A Journey Into A Blackhole

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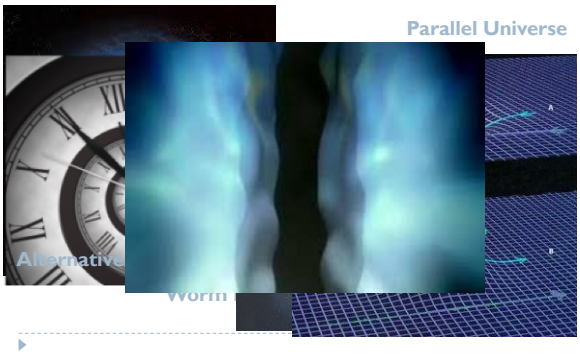
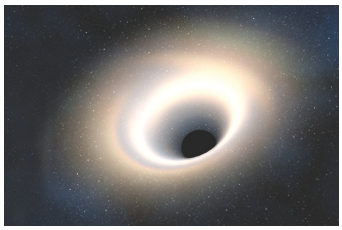
What comes to mind when you think about blackholes?



What if you fell into a blackhole?

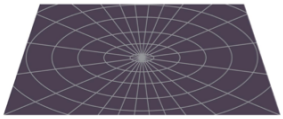


- You would most likely die!

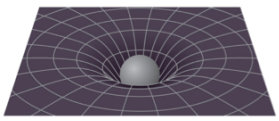
What is a blackhole ?

- A region of space having a gravitational field so intense that no matter can escape (not even light).

The fabric of spacetime



a A two-dimensional representation of "flat" spacetime. The distances between adjacent circles are the same.



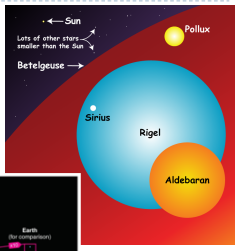
b Gravity arises from curvature of spacetime, represented here by a mass pushing down on the rubber sheet. Notice how the circles become more widely separated near the mass, showing that the curvature is greater as we approach the mass on the sheet.

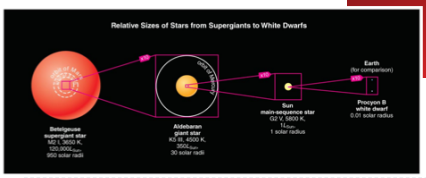
A warp in the fabric of spacetime

c The curvature of spacetime becomes greater and greater as we approach a black hole, and a black hole itself is a bottomless pit in spacetime.

How is a blackhole formed?

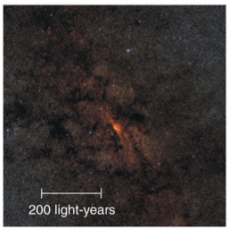
- Stellar black holes are made when the center of a very big star falls in upon itself, or collapses. (3M_{sun})
- Our galaxy harbours100 million stellar blackholes



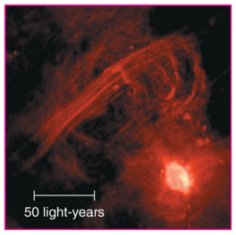


Super massive blackholes

- Object in our galactic center at least 4 million M_{sun}.



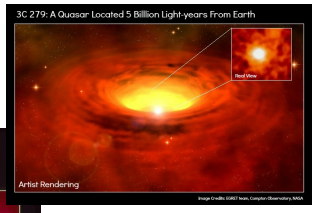
a This infrared image shows stars and gas clouds within 1000 light-years of the center of the Milky Way.

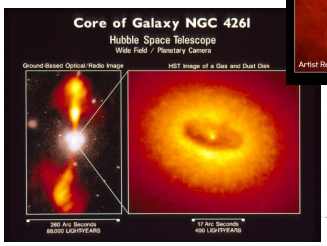


b This radio image shows vast threads of emission tracing magnetic field lines near the galactic center.

How can we detect them?

- Monstrous 3 billion Msun blackhole at the heart of the giant elliptical galaxy M87.

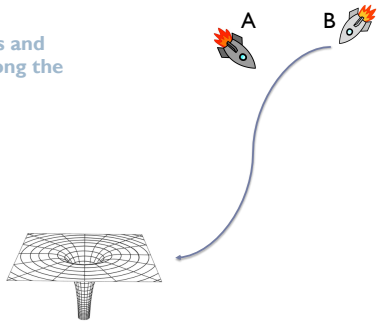




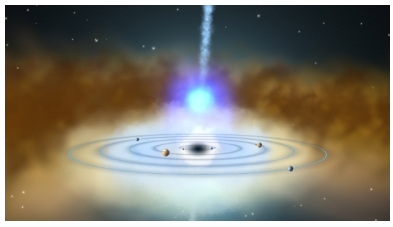
- 1 billion Msun blackhole the size of our planetary system.

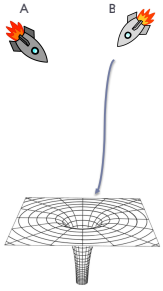
Let's take a journey

Clarify some ideas and misconception along the way

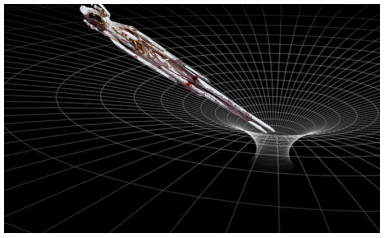


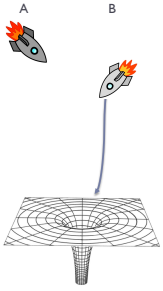
- Do black holes suck everything up?



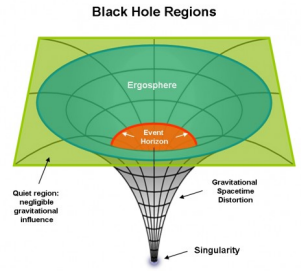


- What is the influence of gravity?

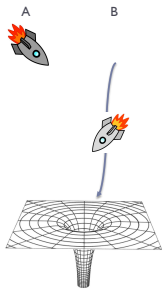




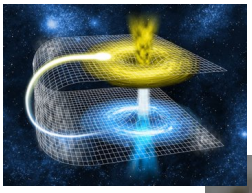
Information beyond the event horizon, is in a sense disconnected from our universe.

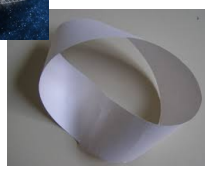


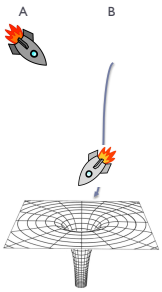
- Does it connect to a parallel universe?



- Can it transport you to another place in the universe?



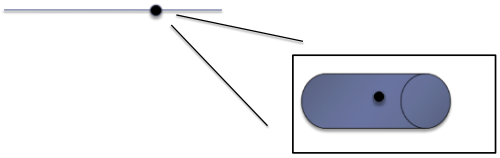




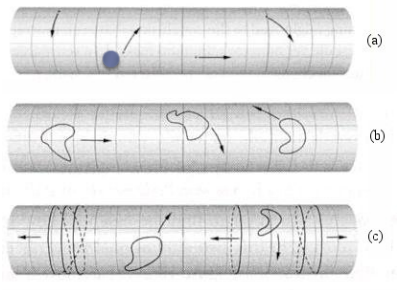
Folding spacetime

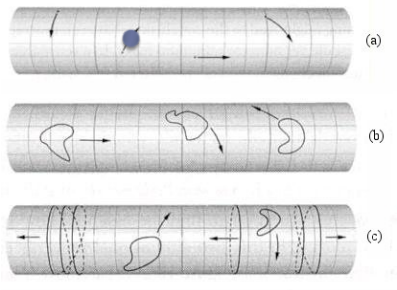
A line segment

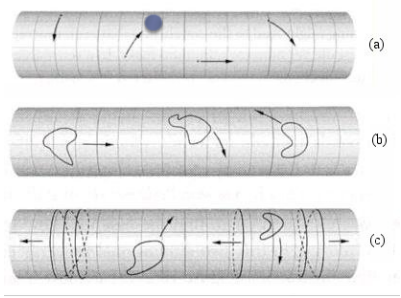
- Zooming in we see thickness

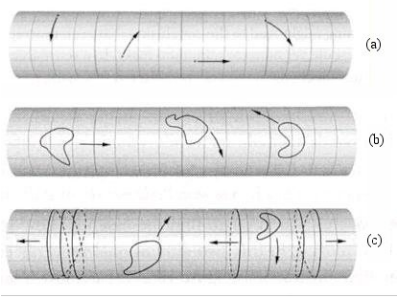


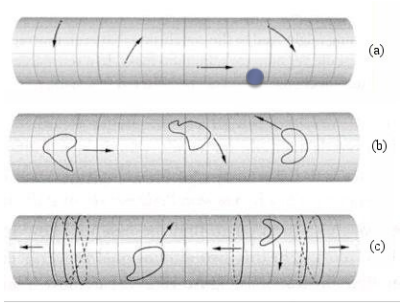
Wrap Around fabric of spacetime



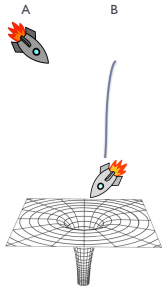






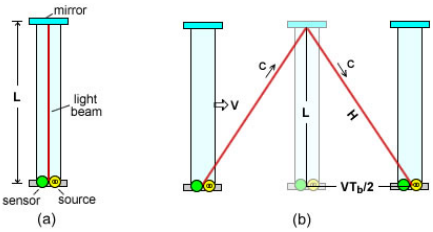


- Can you travel through time?



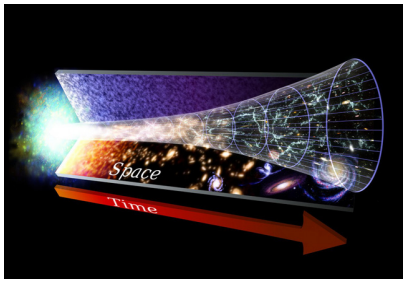
Time dilation

The faster you move the slower time passes.



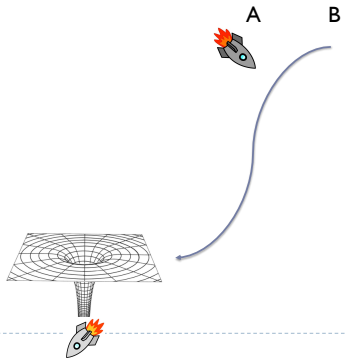
The arrow of time

Time flows easier forward due to entropy.



Traveling through a blackhole you might be able to see all time at once.

Will we ever know what happens?



Q & A