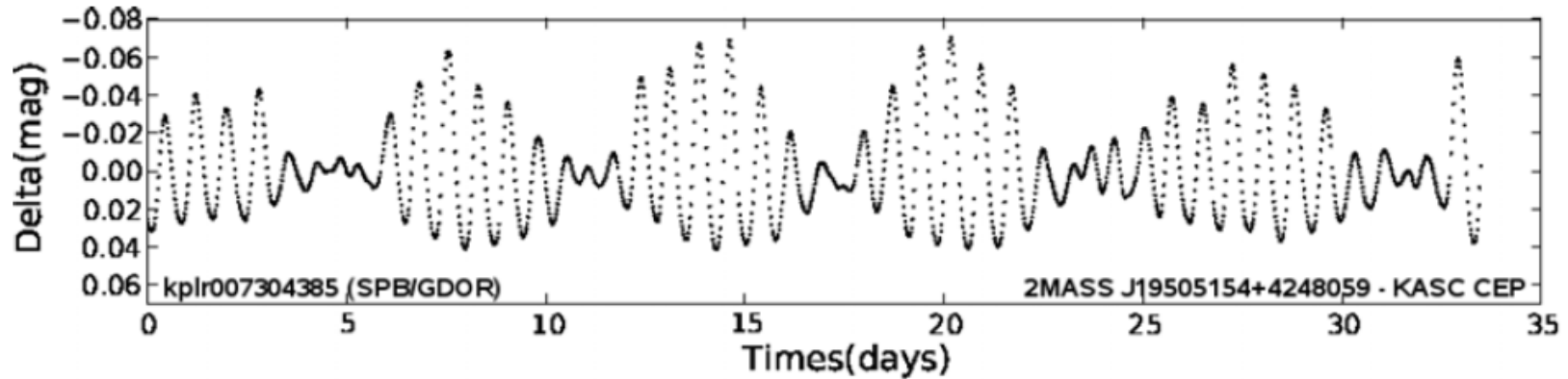


**NASA's
first mission
capable of
finding
Earth-size
and smaller
planets**

Transit of an exoplanet:

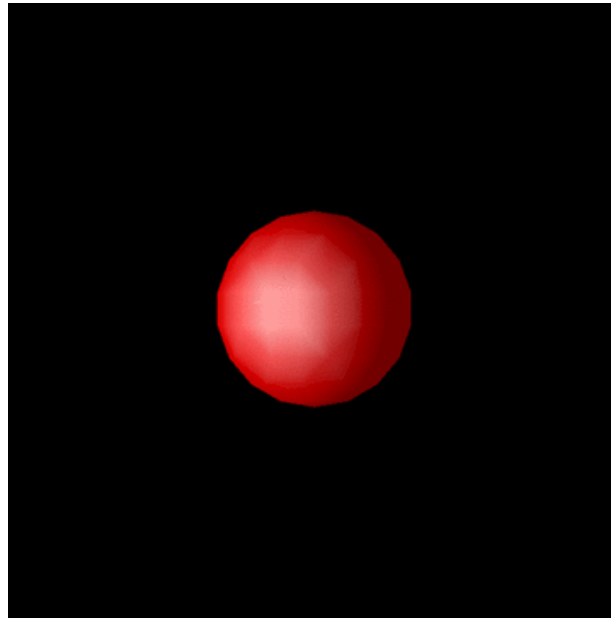


Two examples of oscillating stars discovered by *Kepler*

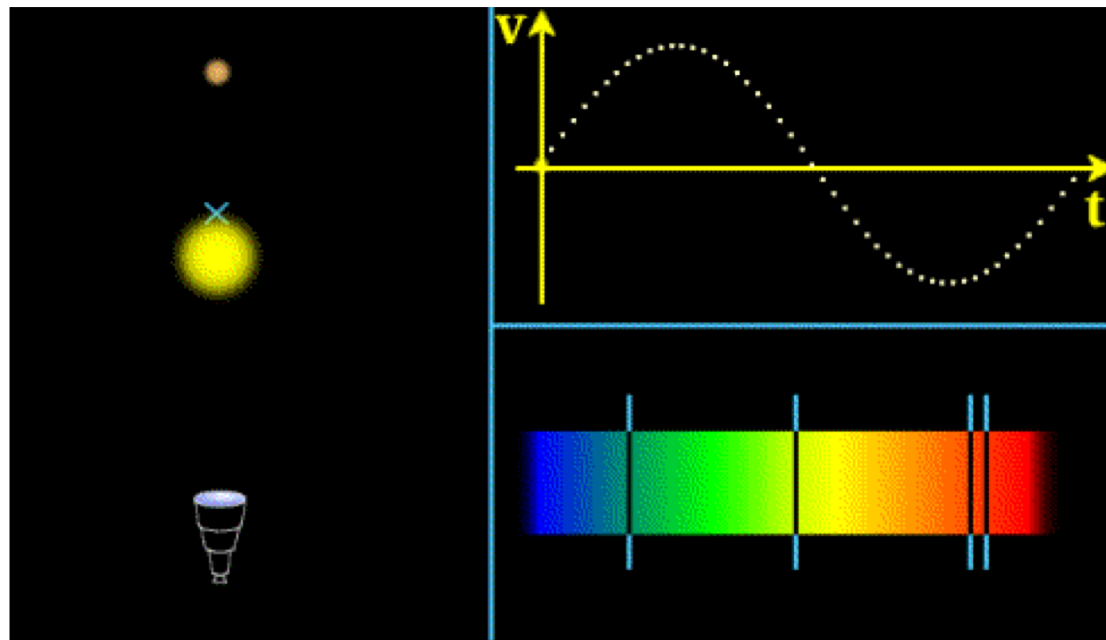


2. How do we measure stellar oscillations?

Method B: velocity variations



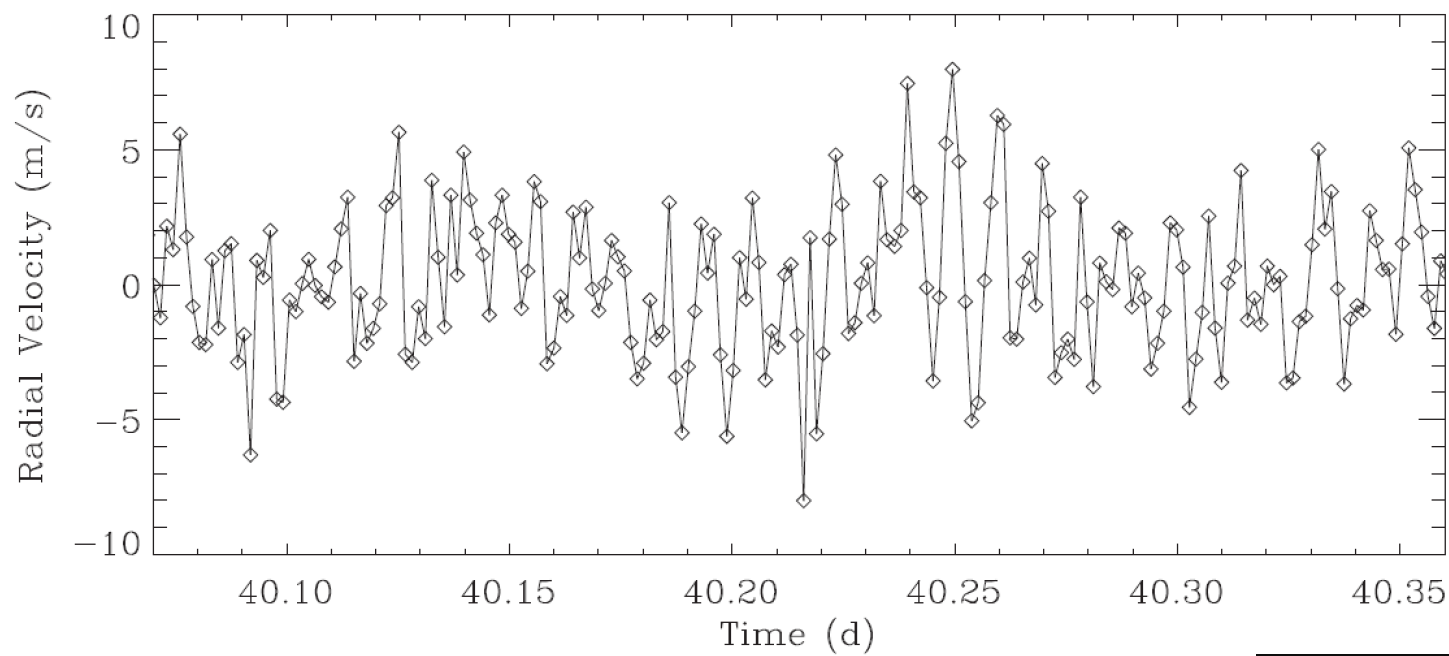
Doppler shifts



Tenerife - Spain



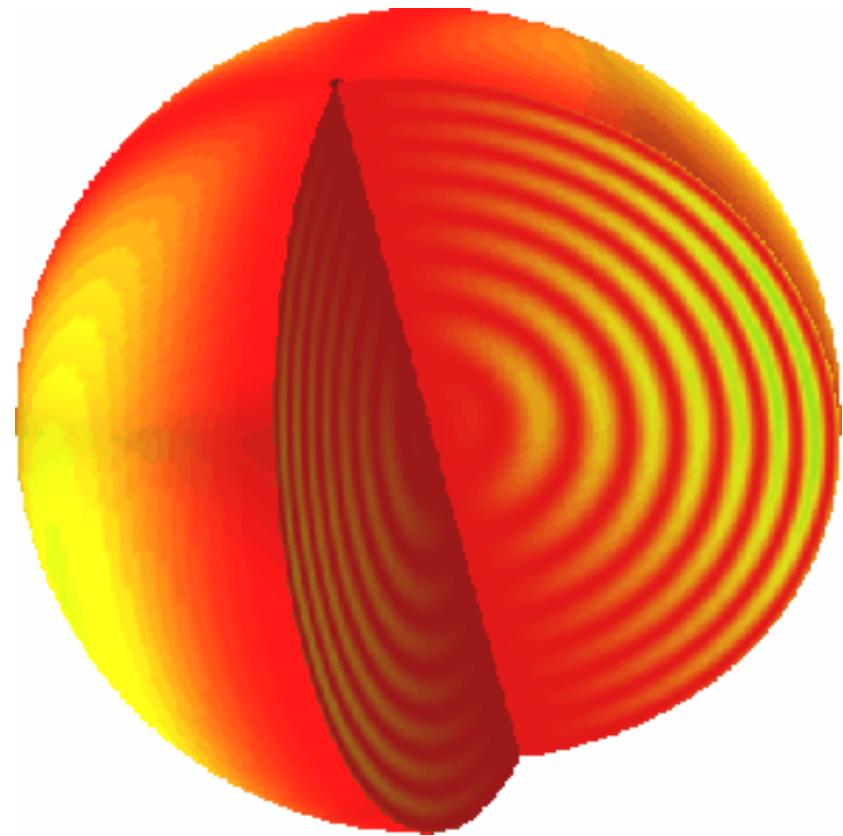
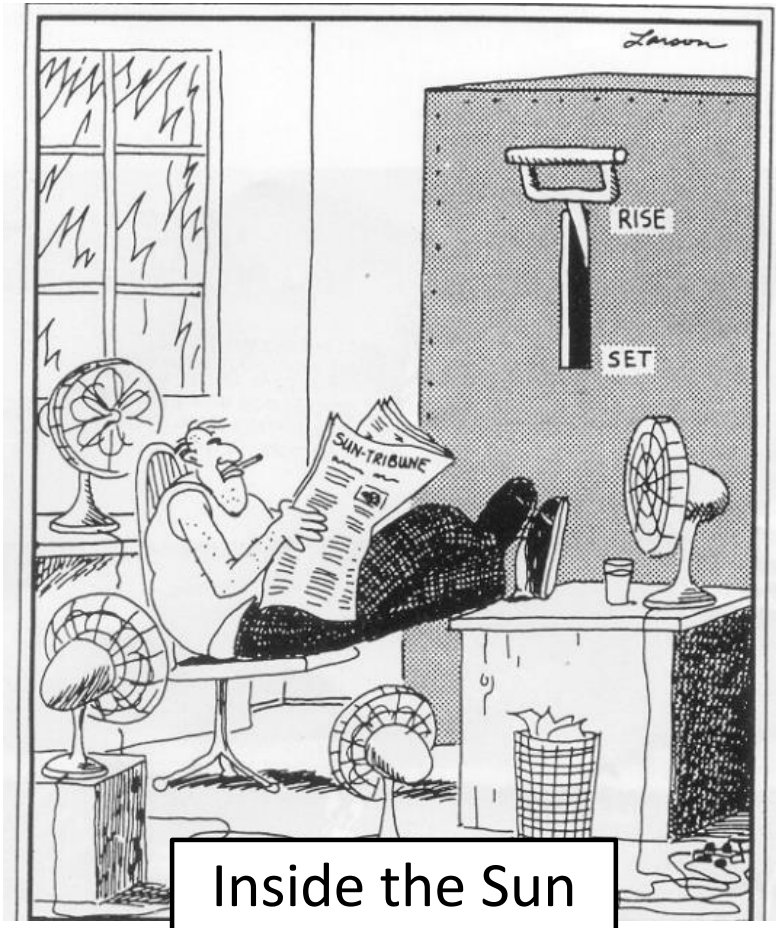




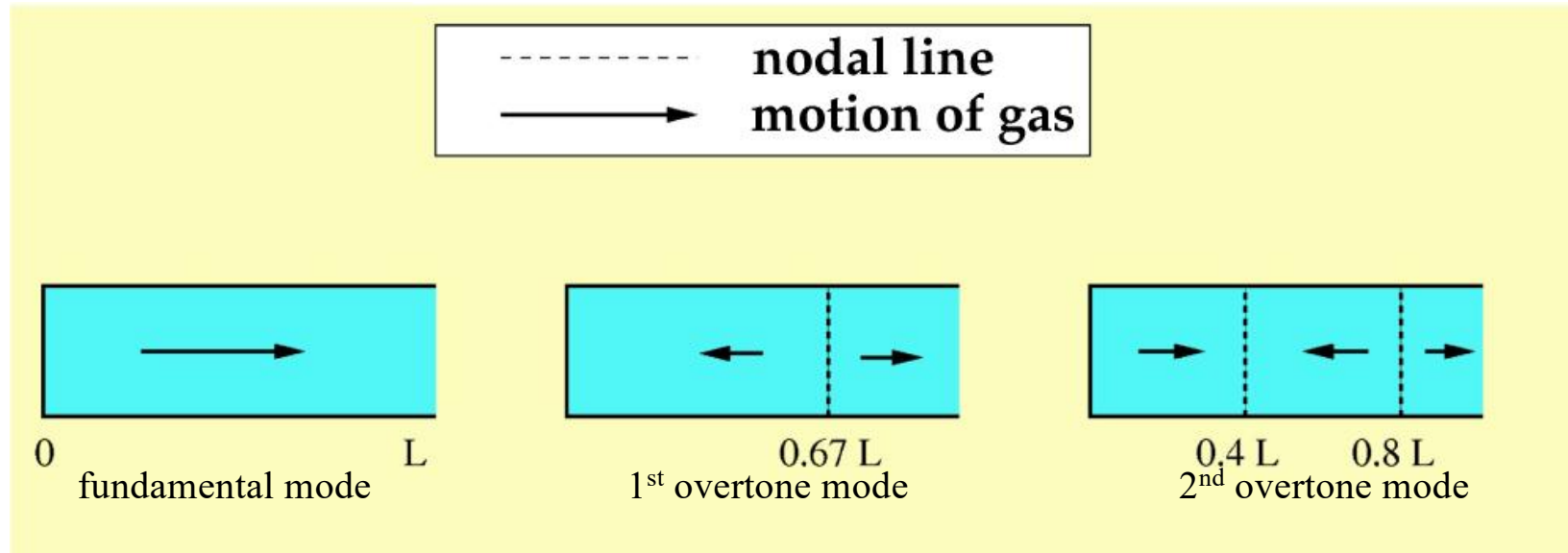
Doppler observations
of the star μ Herculis
with SONG



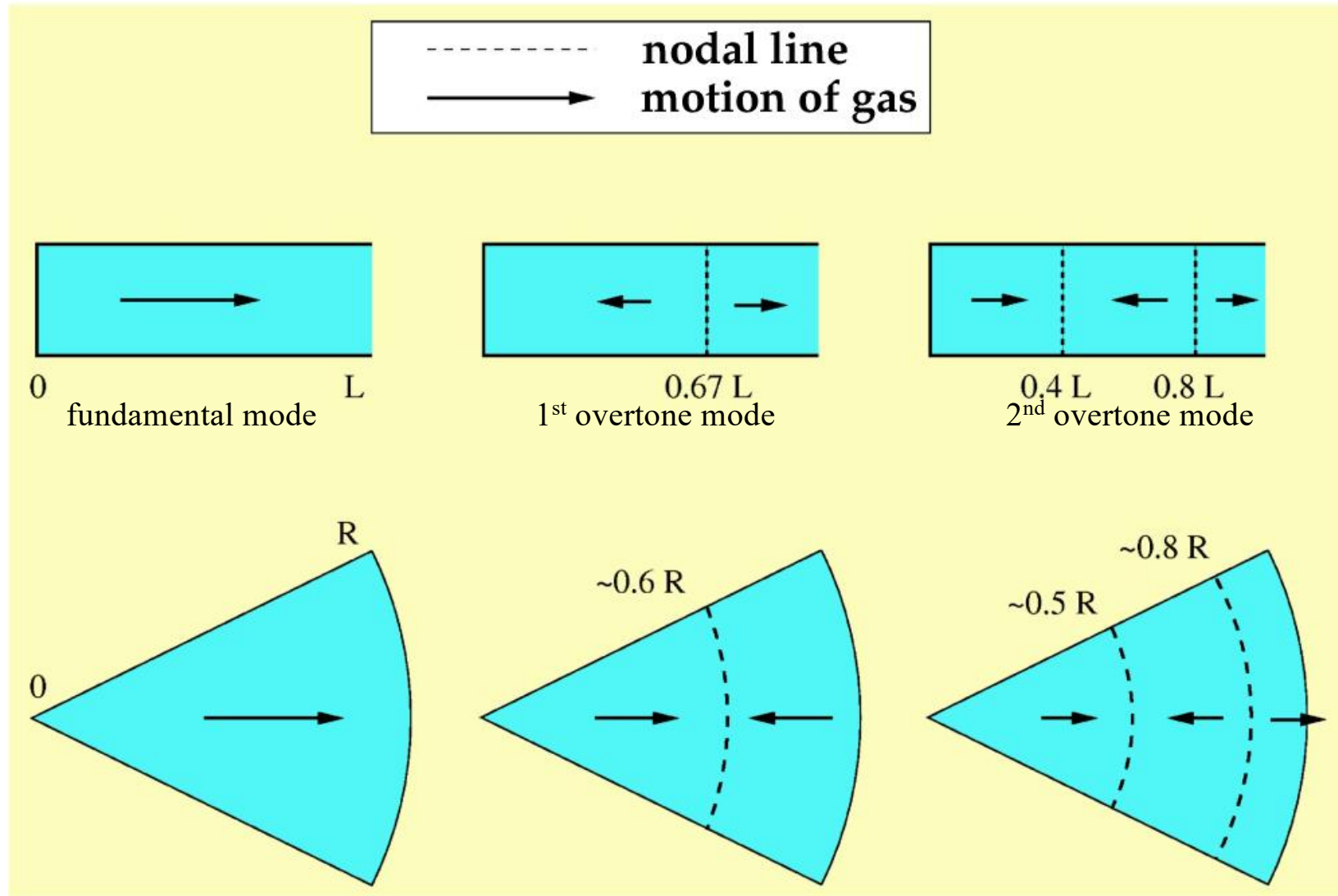
3. What can we learn about stars?



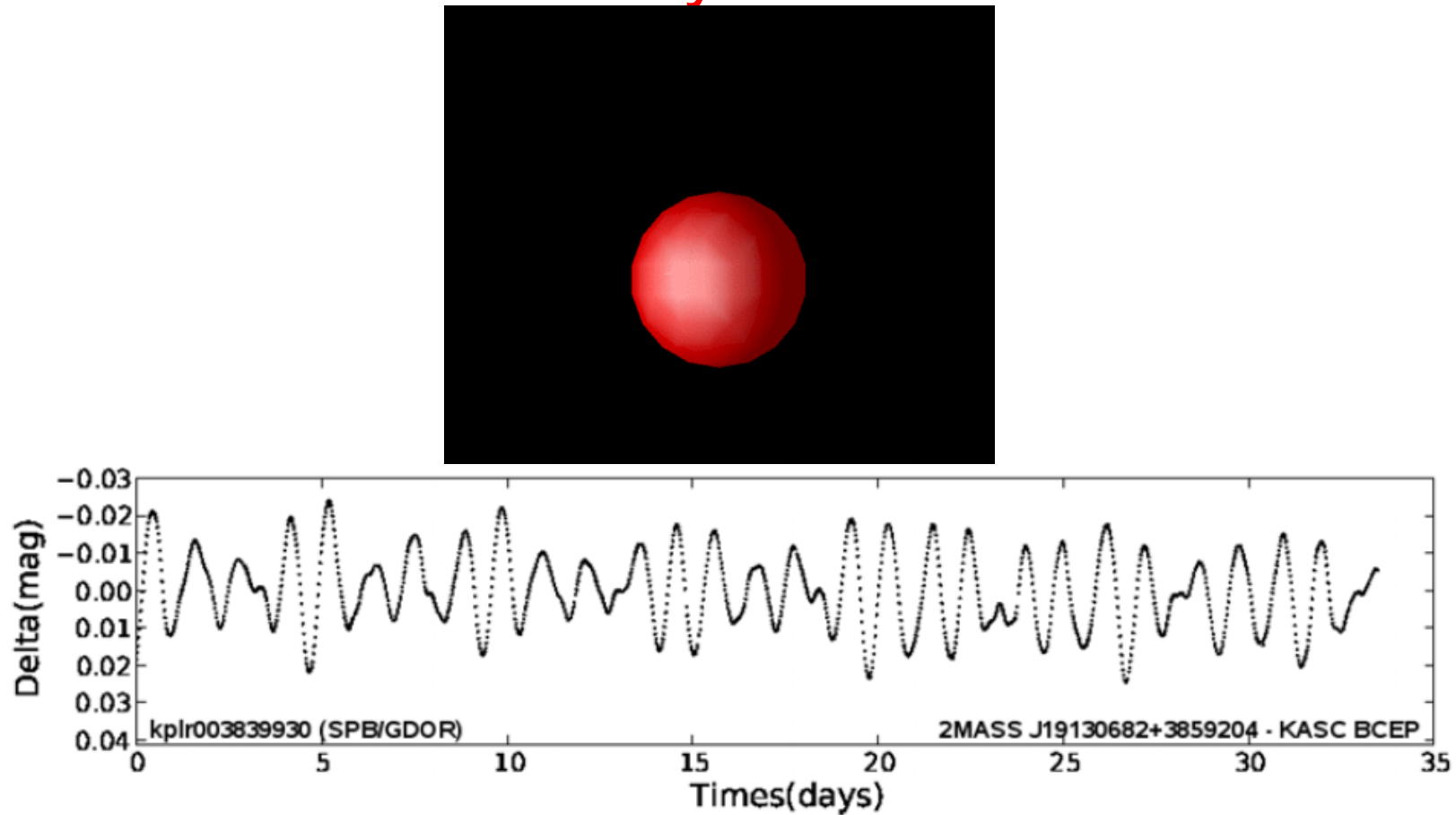
Stellar oscillations are standing sound waves



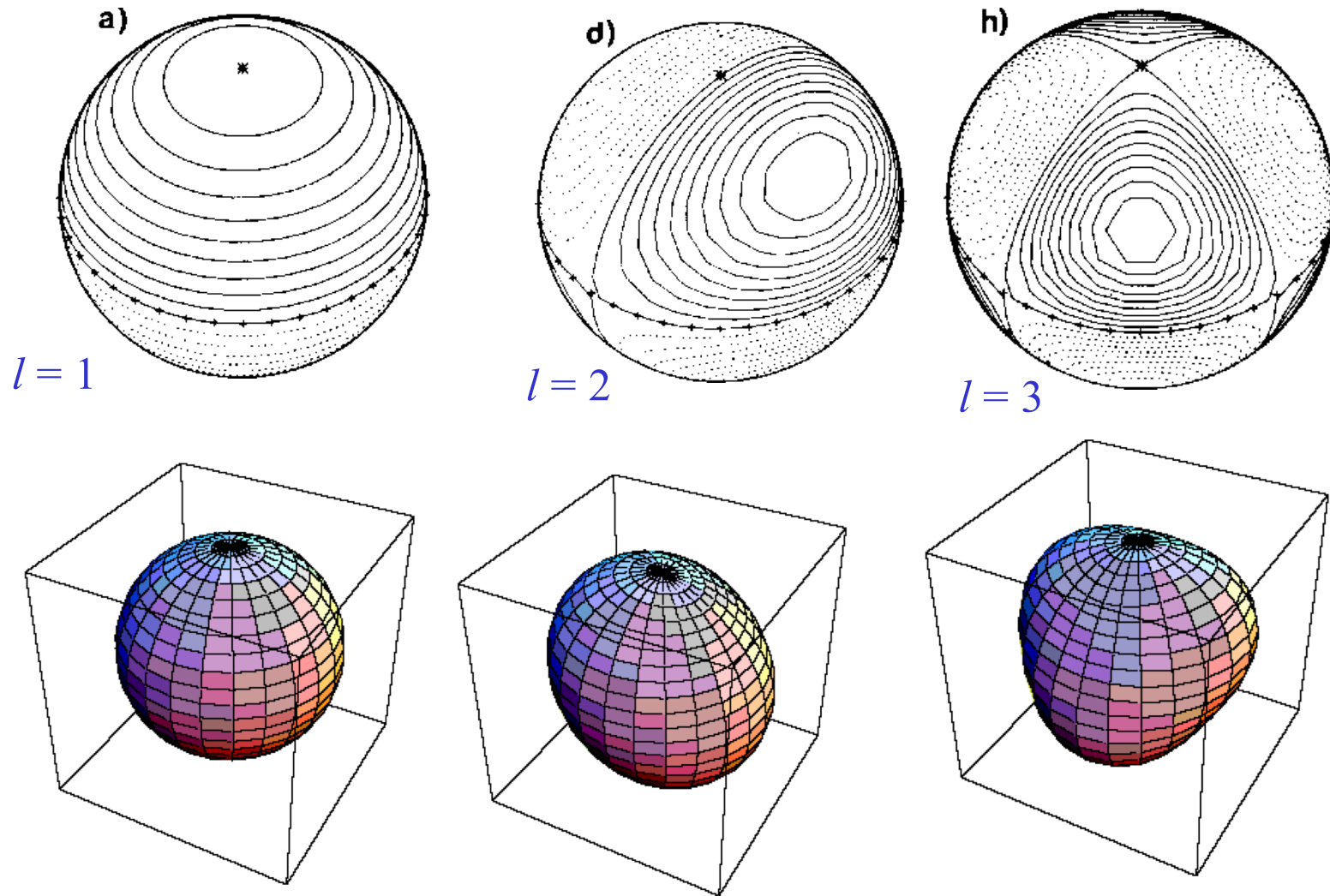
Stellar oscillations are standing sound waves



stars can oscillate simultaneously in
many modes



Also non-radial modes:

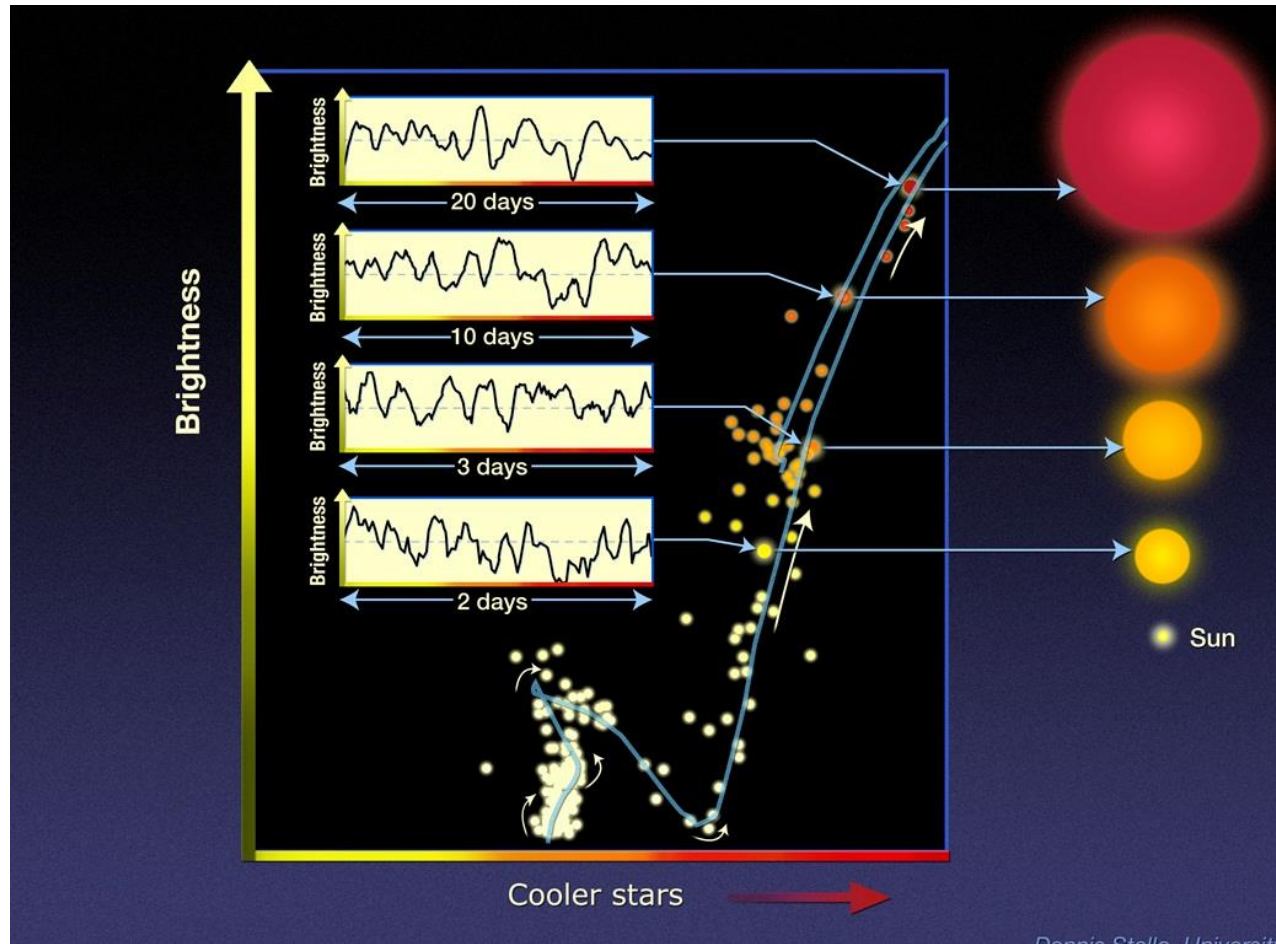


Oscillations in the Sun (sped up 300,000 times)

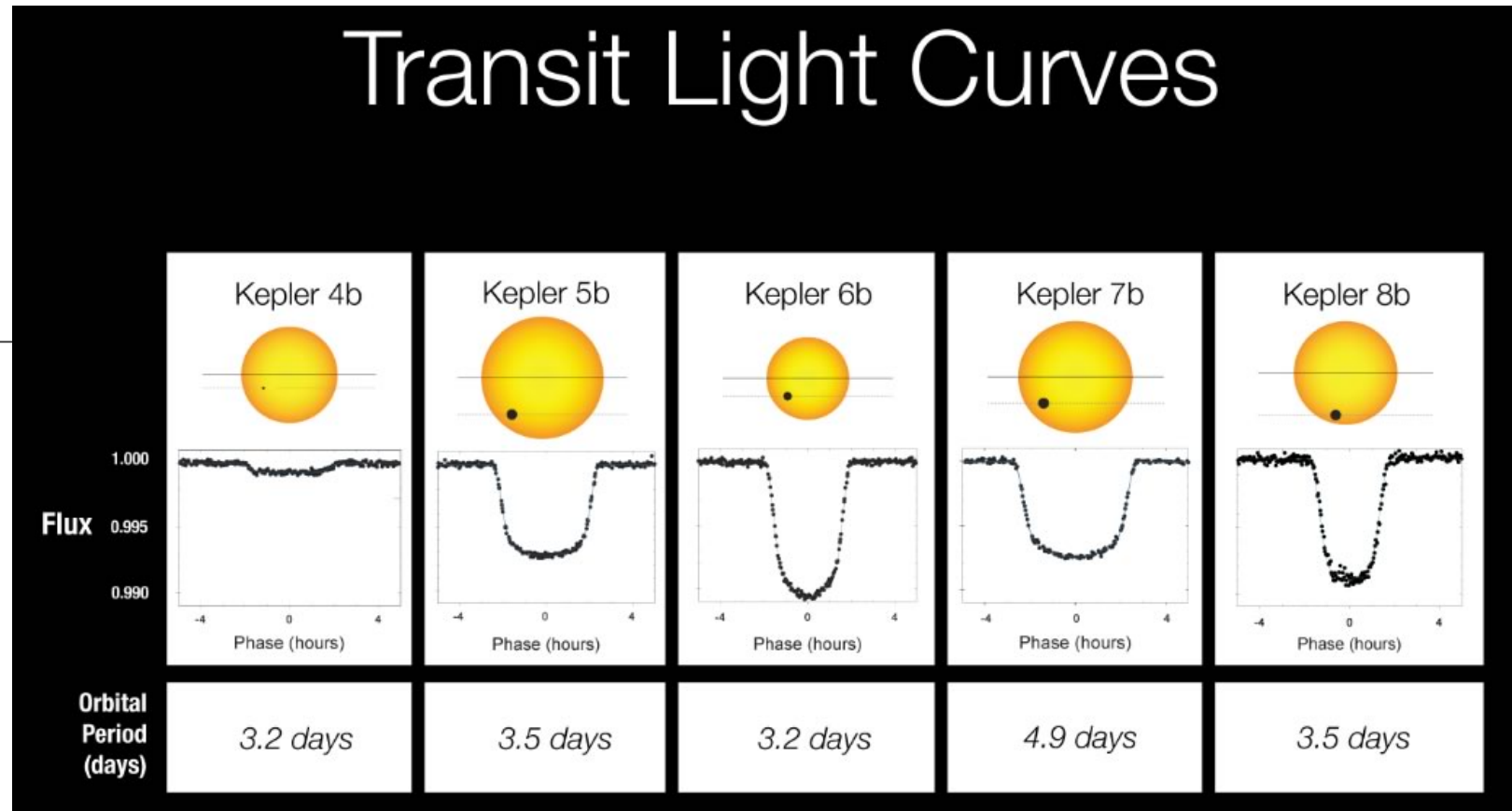
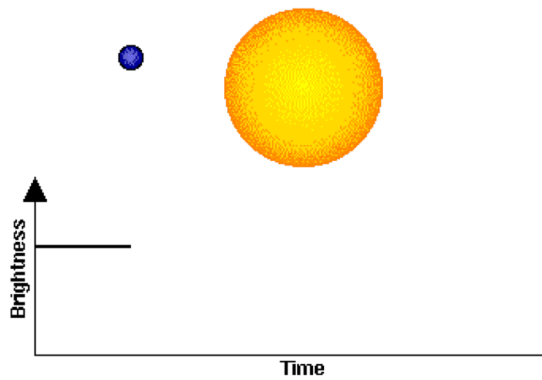


3. What can we learn about stars?

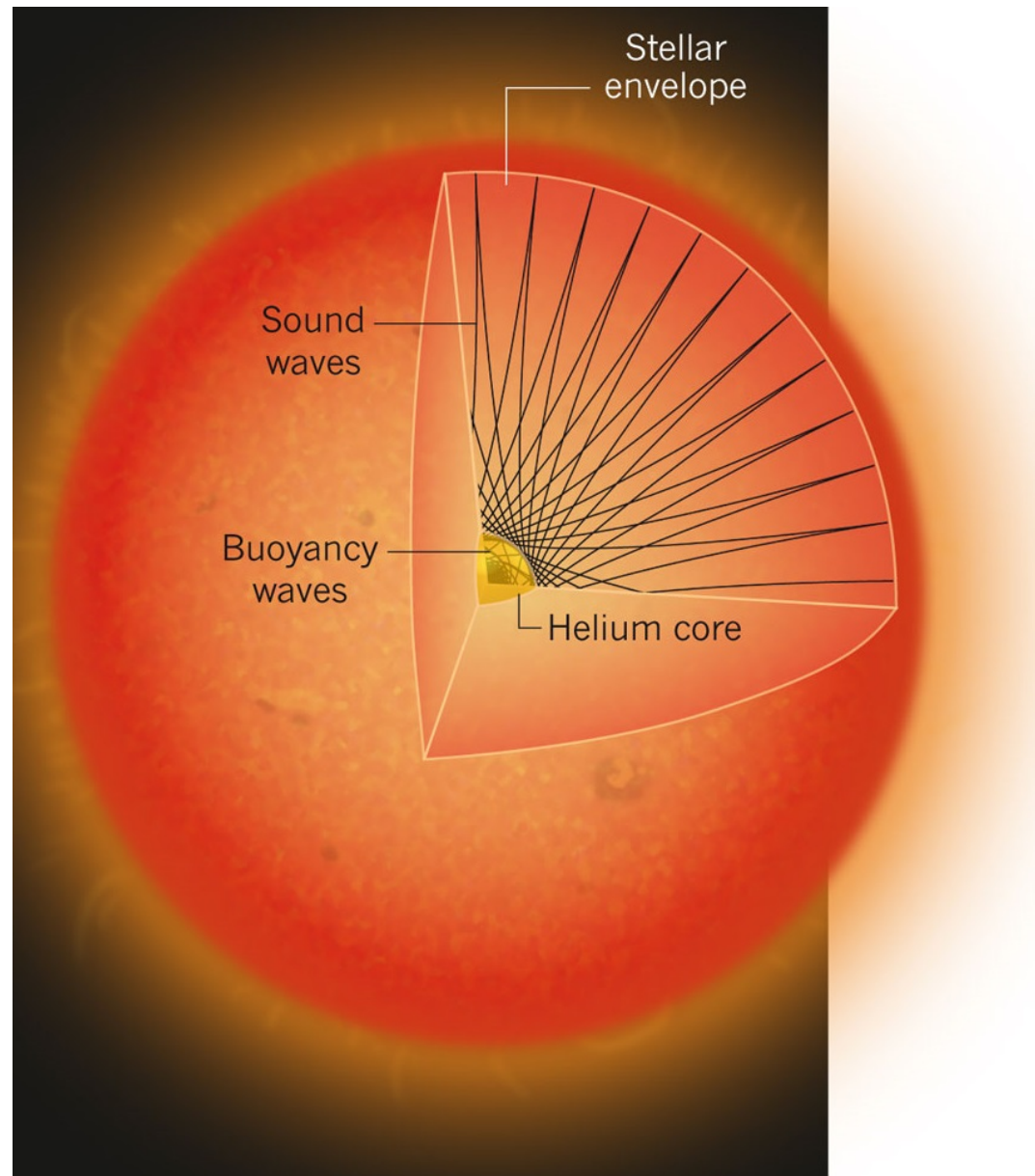
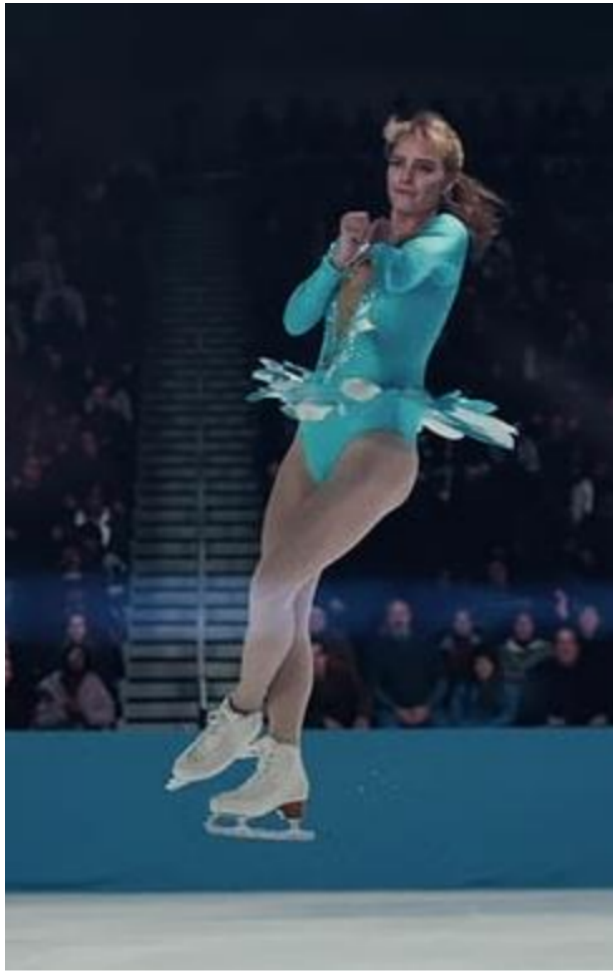
3a: measuring the sizes of stars



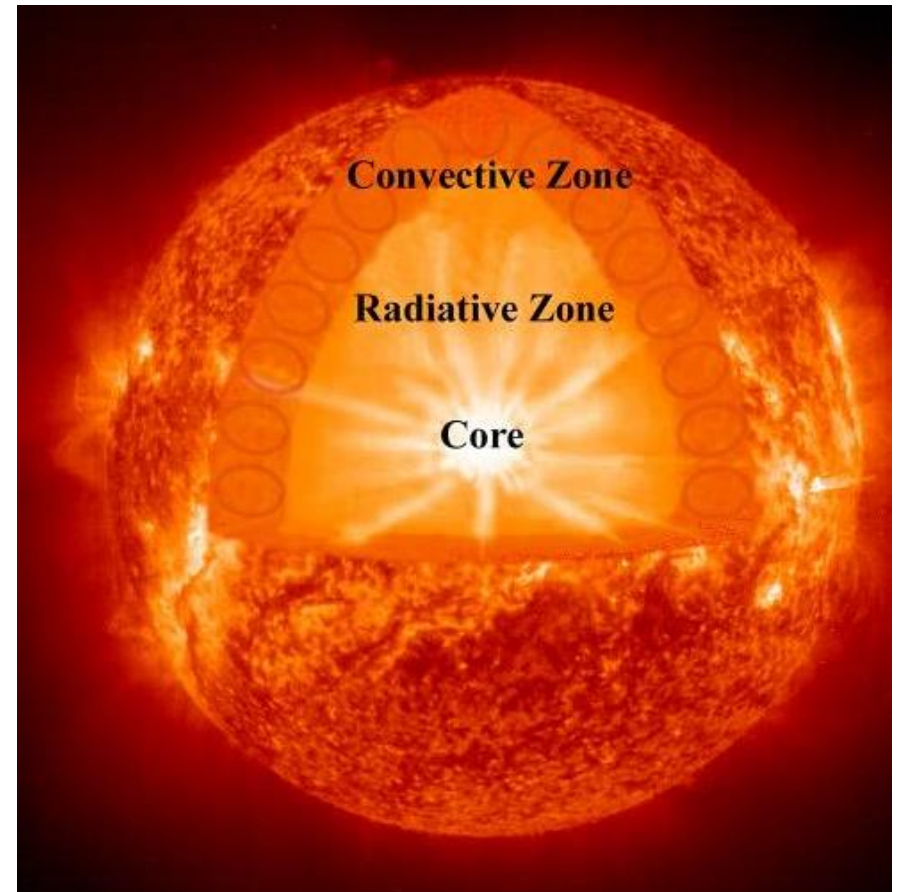
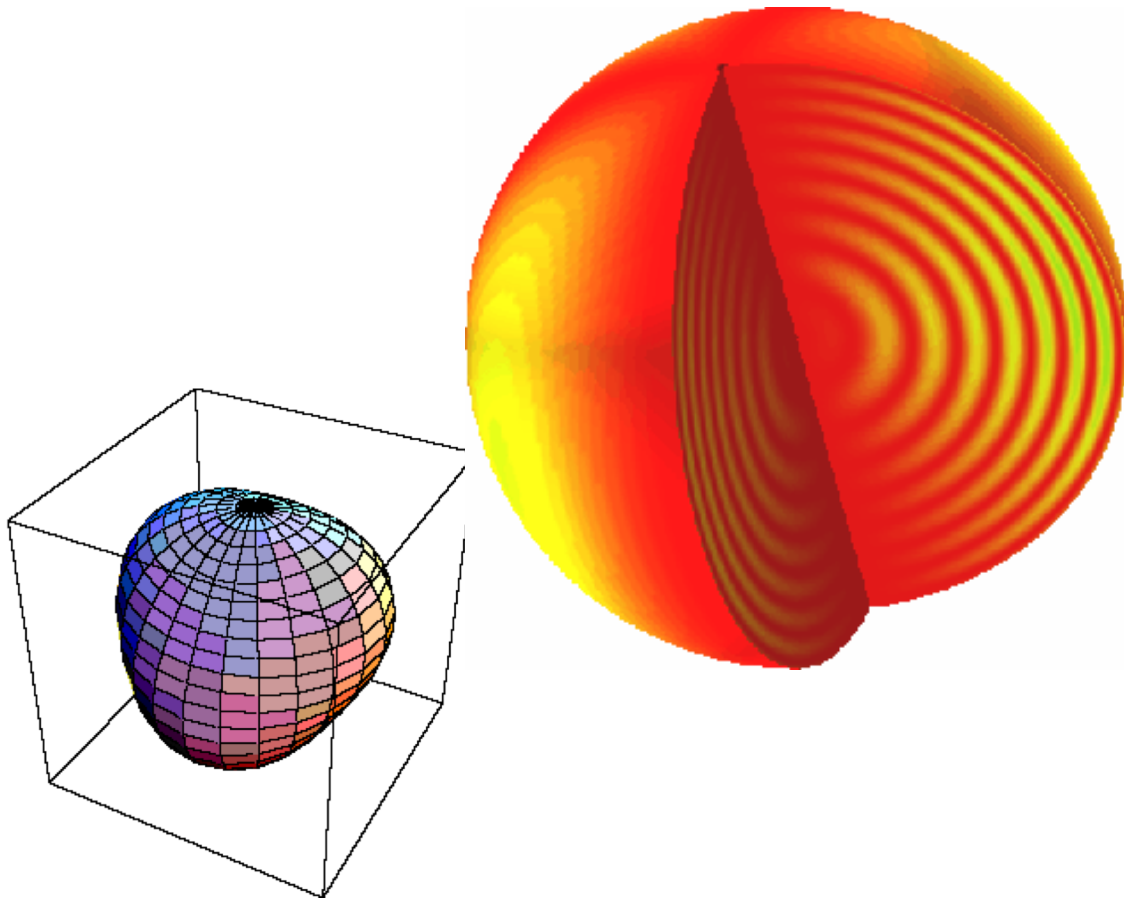
... which is important for transiting exoplanets



3b: measuring internal rotation of stars



3c: measuring the ages of stars





National Aeronautics and Space Administration
Goddard Space Flight Center



Transiting Exoplanet
Survey Satellite

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The TESS Mission

Science and Data

Education and Outreach

News and Resources

The TESS Mission

The Transiting Exoplanet Survey Satellite (TESS) will discover thousands of exoplanets in orbit around the brightest stars in the sky. In a two-year survey of the solar neighborhood, TESS will monitor more than 200,000 stars for temporary drops in brightness caused by planetary transits. This first-ever spaceborne all-sky transit survey will identify planets ranging from Earth-sized to gas giants, around a wide range of stellar types and orbital distances. No ground-based survey can achieve this feat.

TESS IN FLIGHT

194 : 13 : 41 : 10

DAYS HOURS MINUTES SECONDS

Tweets by @NASA_TESS

