

# Cosmology 2

Week 11

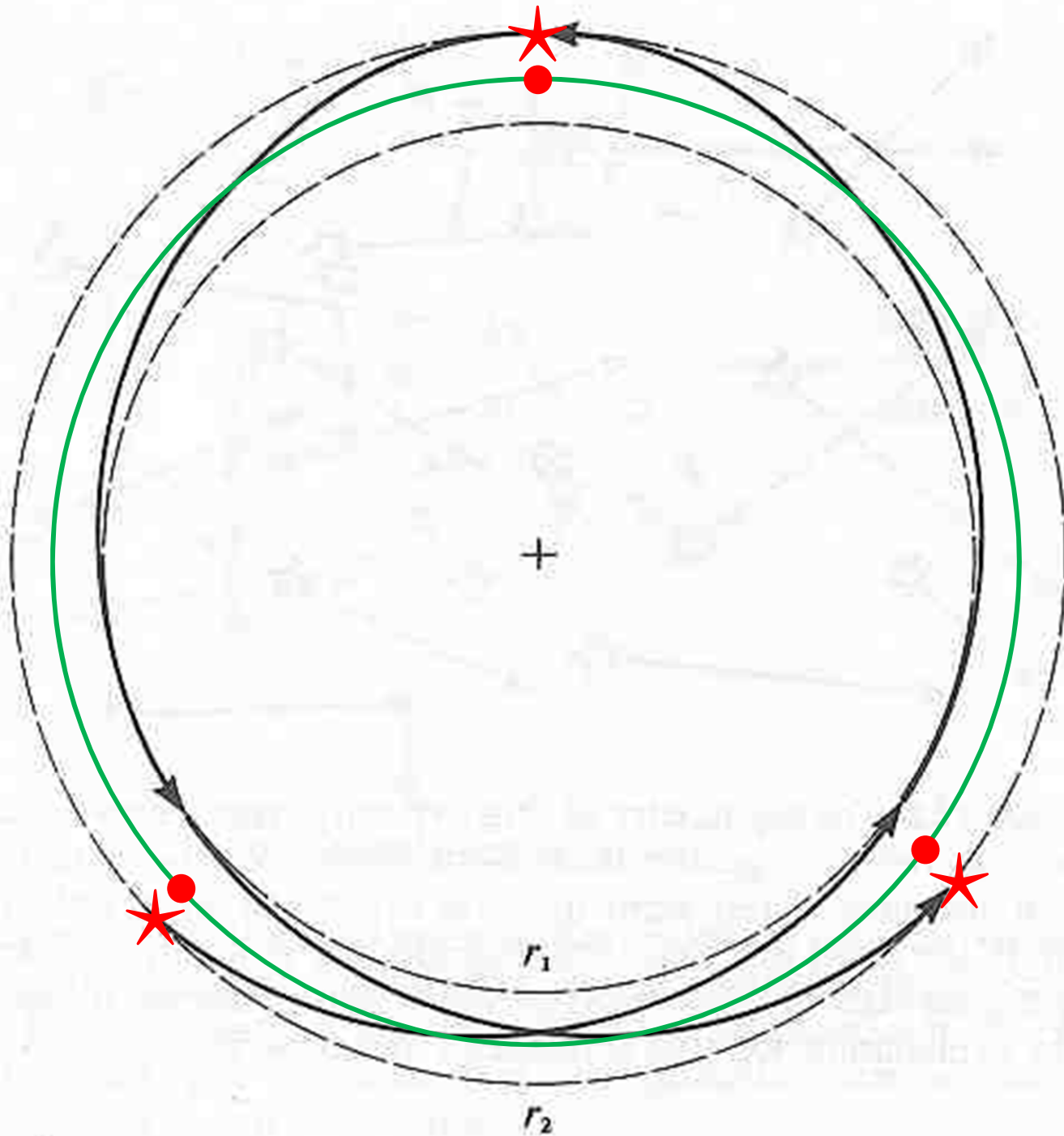
Prof. Rennan Barkana

<http://wise-obs.tau.ac.il/~barkana/cosmology2.html>

# NGC 891







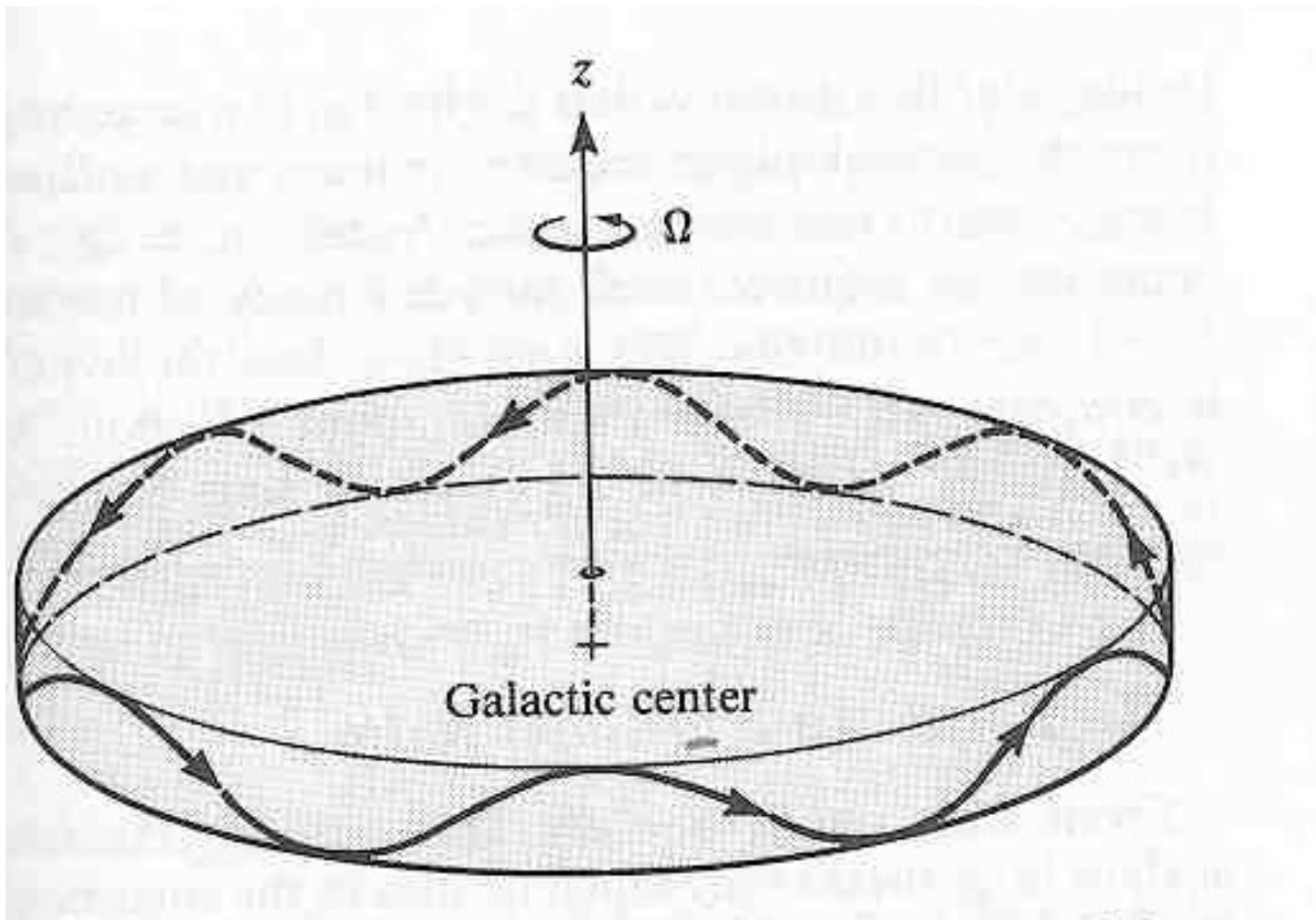
$$T_c = \frac{2\pi}{\Omega}$$

$$T_{\text{epi}} = \frac{2\pi}{\kappa}$$

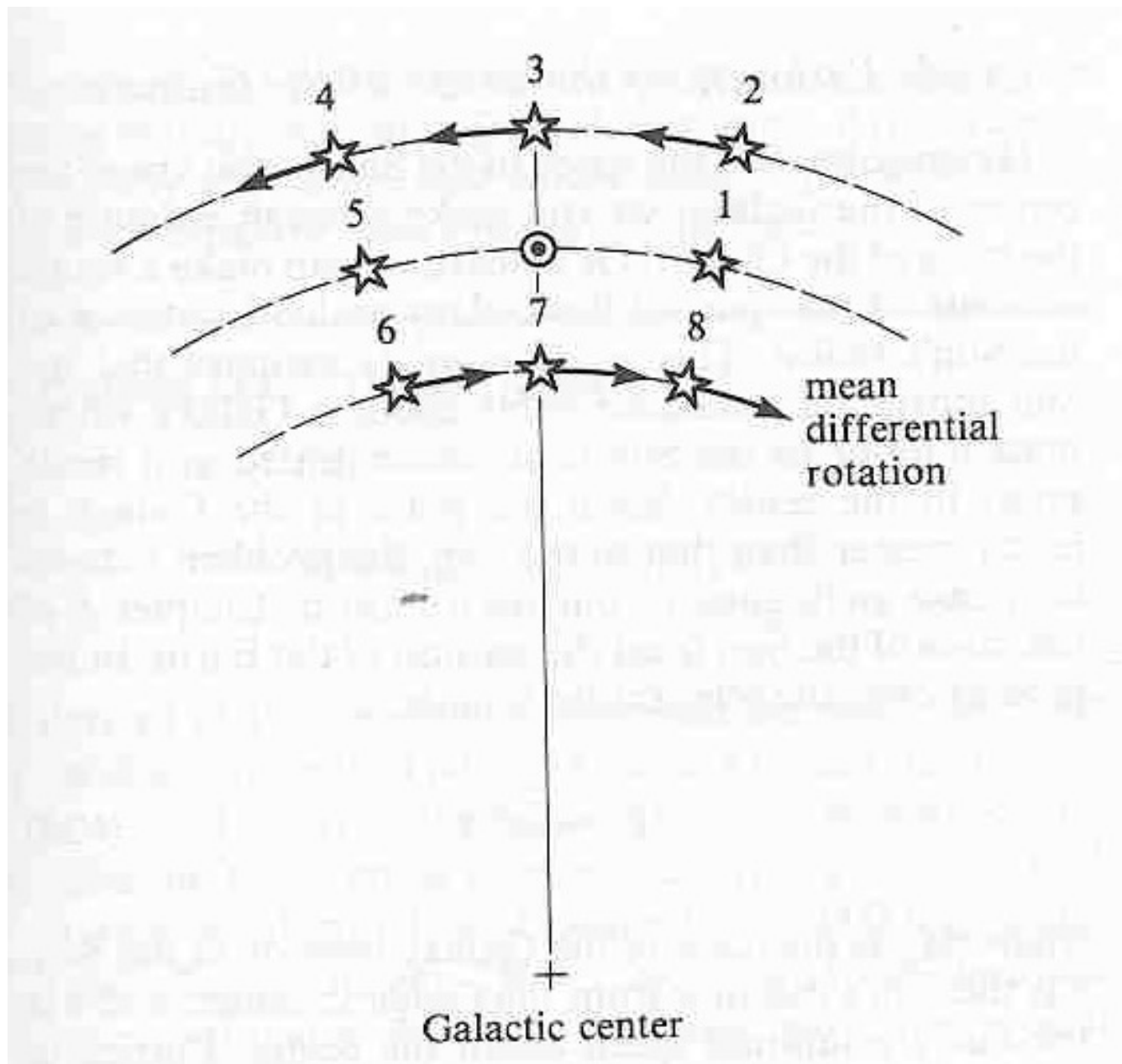
For the Sun:

$$T_{\text{epi}} < T_c$$

Also:  $z$  oscillations

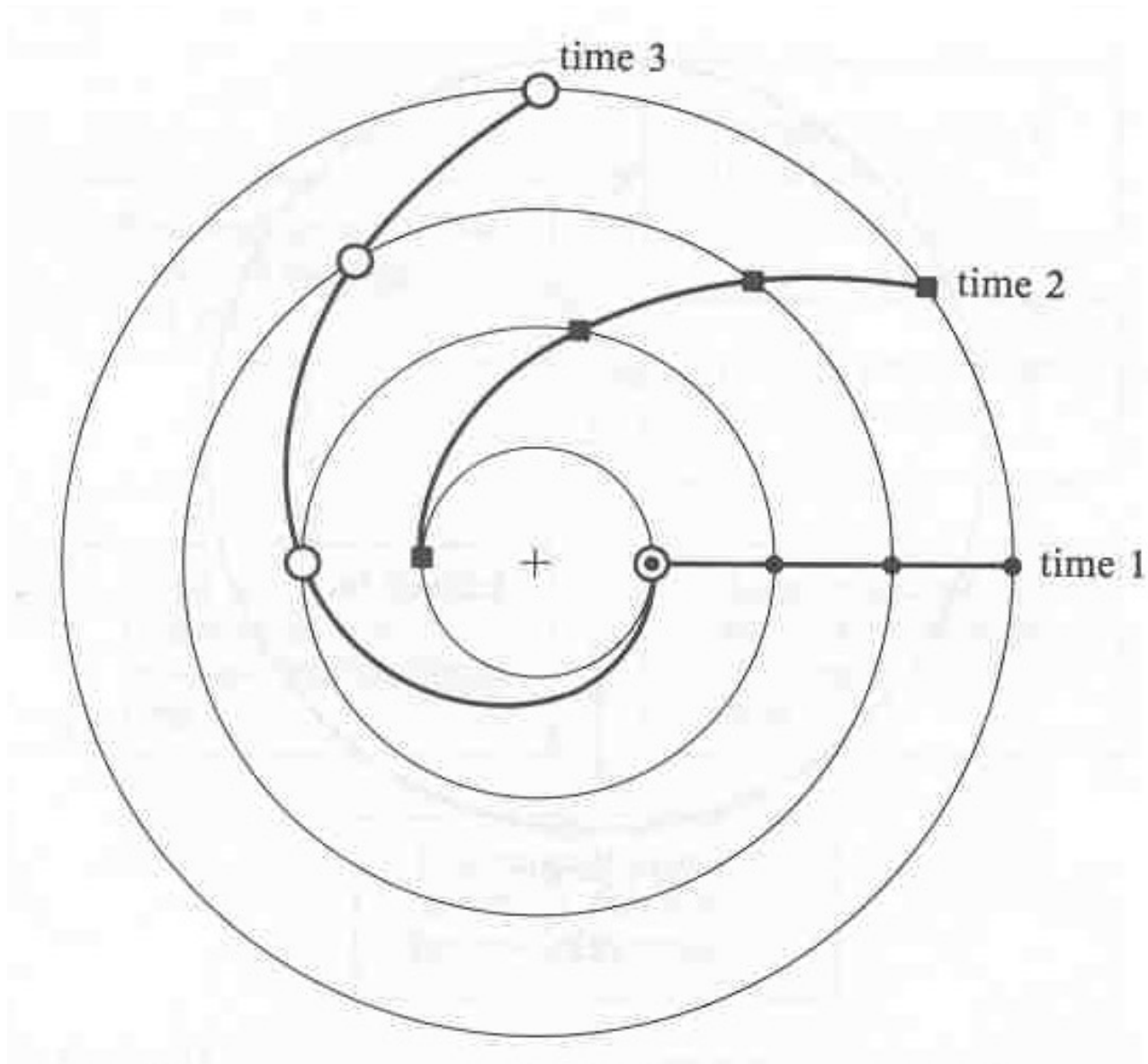


## Oort constants from radial-velocity observations:



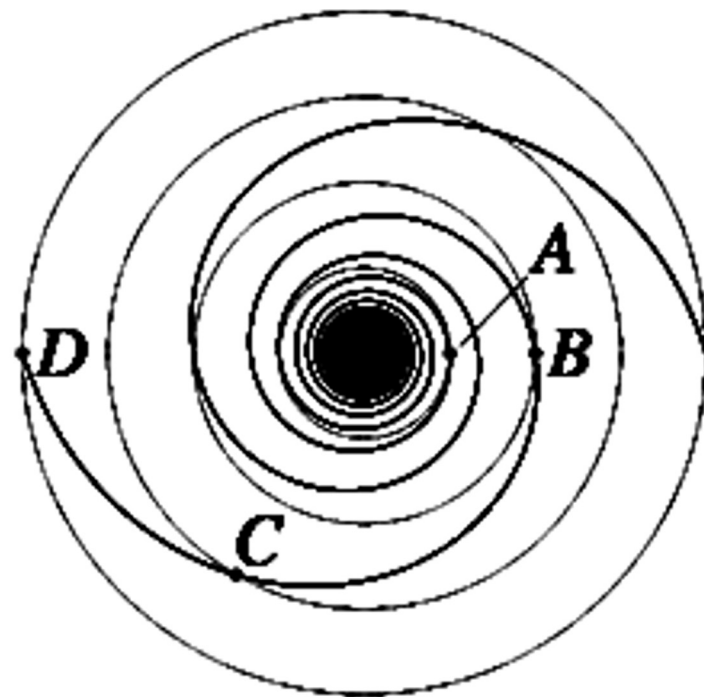
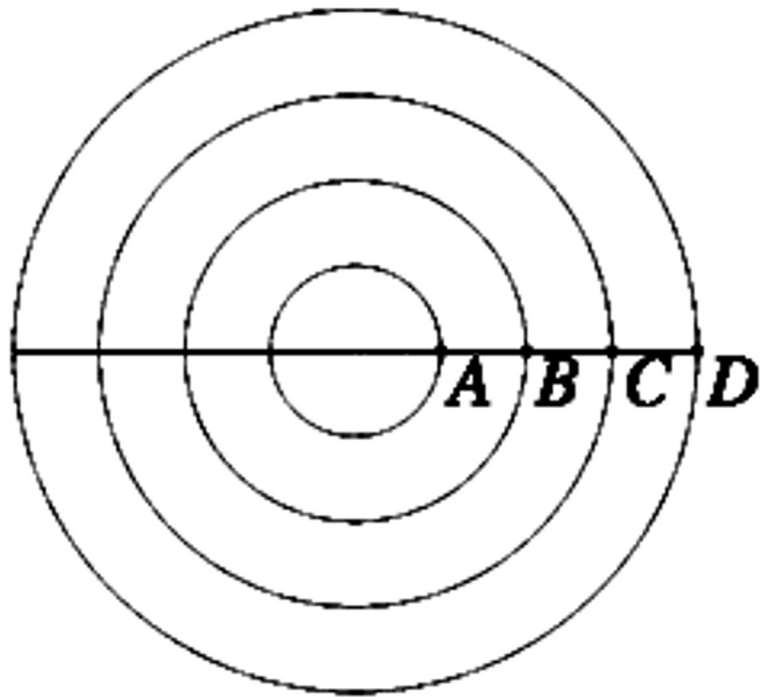
$\Rightarrow$  A

# Spiral Structure: Winding Problem



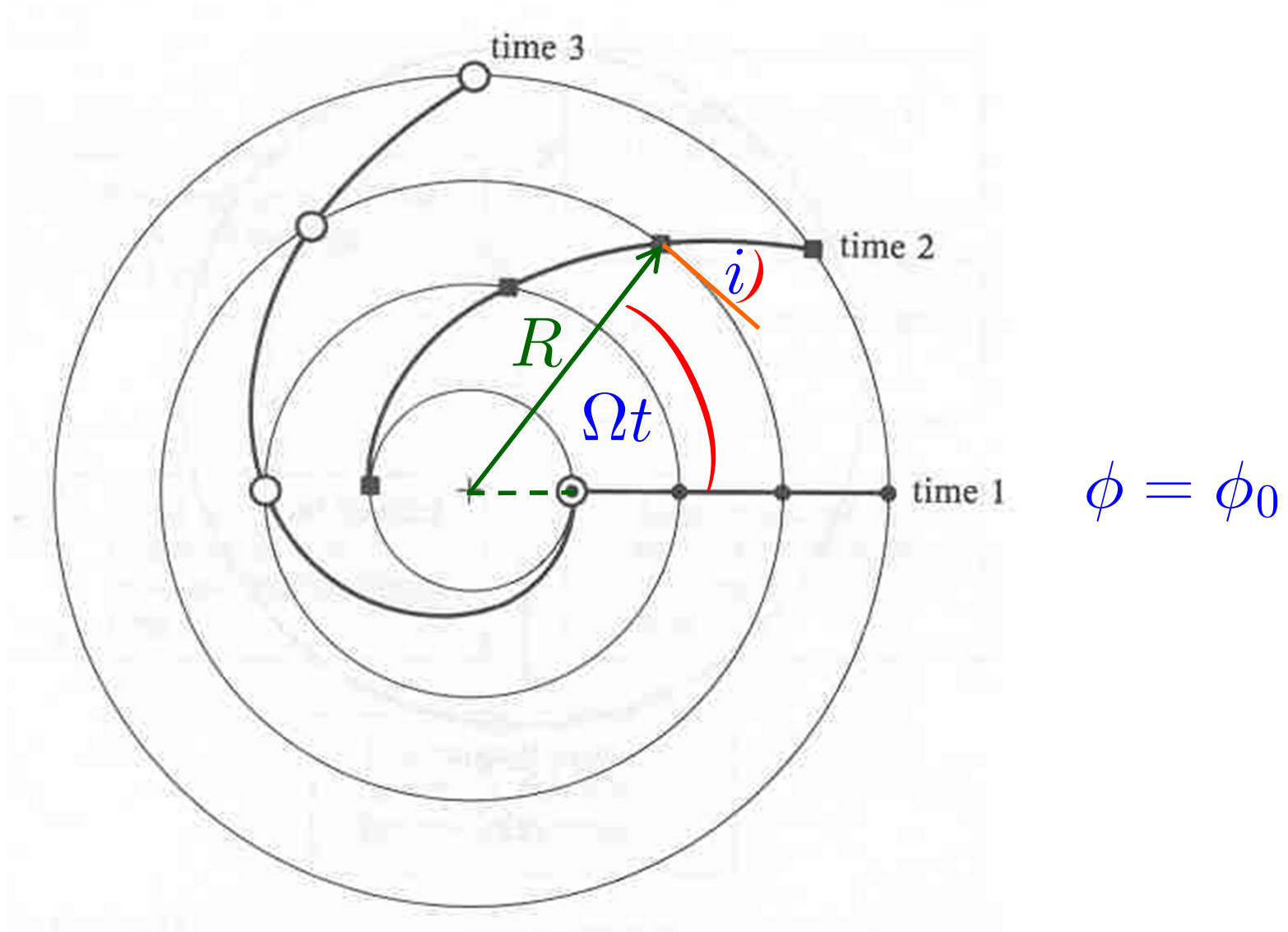
# Spiral Structure: Winding Problem

After a long time:





# Spiral Structure: Winding Problem









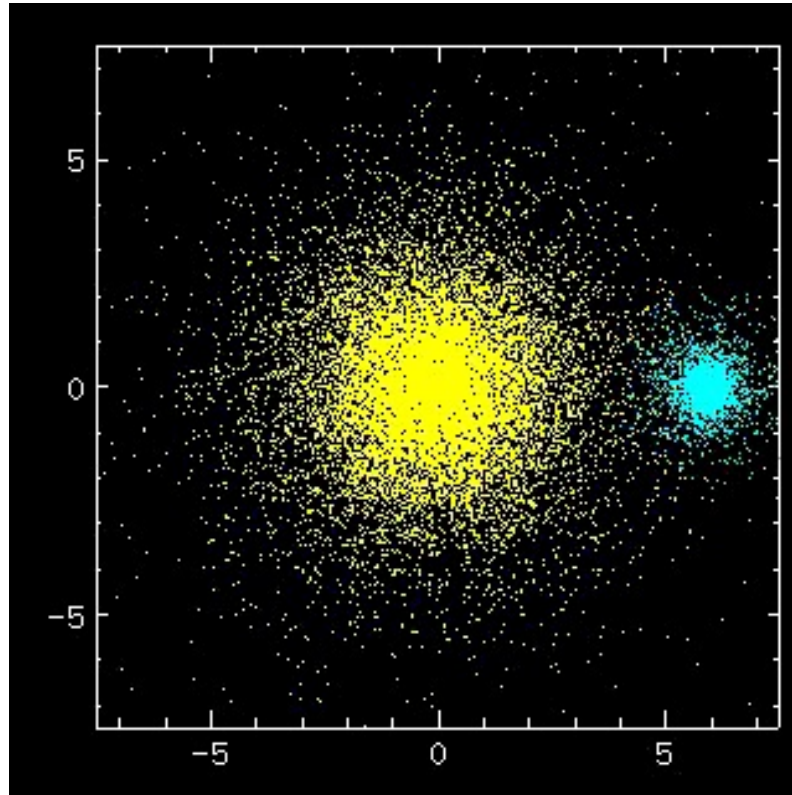
Spiral Galaxy NGC 5584



Hubble  
Heritage

NASA, ESA, A. Riess (STScI/JHU), L. Macri (Texas A&M University),  
and the Hubble Heritage Team (STScI/AURA) • HST/WFC3/UVIS • STScI-PRC11-08





Movie:

<http://burro.astr.cwru.edu/Academics/Astr222/Galaxies/Spiral/spiral.html>