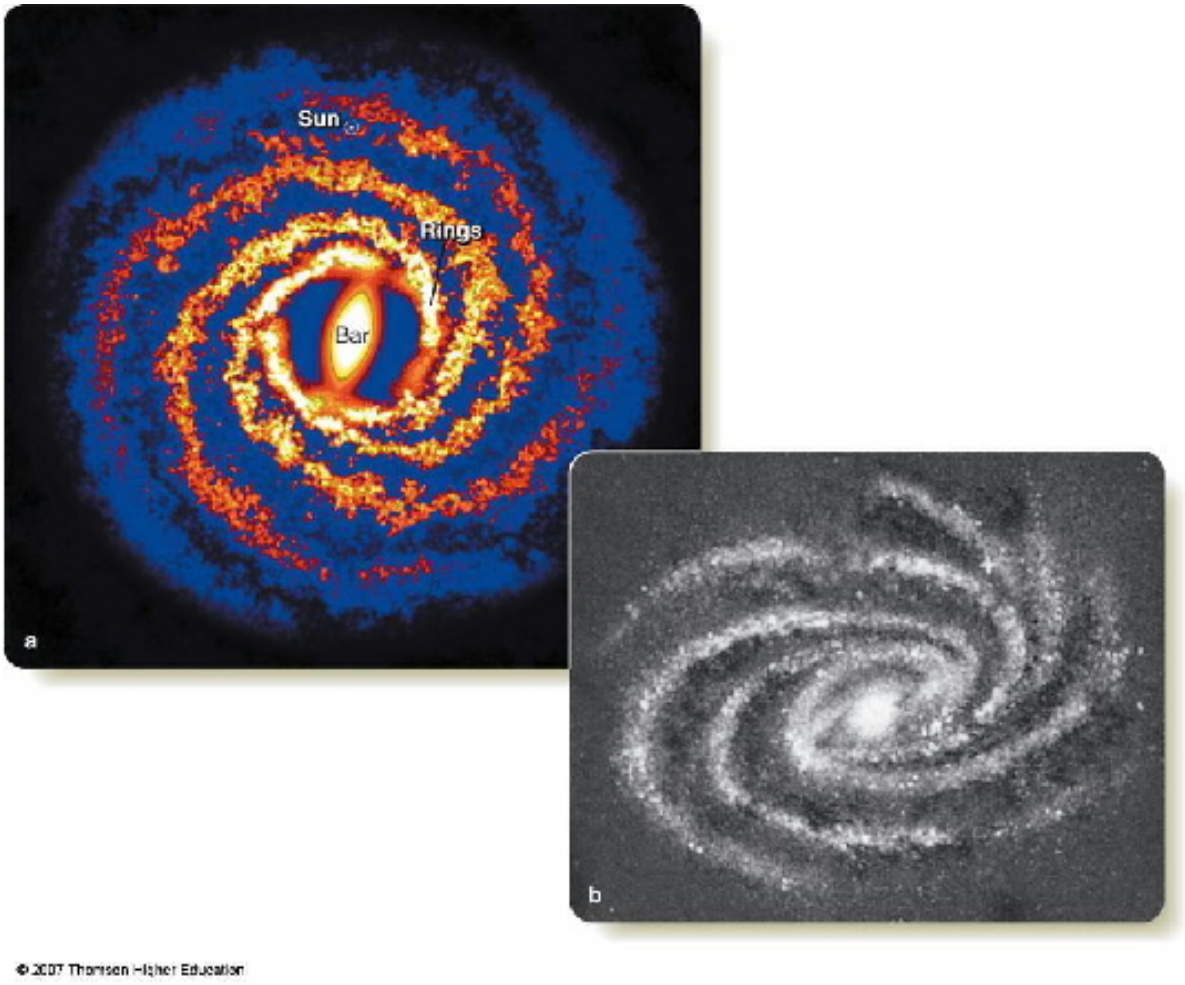
1 The Milky Way Galaxy

Our host galaxy

The Milky Way is either a spiral or a barred spiral galaxy (it's difficult to determine)



Our largest close neighbor - Andromeda Galaxy M 31 (NGC 224)

The Milky Way probably looks more like this

1.1 Physical Characteristics

Formed between 10 to 14 billion years ago

Home to at least 200 billion stars (latest estimates closer to 400 billion)

Contains from 750 billion to a trillion solar masses

Figure 1: M 83 - 20 million light years distant

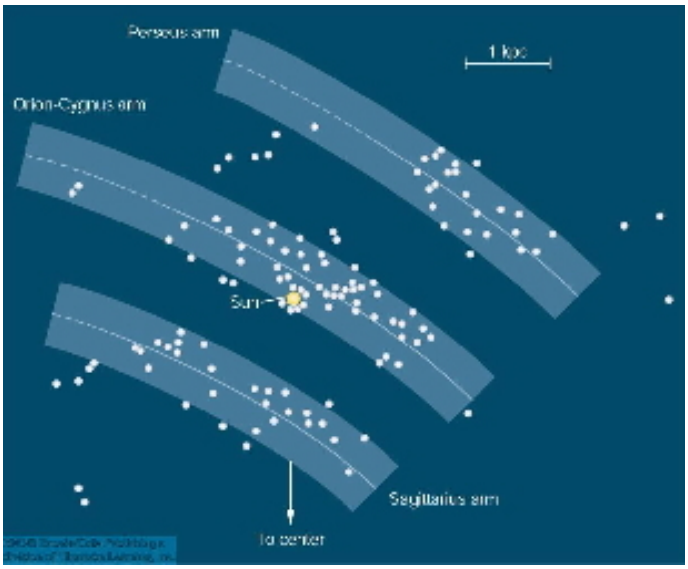
Thousands of star clusters and nebula

Diameter is around 100,000 light years or 30 kiloparsecs (1 kpc = 1000 pc)

Thickness of the spiral arms around 100 pc

Our solar system is situated within the outer regions of this galaxy, well within the disk and only about 20 light years above the equatorial symmetry plane but about 28,000 light years from the Galactic Center.

Our solar system is located in one of the spiral arms called the Orion-Cygnus arm



1.2 Components of the galaxy

1.3 Spherical Components

1.3.1 Nuclear Bulge

- Located at the center of the galaxy
- Radius about 3 kpc
- Contains a large number of stars
- Also contains a supermassive blackhole, Sagittarius A, $\sim$ 3 million solar masses

Data for the Galactic Center (this and all following positions for epoch 2000.0):

Right ascension 17 : 45.6 (h : m)

Declination -28 : 56 (deg : m)

Distance 28 (kly)

Source **??**

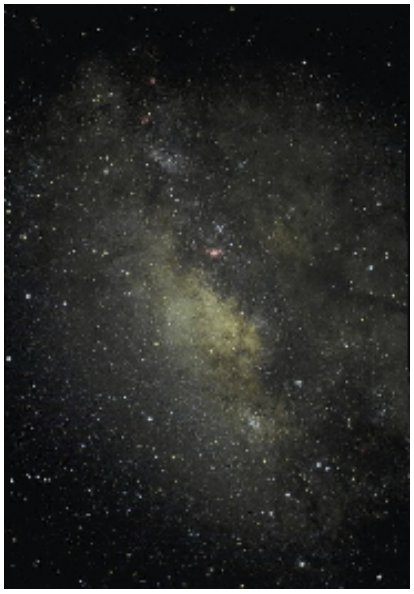
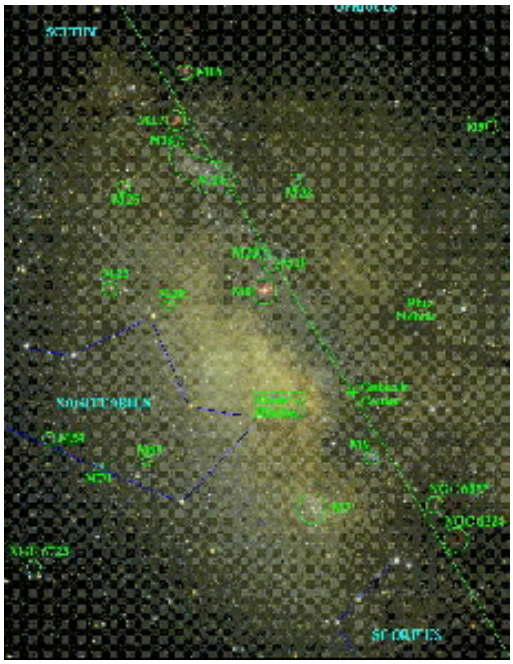
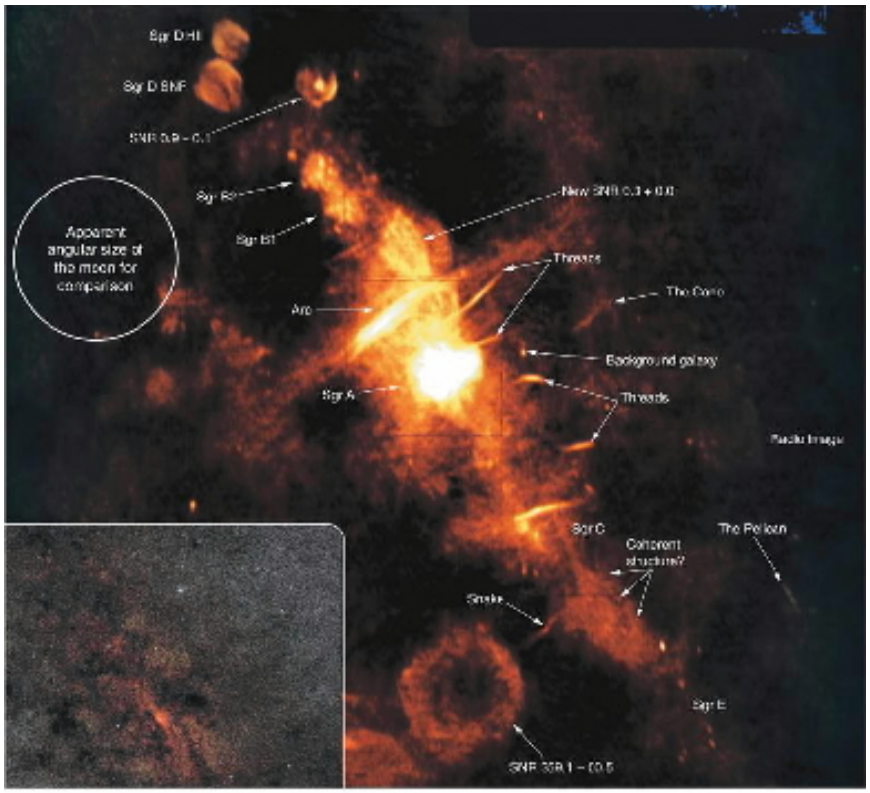
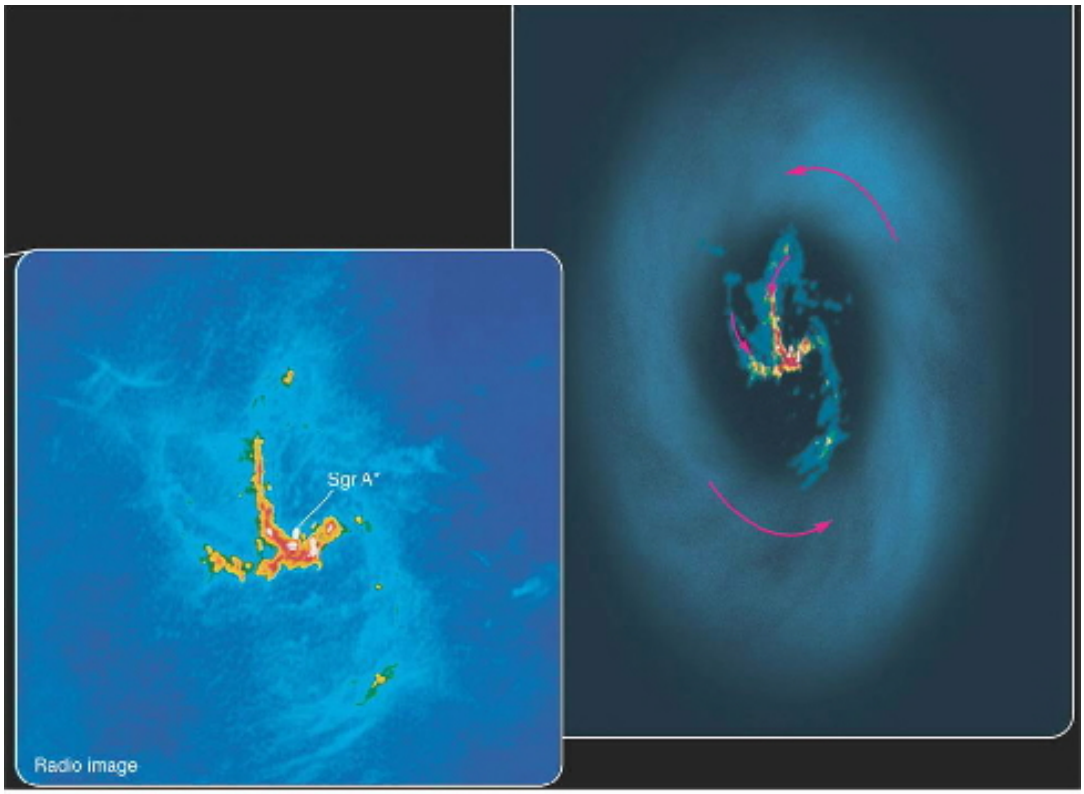
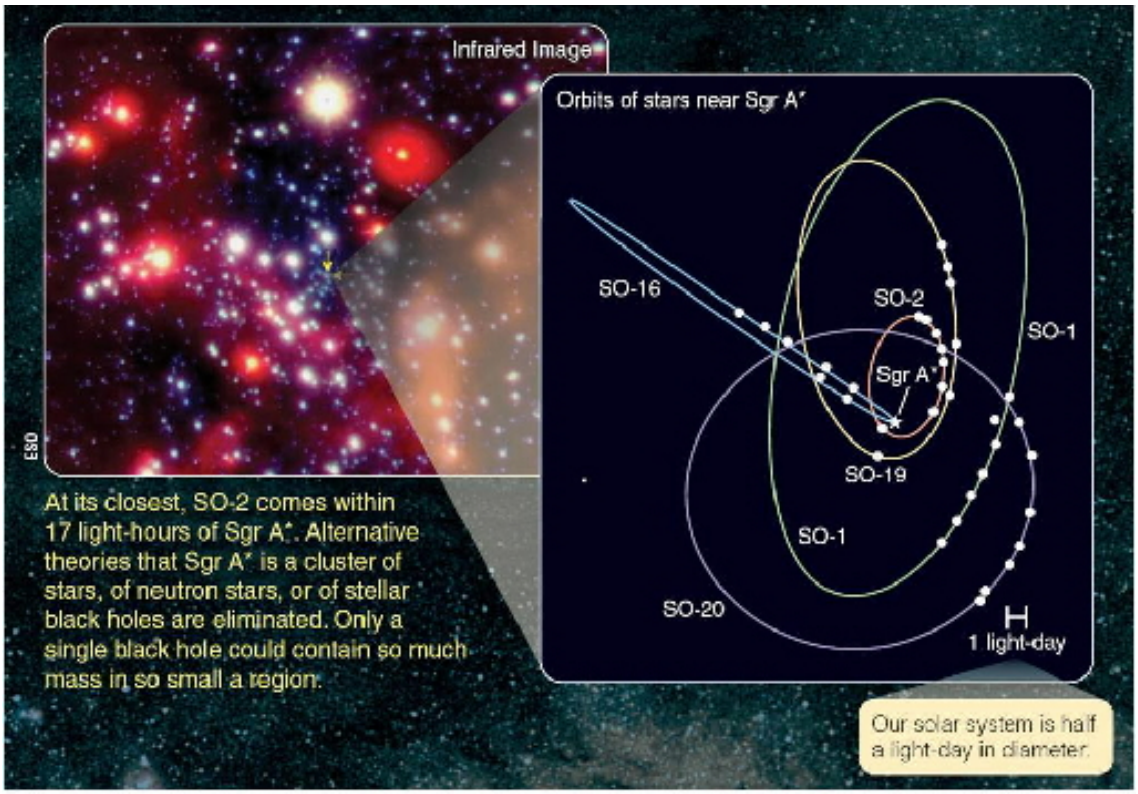


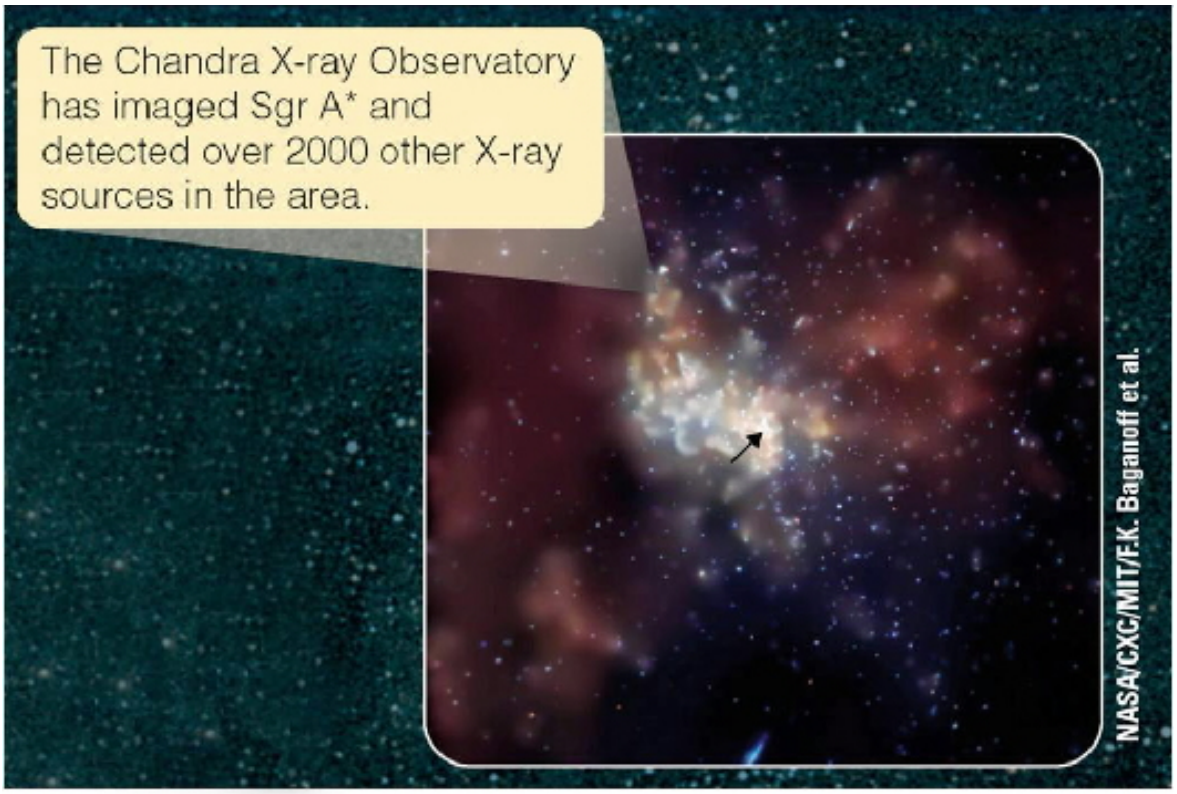
Figure 2: Starfield - Milky Way center











1.3.2 Halo

Over 200 globular clusters

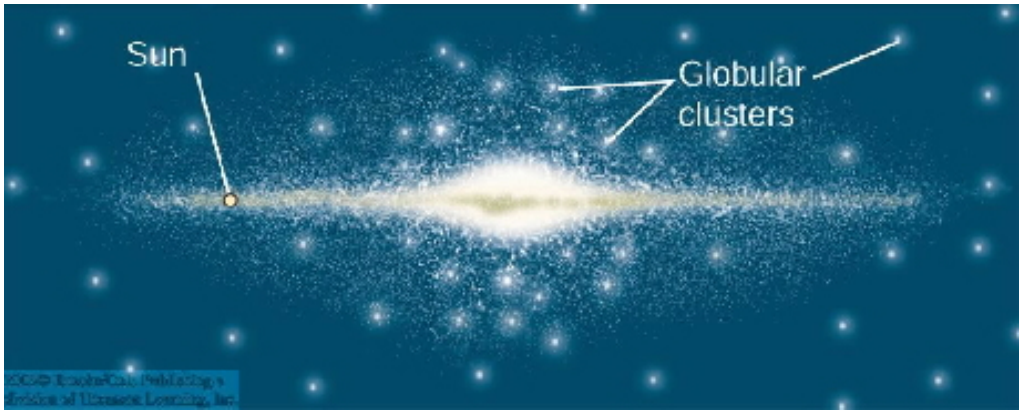
Randomly tipped ellipitical orbits around the center of the galaxy

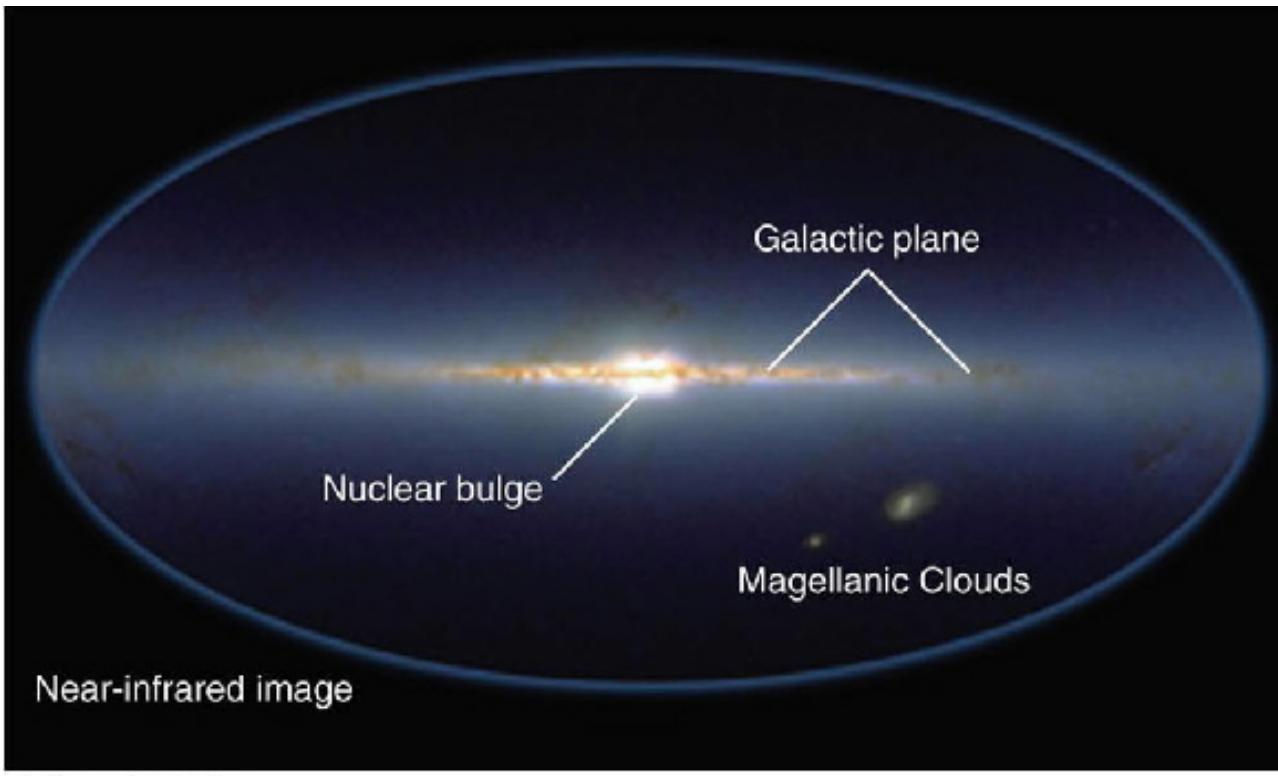
Population II stars - metal poor stars

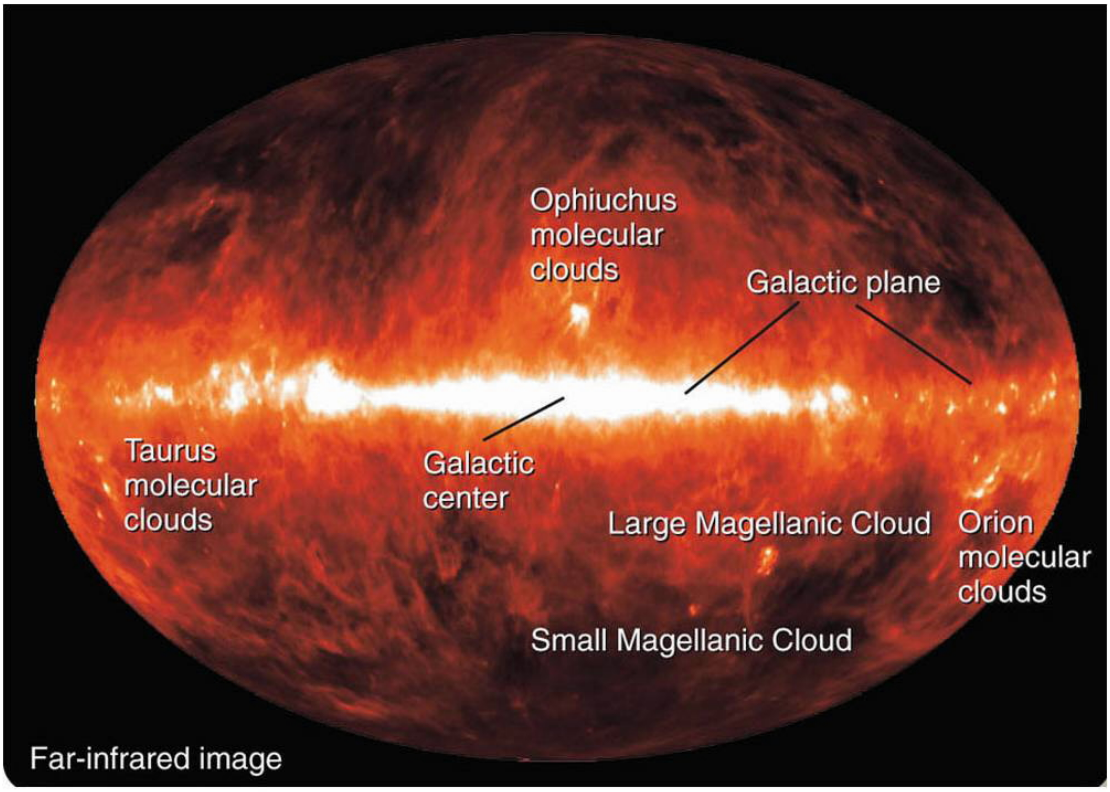
Old stars, no new star building taking place

1.3.3 Disk Components

Here is what the Milky Way looks like from Earth


Sun
Globular
clusters


Galactic plane
Nuclear bulge
Magellanic Clouds
Near-infrared image



Here is the Sombrero Galaxy in Virgo

1.4 Spiral Arms

Spiral Tracers - Hot O and B type bright giants and supergiants
Found in associations
These are young stars where new star formation is active
Earth's solar systems is located in the Orion-Cygnus arm
Other tracers - open clusters, HII regions and certain variable stars
Younger stars
Population I - Metal rich stars
Made from the recycled elements of many generations of stars

Table 15-1 | Stellar Populations

	Population I		Population II	
	Extreme	*Intermediate*	*Intermediate*	*Extreme*
Location	Spiral arms	Disk	Nuclear bulge	Halo
Metals (%)	3	1.6	0.8	Less than 0.8
Shape of orbit	Circular	Slightly elliptical	Moderately elliptical	Highly elliptical
Average age (yr)	100 million and younger	0.2–10 billion	2–10 billion	10–13 billion

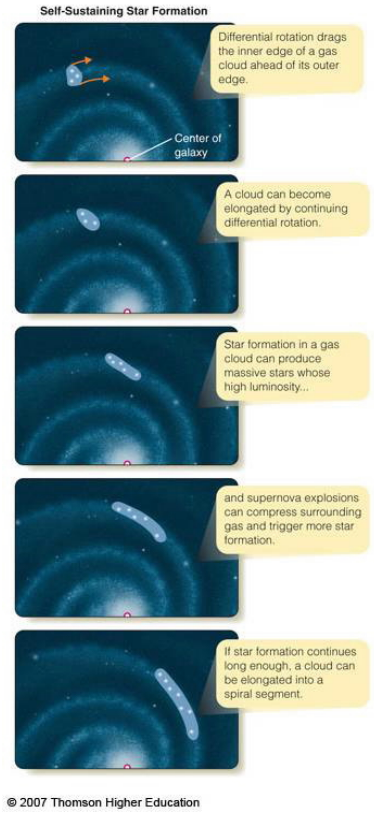
1.4.1 Density Waves

One theory to explain the spiral structure of the spiral galaxies

Dynamically stable regions of compression that move slowly around the galaxy

Self-sustaining star formation

Figure 3: Open Cluster in Persius



Element building process