

# Lect 8: Galaxies 19.3 Part 1

With help from:  
[http://www.cosmos4kids.com/files/stars\\_dev/ibp.htm](http://www.cosmos4kids.com/files/stars_dev/ibp.htm)

## 1. Review from Last Time

## 2. A Star is Born

*What is a galaxy?*

So now that we've talked about stars, it is time to discuss how these stars are organized in the universe.

A galaxy is a huge group of stars, dust, gas, and other objects bound together by **gravity**.

Galaxies come in a variety of sizes and shapes.

*What is a galaxy?*

- The largest galaxies have trillions of stars, others have only a few million.
- Edwin Hubble, the astronomer for whom the Hubble Space telescope is named, began classifying galaxies in the 1920s.
- **Be sure to draw these in the space provided!**

## *Five types of Galaxies*

1. **Spiral** Galaxy:
  - Looks like a **pinwheel** – central dense area surrounded by spiraling arms
  - Most common type
  - Central region is yellow: made up of cooler stars
  - Outer arms are blue: made up of new stars




# Five types of Galaxies


## 2. Barred –Spiral Galaxy:

- A spiral galaxy with a **bar-shaped** structure in the middle
- Sometimes have just **1 or 2** spirals, or “arms”

Barred Spiral Galaxy NGC 1100



Barred Spiral Galaxy NGC 1376

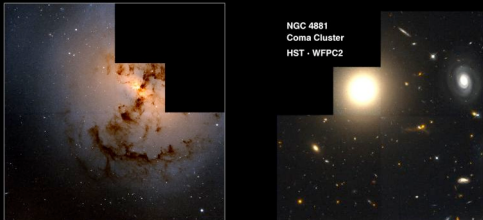


NGC 1100 and the NGC 1376 galaxy have been classified as barred spiral galaxies and are often referred to as barred spiral galaxies.

# Five types of Galaxies

### 3. Elliptical Galaxy:

- Looks like the middle part of a spiral galaxy, but without the arms.
- Some astronomers think these are actually spiral galaxies, but we're looking at them sideways & can't see the arms.



NGC 4881  
Coma Cluster  
HST - WFPC2

Galaxy NGC 1316  
HST-Galaxy Cluster and NGC 1316  
HST - WFPC2


NGC 4881 (Coma Cluster)  
HST - WFPC2

# Five types of Galaxies

## 4. Lenticular Galaxy:


- Lens-shaped with a smooth, even distribution of stars
- No central dense region

Small Credit: NASA



Sombrero Galaxy • M104

Small Credit: NASA



Edge-On Lenticular Galaxy NGC 4566

Small Credit: NASA

Small Credit: NASA


## Five types of Galaxies

5. **Irregular** Galaxy:

- Don't fit into any other classification
- Do not appear to rotate

• BrainPOP: Galaxies

Gravitationally Lensed Quasar in Galaxy Cluster SDSS J1004+4112 HST • ACS/WFC

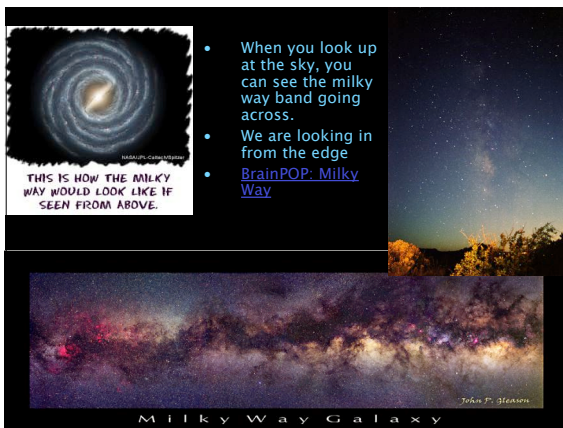
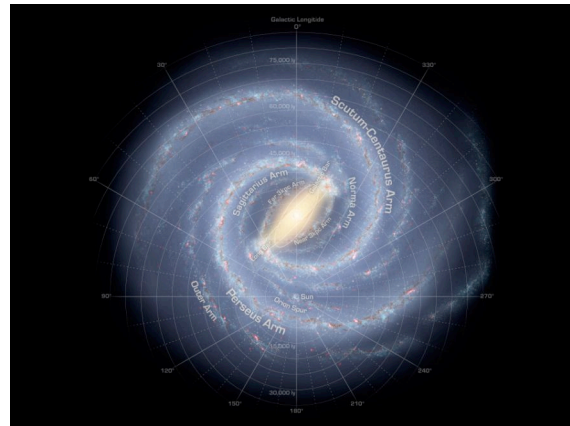
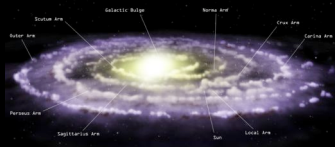


NASA, ESA, K. Sharon (Tel Aviv University) and E. Orlin (Caltech) STScI PRCS-23

## 4. Hubble Extreme Deep Field

## Our Galaxy: The Milky Way

- barred-spiral galaxy
- about 12–14 billion years old
- It is 100,000 light years across
- the bar in the center extends about one-third the diameter of the galaxy
- Our sun sits about 26,000 light years from the center of the disk – on one of the spiral arms
- Astronomers think there is a giant black hole at the center



### BrainPOP MILKY WAY

- What keeps the arms of the Milky Way spinning around its center?
  - A. Friction
  - ☒ B. Gravity
  - C. The strong force
  - D. Nuclear force
- What might happen if you got too close to the center of the Milky Way galaxy?
  - A. You would be burned up by the galaxy's brightest stars
  - B. You would be spun outward toward the edge of the galaxy
  - ☒ C. You would be trapped in the gravitational pull of a black hole
  - D. You would find yourself traveling faster than the speed of light
- How do the stars in the halo of the Milky Way differ from the stars in the arms?
  - ☒ A. The stars in the halo are older
  - B. The stars in the halo are brighter
  - C. The stars in the halo are more massive
  - D. The stars in the halo have a stronger gravitational pull
- Which term best describes dark matter?
  - A. Luminous
  - B. Transparent
  - C. Invisible
  - ☒ D. Mysterious
- Which choice best depicts the shape of the Milky Way?
  - ☒ A.
  - B.
  - C.
  - D.

- Why is our galaxy called the Milky Way?
  - A. Because of its dense, hazy center
  - B. It's a translation of an ancient name for "galaxy"
  - C. Because it's relatively homogeneous
  - ☒ D. Because it looks hazy and milky from Earth
- How is the center of the Milky Way different from the arms?
  - A. The center is fairly flat, while the arms form a bulge
  - ☒ B. The center is a giant red giant, while the arms are relatively flat
  - C. The center contains stars, while the arms contain only gas, planets, and dust
  - D. The center contains dark matter, while the arms do not
- What has to happen for a black hole to form?
  - A. A giant must collapse inward on itself
  - B. A galaxy must spin extremely fast around its center
  - ☒ C. A large star or group of stars must collapse
  - D. Two stars must collide with one another
- If you were looking down the line of sight from another galaxy, how would you tell how to locate Earth?
  - A. Look for the Orion arm
  - ☒ B. Tell how to find the Sagittarius arm
  - C. Tell how to find the Perseus arm
  - D. Tell how to find the central bulge
- What is a galactic year?
  - A. The time it takes the Earth to make one revolution around the sun
  - ☒ B. The time it takes for one arm of the galaxy to move slowly
  - C. The time it takes for the sun to make one revolution around the center of the galaxy
  - D. The time it takes for the moon to make one revolution around the earth

## Do we have neighbors?

- Our closest neighbor is Proxima Centauri, a star.
- It is about 4.2 light years from Earth.
- Even though it is close, it is a tiny **red dwarf** with a luminosity of 0.006 – so it's hard to see.
- At this time, the Voyager spacecraft are the only manmade objects to leave the Solar System.
- Launched in 1977, they should reach the edge of the Solar System by 2015.
- At this pace, they will need to travel another 82 thousand years before reaching the closest star.



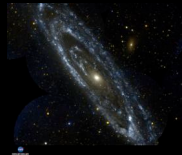
## Do we have neighbors?

- The closest galaxy is called the Sagittarius Dwarf.
- It is a little over 78,000 light years away.
- If it would take us thousands of years to reach the closest star, you can only imagine how long it would take to reach the closest galaxy.



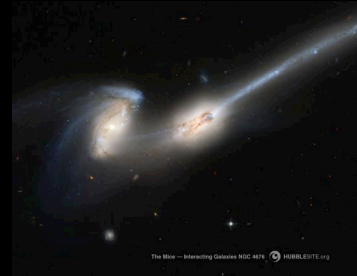
### *Do we have neighbors?*

- The Milky Way belongs to a group of about 30 galaxies called the local group.
- This group includes the Large Magellanic Cloud & the Small Magellanic Cloud.
- It also includes the Andromeda Galaxy, which is 2.9 million light years away.



This pair of galaxies, NGC 4676, also known as "The Mice" for their tails of stars and gas, have collided and will eventually merge into a single galaxy.

Streams of material have been tugged out of the galaxies by the force of gravity, triggering new starbirth.



The Mice — Interacting Galaxies NGC 4676 © HUBBLE.ORG