Star Clusters





Culpeper Astronomy Club (CAC) Meeting May 21, 2018

Overview

- Introductions
- Main Topic: Star Clusters Open and Globular
- Constellations: Bootes, Canes Venatici, Coma Berenices
- Observing Session TBD

Observing Session – 29 April 18

- Kicked off at about 6:30 p.m
 - Ended at about 1:30 a.m
- Set up several telescopes
 - Three refractor's (RAS -7", f/12)
 - 11" CPC 1100 SCT (Dennis)
 - 12" Meade SCT
- Targets included:
 - Venus
 - Moon
 - Several double stars
 - Several deep sky objects
 - Jupiter
- Checked out Saturn and Mars at after arriving home 2:30 a.m.



Loaner Telescopes



Jupiter near Opposition

- Taken on 13 May 2018 by Jerry Sykes (Opposition 8 May)
- Taken with a 120mm refractor, 3x barlow and ASI224mc video camera
- First time using his ASI224mc camera
 - Took several videos through breaks in the clouds
 - Shot 21,700 frames in a little over two minutes.
 - Used 29% of 21,700 frames
- Captured using Sharpcap
- Stacked in AS!3
- Processed in Registax6



Stellar Evolution - The Birth

- Stars are born within the clouds of dust and gas scattered throughout most galaxies (Orion Nebula)
- Swirling cloud gives rise to knots with sufficient mass that the gas and dust can begin to collapse under its own gravitational attraction
- As cloud collapses, material at the center heats up and begins gathering dust and gas (Protostar)
- Spinning clouds may break up into two or three blobs resulting in paired or groups of multiple stars
- Not all of this material ends up as part of a star the remaining dust can become planets, asteroids, or comets or may remain as dust





Star Groupings – A Common Bond

- Some of the stars in the universe are part of multiple star systems known as star clusters
- Most appear to be part of a binary system where two stars orbit a common center of gravity
 - some are part of triple/multiple star systems
- But some stars are also part of larger groups
 - They can be found together in associations known as star clusters
 - Star clusters are groupings of stars held together by a common gravitational bond



Star Clusters - Types

- Star clusters are among the <u>most spectacular</u> objects in the sky to observe
- Gravity is the force that binds these cosmic swarms together
- Vary greatly in size and shape as well as the number of stars
- Vary in age from just hundreds of thousands of years to billions of years
- Can be divided into two main types according to their shape and number of stars
 - Classified as either open clusters or globular clusters





Open Clusters - Stellar Siblings

- Found mostly near the arms of spiral and irregular galaxies where there is abundant gas and dust for new star formation
 - For that reason, they're sometimes called "galactic star clusters"
- More than 1,100 open clusters have been discovered within the Milky Way Galaxy, and many more are thought to exist
- The greatest concentration of open clusters in our sky lies along the band of the Milky Way in the constellations:
 - Cygnus, Scutum, Scorpius, Sagittarius, Crux, Centaurus, Cassiopeia, and Perseus





Open Clusters - Stellar Siblings

- Open clusters are formed when several stars are formed at the same time from the same cloud of dust and gas
 - Our own Sun is part of an open cluster that includes other nearby stars such as Alpha Centauri and Barnard's star
- Usually contain somewhere between a dozen and a thousand stars
- Generally survive for a few hundred million years, with the most massive ones surviving for a few billion years
- Open star clusters are composed of hot, relatively young stars
- The reason open clusters are so young is because they don't last very long
 - Gravitational interactions between the stars and other objects will cause these clusters to eventually disperse over time





Globular Clusters – Primordial Stars

- Unlike open clusters, globular clusters are:
 - Much older and usually contain between ten thousand to a million stars
 - Gravitationally bound in a tight concentration
- Most globular clusters are believed to be between 11 and 13 billion years old
- Usually packed into a spherical arrangement with the highest density of stars occurs in the center of the cluster
- They are believed to have formed from the same primordial matter that initially formed the galaxies
- Although it appears that globular clusters contain some of the first stars to be produced in the galaxy, their origins and their role in galactic evolution are still unclear





Globular Clusters – Primordial Stars

- There are about 200 known globular clusters surrounding the Milky Way galaxy
- Located just outside our galaxy
 - Orbit around the central halo or bulge
 - Their concentration increases closest to the galaxy's center
- They orbit the galaxy in highly elliptical orbits, which take them far outside the Milky Way
- Every galaxy of sufficient mass in the Local Group has an associated group of globular clusters
 - Almost every large galaxy surveyed has been found to possess a system of globular clusters



Deep Sky objects – Star Clusters

GLOBULAR STAR CLUSTER

Group of tens of thousands to hundreds of thousands of stars

Highly symmetrical ball of stars

Frequently contains bright red giant stars

Located in the halo or bulge of a galaxy

Composed of old stars that formed when the universe was younger

> No longer forming in our galaxy, the Milky Way

OPEN STAR CLUSTER

Group

of stars held

together by mutual

All of its stars are the

same age, having formed from the same cloud of

gas and dust.

Stars in the cluster

are at the same

distance from Earth.

The star colors in a

cluster indicate the age

of the cluster.

Orbits the center

of a galaxy

Group of hundreds of stars gravitational attraction

> Irregularly shaped grouping of stars

Contains bright blue stars

Located in the arms of the Milky Way and other spiral galaxies

Composed of young stars that recently formed in the disks of galaxies

Continues to form in the arms of spiral galaxies, including the Milky Way









Constellations

- Summer Triangle
- Bootes Herdsman
- Canes Venatici Hunting Dogs
- Coma Berenices Bernices Hair





Bootes – "The Herdsman"

- Bootes Herdsman with two hunting dogs on a leash and a club in his other hand
- Arcturus: the third brightest star in the sky at 21 LY; fast moving star
- Izar: Binary star located approximately 300 LY distant
 - Consists of a bright orange giant and a smaller and fainter pale green main sequence star
- Deep Sky Objects:
 - The Boötes void, (aka: Great Void), sphereshaped region of the sky, almost 250 LY in diameter, containing very few galaxies
 - NGC 5466: Globular Star Cluster



Coma Berenices – "Bernices Hair"

- Coma Berenices Named after the Queen Berenice II of Egypt
- Consists primarily of three bright stars
- Deep Sky Objects:
 - Globular Cluster (M53)
 - Spiral Galaxy (Black Eyed Galaxy, M64):
 - Spiral Galaxy (Needle Galaxy, NGC 4565)
 - Lenticular Galaxy (M85)
 - Spiral Galaxy (M100)



Canes Venatici – "The Hunting Dogs"

- Brightest star is Cor Caroli
 - Colorful double star
 - Name means "Charles' heart"
 - Two stars are 19.6" apart; 110 LY distant
- Deep Sky Objects:
 - Globular Star Cluster (M3):
 - One of the brightest in the sky, Mag 6.2
 - Approximately 33,900 LY distant
 - Spiral Galaxy (M51):
 - Whirlpool Galaxy: apparent mag of 8.4; 23M LY distant
 - Spiral Galaxy (M94):
 - Mag 8.99; 16M LY distant



Upcoming Events

- Date: June 18, 2017 at 7-9 p.m.
 - Shift from 4th Monday!!
 - Topic: Variable Stars or Double Stars
- Mars Opposition: July 27
- Perseid Meteor Shower: August 11-14
- Comet 46P/Wirtanen: December 2018

Comet 46P/Wirtanen

- Small short-period comet orbital period of 5.4 years
- Discovered on Jan 17, 1948, by the American astronomer Carl A. Wirtanen
- On 16 December 2018 the comet will pass within 7.2M miles of Earth
 - Estimated magnitude of 3 to 7.5
- Brightest predicted pass to date...and all future passes

