10/22/04

Test 3, Chapters 8, 9 Friday, October 29. Review sheet maybe Monday.

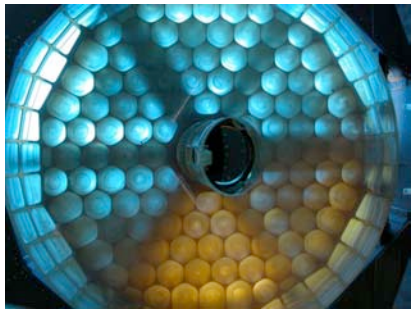
Wheeler Wednesday office hours then gone, Wednesday afternoon, Thursday, Friday. Mike Dunham will run the Wednesday evening review***. If you want to see me, make it earlier in the week!***

News?

Eclipse Wednesday, October 27, start 8 PM

Burt Rutan (SpaceShip1) 10am Friday, October 29, in the LBJ Auditorium. www.me.utexas.edu/rutan

Pic of the day: SOFIA IR telescope in airplane under construction in Waco.



Gravity for Einstein - no Newtonian Force

Gravitating objects curve the space around them - nearby objects move in that curved space

The straight lines of their force-free motion are warped by the curved space.

3 D space is not a "cone;" that is just a property of the 2 D embedding diagram.

Real 3 D space around gravitating objects has the properties:

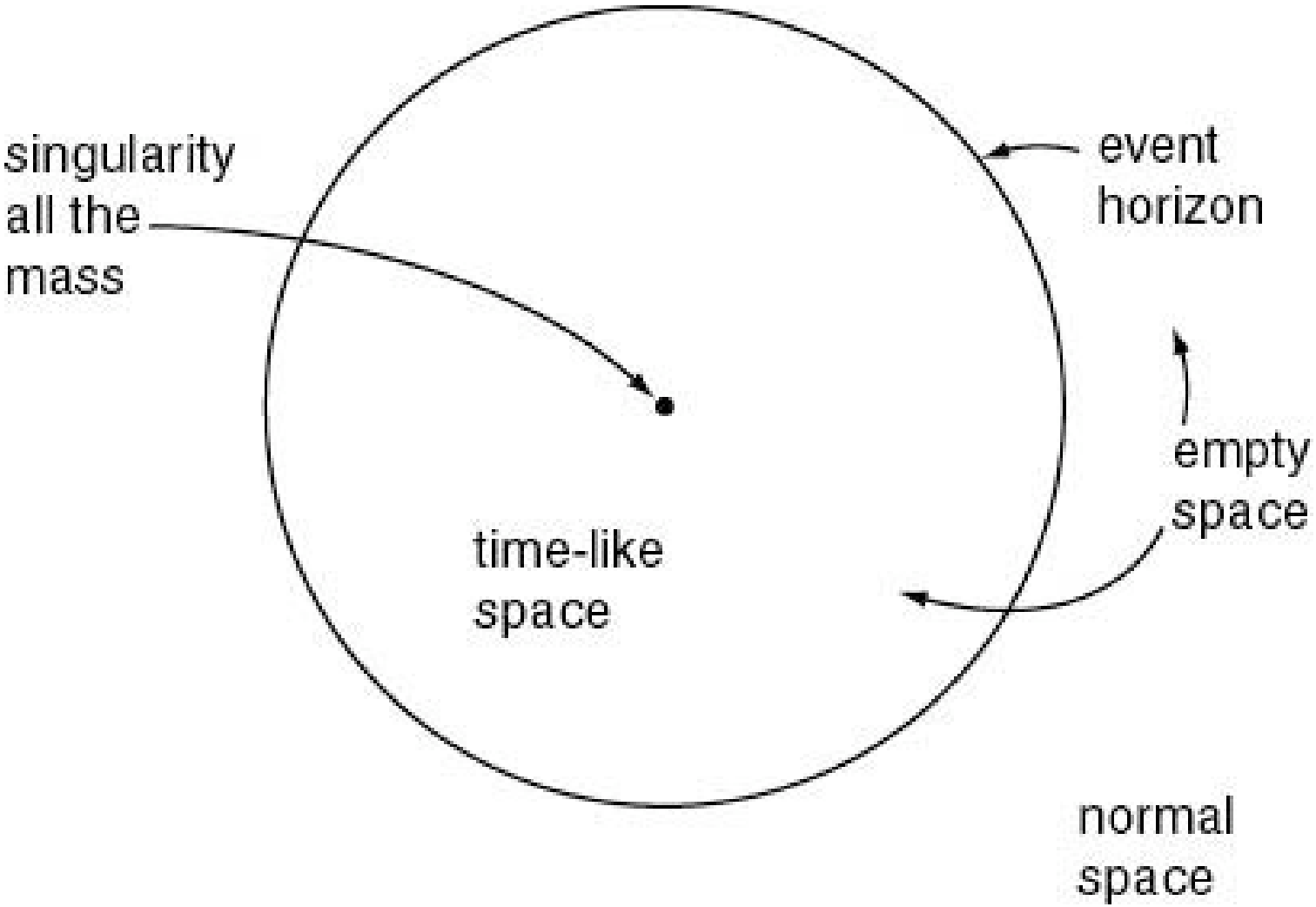
$C < 2\pi R$

Δ not equal 180^{o}

// lines cross

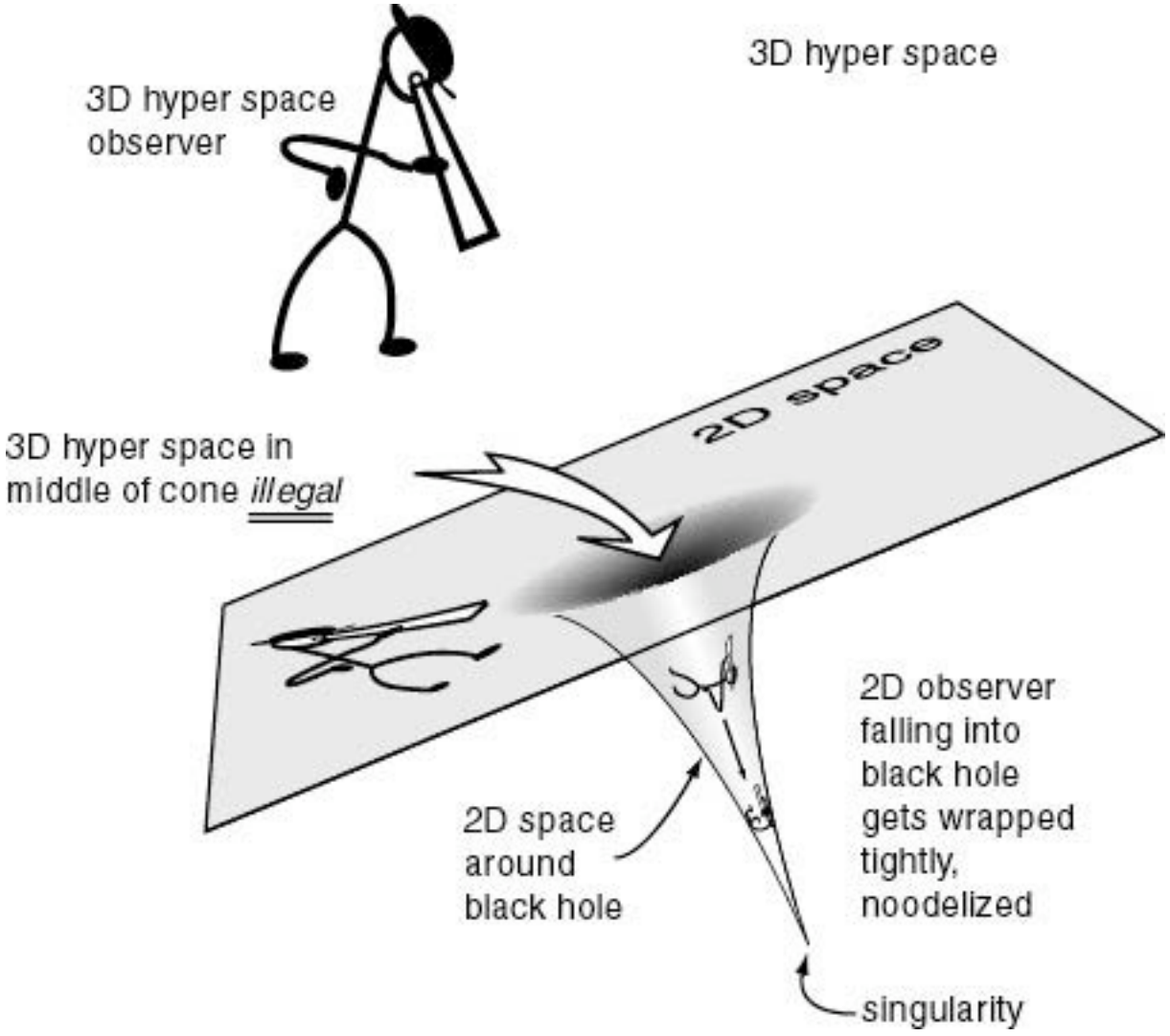
light is deflected (this one has been experimentally verified)

Figure 9.1



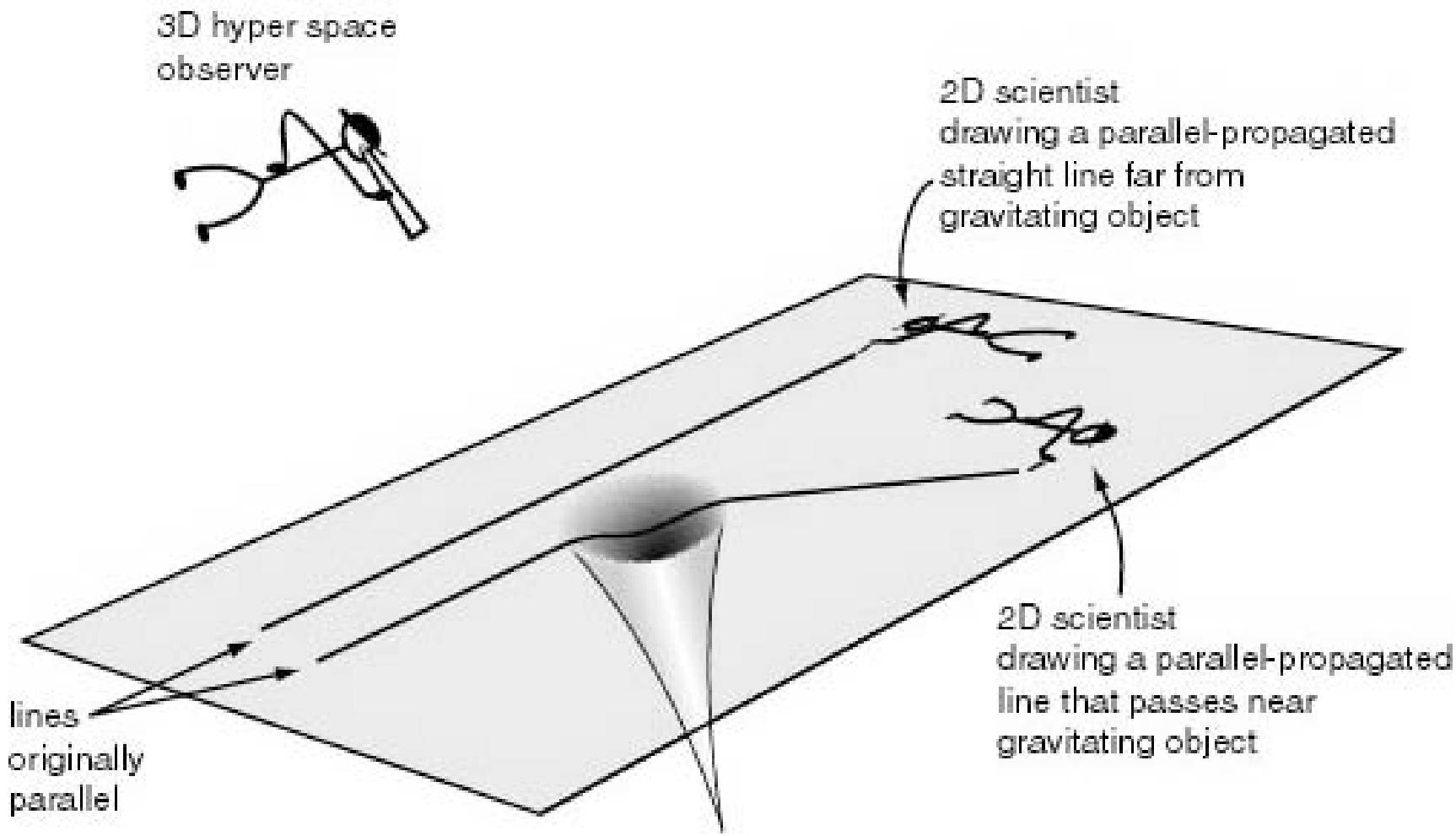
Basic properties of (non-rotating) black hole

Figure 9.3



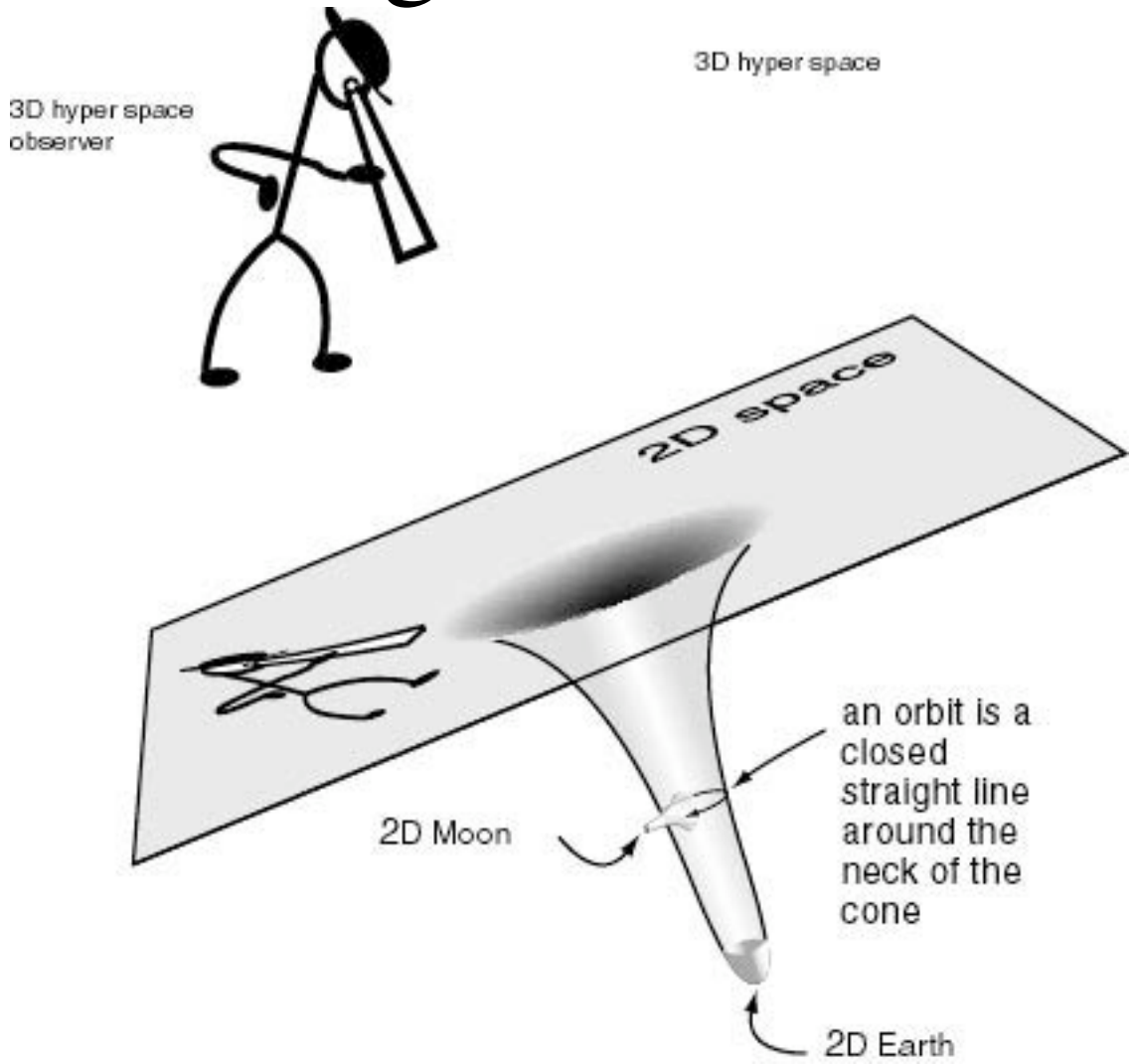
2D embedding diagram of 3D curved space around a black hole

Figure 9.4



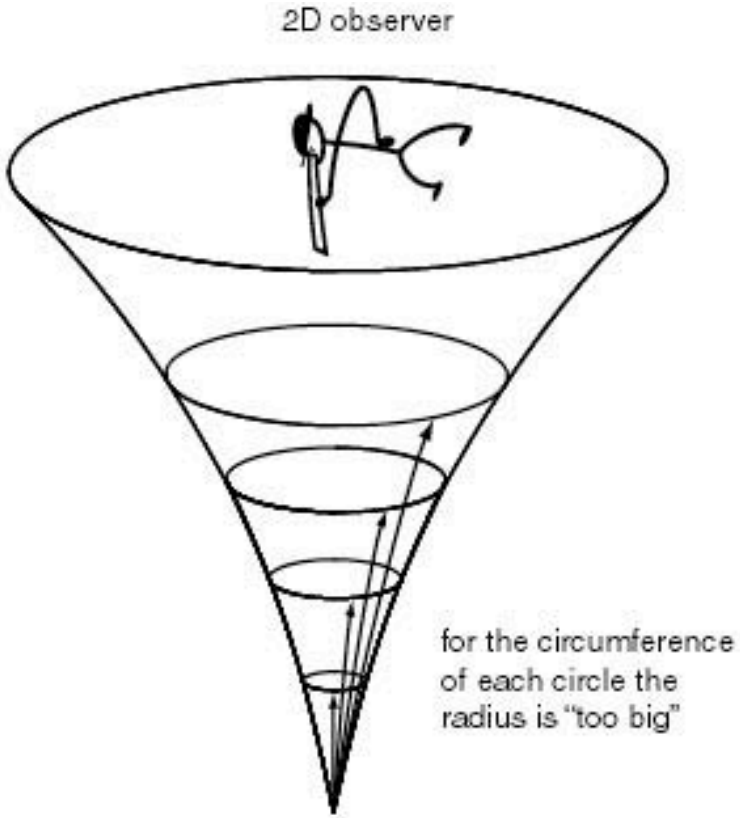
Straight lines in the 2D embedding diagram of curved, gravitating space.

Figure 9.5



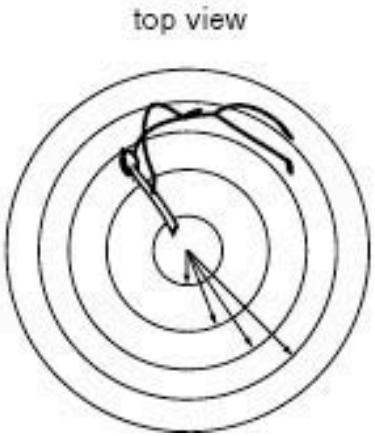
Orbits in curved 2D embedding diagram of gravitating space

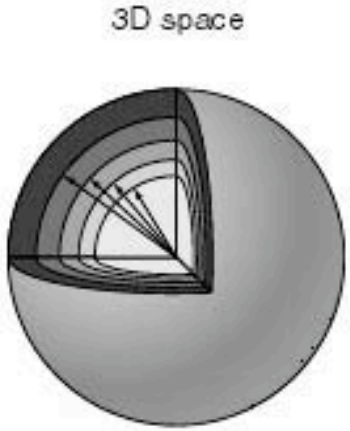
Fig 9.6



Curved 3D space

space around a black hole: each inner surface has a smaller circumference and area, but for each the radius is "too big"





Black holes and Time (Section 5.2)

If a clock moves away from an observer it ticks more slowly.

If a clock is deep in a gravity well it ticks more slowly according to an observer at large distance where gravity is absent.

Both effects if you drop a “clock” into a black hole and watch it fall in from a safe distance where gravity is weak (flat 3D space).

What does it mean to fall? Rather deep and strange phenomenon!