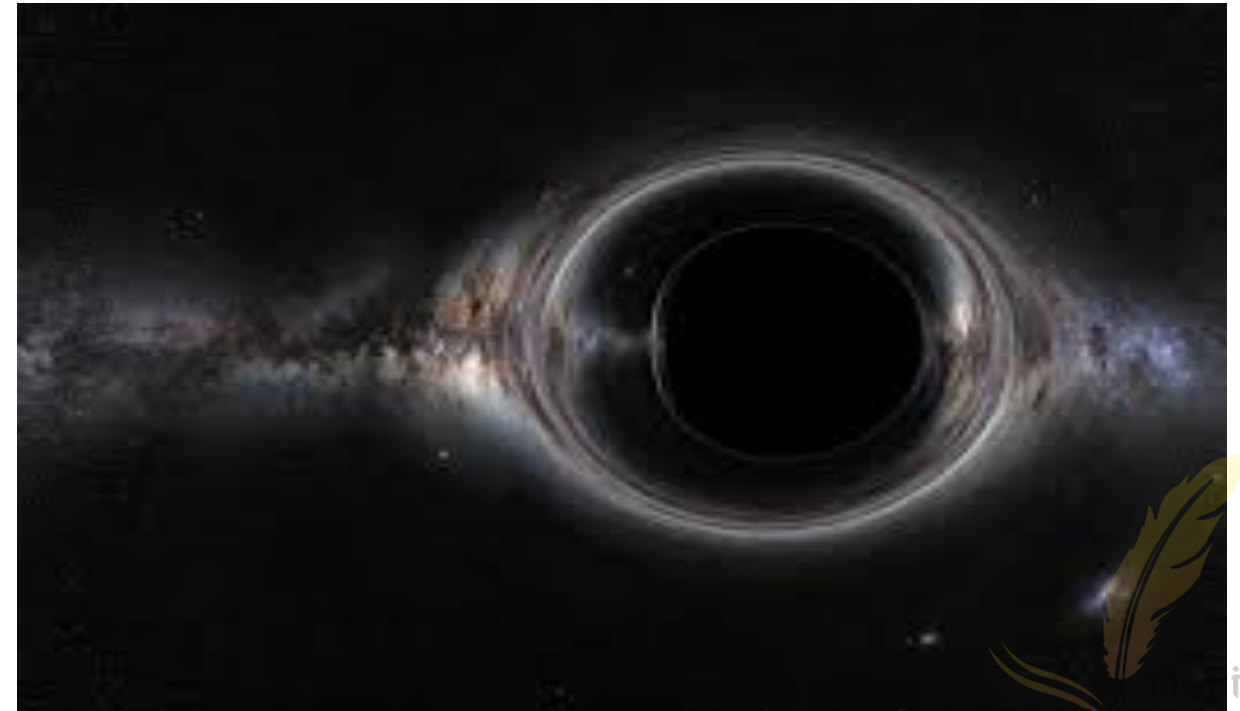
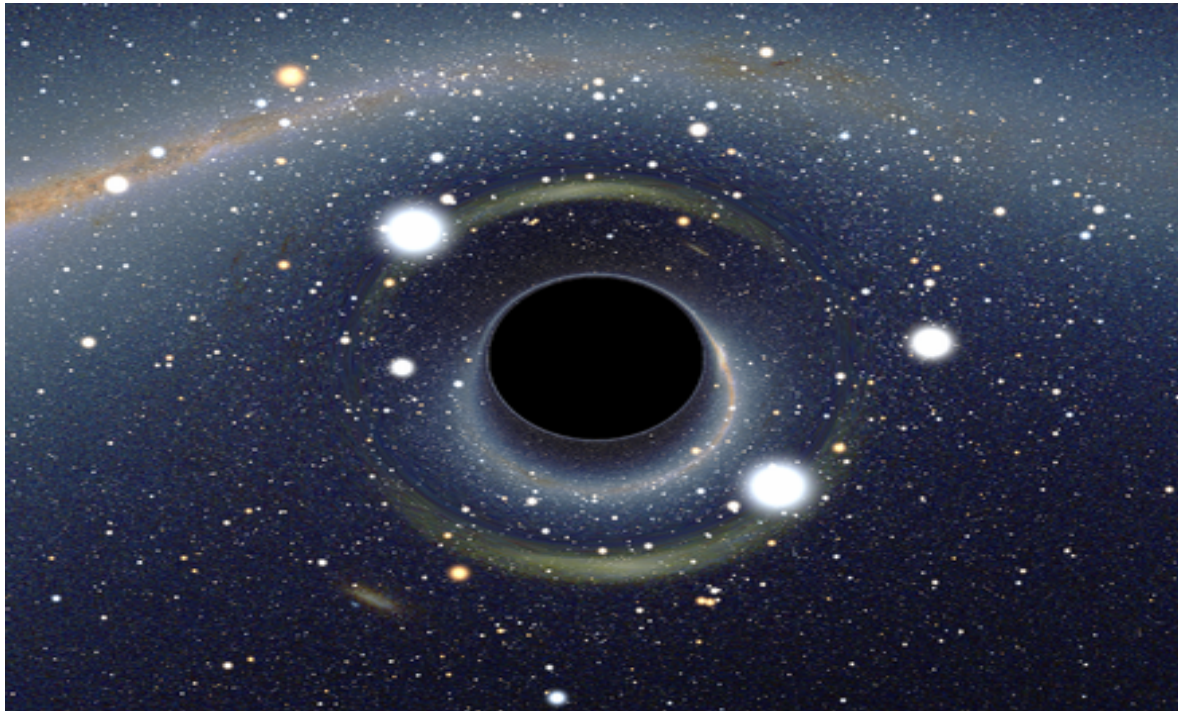


# BLACK HOLES



# WHAT IS A BLACK HOLE?

- A black hole is an unimaginably dense region where space is curved around so completely and gravity becomes so strong that nothing, not even light, can escape.
- In a black hole, large mass exists in small volumes. Therefore, in order to escape from a black hole, you have to travel faster than light.
- Most black holes form from the remnants of a large star that dies in a supernova explosion.



# HISTORY BEHIND BLACK HOLES

- Most famously, black holes were predicted by Einstein's theory of general relativity, which shows that when a massive star dies, it leaves behind a small, dense remnant core. Assuming this core's mass is roughly three times the sun's mass, gravity overwhelms so much that the mass falls in on itself into a single point which is the black hole's core.
- Einstein's theory of general relativity also predicts that due to the strong gravitational pull around a black hole, the light must bend as well as reflect.
- The black hole area theorem, which Stephen Hawking derived from Einstein's theory of general relativity, states that it is impossible for a black hole's surface area to decrease over time. According to him, as a black hole's surface area increases with its mass, its surface area cannot decrease because no object thrown inside can exit.

# WHAT ARE THE FOUR TYPES OF BLACK HOLES?

STELLAR MASS  
BLACK HOLES

3-20 TIMES SUN'S MASS

SUPER MASSIVE  
BLACK HOLES

1 BILLION TIMES SUN'S MASS

PRIMORDIAL  
BLACK HOLES

AN ATOM'S SIZE

MID MASS  
BLACK HOLES

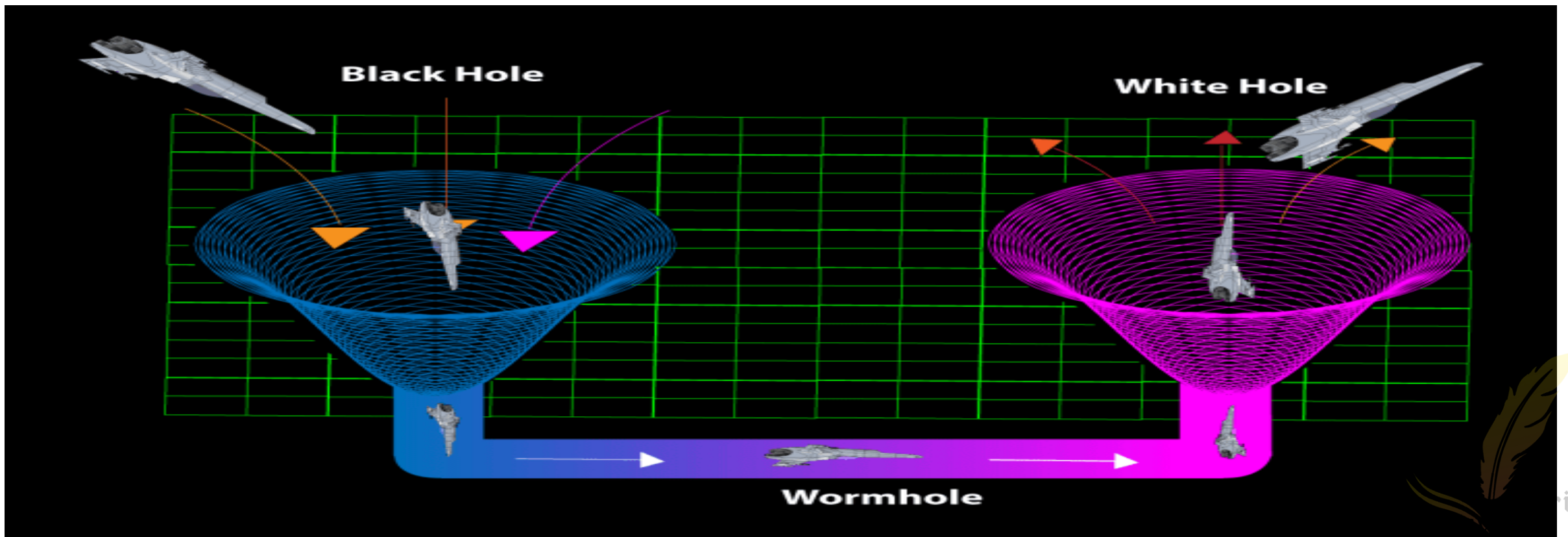
1 MILLION TIMES SUN'S MASS





# WHITE HOLES AND WORM HOLES

- A white hole is a hypothetical region of spacetime that cannot be entered from the outside, although energy, matter, light and information can escape from it.
- A wormhole is a hypothetical tunnel with two ends in separate points in spacetime. It acts as a shortcut that connects a black hole to a white hole.



# INTERESTING FACTS ABOUT BLACK HOLES

- Black holes eventually evaporate because of the radiations that they emit.
- Even though black holes are portrayed as funnels, they are closer to spheres in shape.
- Every galaxy has a supermassive black hole in its center. Some are active while most are quiet.
- When black holes collide, they cast-off energy, in the form of gravitational waves that is greater than the luminosity of all the stars and the universe combined. In fact, they produce so much energy that they would have been the most luminous objects in the universe if they did produce light.
- Although the vacuum of space doesn't allow for sound waves, if you listened with special instruments, you would hear a static-like sound. When a black hole pulls something in, its event horizon supercharges the speed of particles close to the speed of light to produce this exact sound.
- The number of stars in the universe is limited by the number of black holes. This is due to the way black holes affect gas clouds and element formation in the parts of the universe that are known to produce new stars.



# LET'S DISCUSS!

What happens when you fall into a black hole?

What would happen to the Earth if the Sun was replaced by a black hole?

Will the black holes in our galaxy eventually suck up everything in it?

If we can't see black holes, how do we know if they are there?



# ASSIGNMENT

- Imagine that you get stuck in a black hole but somehow manage to escape from it and return back to planet Earth. However, when you arrive on Earth, you realize that in the few moments you spent in the black hole, you have actually missed many years on Earth. Describe what the new Earth looks like and how you feel when you see all the changes that have taken place over the years.
- Your submission can be in the form of any song, poem, drawing, paragraph etc. that you have created and wish to share with the rest of us.
- Submit your work by Tuesday evening.

