

Wednesday, April 12, 2017

Change of travel plans, Wheeler here all next week.

Exam 4, Skywatch 4, Friday, April 21.

Reading for Exam 4:

Chapter 8 Neutron Stars - Sections 8.1, 8.2, 8.5, 8.6, 8.10;

Chapter 9 Theory of Black Holes: 9.1 to 9.5, 9.8

Astronomy in the news?

The Event Horizon Telescope has finished its first 5 days of data collecting. It will take months of analysis to find if the black hole in the center of the Milky Way is revealed.



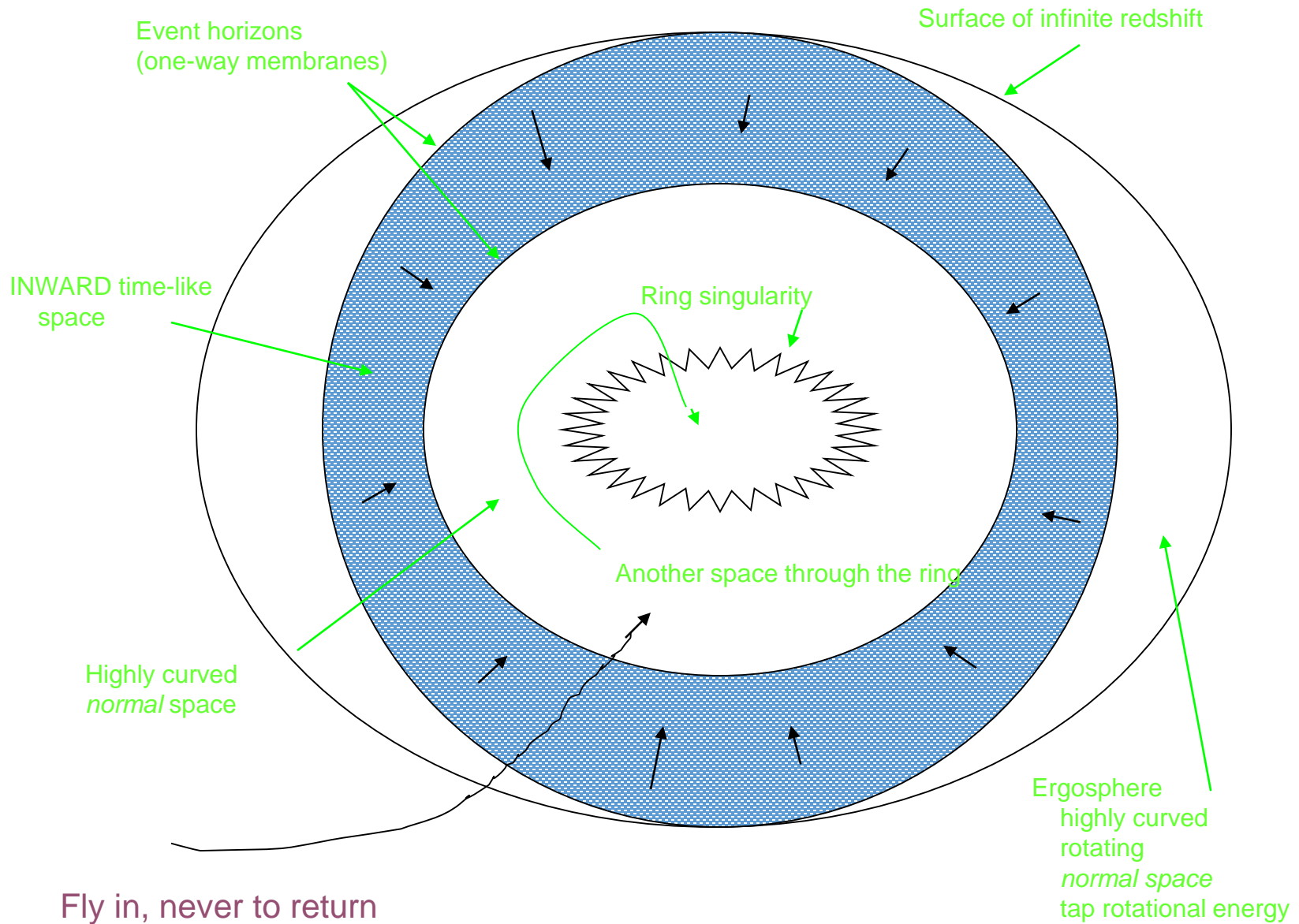
Goal:

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

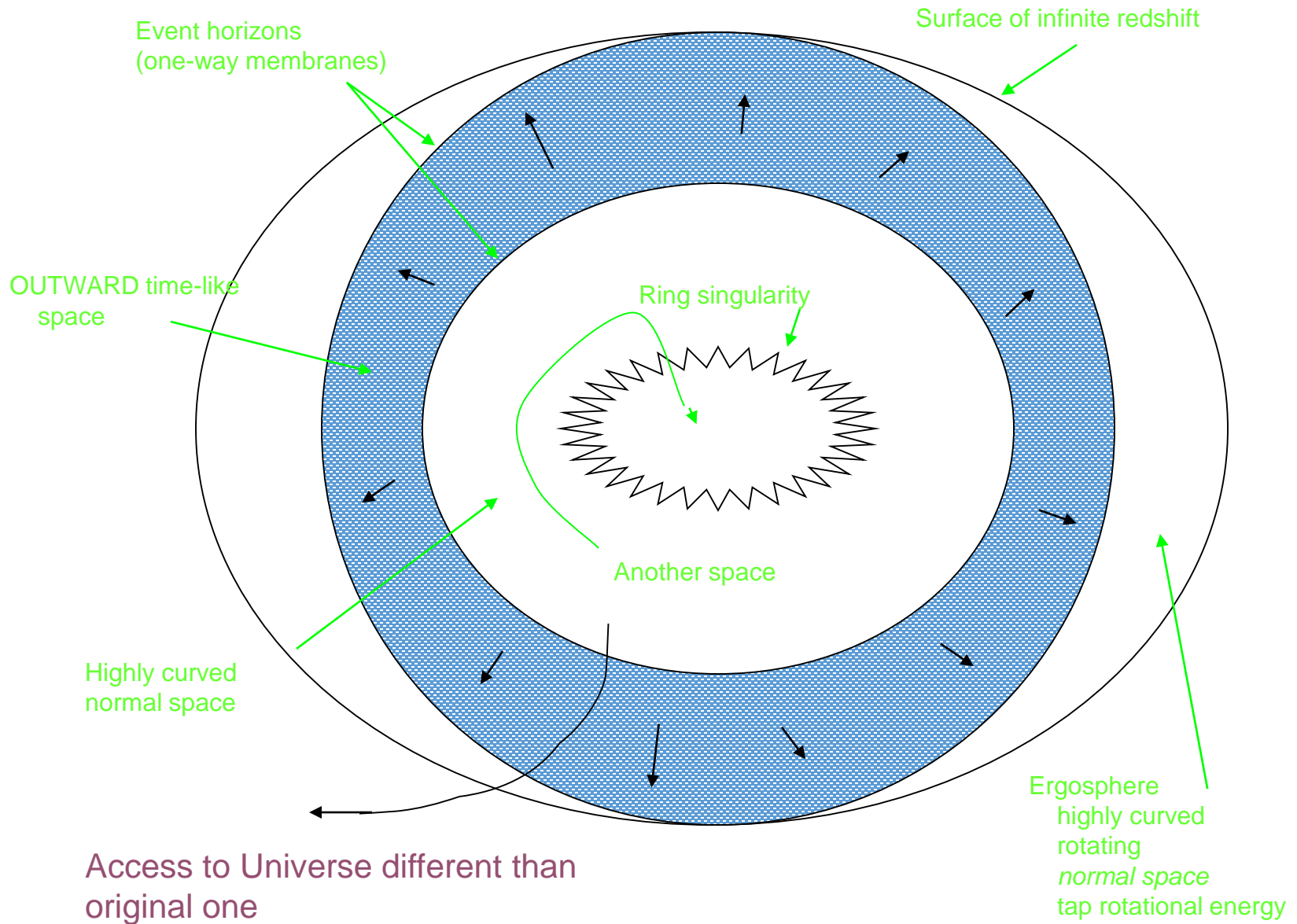
Goal:

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

Cross-sectional view of rotating Kerr black hole







In future



One Minute Exam

In the mathematical solution for a rotating black hole:

-  The surface of infinite redshift is identical to the event horizon.
-  You can escape the black hole back to the universe from which you entered.
-  There are exactly two universes.
-  The space entered through the ring singularity is different than the space surrounding the singularity.

Are different universes in Schwarzschild and Kerr solutions to non-rotating and rotating black holes real?

In Real Universe:

Light (at least!) falls into the black hole

Photons are Doppler blue shifted, accelerated to higher energy, =>the energy/mass ($E = mc^2$) warps the space and changes the mathematical, hence the physical solution

So, probably not in this case, but stay tuned...

The story so far:

Look up at the sky and wonder about the stars.

Betelgeuse is a red supergiant about to collapse.

Collapse can lead to supernova explosions and the production of neutron stars, but also of black holes.

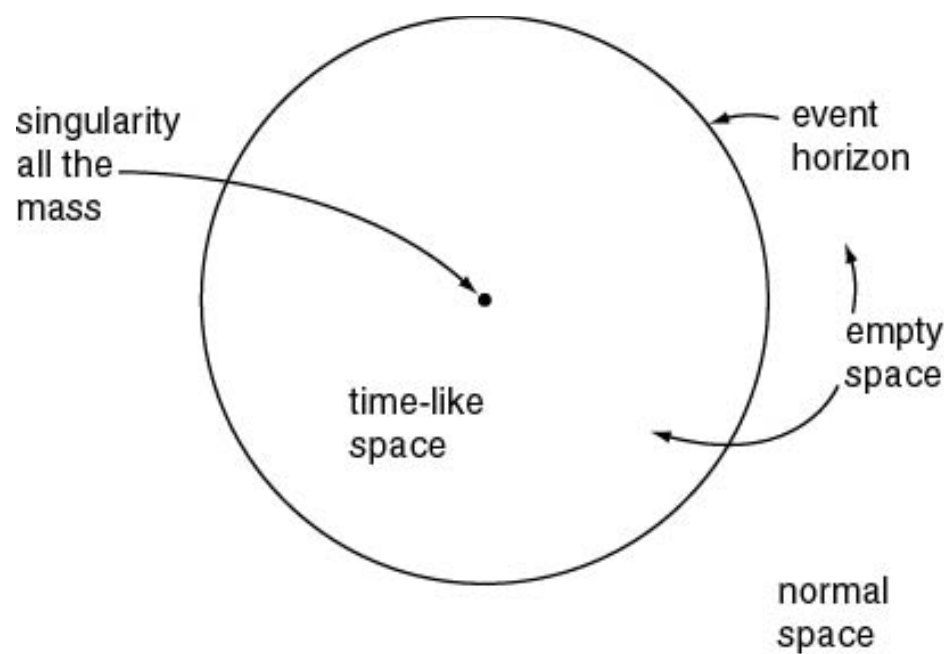
Black holes are predicted by Einstein to have a singularity, infinite density, infinite tidal forces, the end of space and time.

We need a new all-embracing Quantum Gravity to know what the “singularity” really is.

End of Material for Exam 4

Goal:

To understand the conflict between Einstein's theory of gravity and the Quantum theory.



Einstein's theory does not incorporate any of the tenets of the quantum theory.

Singularity - all the mass is in a zero volume point in Einstein's theory.

Violates the Uncertainty Principle of Quantum Theory: cannot specify the position of anything exactly.

Need theory of *Quantum Gravity* to rectify, to understand what the "singularity" really is. **Deepest issue in modern physics.**