



SHENANDOAH ASTRONOMICAL SOCIETY

March 2009

Program for March 11

7:00 PM at LFCC

Room 160

Presentation by John Hershey

The operation of the Hubble fine guidance system for telescope guidance and astrometric research.

There are three fine guidance units on the Hubble Space Telescope whose purpose is to lock onto guide stars and hold the pointing of the telescope steady at a level of 3 milli-arc-seconds while cameras or other instruments do their observing. Diagrams and graphs will show in a general way the optics and operation of these units. Some examples of dealing with problems in a spacecraft in orbit will be given. The FGS units are very powerful astrometric instruments and their use for parallax, double star and other research efforts will be illustrated. I worked in a peripheral way with these units during 12 years at the Space Telescope Science Institute (STScI) at Johns Hopkins University in Baltimore before retirement 8 years ago.

Astronomy Celebrated

The International Astronomical Union has designated 2009 as the International Year of Astronomy celebrating the 400 years of telescopic observation. Galileo Galilei started it with his home-made telescope in December 1609. Also, in 1609 Johannes Kepler published the first two laws of planetary motion. Great!!!

Astronomy Musings

What is the greatest distance any object can be seen without optical aid? The usual answer is nearly three million light years or about seventeen billion billion miles. That is the distance to the Andromeda Galaxy according to the latest estimates. It would require over nineteen thousand billion years to get there at one hundred miles per hour. Quite a ways, for sure!

The Observer's Handbook 2000 edited by Roy Bishop refers to the quasar, 3C 273, as the most distant object that can be seen in a small telescope (page 276). The stated distance is between two and three billion light years and the magnitude is given as 12-13.

So 3C 273 is possibly 1,000 times as far away as the Andromeda Galaxy. The estimated power output is on the order of that of a million billion suns or several hundred ordinary galaxies

What magnitude can we reach with our telescopes? This depends on atmospheric conditions and light pollution. However, we can calculate a fair estimate. The usual convention used in determining the light gathering power of a scope is to compare the aperture to the human eye. The ratio of aperture to the size of the pupil, taken as 7 millimeters, is computed and squared. The result may be casually considered as "that many eyes."

Using a scope of 8 inches, 203.2 mm, dividing by 7 and squaring, the result is 842. This is the number given by Celestron as the light gathering power of the 8 inch SCT. A little more calculator work and we can compute the approximate visual magnitude limit. Take the logarithm (base 10), multiply by 2.5 obtaining 7.3 which you then add to the unaided eye limit.

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IN THE SKY

Let us say that the dimmest star you can see has a magnitude of 5. Adding this to 7.3 gives 12.3 which is an approximate magnitude limit for observing conditions on that night at that locality (8 inch scope). Now assume ideal conditions when good eyes can see 6.5 magnitude stars . Adding 6.5 and 7.3 gives 13.8 or about 14 for the limit. This is the limit usually given for a scope of 8 inch aperture.

Here is a formula. $VL = U + 5 \times \log(D/7)$. VL is the visual limit with a scope of aperture D millimeters when the unaided limit is U.

According to my musings at the December meeting, A scope of aperture 25 inches is about like 8,000 human eyes but believe it or not, the limiting magnitude for that size telescope is only about 16.3 in a dark sky. We would hope that going to that size telescope would let us go deeper. Note that tripling the Aperture from 8 to over 24 only raises the limiting magnitude a little over 2 magnitudes.

Quasar 3C273 is in the constellation of Virgo and will be visible again this spring. So some amateurs may want to try for it.

- *Jim Adkins*

Thanks to Alan Moeck

Our new SAS web site is at
<http://shenandoahastronomical.org/>



Trapezium in the famous Orion Nebula

The Constellation of Orion and all its wonders are still up there for observing if it would only warm up a bit.

Saturn is in the constellation of Leo the Lion and can be seen before very late in the evening and will be coming up earlier soon.
