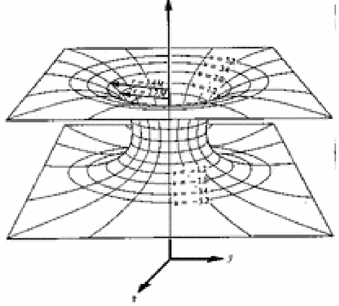
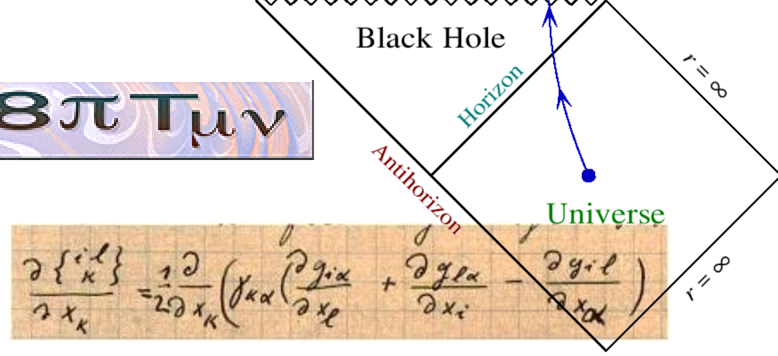


$$G_{\mu\nu} = 8\pi T_{\mu\nu}$$



PHY 490 – Spring 2018

Instructor: Dr. R. L. Herman

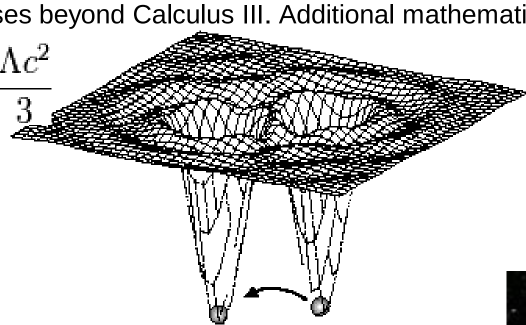
Introduction to General Relativity and Cosmology

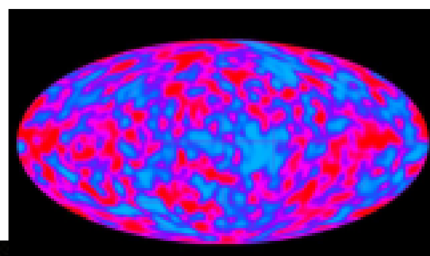
The 2015 discovery of gravitational waves was recently recognized by the awarding of the 2017 Nobel prize in physics. Einstein predicted gravitational waves in his 1916-1918 papers based on General Relativity. Over the last century we have learned that the universe is expanding; our galaxy is one of billions and billions of other galaxies; the age of the universe is 13.80±0.04 billion years; gravitational waves exist; and, neutron stars were seen to collide.

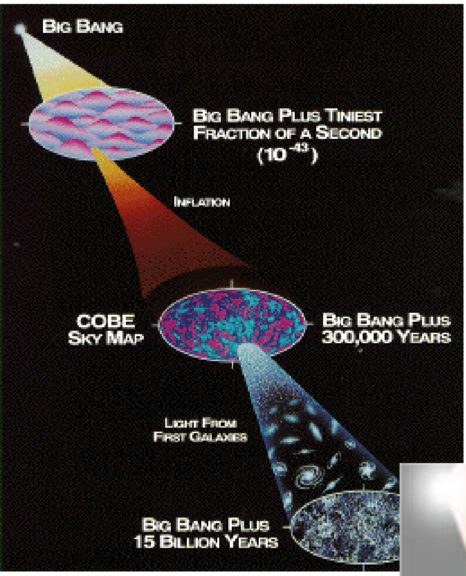
This course is an introduction to special and general relativity as applied to the structure and evolution of the Universe. We will use space-time models to see general relativity as a metric theory of gravity and will explore examples of specific solutions (black holes, wormholes) and ‘tests’ of general relativity (bending of light). We will probe the nature and implications of cosmological models assuming large-scale homogeneity and isotropy. Topics may also include black holes, neutron stars, dark matter and energy, cosmic microwave background radiation, inflation, binary pulsars, gravitational waves, and the standard big bang model.

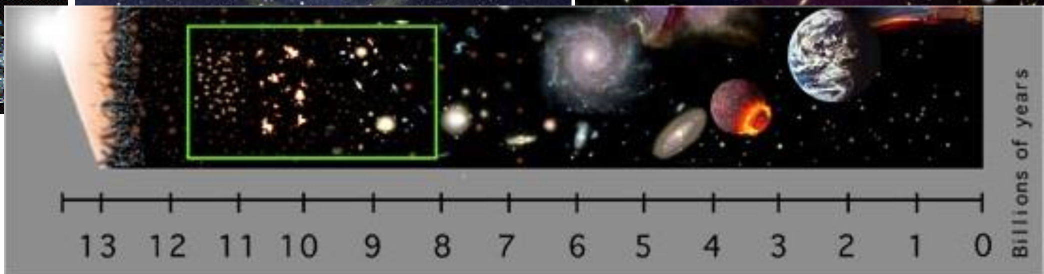
Prerequisites: Junior/Senior Standing. Students should have had introductory physics (PHY 201-202, PHY 335, PHY 321) and have completed courses beyond Calculus III. Additional mathematics/physics is definitely a plus.

$$H^2 = \left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3}\rho - \frac{kc^2}{a^2} + \frac{\Lambda c^2}{3}$$









Interested students can contact Dr. Herman,
Osprey Hall 2007J
hermanr@uncw.edu