

Wednesday, April 16, 2014

Exam 4, Skywatch 4, back Friday

Fifth exam and sky watch, FRIDAY, May 2.

Reading for Exam 5: Chapter 9 – Sections 9.6.1, 9.6.2, 9.7, 9.8; Chapter 10 - Sections 10.1-10.4, 10.9; Chapter 11 - all except Section 11.6 (abbreviated, focus on lectures); Chapter 12 - all; SKIP Chapter 13; Chapter 14 - all

Astronomy in the news:

U.S. casino mogul Sheldon Adelson's foundation has given \$16.4 million to SpaceIL to land an Israeli spacecraft on the moon. SpaceIL is among 18 groups competing for Google's \$20 million LunarX Prize, which will go to the first team to land a craft on the moon and make it jump while transmitting images back to Earth.

## Update on new “nearby” supernova SN 2014J in M82

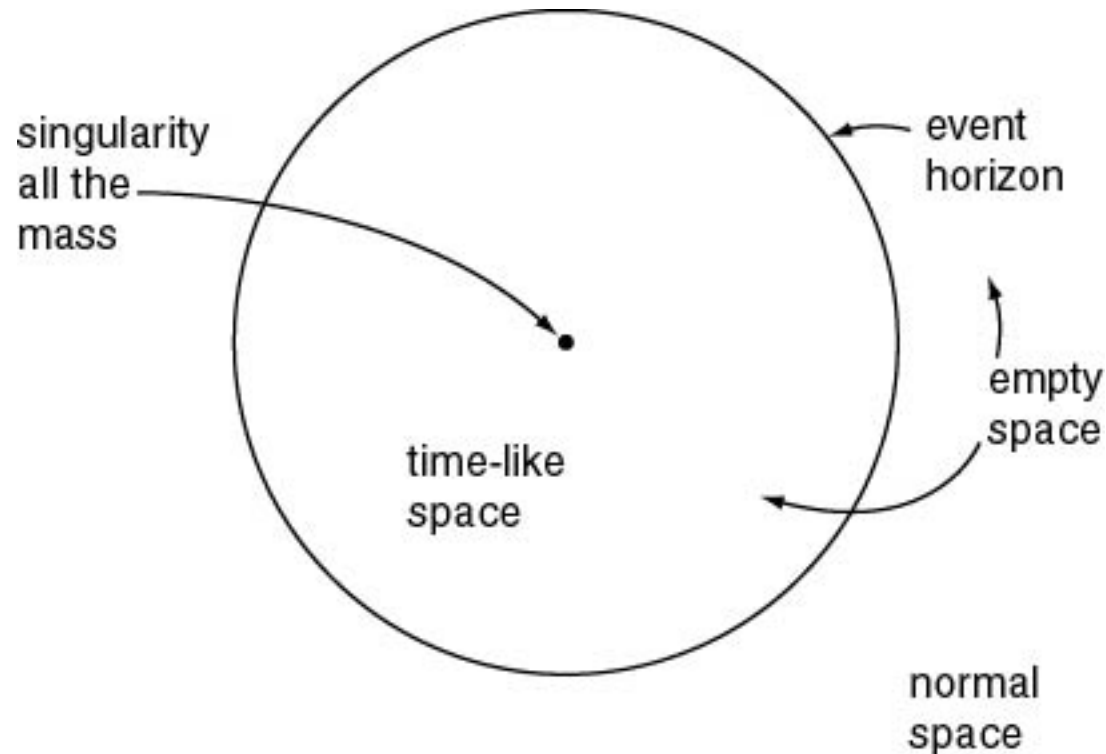
Proposals to use the Hubble Space Telescope were due on Friday. Many proposed to observe SN 2014J in various ways.

Goal:

To understand the nature of time-like space inside a black hole.

## § 8 Time-like Space

Figure 9.1



“Time-like” space forces motion in one direction. Space moves faster than the speed of light compared to a distant observer; **the real reason black holes are black.**

Goal:

To understand the full space-time associated with non-rotating black holes.

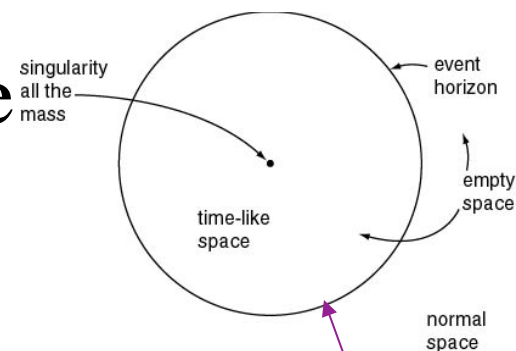
# Non-rotating Schwarzschild Black Hole

Mass, but no spin, no electrical charge

Assume all mass is in the singularity, no mass anywhere else (assumption necessary to solve equations)

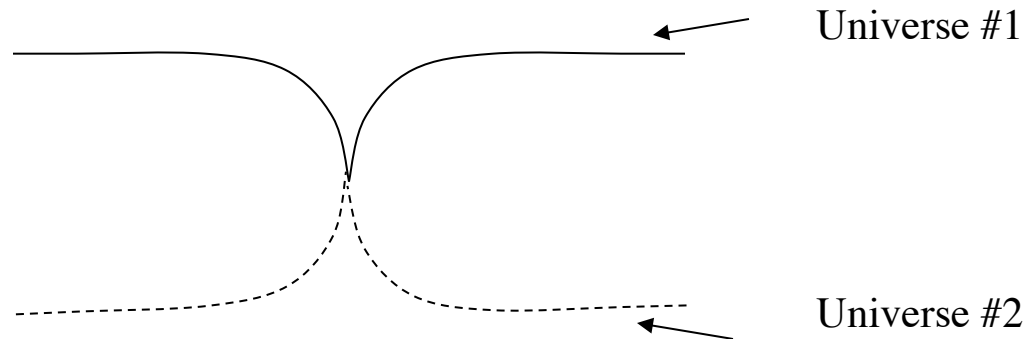
Find two Universes, each of infinite space, connected at one instant by the singularity.

Cannot pass from one to the other if travel at less than the speed of light.



Event horizon is also surface of infinite redshift

Slice of embedding diagram



Somewhere else in hyperspace

Goal:

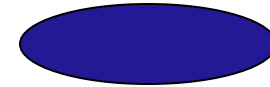
To understand the full space-time associated with rotating black holes.

# Rotating Kerr Black Hole

Mass and spin, but no electrical charge

Assume all mass is in the singularity, no mass anywhere else  
(assumption necessary to solve equations)

Find *singularity is a ring* (not a point)



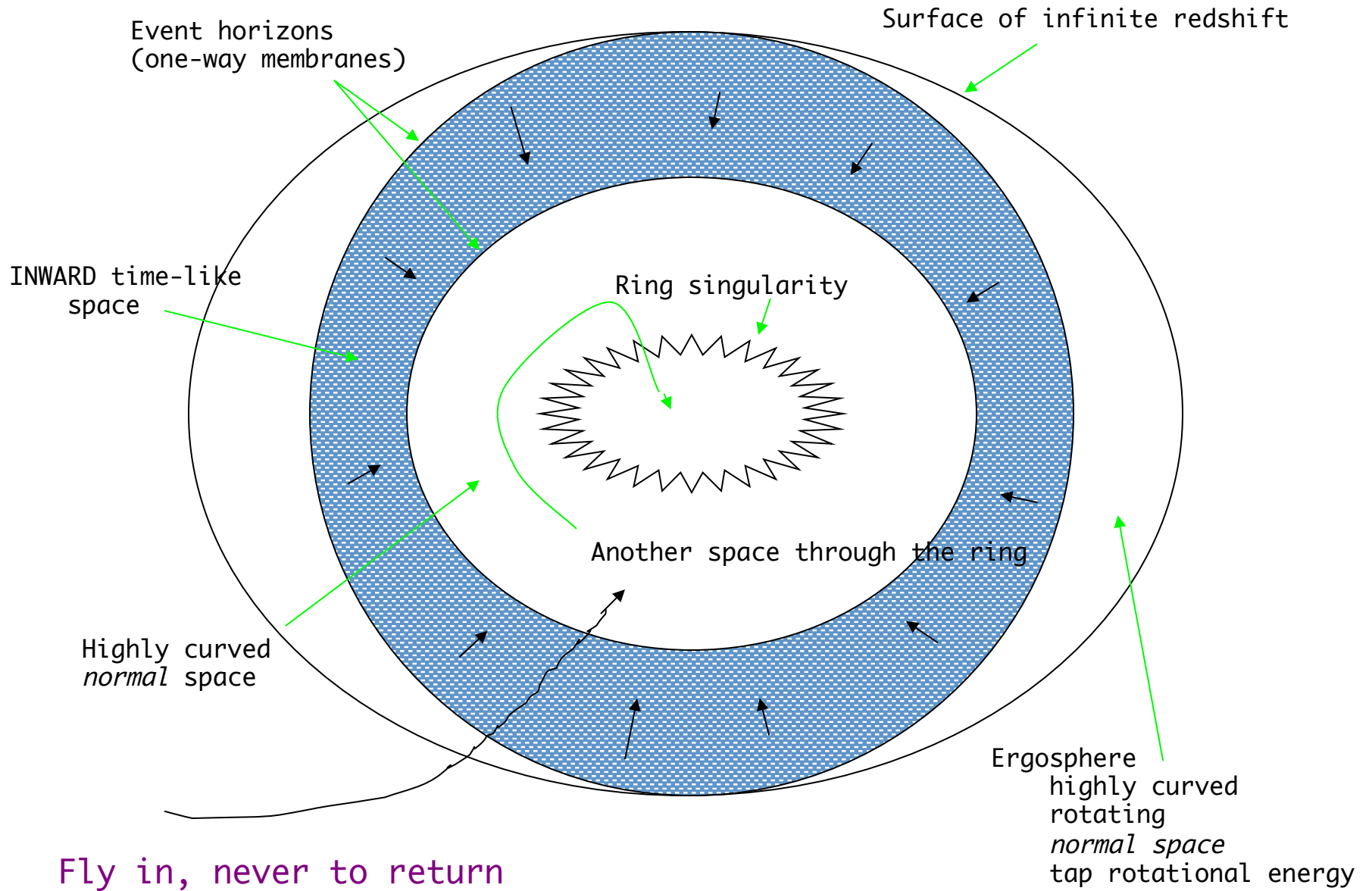
0 thickness,  $\infty$  density, still uncertainty problem

Infinite Universes!

(implicitly spread through hyperspace)



# Cross-sectional view of rotating Kerr black hole



# In future

