Journal of Astrobiology and Outreach

Dr. David F Mota

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Dr. David F Mota

Biography

DAVID FONSECA MOTA finished his ph.D from University of Cambridge. Currently working as Professor in Institute of Theoretical Astrophysics, University of Oslo. His research produced more than 70 articles published in top-ranked international journals. These articles have more than 3600 citations, and have an h-index of 34.He is a member of PhD Degree committee, Institute of Theoretical Astrophysics,

Research Interests

Cosmology,
Theoretical Astrophysics,
Theoretical Physics,

Recent Publications

1. Local observables in a landscape of infrared gauge modes, M Thorsrud, DF **Mota**, FR Urban - Physics Letters B, 2014 - Elsevier

2. Accelerating cosmologies with an anisotropic equation of state, T Koivisto, DF **Mota** - The Astrophysical Journal, 2008 - iopscience.iop.org

3. Constraining dark energy anisotropic stress, DF **Mota**, JR Kristiansen, T Koivisto, Monthly Notices of, 2007 - mnras.oxfordjournals.org

4. An Improved Semianalytical Spherical Collapse Model for Nonlinear Density Evolution, DJ Shaw, DF **Mota** - The Astrophysical Journal Supplement …, 2008 - iopscience.iop.org

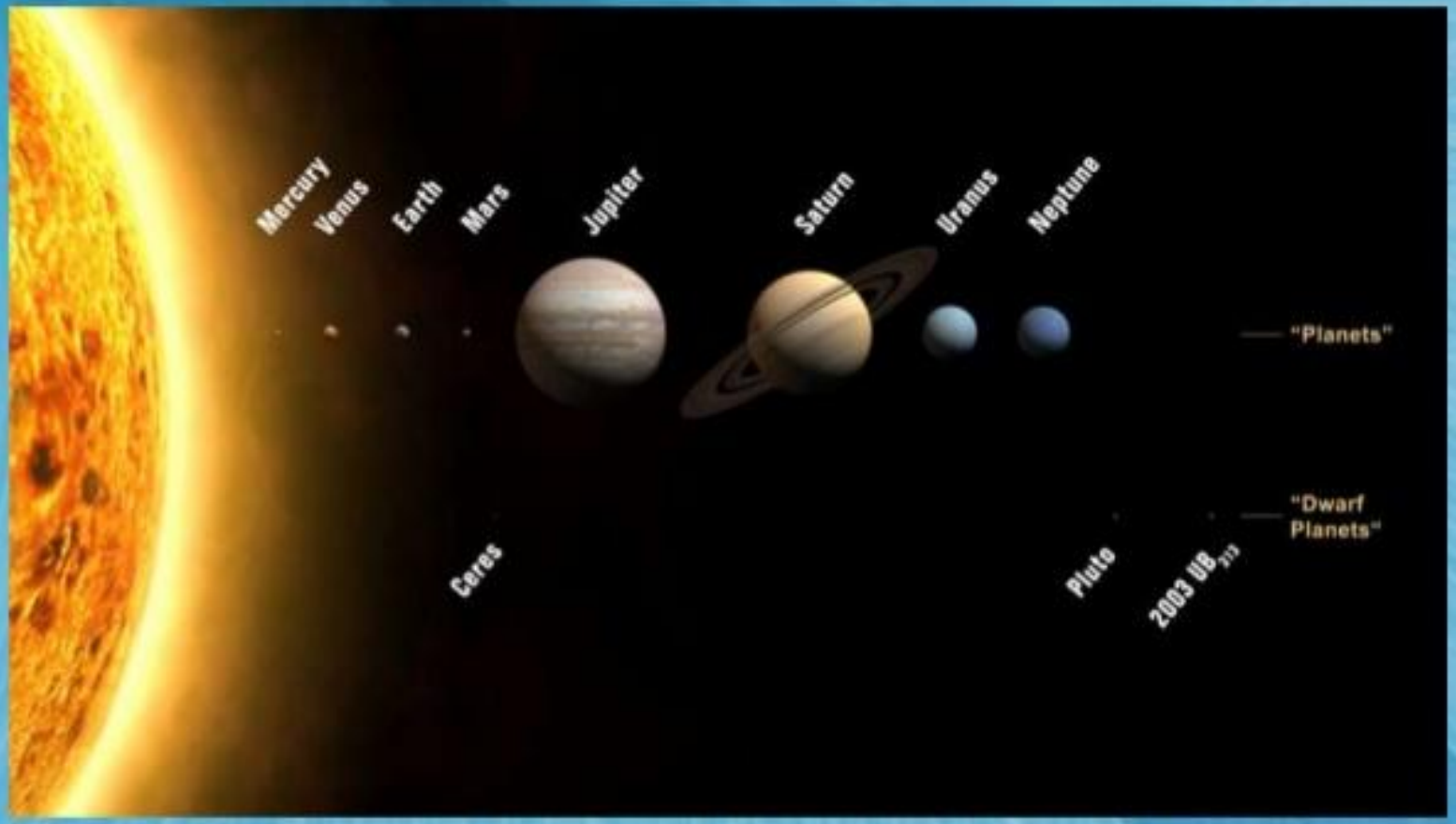
5. Local and global variations of the fine-structure constant, DF **Mota**, JD Barrow Monthly Notices of the Royal …, 2004 - mnras.oxfordjournals.org

6. On the magnitude of dark energy voids and overdensities, DF **Mota**, DJ Shaw, J Silk - The Astrophysical Journal, 2008 - iopscience.iop.org

- **Astrophysics** (from Greek *astron*, ἄστρον "star", and *physis*, φύσις "nature") is the branch of astronomy that deals with the physics of the universe, especially with "the nature of the heavenly bodies, rather than their positions or motions in space.
- Among the objects studied are galaxies, stars, planets, extra solar planets, the interstellar medium and the cosmic microwave background.
- Their emissions are examined across all parts of the electromagnetic spectrum, and the properties examined include luminosity, density, temperature, and chemical composition.
- Because astrophysics is a very broad subject, astrophysicists typically apply many disciplines of physics, including mechanics, electromagnetism, statistical mechanics,thermodynamics, quantum mechanics, relativity, nuclear and particle physics, and atomic and molecular physics.

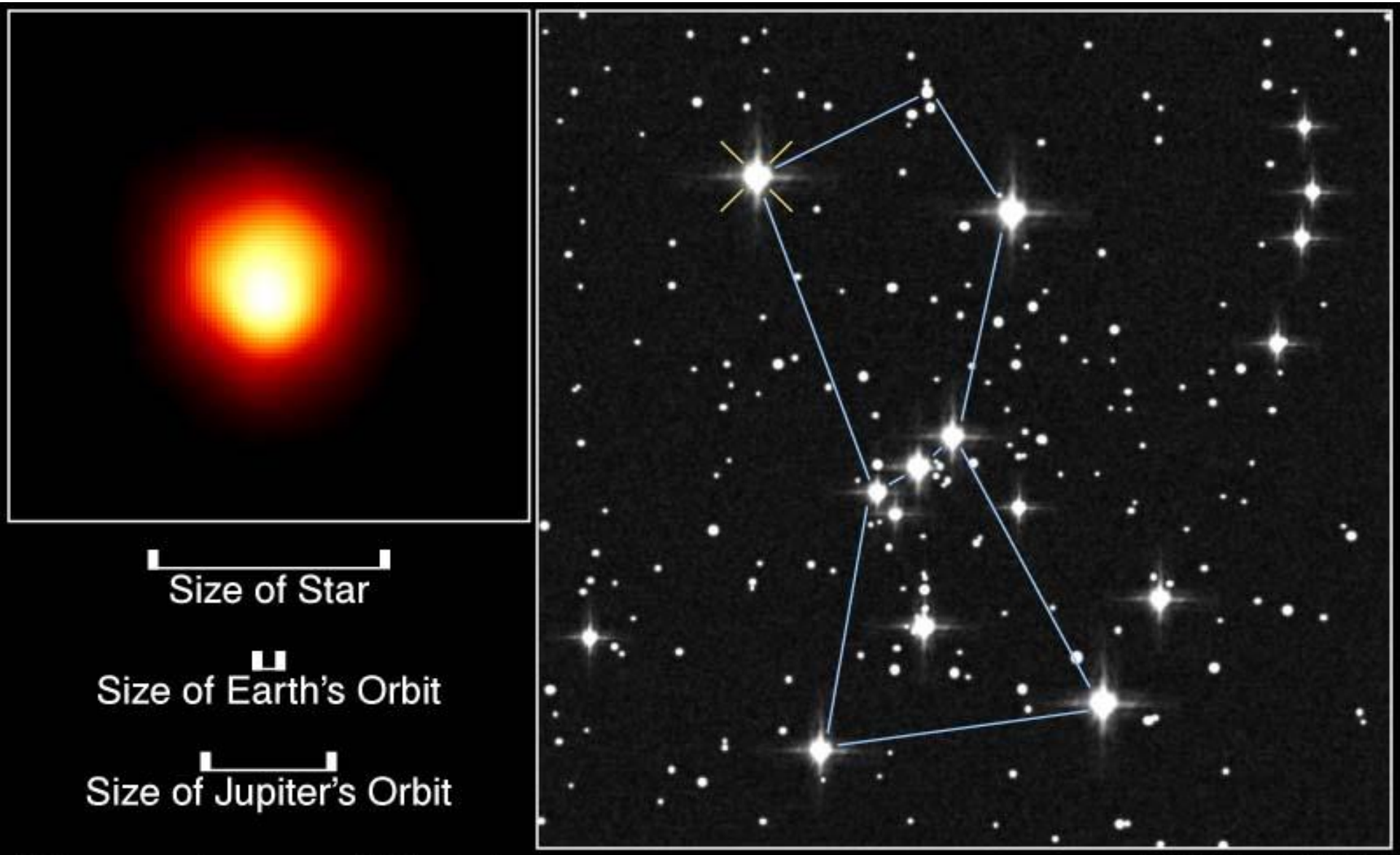


The Solar System



You need to know the names of the planets

Stellar Sizes

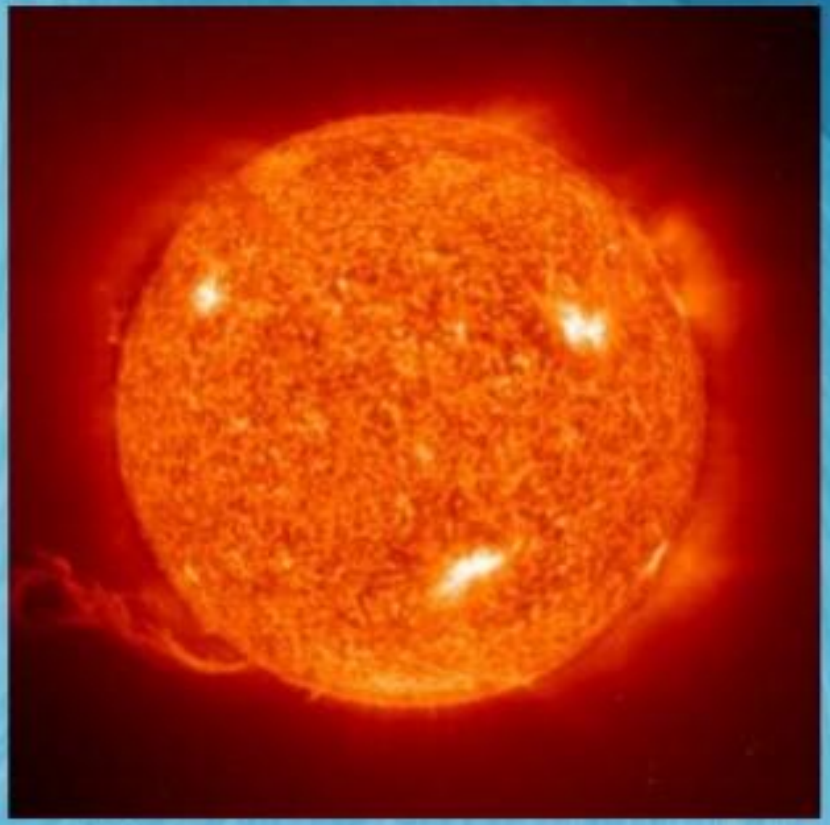


Planets orbit in ellipses

- An ellipse is a "flattened circle" with two foci about which the planet orbits.

- Moons orbit the planets in much the same way.

The Sun



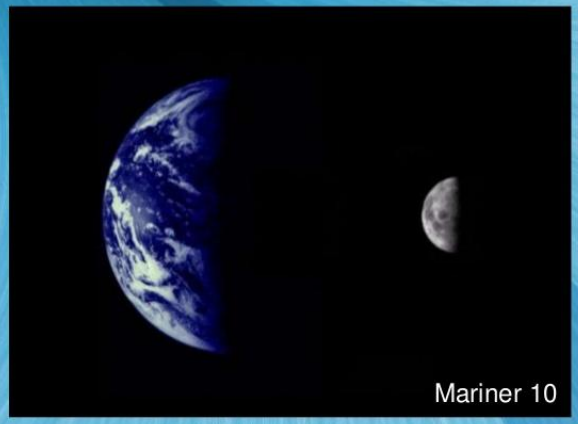
- Mass: 1.99×10^{30} kg
- Radius: 6.96×10^{8} m
- Surface temperature: 5800 K

Planets Data

Planet	Picture	Distance to the Sun (km)	Diameter(km)	Orbital period around its axis	Orbital period	Surface day temp (°C)	Density (water=1)	Satellites
Mercury		58 million	4 878 km	59 days	88 days	167	5,43	0
Venus		108 million	12 104 km	-243 days	225 days	464	5,24	0
Earth		149,6 million	12 756 km	23, 93 h	365,2 days	15	5,52	1
Mars		228 million	6 794 km	24h 37min	687 days	-65	3,04	2
Jupiter		778 million	142 800 km	9h 50min 30s	12 years	-110	1,32	+63
Saturn		1 427 million	120 000 km	10h 14min	29,5 years	-140	0,69	+56
Uranus		2 870 million	51 800 km	16h 18min	84 years	-195	1,27	27
Neptune		4 497 million	49 500 km	15h 48min	164 years	-200	1,77	13
Pluto		5 900 million	2 400 km	6 days	248 years	-225	2	1

Mercury and Venus

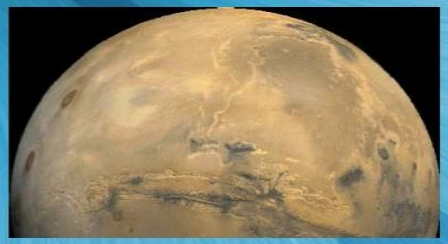
Earth and Moon



Mariner 10

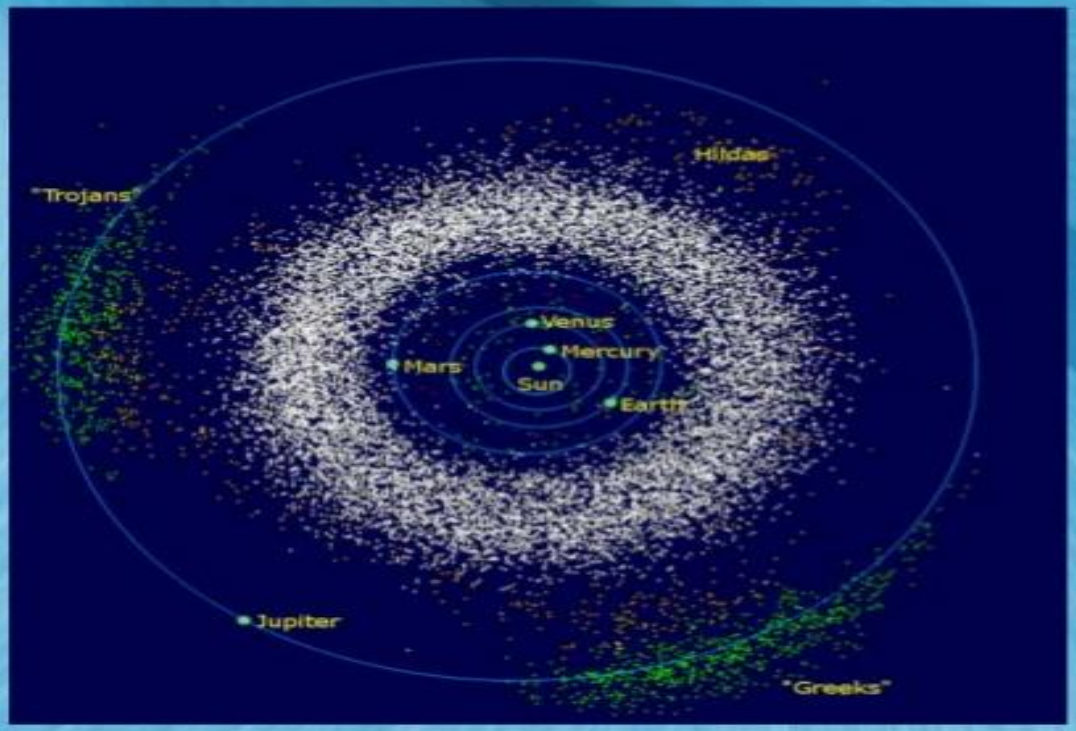
Earth and Moon

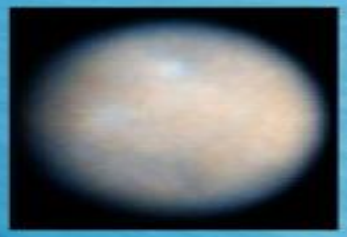
Mars



Spirit Rover: Mars' West Valley

Asteroid Belt





Ceres (480km): it was the first asteroid to be seen. Now it's a dwarf planet.

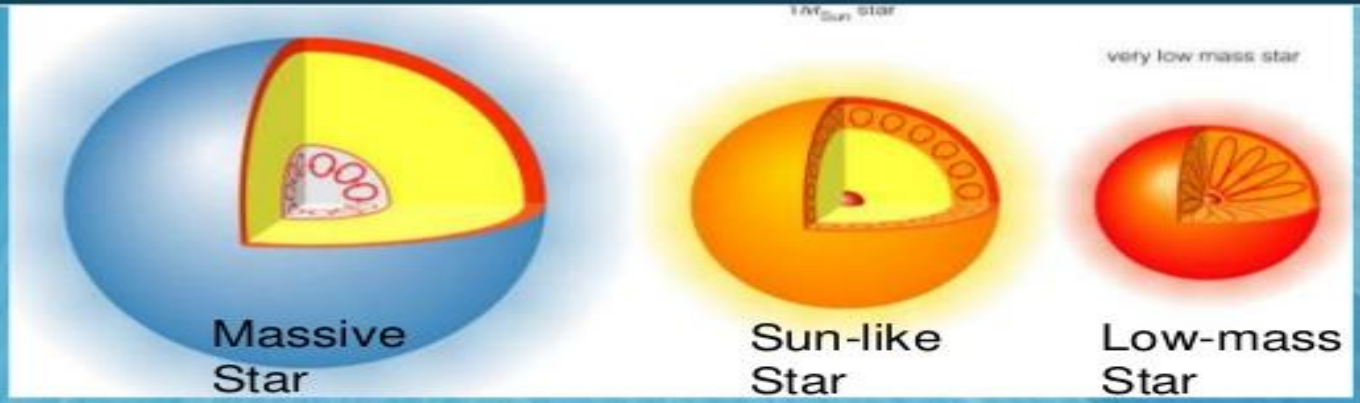
Mathilde (52km)

Eros (13x13x33km)

How far is the asteroid belt?

It is 2 – 3.5 AU. An AU is the astronomical unit, the mean distance from the Earth to the Sun Distance = 2 * 1.496 x 108 km = 293200000000 m from the sun.

A star is a big ball of gas, with fusion going on at its center, held together by gravity!



There are variations between stars, but by and large they're really pretty simple things.

- The most important thing about a star is MASS!
- The mass of a normal star almost completely determines its LUMINOSITY & TEMPERATURE!
- The LUMINOSITY of a star is the TOTAL ENERGY emitted per time from the surface of the star. This light bulb has a luminosity of 60 Watts The energy the Sun emits is generated by the fusion in its core…

- COMETS: are frozen balls of ice and dust that can resemble a "dirty snowball".They orbit the Sun is highly elliptical orbits. Their orbital periods can range from a few years to several thousand years. *Halleys Comet* is famous due to the fact that everyone has a chance to see it in their lifetime (Orbital Period of 77 years).
- Light Year (ly): is the distance that light travels in one year.

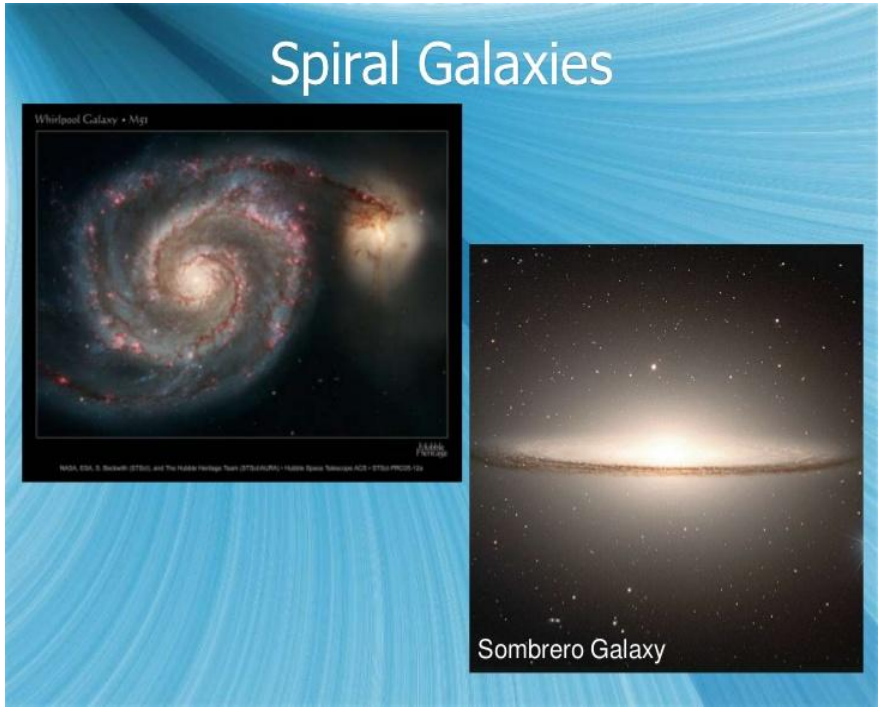
  One light year equals 9.46 x 1015 metres.

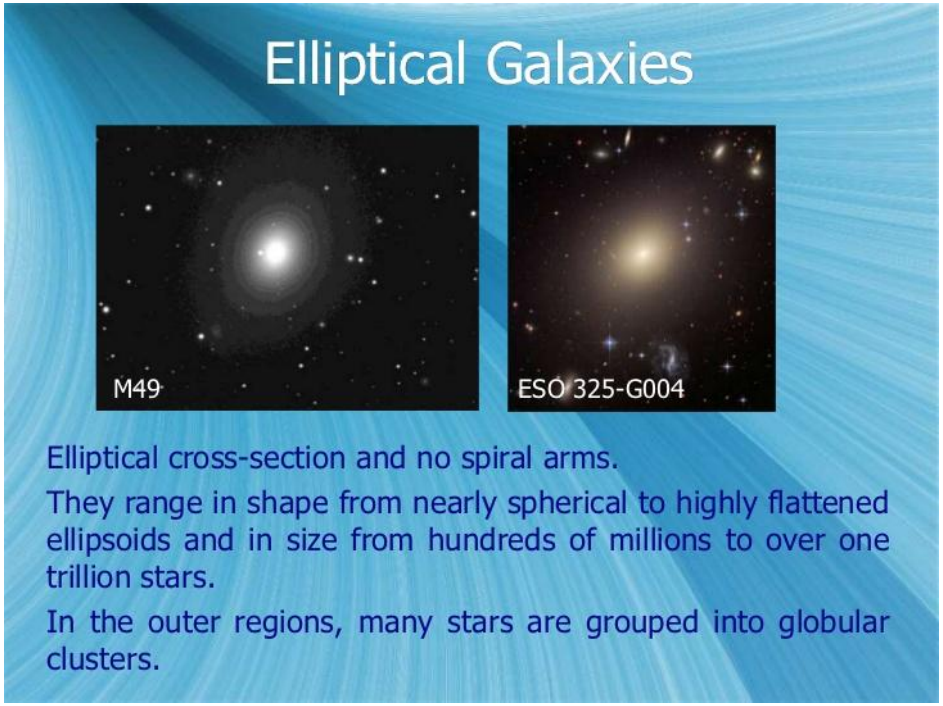
  c = distance/time

  300000000 = distance/365x24x60x60
- Stellar cluster: A number of stars that are held together in a group by a gravitational attraction.They were created at about the same time. There may be many thousands of stars in a group.

Galaxies

- A galaxy is a collection of a very large number of starsmutually attracting each other through the gravitational forceand staying together. The number of stars varies between afew million and hundreds of billions. There approximately100 billion galaxies in the observable universe.
- There are three types of galaxies: -
  - Spiral (Milky Way)
  - Elliptical (M49)
  - Irregular (Magellanic Clouds)

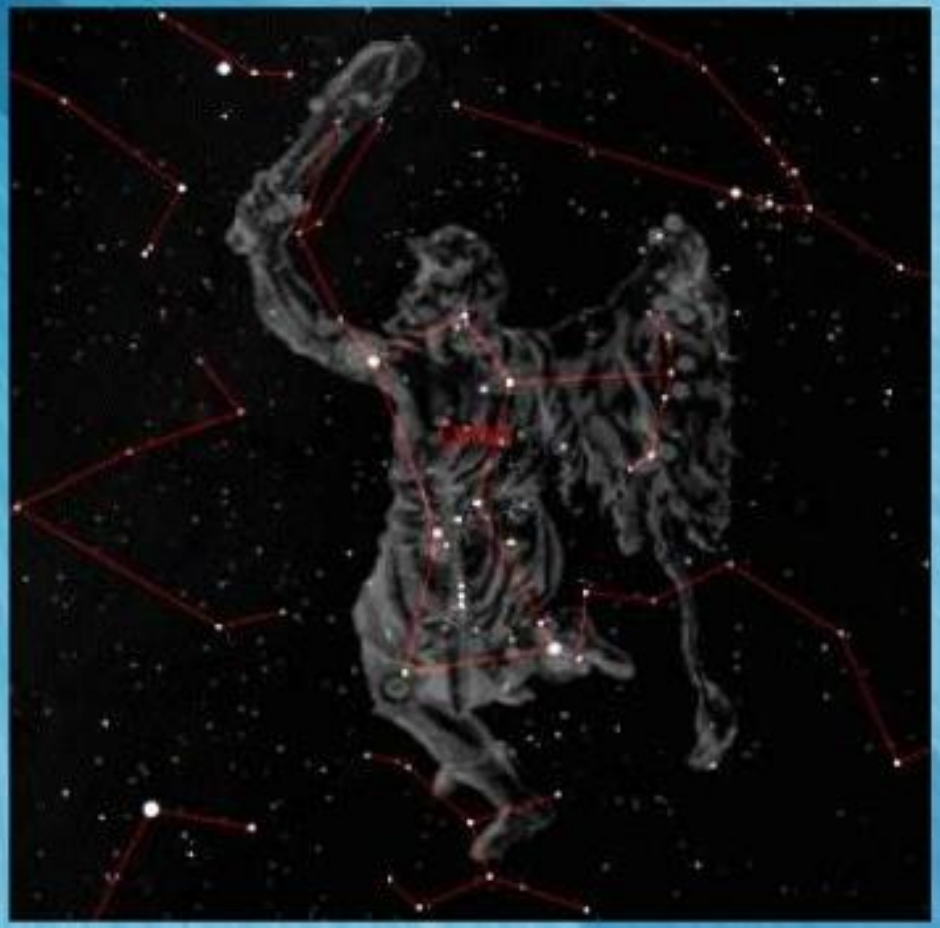




Constellations

A group of stars in a recognizable pattern that *appear* to be near each other in space.

Orion



Nebulae

Nebula is an interstellar cloud of dust, hydrogen gas and plasma. It is the first stage of a star's cycle but it can also refer to the remains of a dying star (planetary nebula).

Originally nebula was a general name for any extended astronomical object, including galaxies beyond the Milky Way (some examples of the older usage survive; for example, the Andromeda Galaxy was referred to as the Andromeda Nebula before galaxies were discovered by Edwin Hubble).

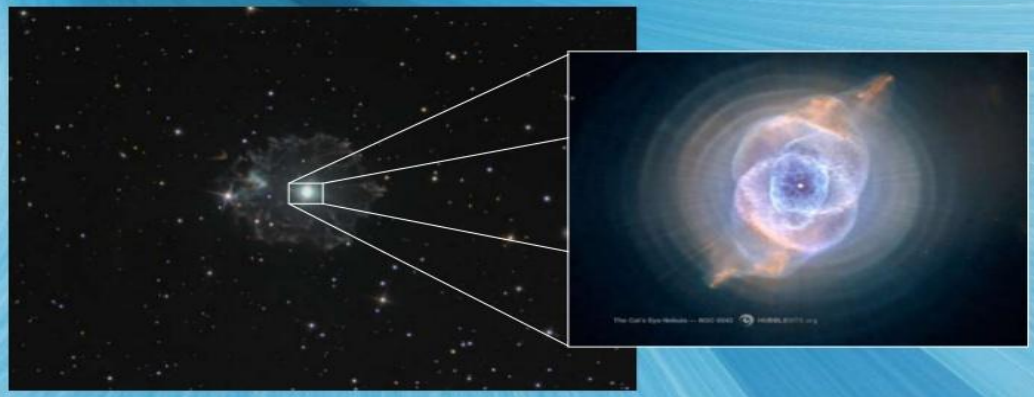
Nebulae often form star-forming regions, such as in the Eagle Nebula.

Nebulae

Eagle Nebula and the Cone nebula:

star-forming regions

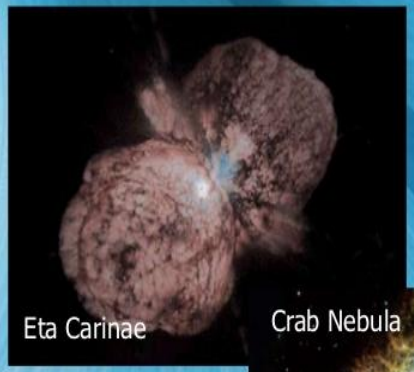
Cat's Eye Nebula

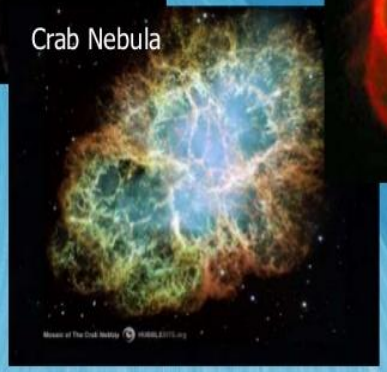


Planetary nebulae are nebulae that form from the gaseous shells that are ejected from low-mass giant stars when they transform into white dwarfs.

Eskimo nebula

Supernovas





Locating Information

- NASA's Astrophysics Data System (ADS): http://adswww.harvard.edu/ and particularly http://adsabs.harvard.edu/abstract_service.html
- SIMBAD: http://simbad.harvard.edu/simbad/ and http://simbad.u-strasbg.fr/simbad/ (there are 2 sites)
- NOTE: VIRTUALLY ALL ELECTRONIC CATALOGS TODAY SEARCH SIMBAD FOR RESOLVING STAR NAMES AND GETTING THEIR COORDINATES. If SIMBAD is down, you may be out of luck!

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