10/25/04

Test 3, Chapters 8, 9 Friday, October 29. Review sheet posted today.

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: Perseus cluster of galaxies

Falling to Einstein

According to Einstein - curved space around gravitating objects "flows" inward - ***inward escalator.***

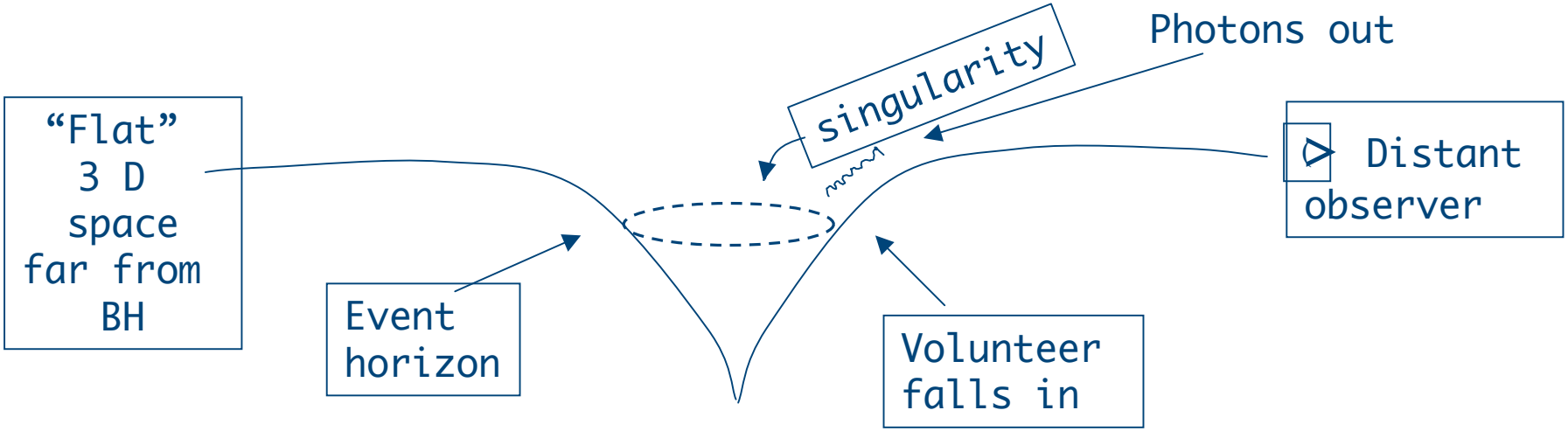
If object floats with ***no force*** in space (free fall), it will move toward the center of gravitation

$\Rightarrow$ falling - all objects respond to same curvature, have the same acceleration

Like water down a drain - sit still in water, but go down the drain.

Must exert force to resist, to avoid free fall, to avoid the flow of space inward toward the center of the gravitating object.

Specifically for Black Holes



Volunteer finds herself rapidly falling through event horizon,
noodleized, dies

Distant observer sees Doppler and gravitational redshifts

Received photons get longer, longer wavelength

Time between photons gets longer and longer

Infinite time for last photon emitted just as volunteer reaches the event horizon

⇒***Distant observer never sees volunteer cross the horizon***

⇒***Photons get undetectable, very long wavelength, most of the time is between photons - absolutely black***

Black Hole Evaporation
Hawking Radiation § 6

Quantum Fuzzy Event Horizon

vacuum "boils" with creation/annihilation of particles/anti-particles

easiest to make photon = anti-photon (no mass)

but also e^- e^+, p^+ p^-, neutron anti-neutron, neutrino anti-neutrino

At event horizon - position of event horizon and of particles is

quantum uncertain

One particle in pair can be swallowed, other escapes - carries mass, energy

Black holes are not just one-way affairs, with quantum effects they will lose mass and energy