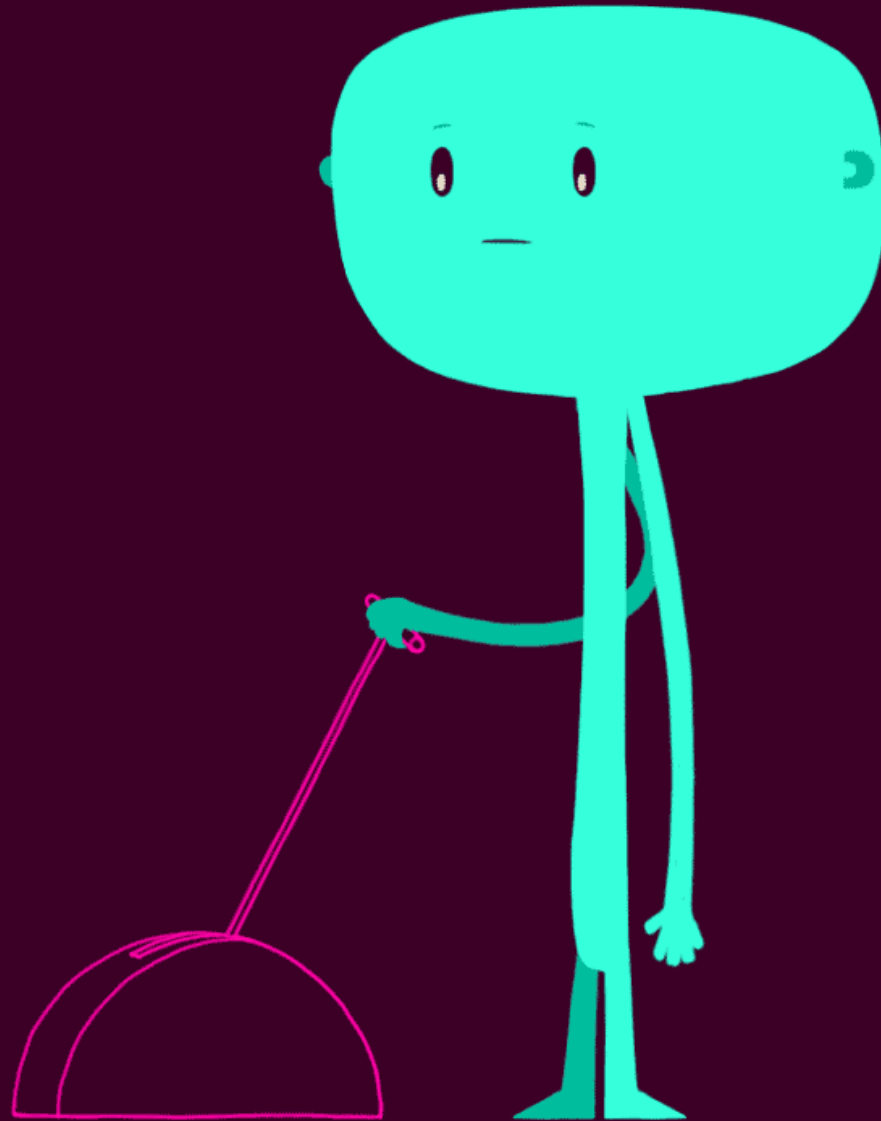


A black hole is depicted as a dark, circular void at the center of the image. It is surrounded by a bright, glowing ring of blue light, representing the accretion disk or the event horizon. The background is a vast field of stars, with many appearing as bright white and yellow points of light, and some as smaller, dimmer stars in various colors like green and orange. The overall scene is set in a dark, cosmic space.

Black Holes

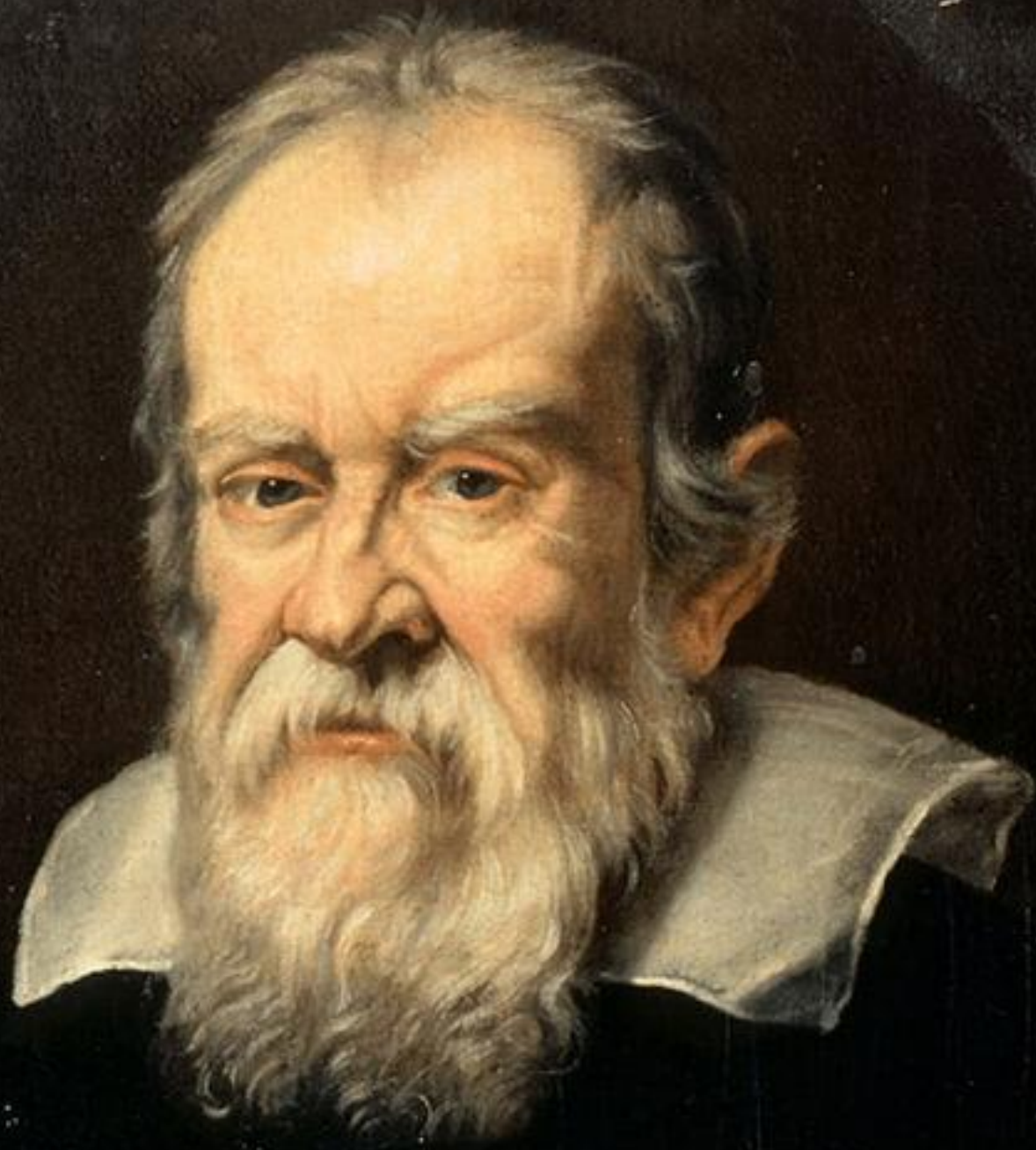




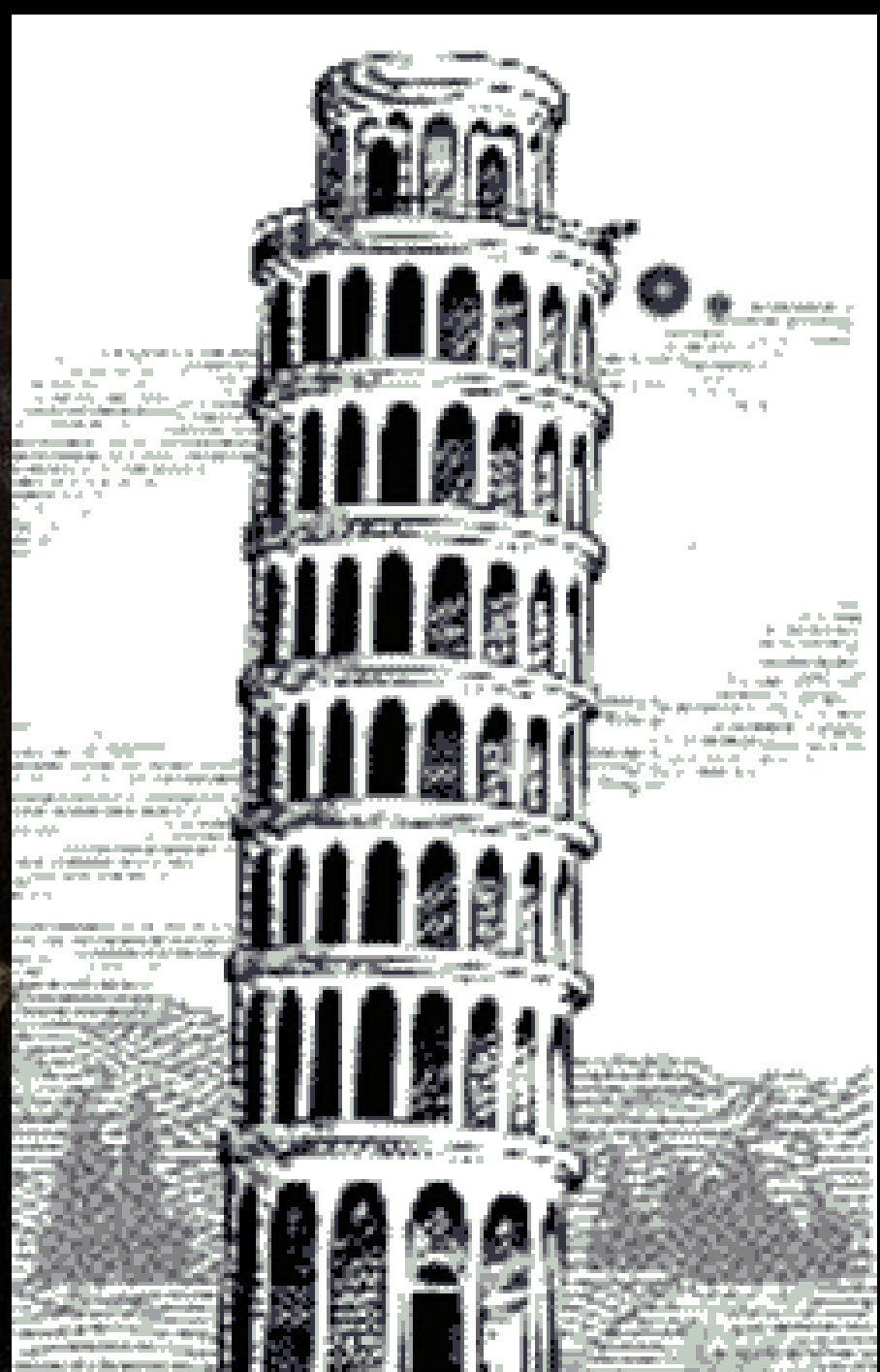
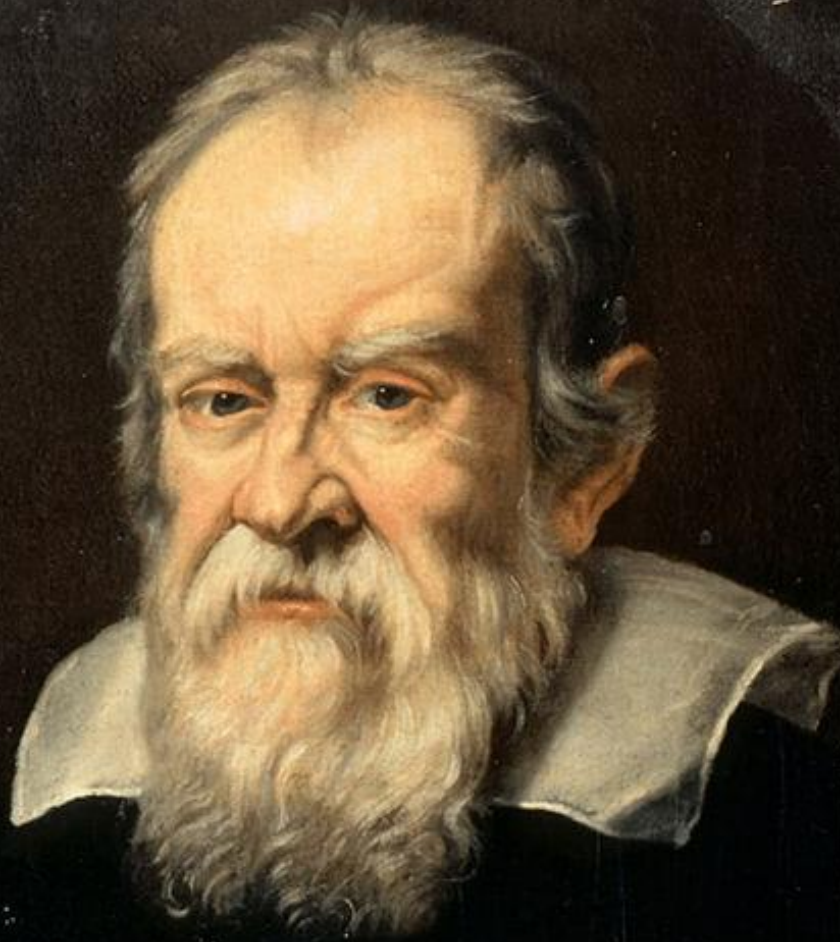
Aristotle

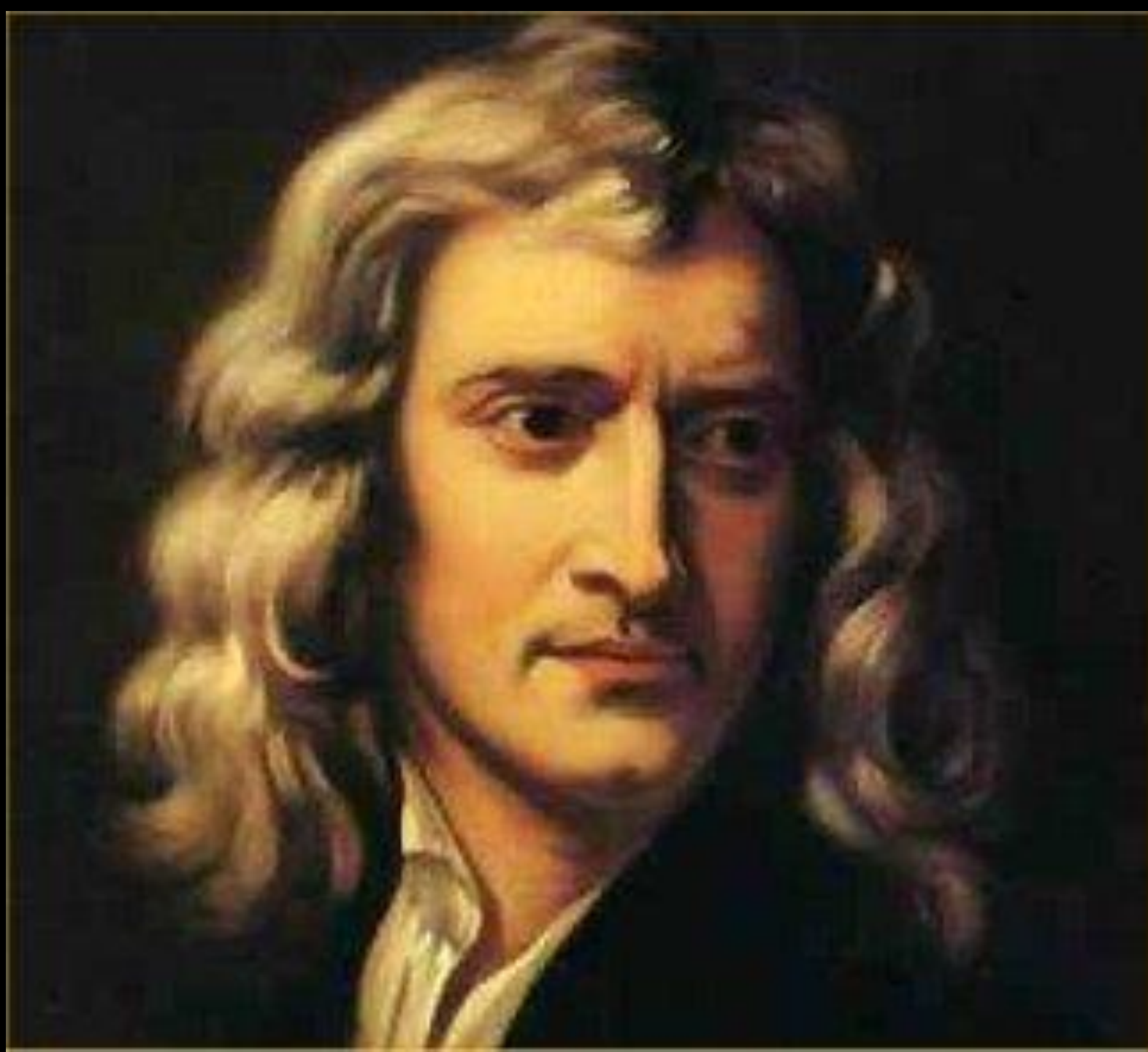
- 384 BC – 322 BC
- Elements move toward their natural place
- Heavier things fall faster





Galileo Galilei

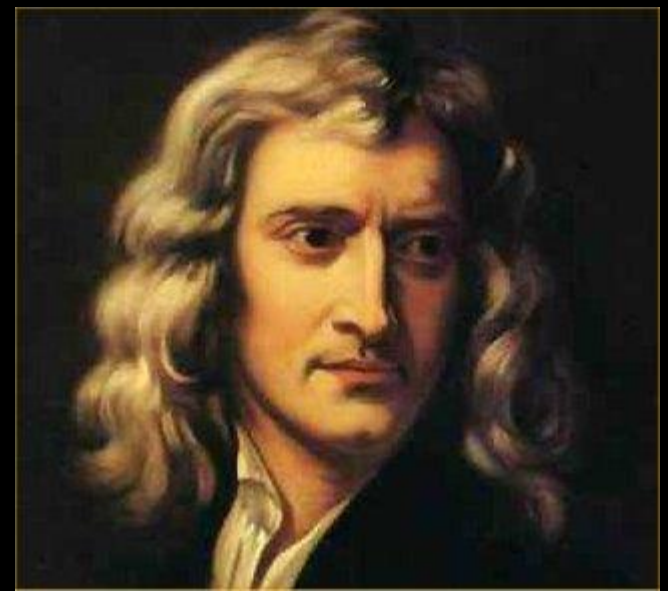






Isaac Newton

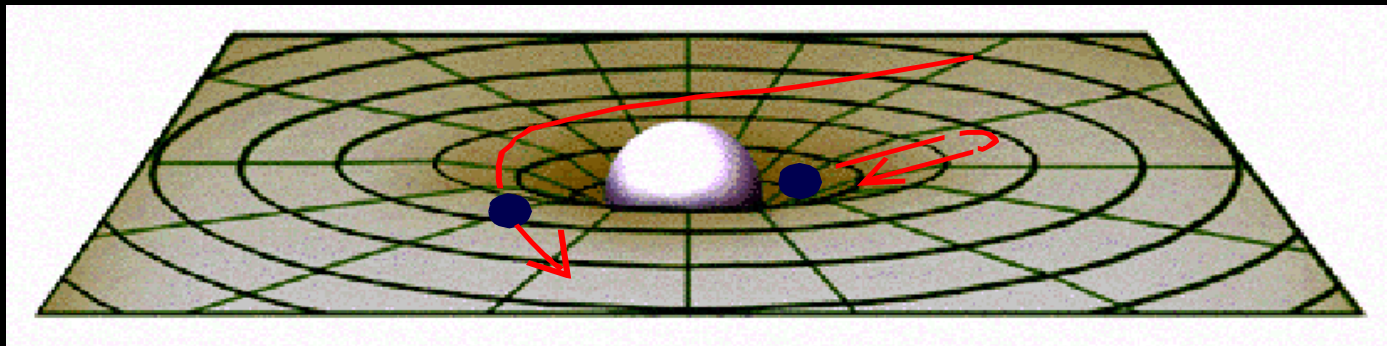
- 1642 –1727
- Gravity is a force that acts over a distance





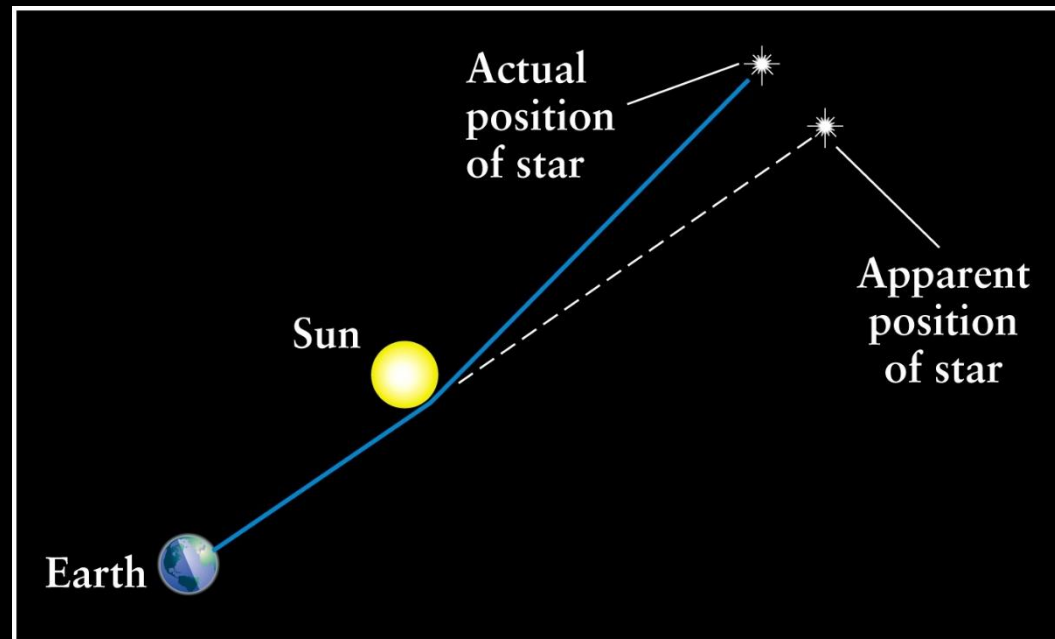
Albert Einstein

- 1879 – 1955
- Gravity is a distortion of space and time

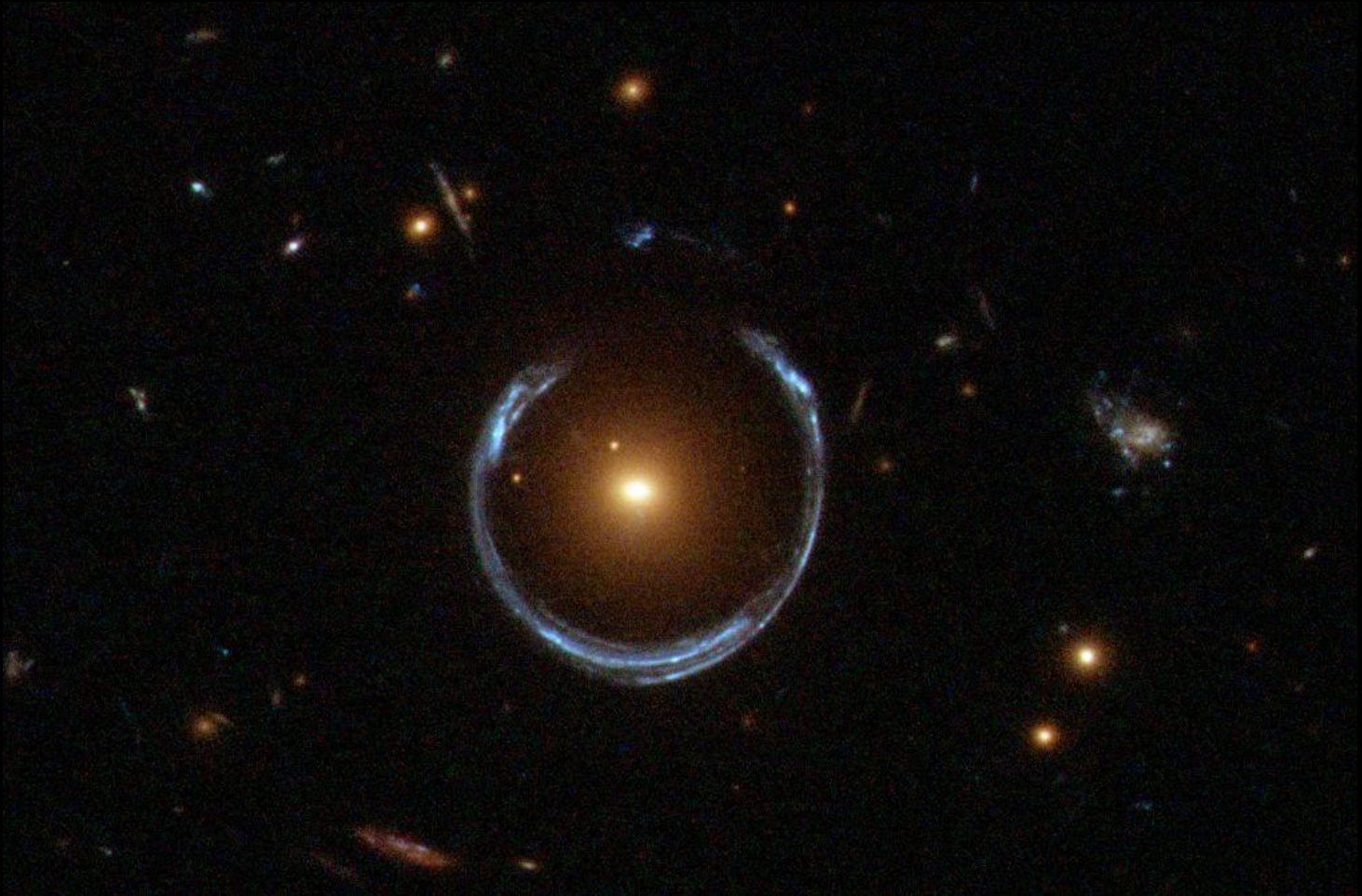


Observations confirming the predictions of general relativity

- **gravitational lensing** (bending of light by gravity) confirmed during a solar eclipse in 1919



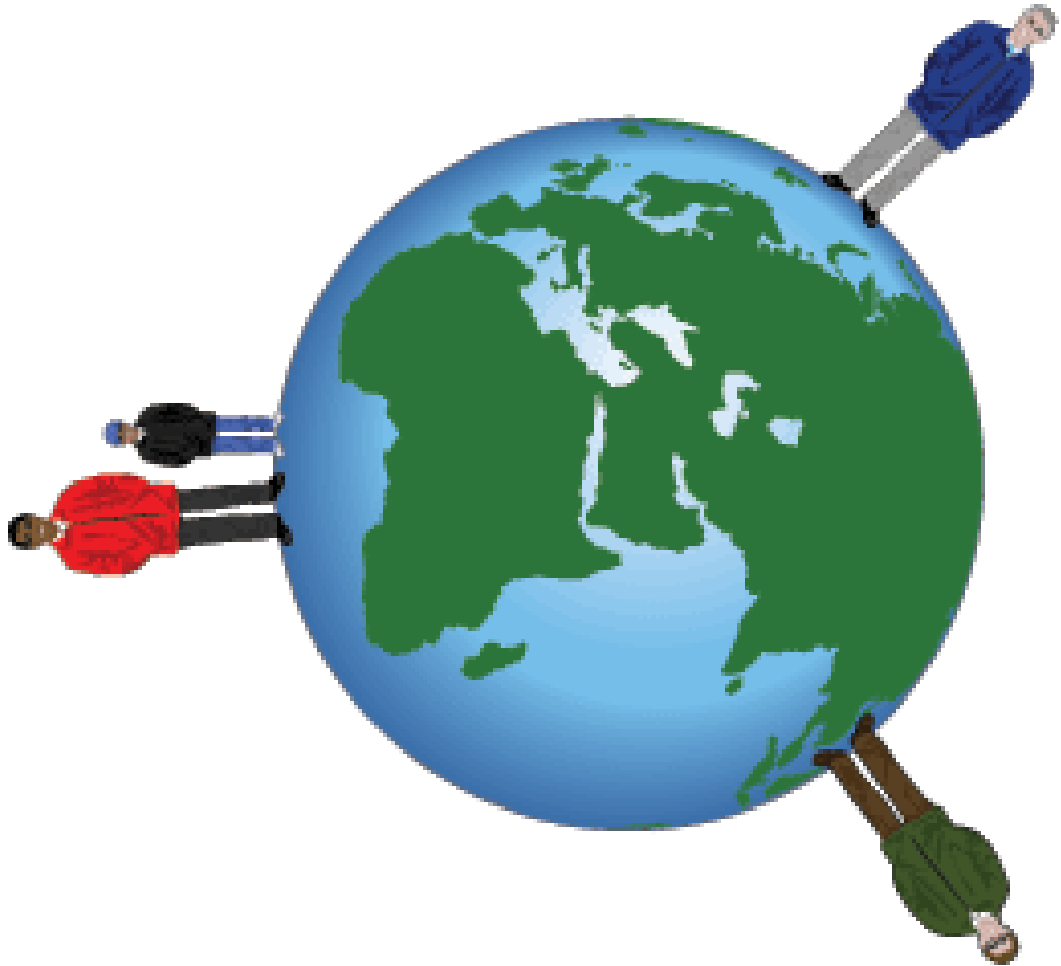
Gravitational Lensing

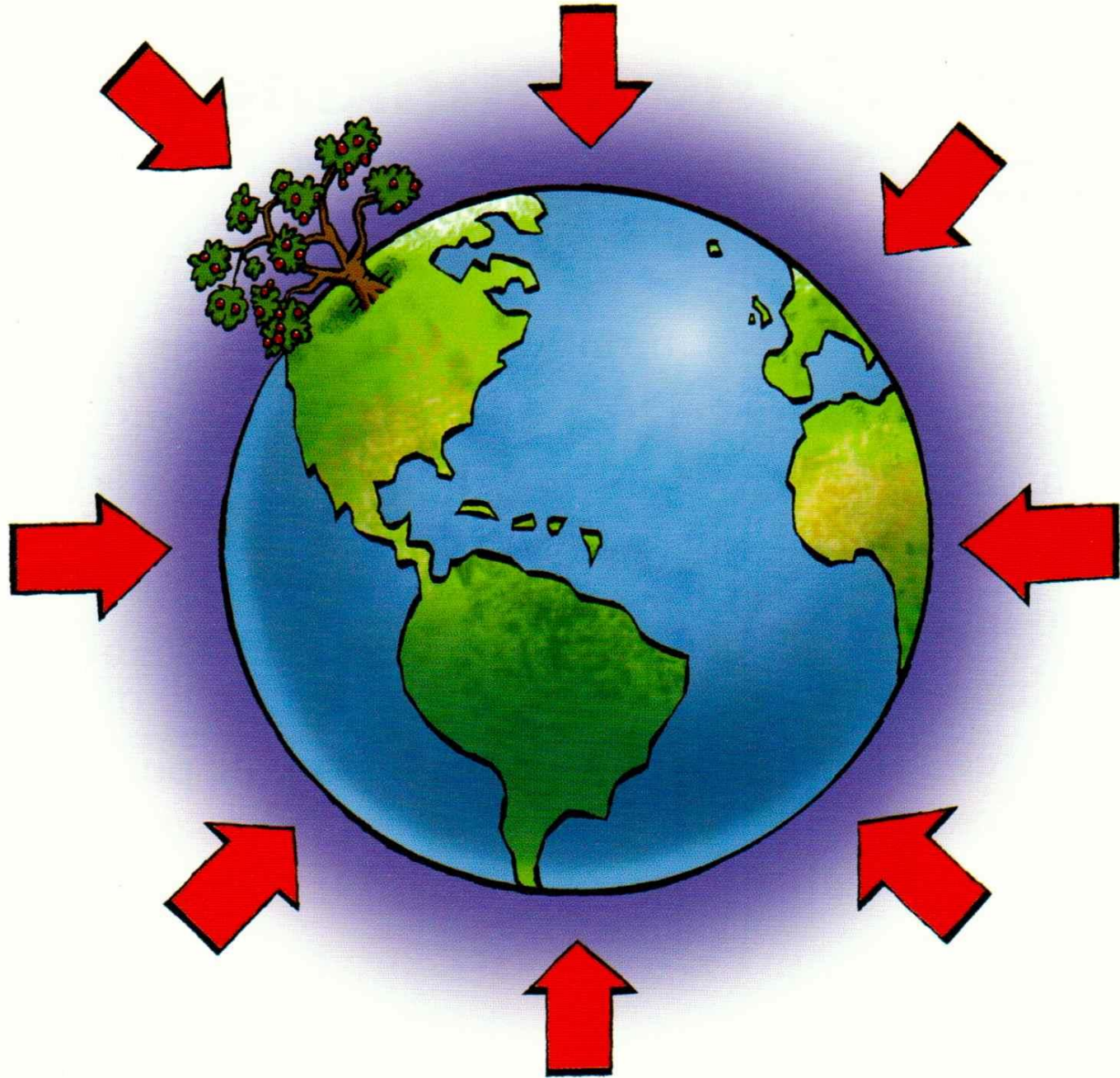




Gravity Questions

- Point at student living in Cape Town South Africa.





Gravity Questions

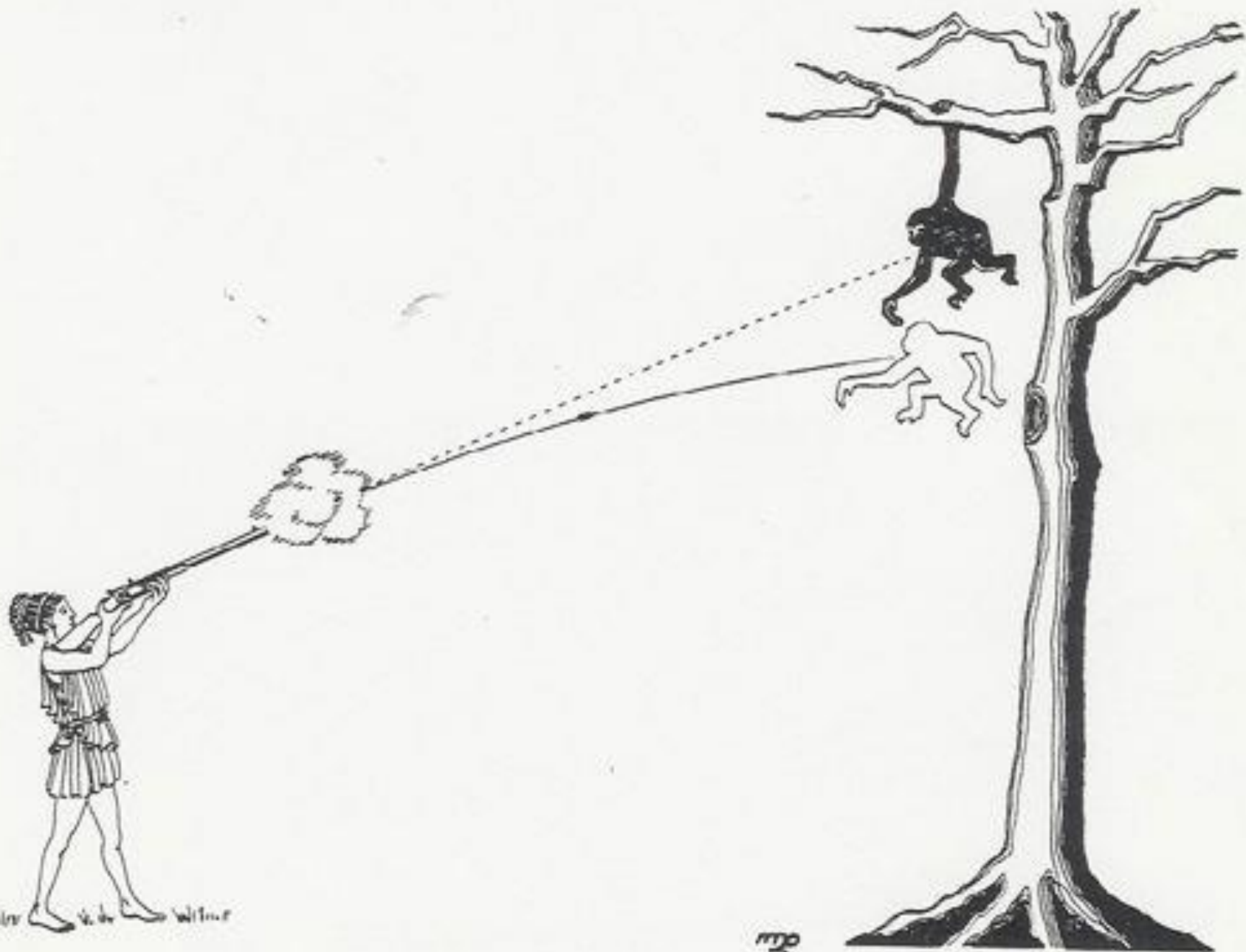
- Point at student living in Cape Town South Africa.
- Do heavier things fall faster than lighter things?





Gravity Questions

- Point at student living in Cape Town South Africa.
- Do heavier things fall faster than lighter things?
- Why doesn't a bullet fired from a gun fall?



1891 W. W. R. W. W. W.

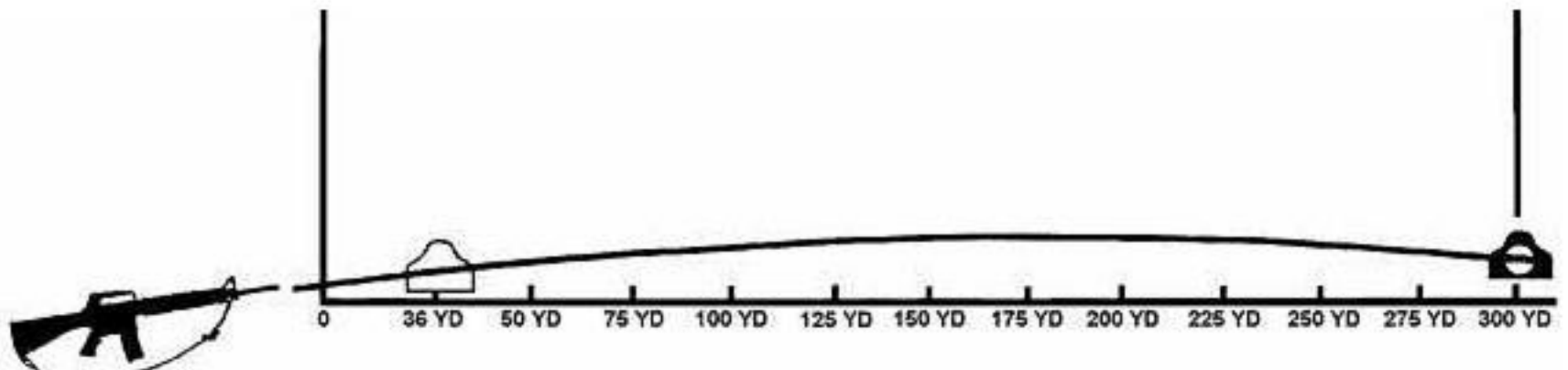
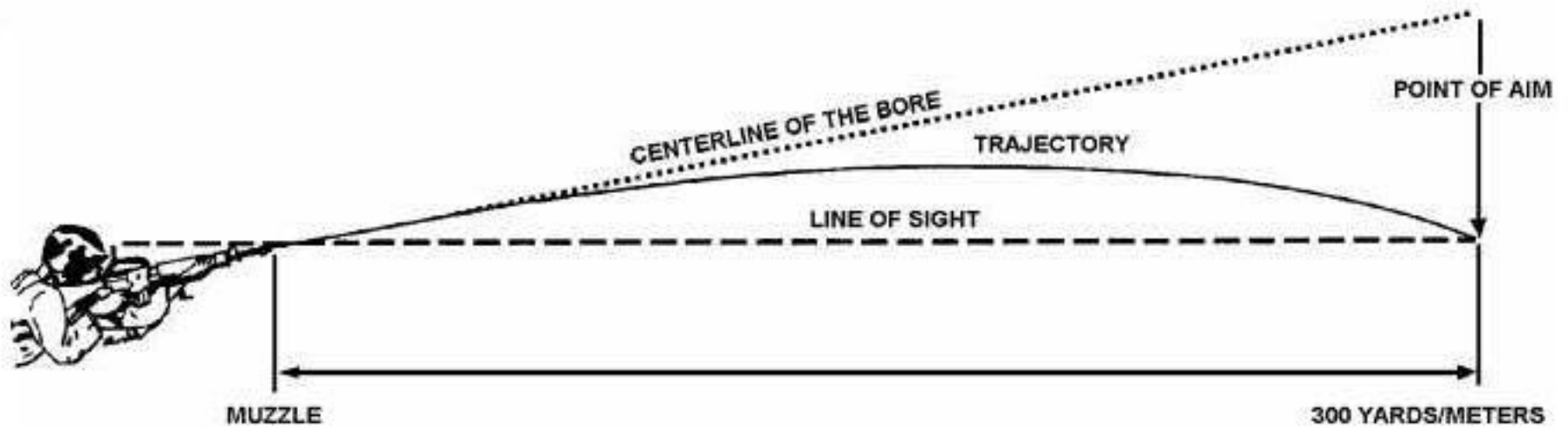
1891

Monkey and a Gun

MIT Department of Physics
Technical Services Group



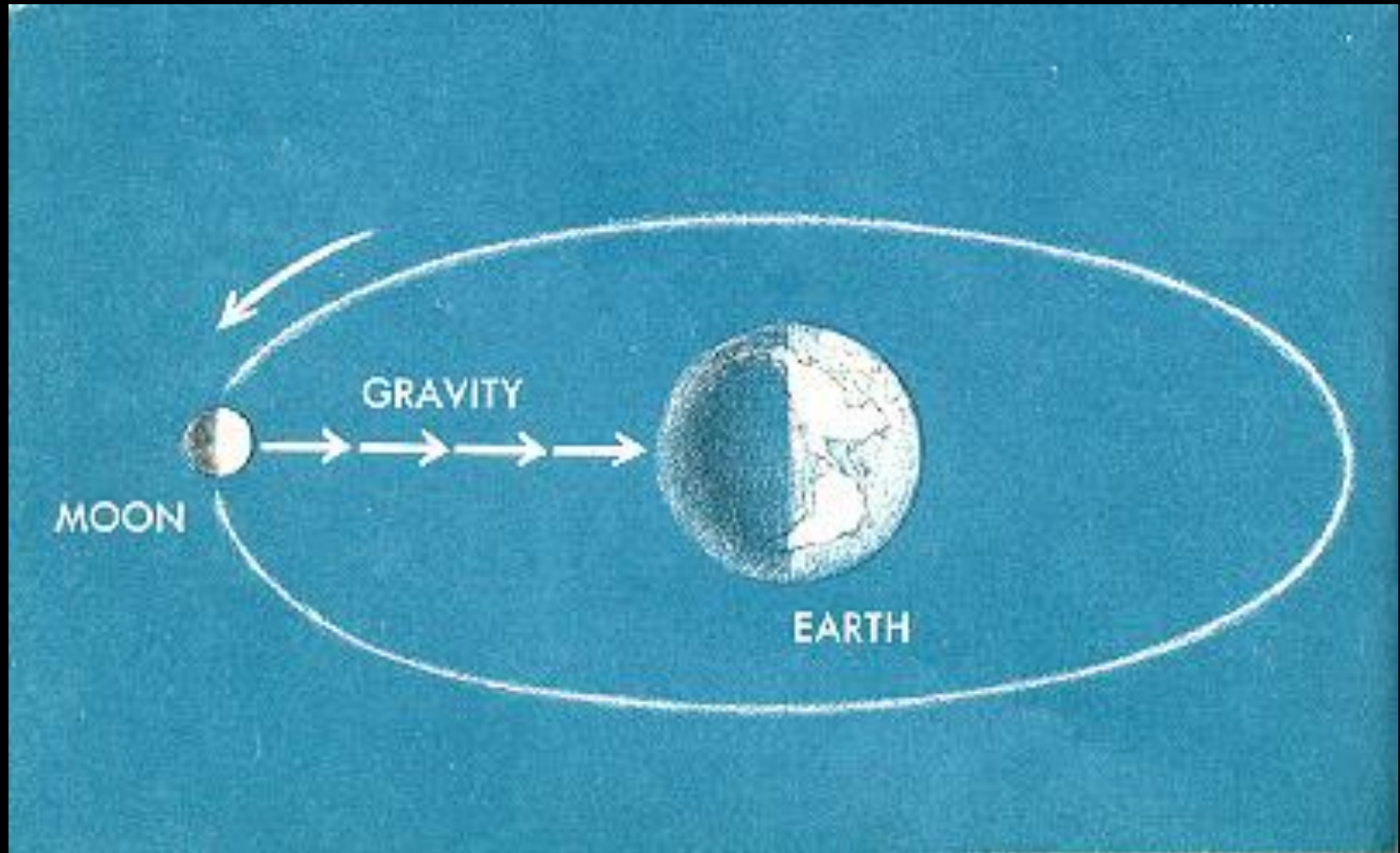
Aiming a Rifle



Gravity Questions

- Point at student living in Cape Town South Africa.
- Do heavier things fall faster than lighter things?
- Why doesn't a bullet fired from a gun fall?
- Why doesn't the Moon (or a satellite) fall to Earth?

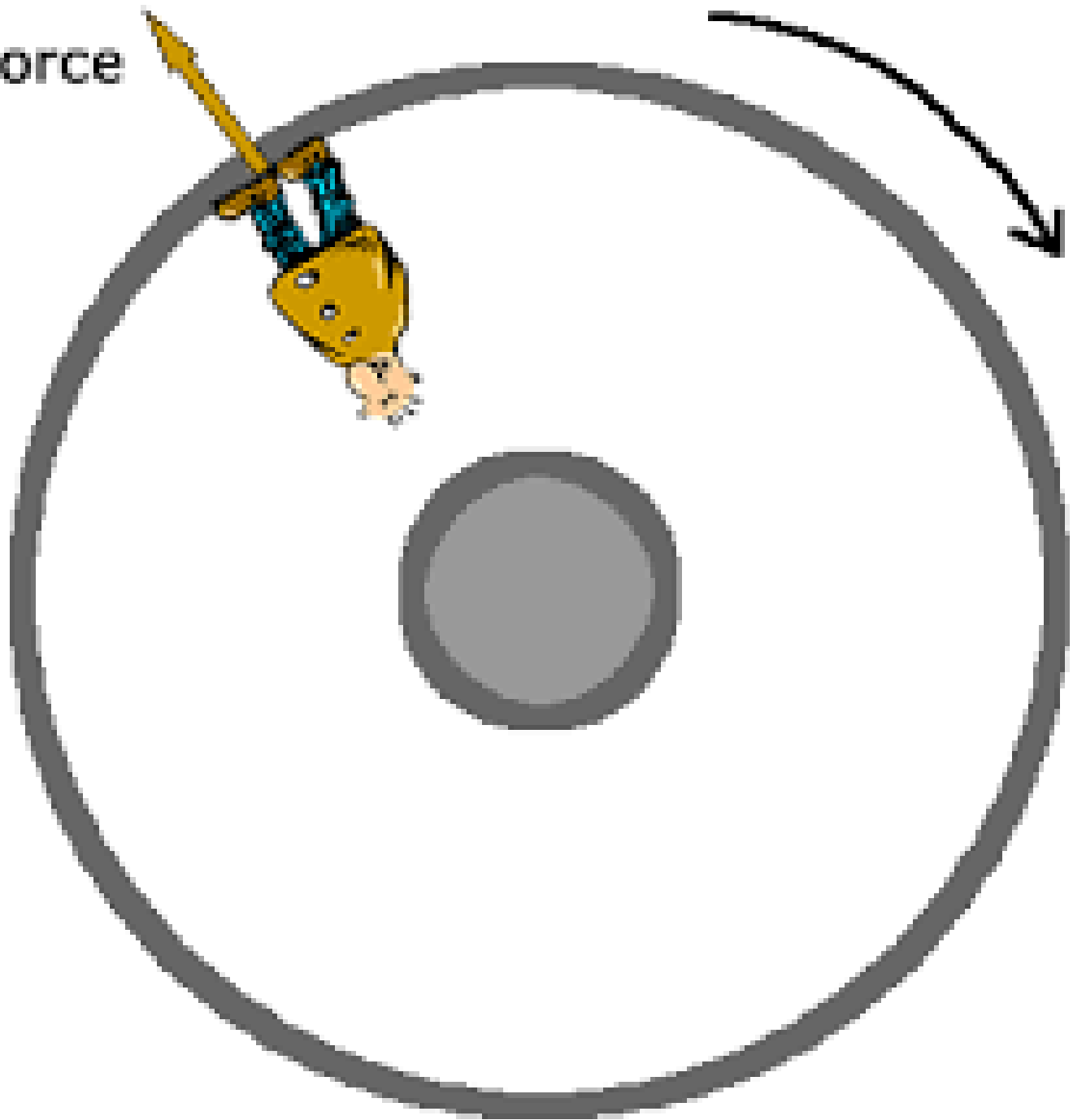
The Moon in Orbit



Gravity Questions

- Point at student living in Cape Town South Africa.
- Do heavier things fall faster than lighter things?
- Why doesn't a bullet fired from a gun fall?
- Why doesn't the Moon (or a satellite) fall to Earth?
- Why is there no gravity on the Space Station?

Force



Gravity Questions

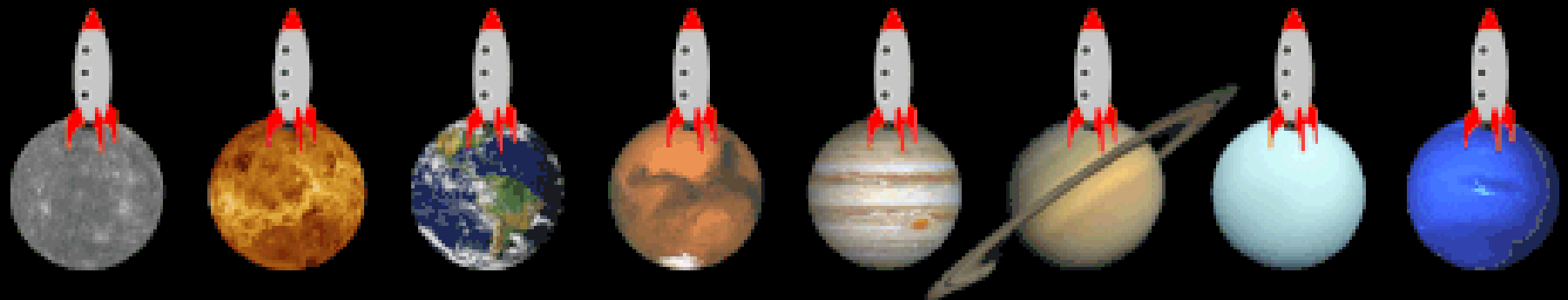
- Point at student living in Cape Town South Africa.
- Do heavier things fall faster than lighter things?
- Why doesn't a bullet fired from a gun fall?
- Why doesn't the Moon (or a satellite) fall to Earth?
- Why is there no gravity on the Space Station?
- If I throw a rock or shoot a bullet at the Moon will it hit it?

Escape Velocity

- How fast would a bullet need to go to leave Earth?

25,000 MPH!

HOW FAST A ROCKET WOULD HAVE TO GO TO LEAVE EVERY PLANET



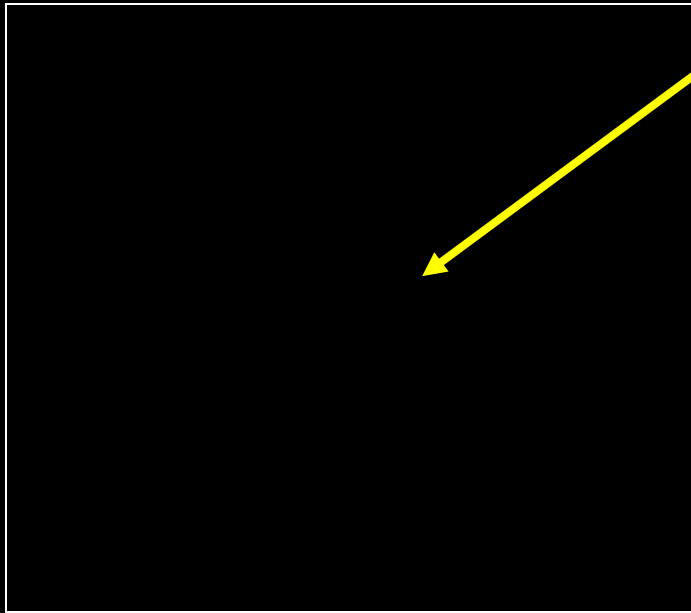
| | | | | | | | |
|----------------|--------------|--------------|-------------|----------------|---------------|---------------|----------------|
| Mercury | Venus | Earth | Mars | Jupiter | Saturn | Uranus | Neptune |
| 9,507 mph | 23,175 mph | 25,031 mph | 11,252 mph | 134,664 mph | 80,731 mph | 47,826 mph | 52,702 mph |

I HAVE NO FRIENDS



I ATE THEM ALL...

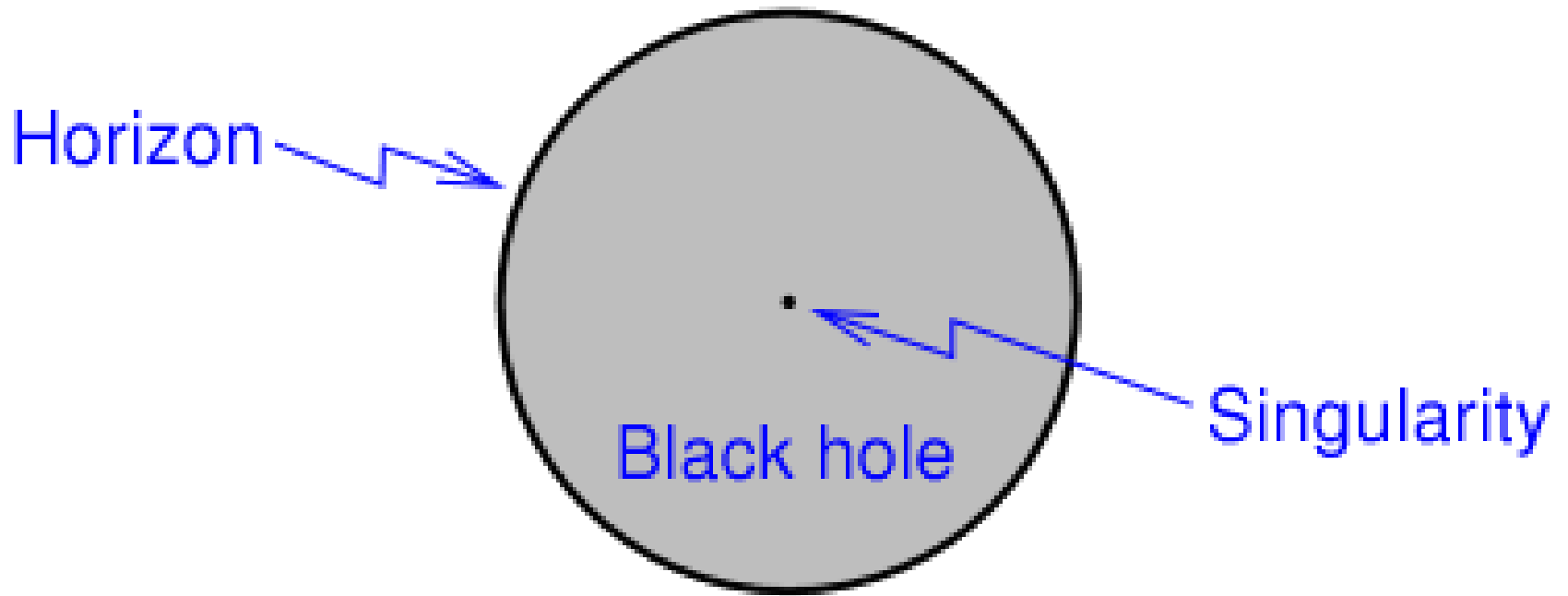
What is a Black Hole?



Mass is so great in such a small volume that the velocity needed to escape is greater than the speed of light

An unimaginably dense region of space where space is curved so completely that nothing, not even light, can escape.

Black Hole Structure





Falling into a Black Hole



Not to Scale

Falling into a Black Hole

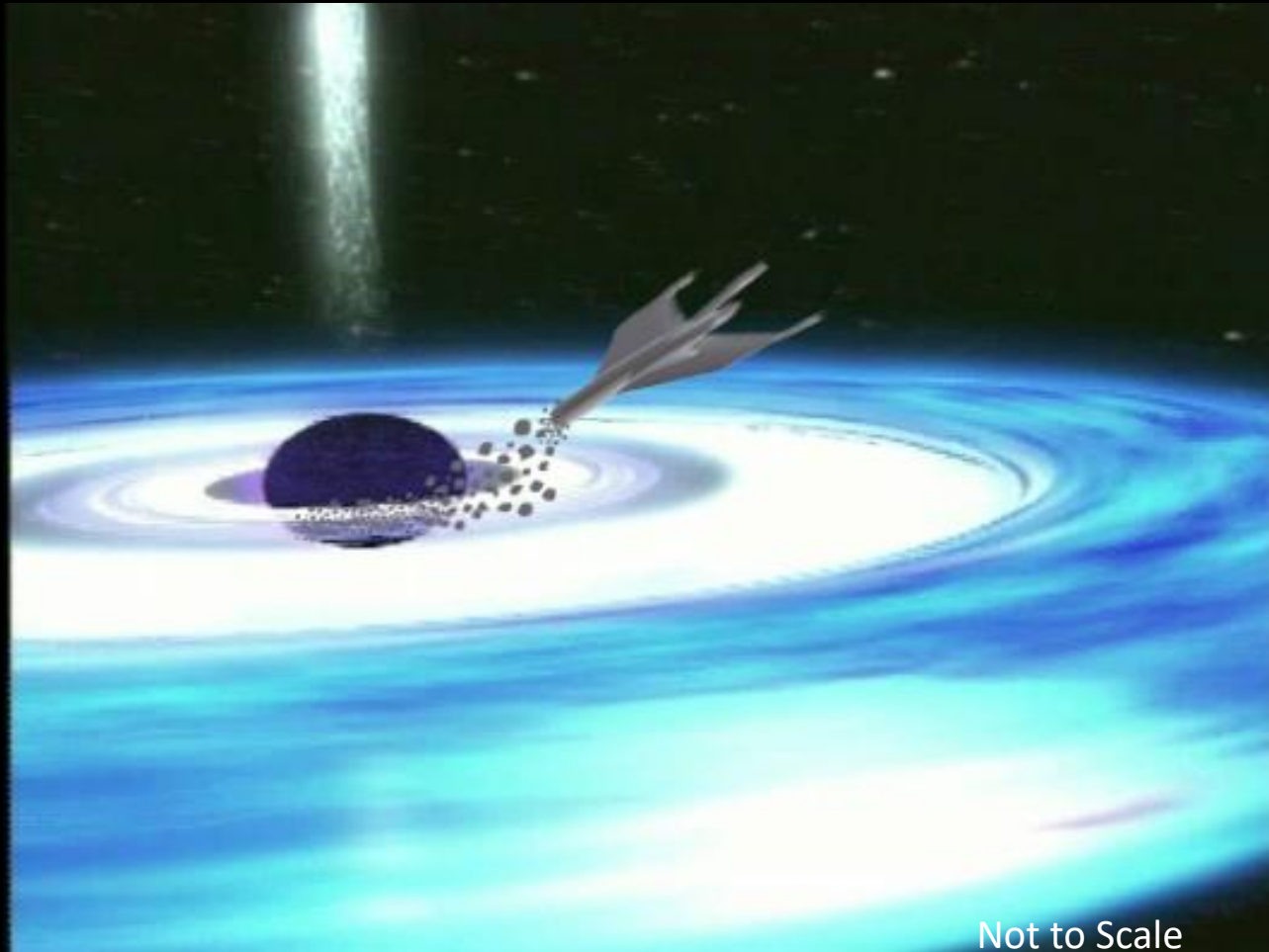


Not to Scale

Falling into a Black Hole



Falling into a Black Hole



Not to Scale







There are 200 billion stars in our galaxy, the Milky Way

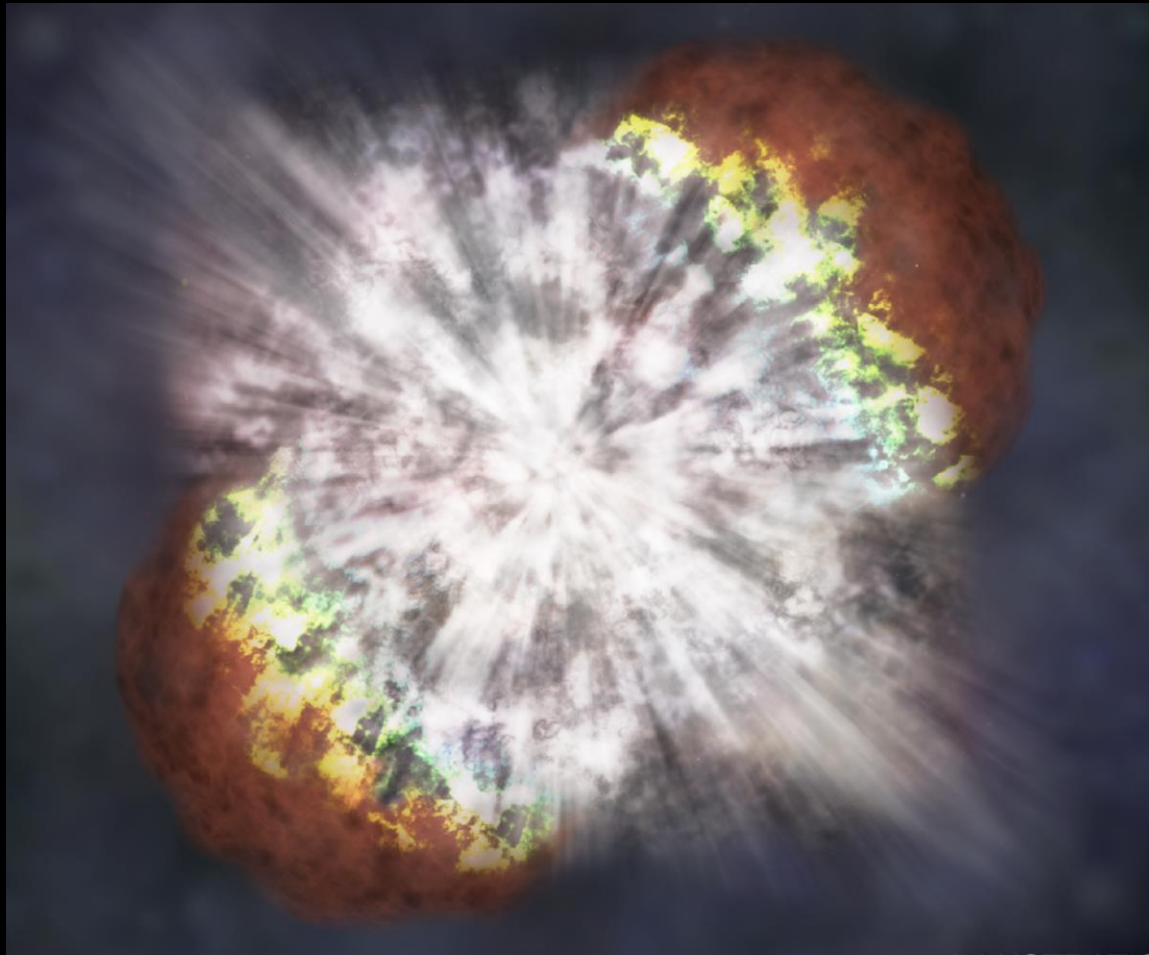
There are also millions of black holes

Including one giant black hole at the very
center.



Where do Black
Holes come
from?

Exploding Massive Star

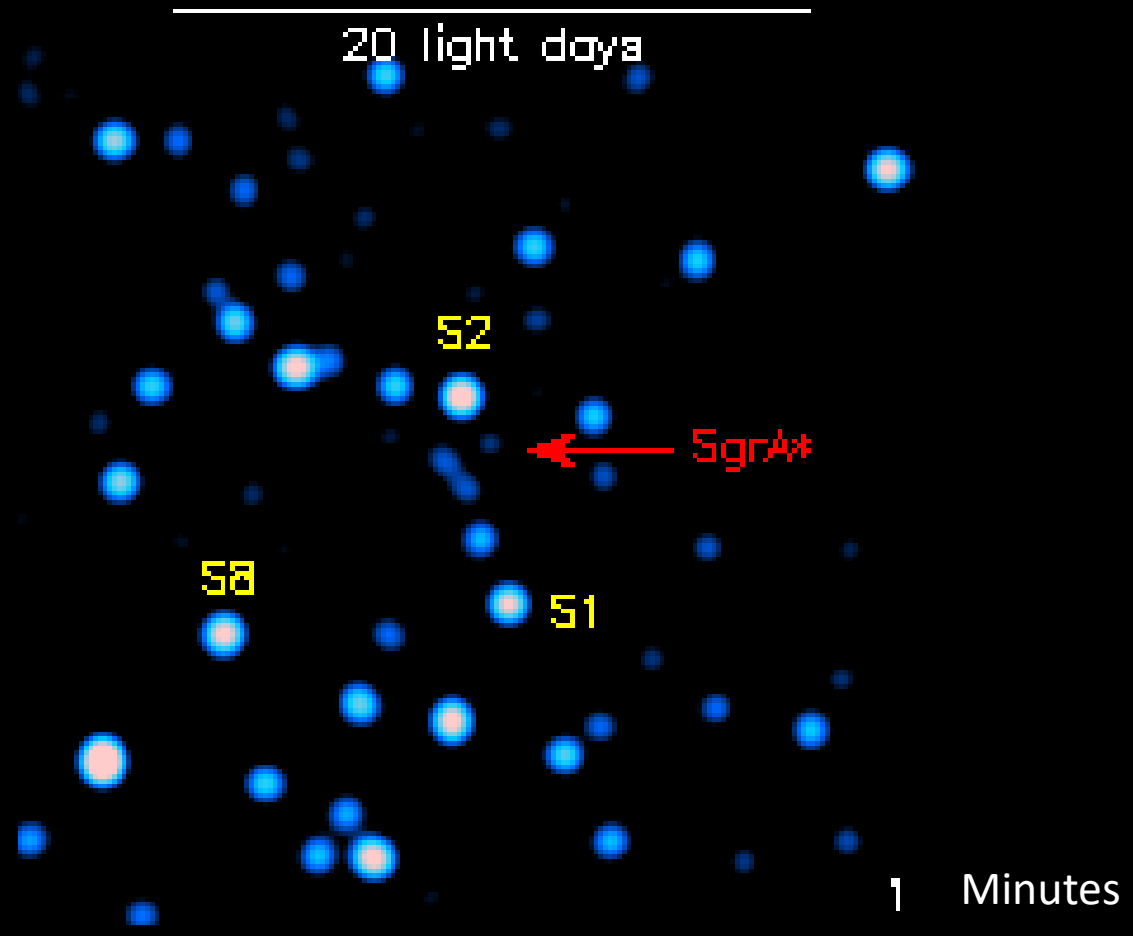


SUPERNOVA!

If we Can't See a Black
Hole, how do we Know it's
there?

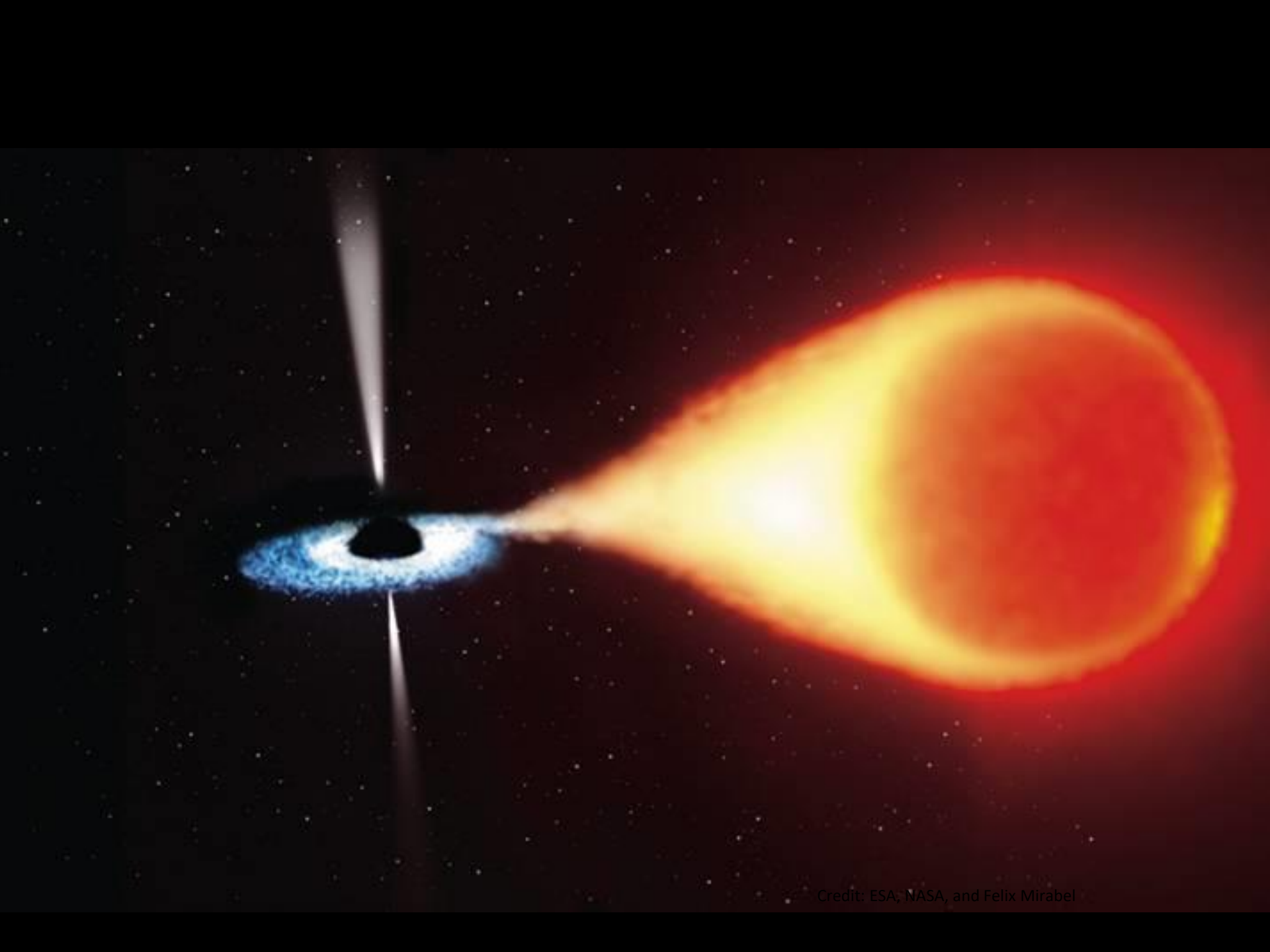
How Do We Know a Black Hole is There?

- Flares caused by stuff falling into the Black Hole.

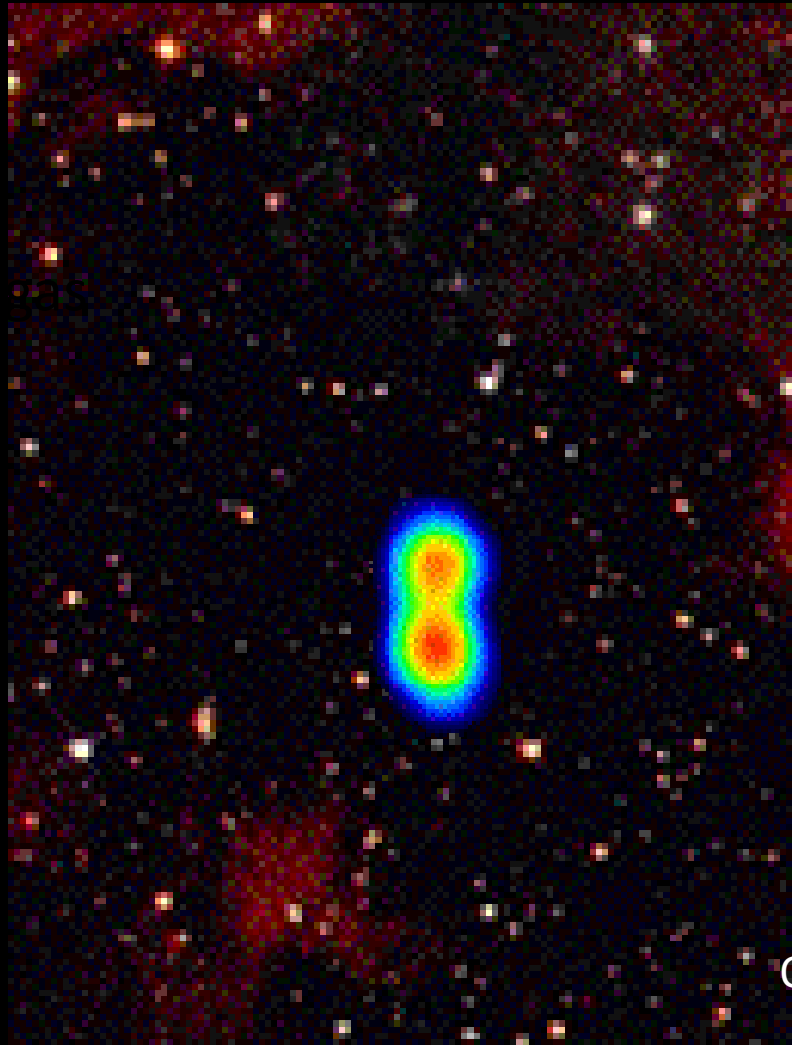


How Do We Know a Black Hole is There?

- Flares caused by stuff falling into the Black Hole.
- Spotting the jets coming off the Black Hole.



Credit: ESA, NASA, and Felix Mirabel

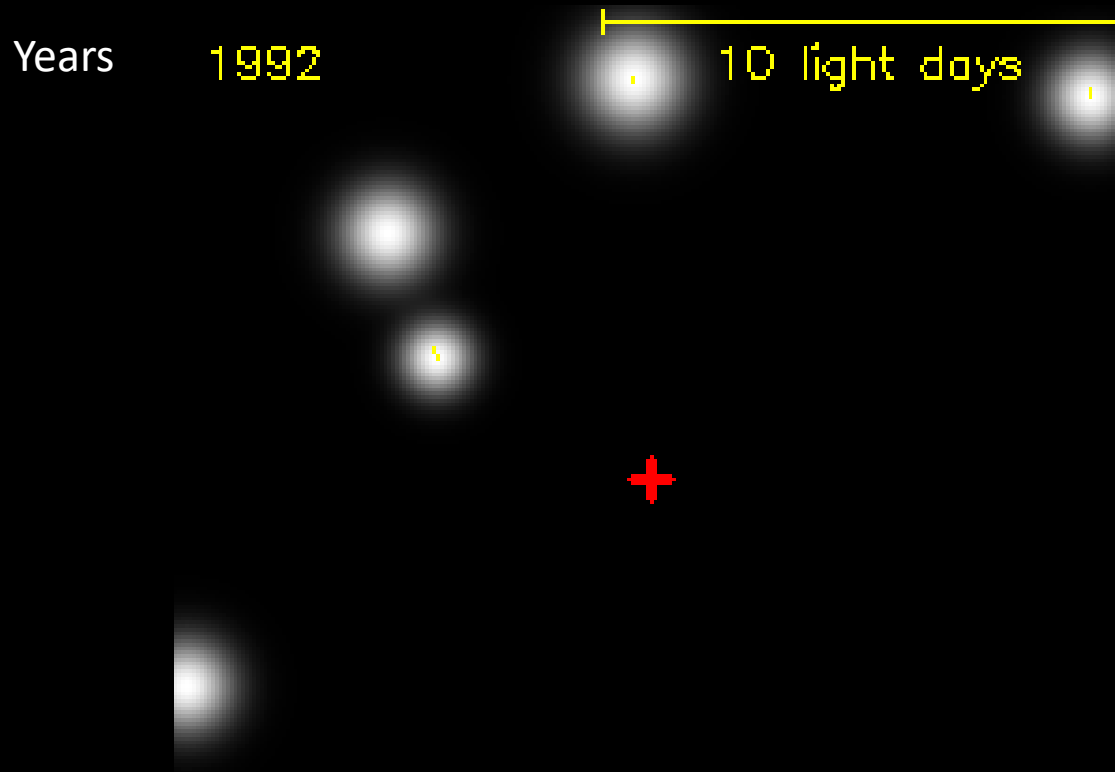


One month

How Do We Know a Black Hole is There?

- Flares caused by stuff falling into the Black Hole.
- Spotting the jets coming off the Black Hole.
- Weird motion of stars around the Black Hole.

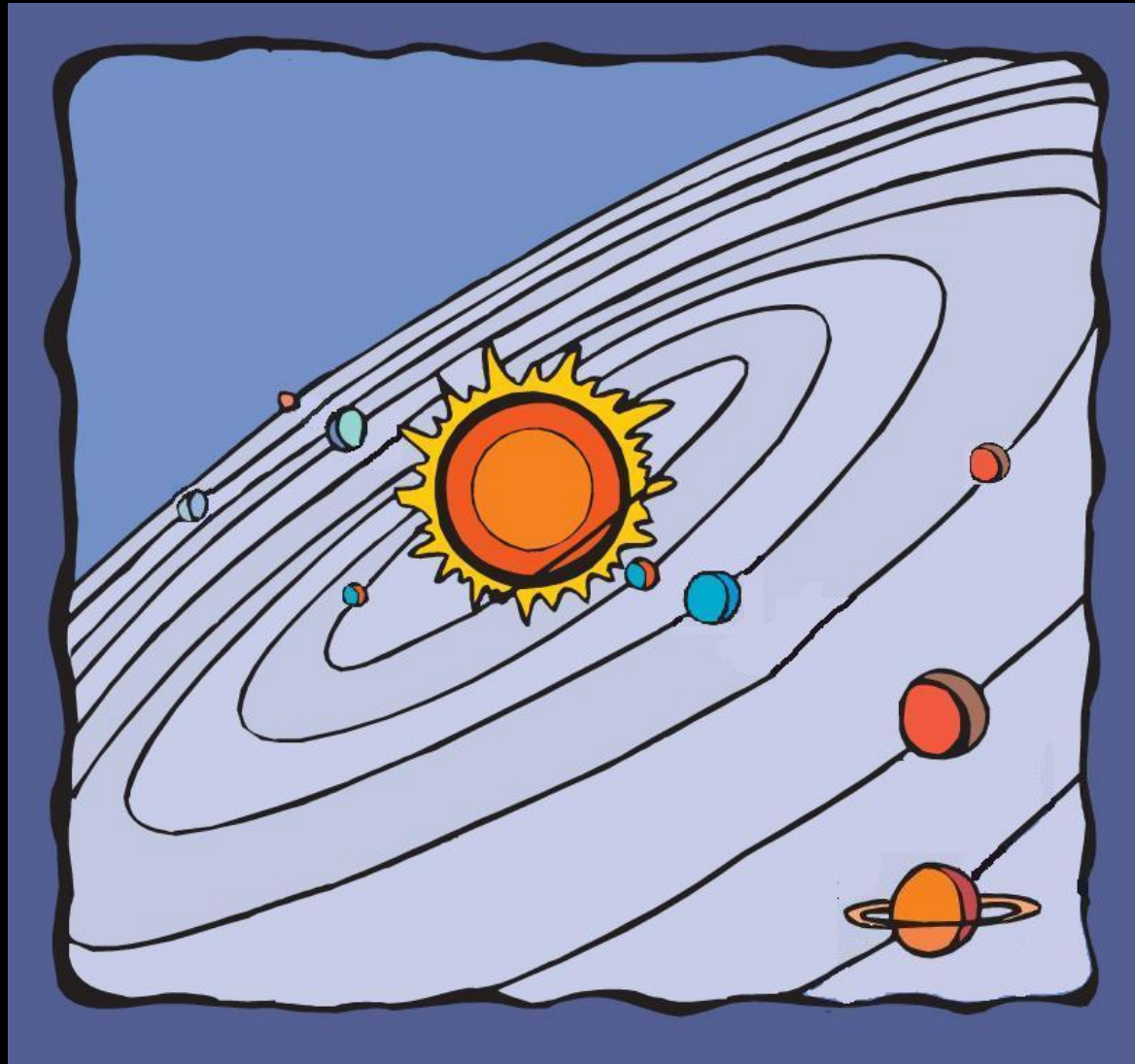
How do we know it's there?



How Do We Know a Black Hole is There?

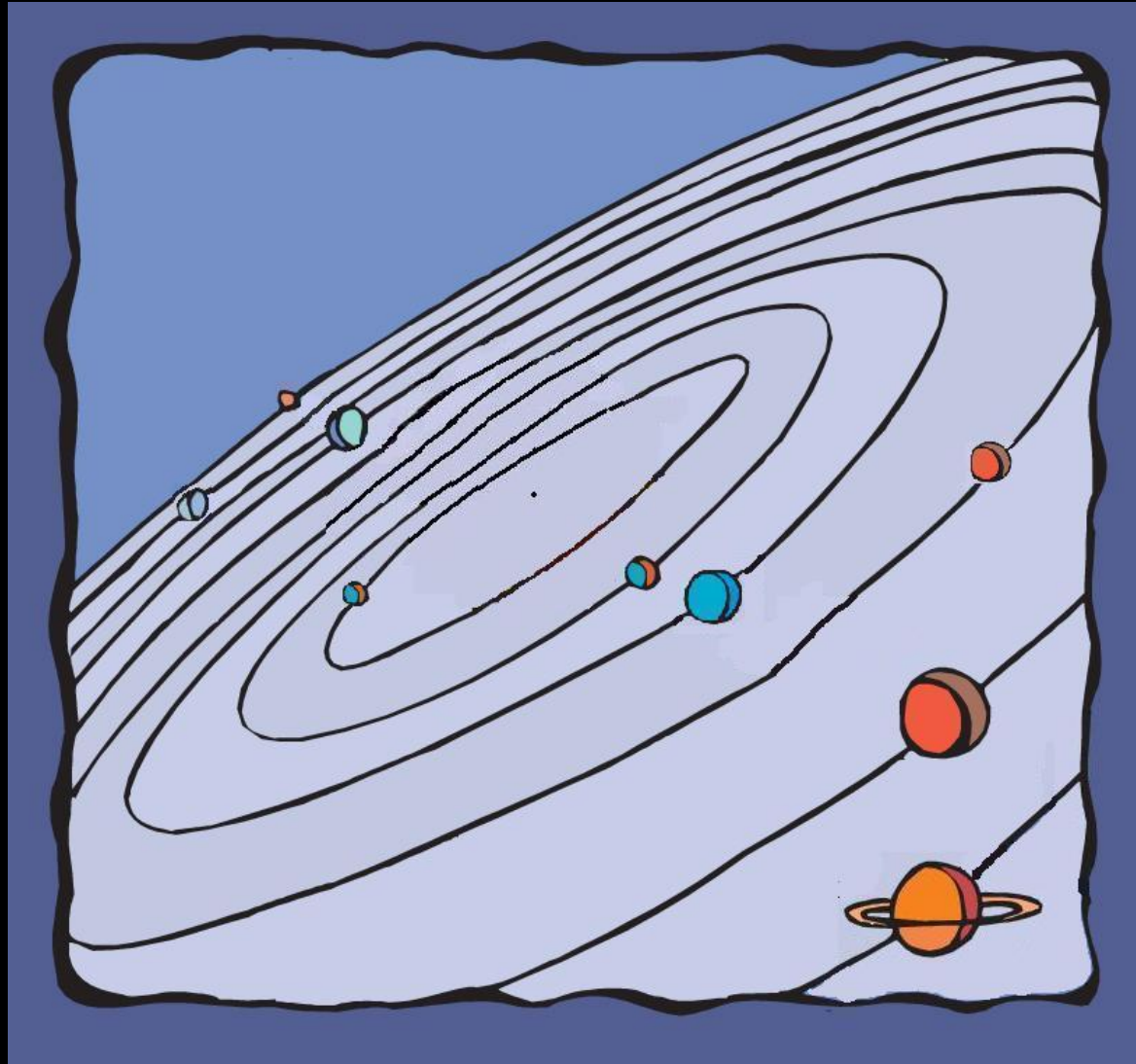
- Flares caused by stuff falling into the Black Hole.
- Spotting the jets coming off the Black Hole.
- Weird motion of stars around the Black Hole.
- NASA took a Picture of one.

What would happen if the Sun
was...



Not to Scale

... changed into a Black Hole?



Not to Scale



A cosmic scene featuring a dark background filled with numerous stars of varying colors and sizes. Two prominent galaxies are visible: a large, face-on spiral galaxy at the top center and a smaller, edge-on galaxy with a bright core at the bottom center. The text 'The' is centered in the upper half of the image.

The

END