

October 29, 2010

Reading: 9.5.2, 9.6.1, 9.6.2, 9.6.3, 9.7, **9.8**, Chapter 10, Sections 10.1-10.4, 10.9.

Astronomy in the News?

Pic of the Day – star trails

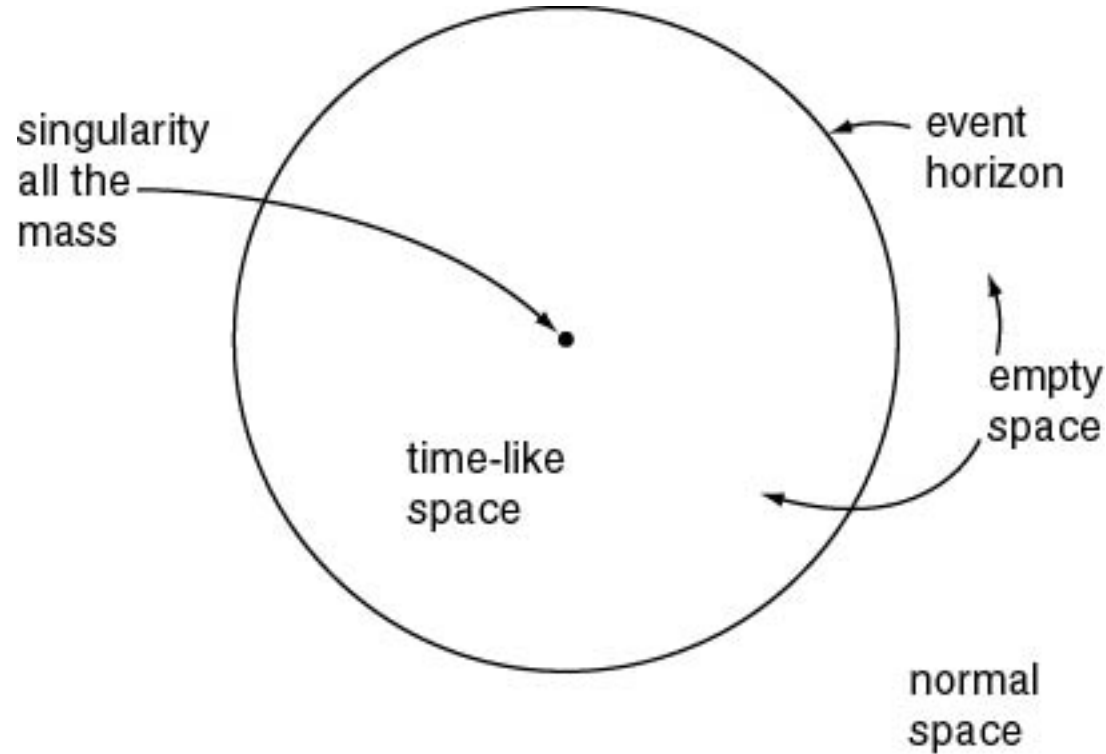


Goal:

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.

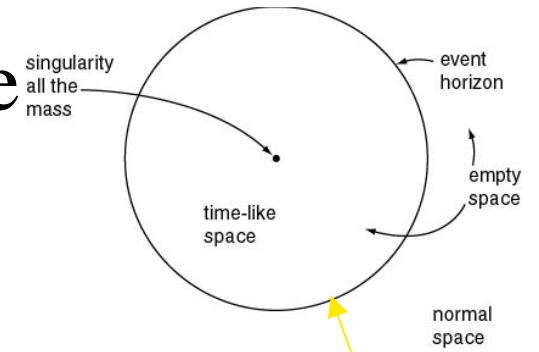
Non-rotating Schwarzschild Black Hole

Mass, but no spin, no electrical charge

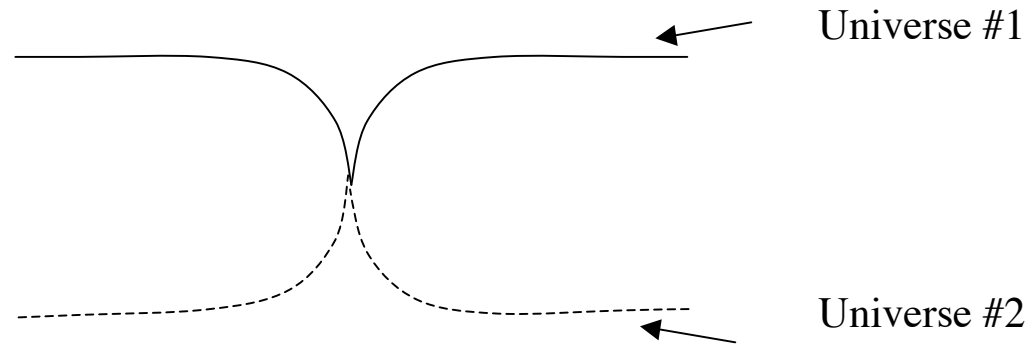
Assume all mass is in the singularity, no mass anywhere else (assumption necessary to solve equations)

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



Somewhere else in hyperspace

Goal:

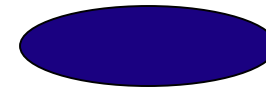
To understand the full space-time associated with rotating black holes.

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)

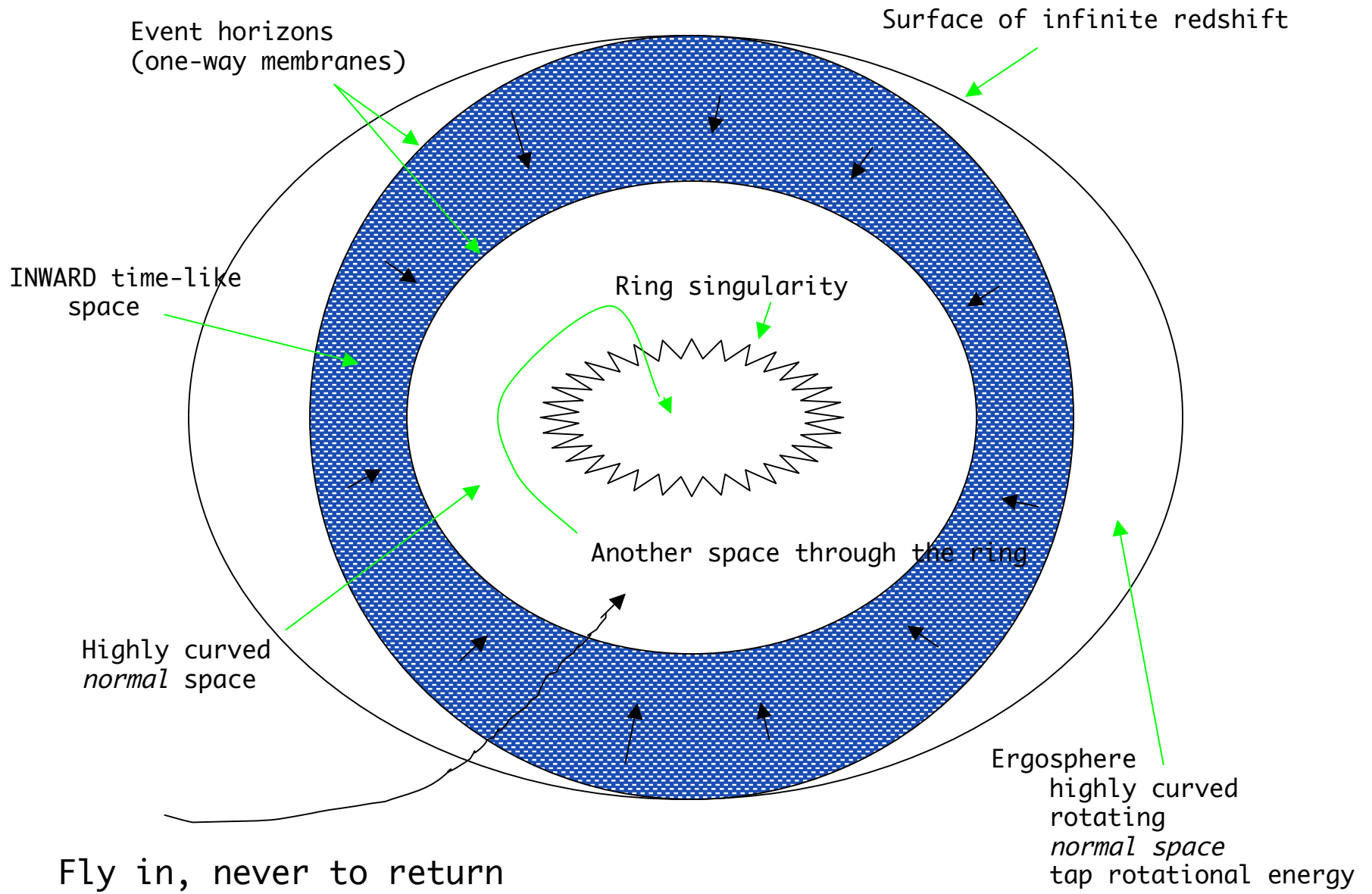


0 thickness, ∞ density, still uncertainty problem

Infinite Universes!

(implicitly spread through hyperspace)

Cross-sectional view of rotating Kerr black hole



In future

