AMATEUR ASTRONOMY REAL SCIENCE

Bill Pellerin, HAS GuideStar Editor

GUIDESTAR

Shallow Sky Object of the Month

Adhara - Epsilon CMa

by Bill Pellerin, GuideStar Editor

Object: Adhara - (Epsilon CMa)
Class: Star
Magnitude: 1.5
R.A.: 6 h, 58 m, 38 s
Dec: -28 degrees, 58 minutes, 20 seconds
Distance: 431 ly
Constellation: Canis Major
Size: (see text)
Optics needed: Naked eye to see the star; telescope to see the companion star

Why this object is interesting.

When you look toward the constellation Canis Major (the big dog) your eye is captured by the dazzling light from Sirius, the brightest star in the night sky (see the December, 2008 *GuideStar)*. If you look down, toward the horizon, from Sirius the 22nd brightest star in the sky comes into view. This one is called Adhara or Epsilon CMa. Being the second brightest star in the constellation, it should be beta CMa, but the naming of the stars is somewhat quirky and it ended up being epsilon, a label that should be associated with the 5th brightest star in the constellation.

To find this star, look for the triangle of bright stars below Sirius. The one to the right (as you view this from Houston) is Adhara. The name, Adhara, means 'virgin' and the small triangle of stars was called 'the virgins'.

Is Adhara bright enough to be included with the group of 1st magnitude stars? Not according to Fred Schaff, (*The Brighteat Stars)* because the category of first magnitude stars includes those down to but not including those shining at magnitude 1.50. So, Adhara is generally considered to be the brightest of the 2nd magnitude stars, although others consider it a member of the 1st magnitude club.

You would think that the list of the brightest stars would be consistent everywhere you looked. Not so. Some of the bright stars are variable, so do you assume their brightness at the peak or at the minimum? What about multiple stars? Do you include the companion stars in determining the brightness of the star system? I am using Fred Schaff's list for this article, but not all lists agree.

In fact, Adhara is a high luminosity, class B (blue-white) star blazing away at 21,000 degrees Kelvin. It only looks dimmer on the sky than Sirius because it is so far away. If it were placed at the distance of Sirius it would shine at magnitude -7, much brighter than Sirius. Because Adhara is so hot it radiates a lot of energy in the ultraviolet. If you could see in the ultraviolet, Adhara would be the brightest star in the sky. This star falls into the "live fast and die young" category, and is believed to have completed most, if not all, of its hydrogen burning phase.

While you can see Adhara easily as a naked eye object, what you can not see is that Adhara is joined by a companion star shining at magnitude 7.5 or dimmer, depending on your source of information. It sits at about 7.5 arc-seconds from the primary star, but seeing the secondary star will be something of a challenge owing to the brightness difference from the primary. I have not tried this one yet, so I can't recommend a telescope / eyepiece combination to you as you attempt this observation.

You will want to wait for a night with very steady air to see the secondary star. Unfortunately from our latitude, Adhara only gets about 31 degrees above the southern horizon as it crosses the meridian.

- Shallow Sky Object of the Month
  - Bright objects in the sky can be very interesting
  - Don’t require large telescopes / dark skies / perfect conditions

INTRODUCTION

- Previous Presentation on Career in Amateur Astronomy
  - Available on HAS Web Site
  - Things to do as an amateur astronomer
    - Certificate chaser
    - Educator
    - Volunteer….
    - Etc.
  - This presentation focuses on contributions to science

SCIENTIST

- You can do real science as an amateur astronomer
  - Unique to this hobby
- You don't need expensive equipment to begin
- You do need dedication to the effort
- Find something that interests you

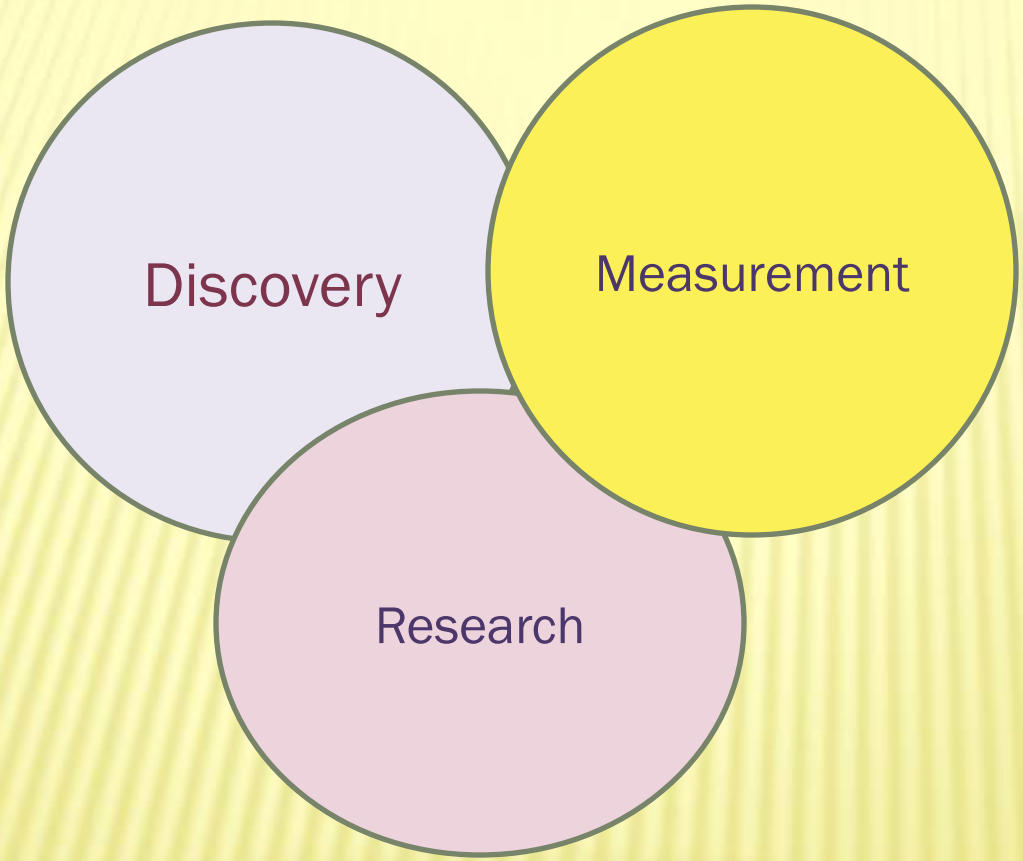
TECHNOLOGY

- The rate of change of technology available to the amateur is amazing!
  - Visual ► Film ► CCD ► better/cheaper CCD
  - Computer controlled telescopes – finding, guiding
- The learning curves on some of this new technology is steep
- Literature (books, articles) becomes obsolete quickly

CATEGORIES

- Discovery
- Measurement
- Research
- Organizing
- Educating

CATEGORY OVERLAP



DISCOVERY

- Discovery is about finding or identifying things.
- Discoveries can take a long time!
- Good opportunity for fame, not fortune.

DISCOVERY

- **Supernova Searches**
  - Reverend Robert Evans
    - Record for visual supernova finds (42 finds)
    - Diligence!!!
  - Competing with automated searches
    - Alex Filippenko (CA) 1000 Galaxies/night

Report to:

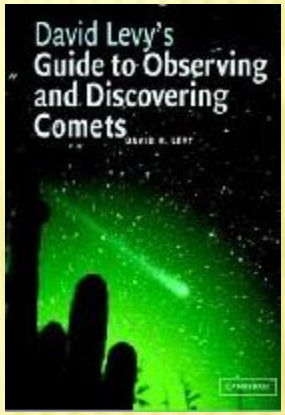
Central Bureau for Astronomical Telegrams
(International Astronomical Union)

DISCOVERY

- **Lunar Meteor Impacts**
  - ALPO (Association for Lunar & Planetary Observers)
  - Lunar Section – Meteoric Impact Search
    - Coordinator Brian Cudnik (11/18/1999 – observation)
    - http://www.pvamu.edu/Include/Physics/documents/lunimpacts.htm
      - Mailing list
      - Information on how to get started
      - Links to other sites.

DISCOVERY

- **Comet Hunting**
  - Why this is important
    - Get your name on a Comet
    - Early orbital parameters determination
  - Difficult
    - Competing with space telescopes
    - Opportunities limited – images w/comets
  - How to get involved
    - Learn from the 'masters' - David Levy
    - Get a big telescope in a dark place
    - Know where/how to look
    - CCD sky surveys!
  - Resources
    - David Levy's *Guide to Observing and Discovering Comets*



917 Hours to find first comet
Now: 22

DISCOVERY

- Asteroids
  - Why is this important
    - Improve orbital calculations
    - Determine rotation periods
    - Recover new asteroids
    - Earth impacts -- LOOK OUT!
  - How to get involved
    - Fort Bend Astronomy Club - A-Team

DISCOVERY

- **Extra-Solar Planets**
  - Using transit method
  - High precision photometry required (hundredths of a magnitude)
  - Should be considered very advanced work

MEASUREMENT

Words that end in …metry (taking the measure of)

Can be done visually

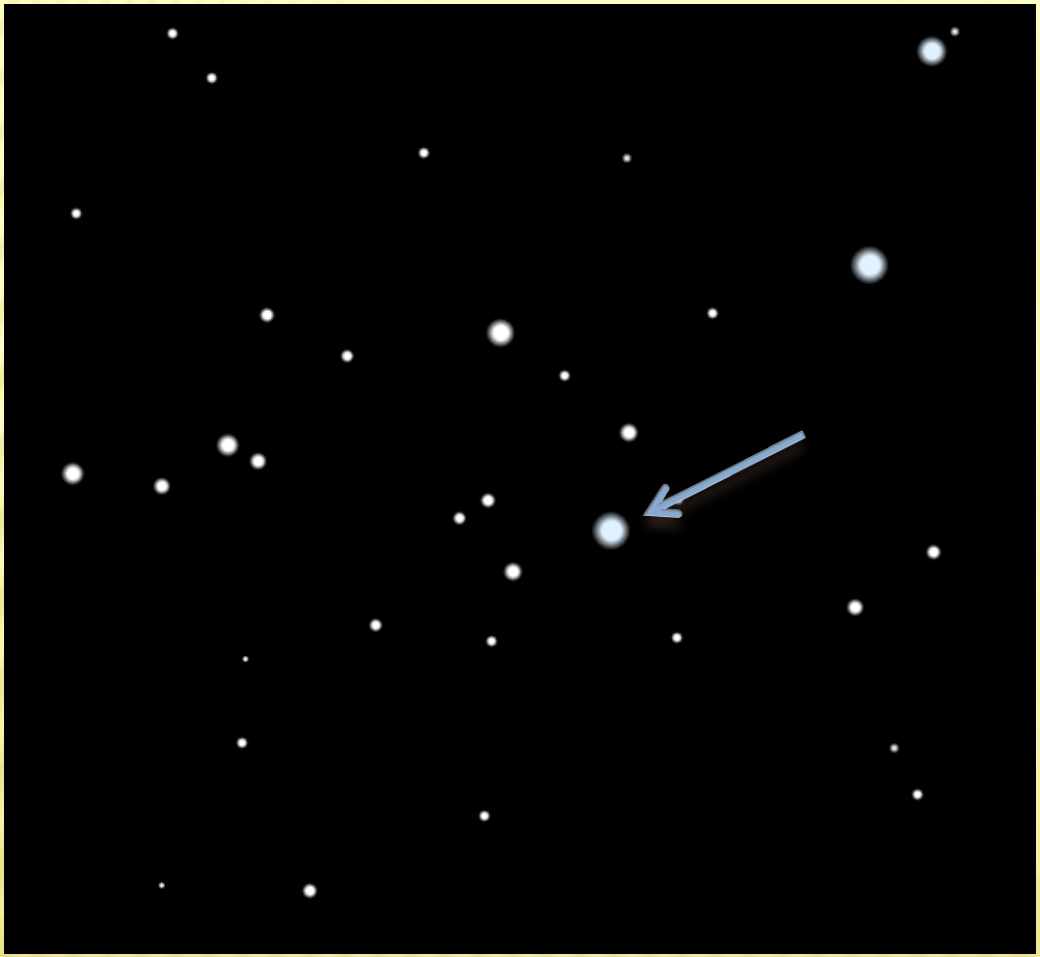
OCCULTATION/GRAZE TIMING

- What is this?
  - Occultation – Object moves in front of a star (usually)
  - Graze – Object edge causes star to flicker
- Why this is important
  - Measure the size of objects (asteroids)
  - Measure the shape of objects
  - Measure the position of objects
  - Edge features (moon especially)
- Resources
  - ALPO - Assn of Lunar and Planetary Observers (alpo-astronomy.org)
  - www.lunar-occultations.com/iota International Occultation Timing Association
  - Richard Nugent - HAS

PHOTOMETRY

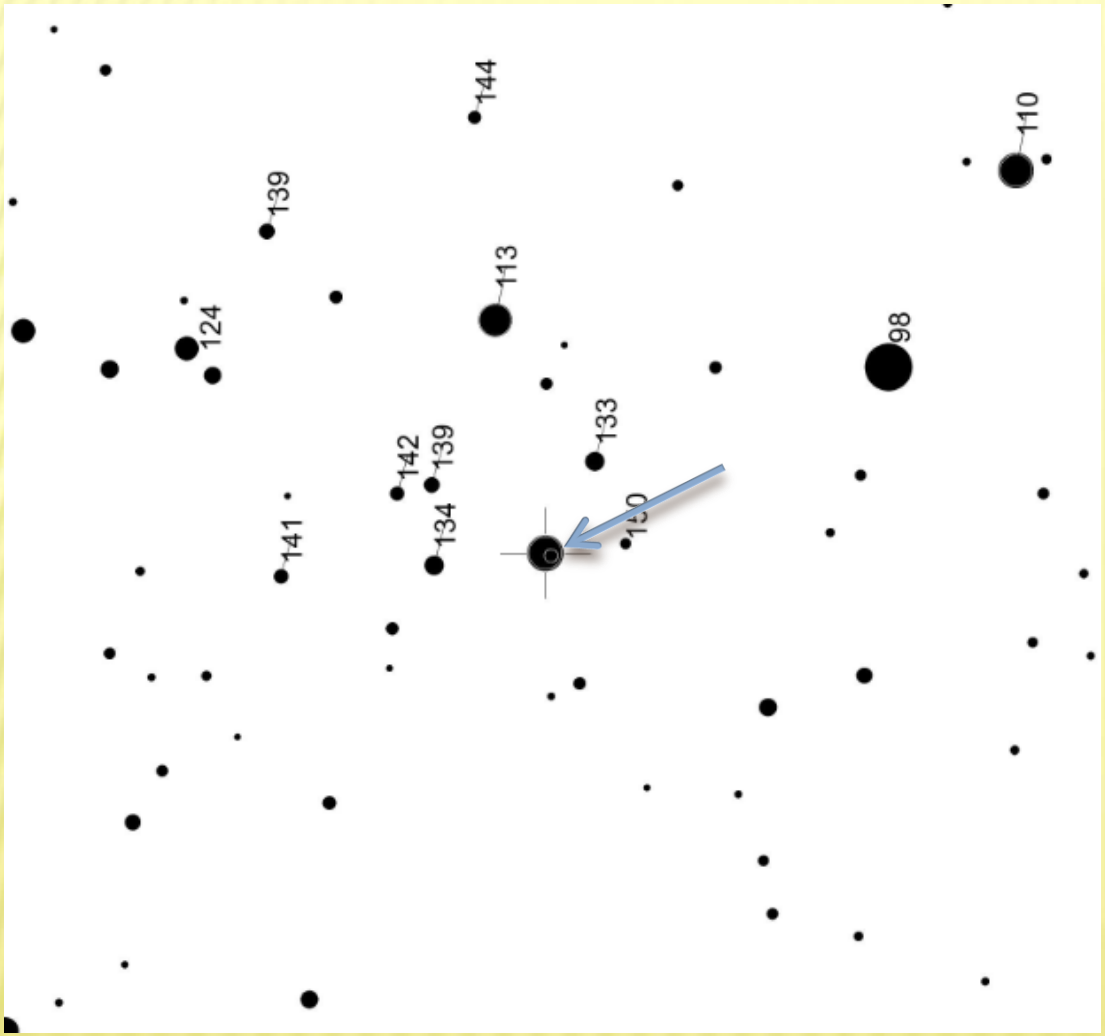
- What is photometry?
  - Measuring the brightness of the object
  - Can be visual or CCD
- Asteroid Light Curves
  - Measure rotational period of asteroid
- Variable Stars
  - Define the light curve of the star – stellar evolution
  - Data is compiled and made available to professional astronomers
  - AAVSO.org (American Assn of Variable Star Observers)

W HER – THESKY



This is from TheSky
Shows position of W HER
Cataloged as
GCVS W HER

W HER – AAVSO CHART



This is a portion of a chart from the AAVSO showing the magnitude of the ‘fixed’ stars.

W HER - IMAGE

This is an image using a CCD camera with ‘V’ filter
W HER at arrow
Determined magnitude to be = 11.2

COUNTING

- **Meteor shower counts**
  - Why is this important
    - Understand cometary debris
    - Could see a meteor STORM!
  - How to get involved
    - Visual
    - Radio
  - Resources
    - "The Sky is Your Laboratory"
    - American Meteor Society
    - International Meteor Organization

ASTROMETRY

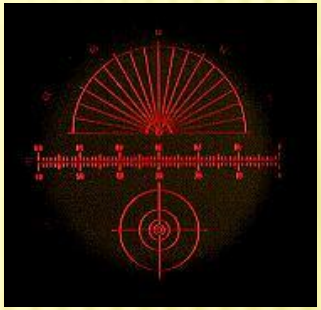
- **What is astrometry?**
  - Position
    - Absolute
    - Relative
- **High proper motion stars**
  - Stars that move on the sky
  - Identifies close-by stars
  - Provides information on the positions of stars
- **Asteroids and Comets**
  - Define orbits

ASTROMETRY

- **Double Stars**
  - Measure separation and position angle
  - Resources
    - US Naval Observatory – Washington Double Star Catalog
      - WWW.USNO.NAVY.MIL
    - Journal of Double Star Observations
      - WWW.JDSO.ORG
    - Book – *Observing and Measuring Visual Double Stars* -- Bob Argyle

ASTROMETRY – DOUBLE STARS

- Tools
  - Visual
    - Filar Micrometer
    - Reticle eyepiece
  - CCD and software



SPECTROSCOPY

- Expensive, Very Expensive
- What is this?
  - Between telescope and camera
  - Splits the components (colors) of the light
  - Learn temperatures of stars (from color)

[A] = H-beta line 4861.3 A [B] = Mg line 5167.3 & 5172.7 [C] = Hg emission line 5460.7 A from reference source

RESEARCHER

- Desktop
  - SETI at Home
  - Stardust at Home
- Lots of data on the Internet
  - Data mining - comets
  - Remote telescopes (lightbuckets.com)
- Never need to leave home

EDUCATOR

- Public star parties
- Astronomy Day

ORGANIZER

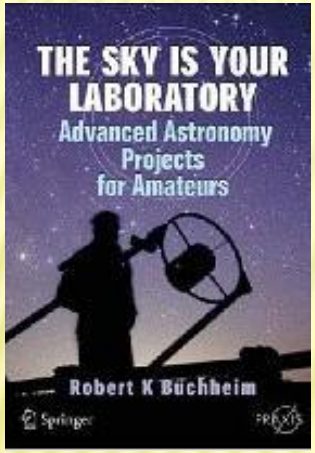
- International Dark Sky Assocation
- Astronomical League
- Many more

FUTURE

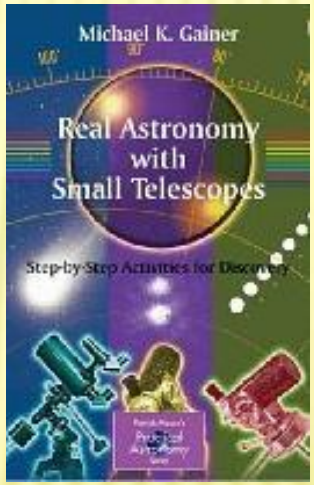
- Automation (for amateurs)
  - Supernova searches
  - Variable stars
  - New objects (compares to internal star maps)
- Remote control
  - Already seeing this (lightbuckets.com)
  - Your own remote control observatory

BOOKS

- The Sky is Your Laboratory

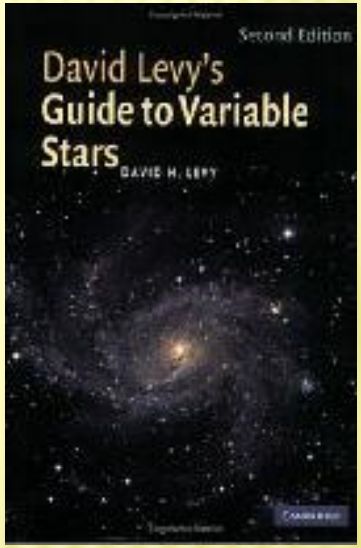


- Real Astronomy With Small Telescopes



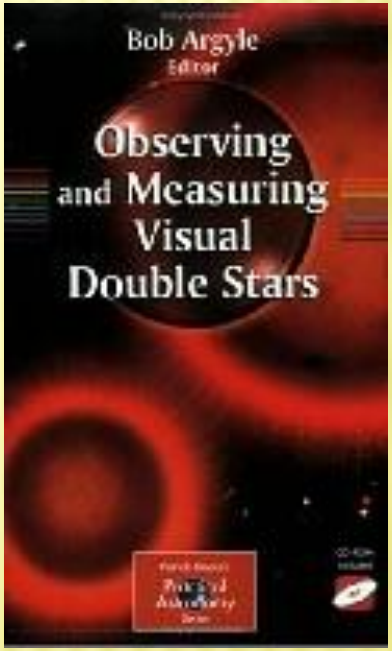
BOOKS

- David Levy's Guide to Variable Stars



BOOKS

- Observing and Measuring Visual Double Stars



This presentation will be online at:

WWW.ASTRONOMYHOUSTON.ORG