Monthly Notices of the Everglades Astronomical Society

Naples, FL
July 2013

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President's Message

Since most of our members have left for the summer, our meetings during July and September are informal in nature. As I like to say, we sit around and complain about the clouds. In reality, our summer meetings are rather important for determining the course our club will take during the coming year. For example, the summer is when our presentation schedule is roughed out.

This year we will meet at Blueberries, on the North Trail; please see the accompanying map. Come join us!

Clear Skies,
President
Mike Usher

Dates for the "Fak"

Usually the best times to go out to the Fakahatchee Strand viewing site are moonless nights. Below is a list of upcoming Saturday nights that you will often find fellow club members out there enjoying the skies with you (weather permitting).

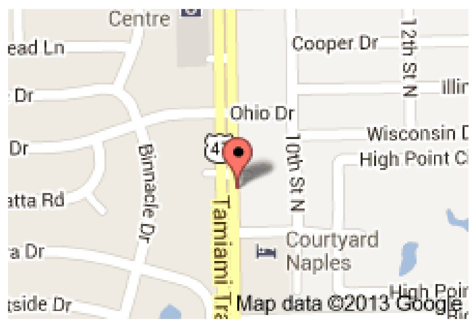
Date	Moonrise	Moonset
July 6	4:21 a.m.	6:09 p.m.
July 27	10:45 p.m.	10:51 a.m.

Sky Events

July 8 - New moon
July 15 - First quarter
July 22 - Full moon
July 28 - South Delta Aquarids meteor shower
July 29 - Last quarter

Next Meeting

July 9, 2013
Time 7:00 – 9:00 pm
At Blueberries, 3350 Tamiami Trail North



Measuring Stellar Distances - Spectroscopic parallax

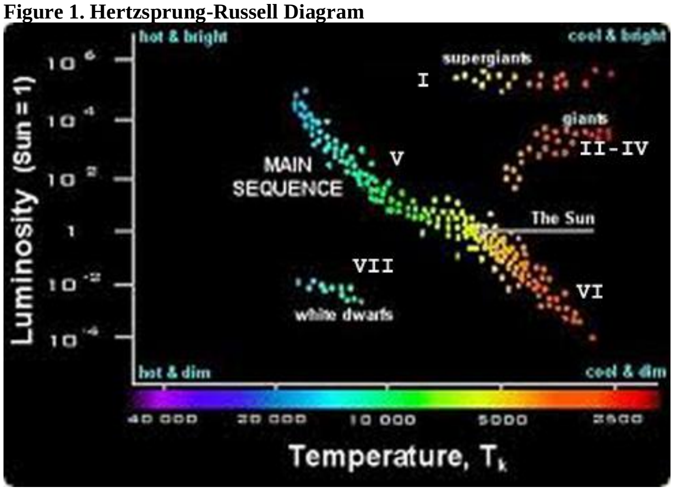
By Dennis Albright

Determining the distance to any star is quite difficult because they are so far away. Their distances are measured in light years (ly), the distance that light can travel in one year. Although, the nearest star is over 4 light years away, most of the stars we see at night are hundreds if not thousands of light years away. For example, Betelguese, one of the brightest stars in the northern night sky, is 643 light years away.

One of the methods used to obtain the distance to a star is to use standard candles. That is, if we know how bright the candle is at a standard distance, its absolute brightness, we can then determine its distance from how bright it appears to us.

Spectroscopic parallax uses this idea. If the astronomer has a spectroscope, the temperature of the star from the number and intensity of the spectral lines can be determined. From the shape of the spectral lines, the luminosity class of the star can also be easily determined. From these two quantities the astronomer can determine the luminosity of the star from a Hertzsprung-Russell diagram, like the one shown below. In this figure, the Roman numerals indicate the luminosity classes. Once the luminosity has been obtained it is compared to the apparent luminosity of the star to determine the distance to the star.

Figure 1. Hertzsprung-Russell Diagram



The STARSDAW code is a computer code based on Wikipedia data that accurately models properties of the stars. I used the STARSDAW code with spectroscopic parallax to calculate the stellar properties of nearly 400 stars. The accuracy of this code in determining the stellar distances, d_s, is amply demonstrated in Table 1 and Figures 2 through 4. In these figures the measured stellar distance, d_{SM}, is the x-axis and the calculated stellar distance, d_{SC}, is the y-axis. Several points lie directly on the agreement which indicates almost perfect agreement between the calculated results and the measured data. These figures show very good qualitative agreement between the stellar distances calculated using spectroscopic parallax and the measured stellar distances with almost all of the points in these figures on or near the agreement line.

The mean error for the stellar distances of all of the stars obtained using spectroscopic parallax, ε_{dsTot}, is 20.90%, which is a good approximation for this type of determination. For example, in the 1970's and early the 1980's, until the Hubble telescope was launched, the many measurements gave stellar distances that were accurate to between 25% and 50%.

If there is relatively little interstellar absorption or the interstellar absorption can be reasonably accurately quantified and the star has a reasonably well-defined luminosity class, spectral class and visual magnitude, a calculation by the STARSDAW code using spectroscopic parallax can give a fairly accurate value for the stellar distance.

Table 1. Comparison of Results for the Stellar Distances

Luminosity Classes	Description	N_{SPdS}	ε_{dsj}(%)
I	Hyper/Super Giants	34	20.20
II	Bright Giants	11	22.14
III	Giants	52	22.49
IV	Sub Giants	40	31.57
II-IV	All Giants	103	25.94
V	Main Sequence Dwarfs	143	15.84
VI	Cool Sub Dwarfs	4	1.80
VI	Red Dwarfs	72	24.64
VI	Brown Dwarfs	5	1.39
V-VI	All Main Sequence Dwarfs	224	18.04
VII	White Dwarfs	23	28.83
I-VII	All Stars	384	20.90

Figure 2. Comparison of Results for the Stellar Distance, d_s, for Luminosity Class I – Super Giants

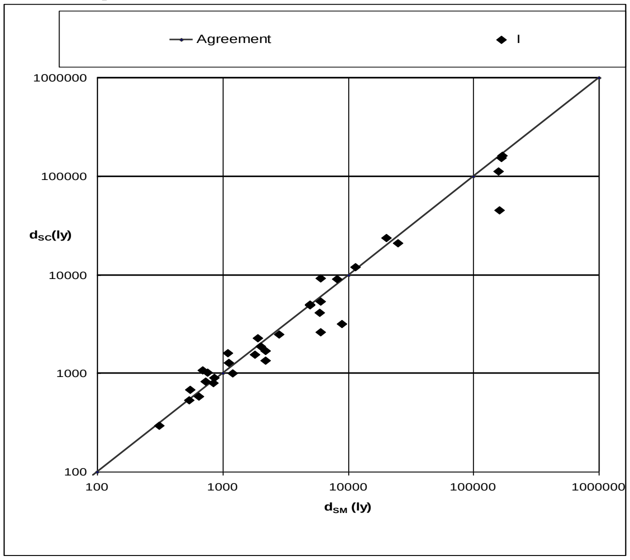


Figure 3. Comparison of Results for the Stellar Distance, d_s, for Luminosity Classes II – IV - Giants

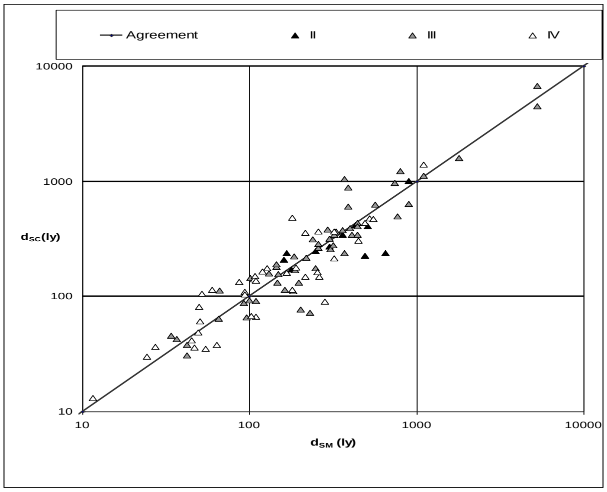
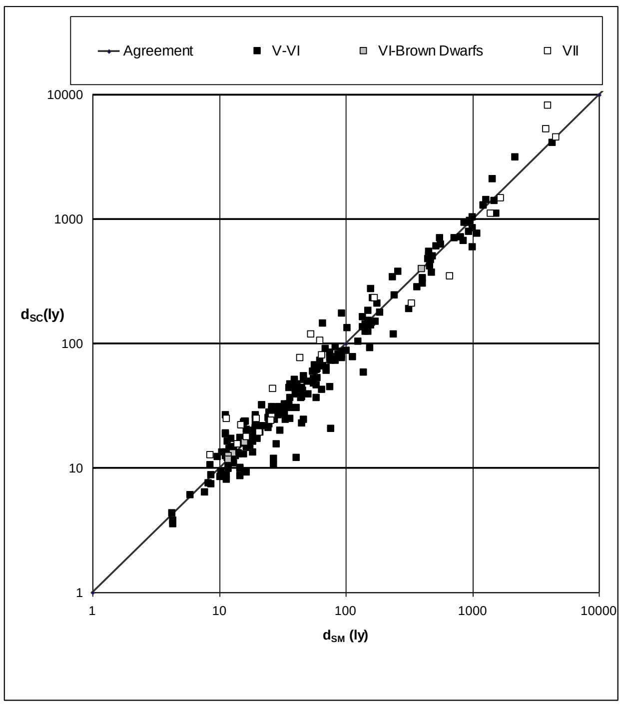


Figure 4. Comparison of Results for the Stellar Distance, d_s, for Luminosity Classes V – VII - Dwarfs



NASA Space Place

High-energy Spy

By Dr. Martin C. Weisskopf

The idea for the Chandra X-Ray Observatory was born only one year after Riccardo Giacconi discovered the first celestial X-ray source other than the Sun. In 1962, he used a sounding rocket to place the experiment above the atmosphere for a few minutes. The sounding rocket was necessary because the atmosphere blocks X-rays. If you want to look at X-ray emissions from objects like stars, galaxies, and clusters of galaxies, your instrument must get above the atmosphere.

Giacconi's idea was to launch a large diameter (about 1 meter) telescope to bring X-rays to a focus. He wanted to investigate the hazy glow of X-rays that could be seen from all directions throughout the sounding rocket flight. He wanted to find out whether this glow was, in fact, made up of many point-like objects. That is, was the glow actually from millions of X-ray sources in the Universe. Except for the brightest sources from nearby neighbors, the rocket instrument could not distinguish objects within the glow.

Giacconi's vision and the promise and importance of X-ray astronomy was borne out by many sounding rocket flights and, later satellite experiments, all of which provided years-, as opposed to minutes-, worth of data.

By 1980, we knew that X-ray sources exist within all classes of astronomical objects. In many cases, this discovery was completely unexpected. For example, that first source turned out to be a very small star in a binary system with a more normal star. The vast amount of energy needed to produce the X-rays was provided by gravity, which, because of the small star's mass (about equal to the Sun's) and compactness (about 10 km in diameter) would accelerate particles transferred from the normal star to X-ray emitting energies. In 1962, who knew such compact stars (in this case a neutron star) even existed, much less this energy transfer mechanism?

X-ray astronomy grew in importance to the fields of astronomy and astrophysics. The National Academy of Sciences, as part of its "Decadal Survey" released in 1981, recommended as its number one priority for large missions an X-ray observatory along the lines that Giacconi outlined in 1963. This observatory was eventually realized as the Chandra X-Ray Observatory, which launched in 1999.

Composite image of DEM L50, a so-called superbubble found in the Large Magellanic Cloud. X-ray data from Chandra is pink, while optical data is red, green, and blue. Superbubbles are created by winds from massive stars and the shock waves produced when the stars explode as supernovas.

The Chandra Project is built around a high-resolution X-ray telescope capable of sharply focusing X-rays onto two different X-ray-sensitive cameras. The focusing ability is of the caliber such that one could resolve an X-ray emitting dime at a distance of about 5 kilometers!

The building of this major scientific observatory has many stories.

Learn more about Chandra at www.science.nasa.gov/missions/chandra. Take kids on a "Trip to the Land of the Magic Windows" and see the universe in X-rays and other invisible wavelengths of light at spaceplace.nasa.gov/magic-windows.

Dr. Weisskopf is project scientist for NASA's Chandra X-ray Observatory. This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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Items For Sale or Trade or Wanted:
http://www.naples.net/clubs/eas/equipment_sales.html

Useful links (software, telescope making, telescope and equipment suppliers, astronomical data sources, iPhone and iPad Apps and more):
http://www.naples.net/clubs/eas/links.html

EAS 2013 DUES

For the bargain price of only $20.00 per family, all this can be yours this year:

- Meet with your fellow astronomy enthusiasts at least 10 times a year;
- Learn about astronomy and telescopes. Check out our club scope;
- Many opportunities to view planets, nebulae and other celestial objects (even if you don't have your own telescope); and
- Enjoy the many astronomy programs at our regular monthly meetings.

Don't miss out! Fill out this form (please print clearly) and send it with your $20 check to the Everglades Astronomical Society, P. O. Box 1868, Marco Island, Florida, 34146.

Name: ______________________________

Address: ______________________________

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Phone: ______________________________

Email: ______________________________