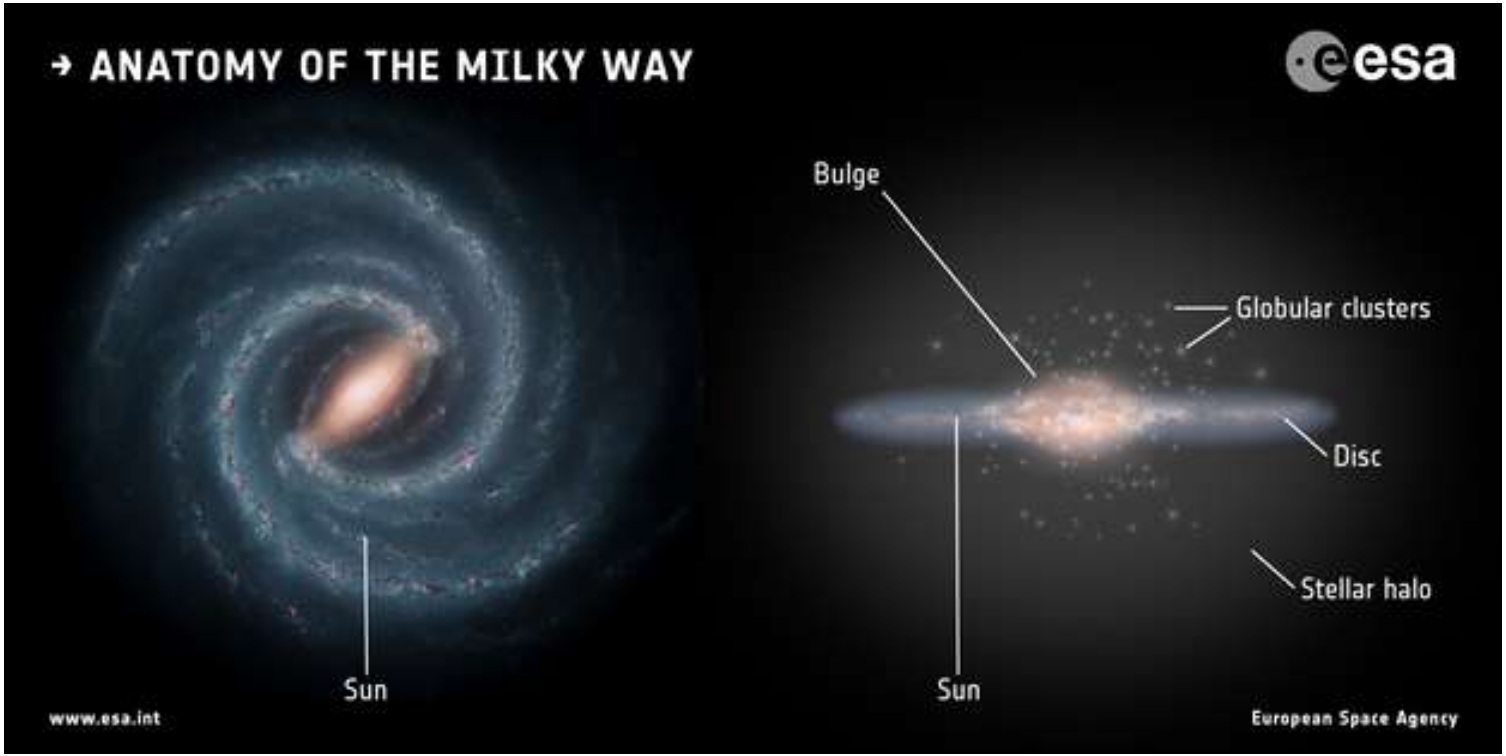
Physics Honors:
Galaxies and the Universe

Shape of the Milky Way



Parts of Our Galaxy

- **Nuclear Bar/Bulge:** Central part of the galaxy - made up of older, redder stars. Also contains the central black hole

- **Halo:** A spherical region where globular clusters are located. Surrounds the nuclear bulge

- **Spiral Arms**: Have a high concentration of hydrogen gas. There are at least 4 spiral arms in the milky way. The sun in located in a spiral arm right now.

Central Black Hole

- Most galaxies have a black hole at their center, and our galaxy is no different.
- Our Central Black Hole is named “Sagittarius A*” which is abbreviated “Sag A*” (Pronounced: A-Star)
- It is estimated that this black hole weights 2.6 millions time more than the sun, but is smaller than our solar system
- We know that the black hole is there because it emits x rays

Stellar Populations

Population 1 Stars:

- 98% Hydrogen and helium
- Younger stars (less than 10 billion years) made from supernovas
- Found in disk arms and open clusters

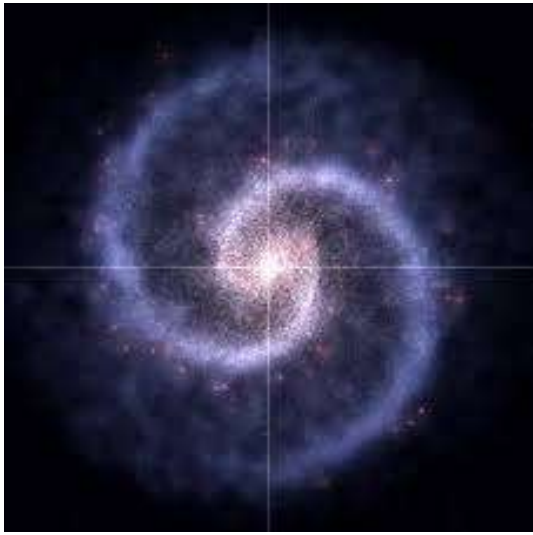
Population 2 Stars:

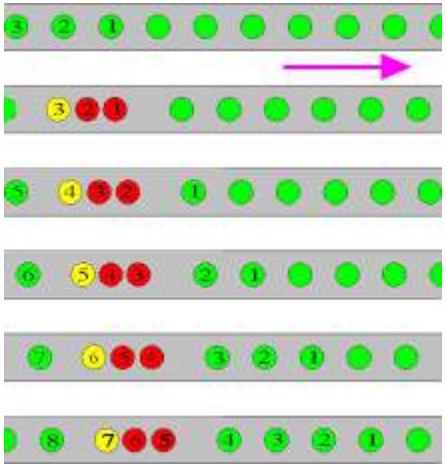
- 99.9% Hydrogen and helium
- Older stars (more than 10 billion years)
- Found in bulge and halo

Spiral Density Wave Theory

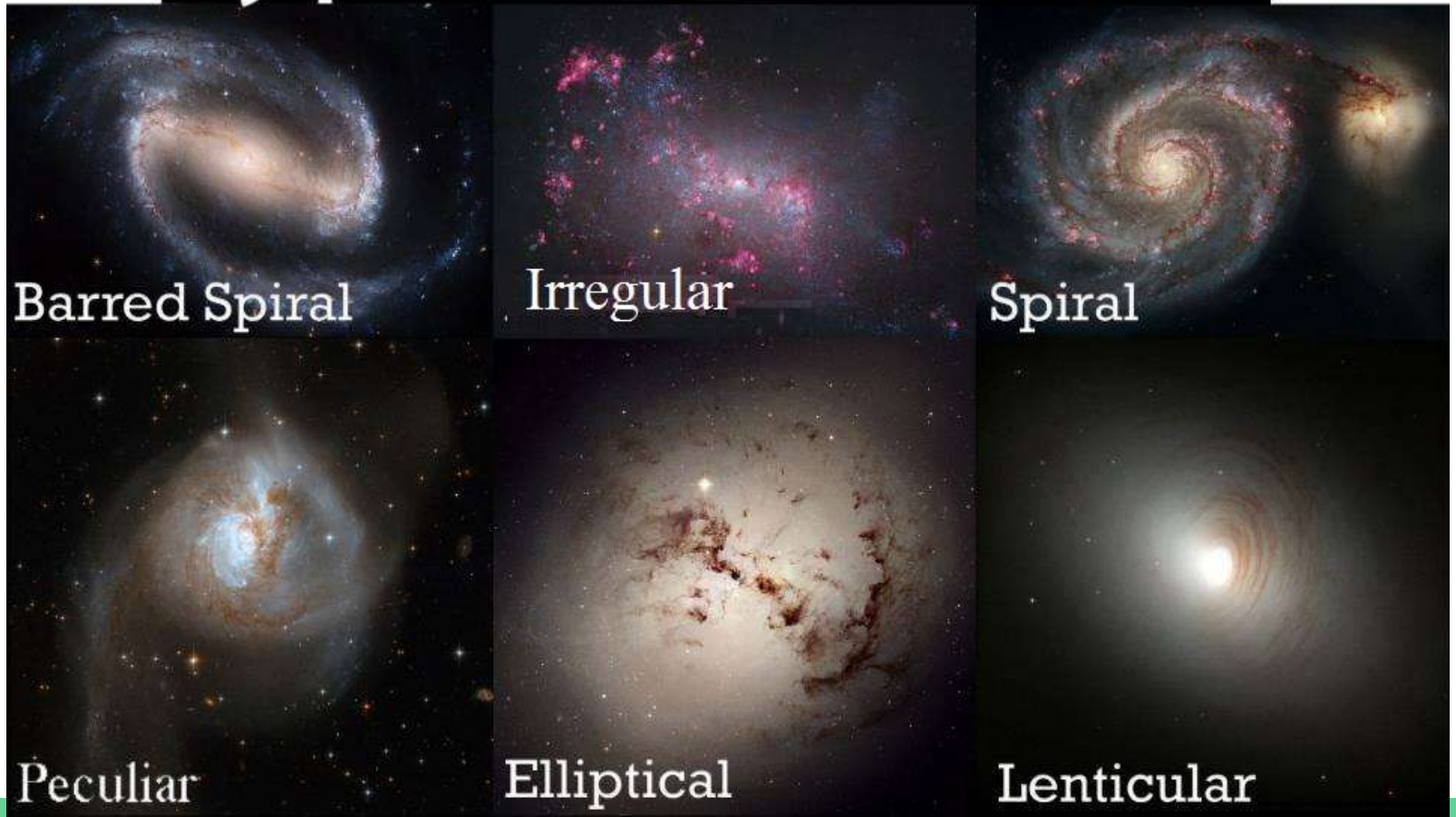
- Particles (and stars) more slowly when they are in a spiral arm

- The spiral arms act like a traffic jam - because it is more crowded in the arms, it takes longer to move through.





Types of Galaxies



Classifications of Galaxies

Elliptical Galaxies:	Disk/Spiral Galaxies:	Irregular Galaxies
● Older ● More Red Stars ● Rounded	● Younger ● More Blue Stars ● Flattened into a disk	● Have no set shape/age ● Usually distorted by gravity from collision with another galaxy

Galaxies Groups and Clusters

- The Milky Way is part of about 40 gravitationally bound galaxies known as the **Local Group.**

- Groups of galaxies can combine with other groups to form a **cluster.** cluster, the **Virgo Cluster,** is 7.5 million light years across.

- Multiple clusters can combine to form a **supercluster.** Superclusters and be hundreds of millions of light years across, and are the largest structures in the universe.