nightwatch

Newsletter of the Pomona Valley Amateur Astronomers

I am not young enough to know everything
Oscar Wilde

VIRTUAL CLUB EVENTS SEE WEBSITE FOR DETAILS

Volume 41 Number 10 ***nightwatch*** **October 2021**

PVAA General Meeting 9/17/21

We had another Virtual Zoom Meeting on Friday, September 17, 2021. Before the main presentation Gary Thompson gave an update on the then occurring Inspiration4 mission. Several firsts and records were recorded for that mission. The mission lasted for just less than 1 hour short of 3 days and orbited the earth 45 times.

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- It was the highest flight this century (585 km before going to 575 km orbit. The ISS is at 408 km high)
- It launched the largest window into space – the cupola. 1st Crew Dragon with a cupola
- The youngest American – Hayley Arceneaux at 29. (The 2nd Soviet to orbit the earth was Gherman Titov who was 25 years old at the time)
- 1st fully private crewed orbital mission, ever
- 1st time 3 Dragons in orbit at once
- Fastest turnaround time of a Dragon at 136.7 days (versus 227.2-day previous record)
- 1st landing of the Dragon in the Atlantic Ocean
- 1st Black female pilot of a spacecraft

Our speaker for the evening was Dr. Brian Carter from Pasadena City College and Mt San Antonio College. His topic for the evening was "The Three Body Problem and its Friends." Brian got into Newton's and Kepler's Laws, but for this presentation, kept out of general relativity. While 3 (or more) body problems are difficult, there are "closed form solutions" for specific cases of the 3-body problem. These were found by Leonhard Euler (L_1, L_2, & L_3) and a few years later by Joseph-Louis Lagrange (L_4 & L_5). These have been named the Lagrange Points. These points only work if the orbits are circular - or nearly so, the 3rd mass is negligible – the ratio of the mass of the larger object is at least 25 times the second object, and the 2nd is 25 times that of the 3rd. (Sun/Earth/Spacecraft) Normally for an object in orbit around the Sun that is closer to the Sun than the Earth, you would expect its orbit to be less than a year. But, if it is exactly in-line with the Earth, it is at the L_1 point, and Earth's gravity cancels out the Sun's to an equilibrium, it also orbits the Sun in one year. The L_2 point is exactly in-line with Earth, but farther away, and "adds" to the Sun's mass, and it too orbits in one year. The L_4 and L_5 points are in Earth's orbit and are like points on an equilateral triangle.

Dr. Carter then got into centrifugal and centripetal force, using a cartoon as an example. Then he brought in the effect for the Coriolis Force. This force is what helps object stay in the L_4 & L_5 positions in front of and behind the Earth. He used a plastic 'saddle' to show how this worked.

We then got a little off topic and talked about cyclers and gravity assists before getting back to centripetal forces and the frame of reference when looking at them. He had a couple of short videos showing what a ball does when it goes down a ramp that is on a spinning table. From the ramp's point of view, it looks like the ball goes off to the side, while to a stationary point above the table, the ball goes straight.

Scott Manley did a talk on the Lagrange Points that came out after Dr. Carter's presentation. You can see it here: https://www.youtube.com/watch?v=7PHvDj4TDfM

Gary Thompson

By Inspiration4 Assets

Right to left: Christopher Sembroski, Sian Proctor, Jared Isaacman, Hayley Arceneaux
By Inspiration4 Assets, Fair use, https://en.wikipedia.org/w/index.php?curid=67783410

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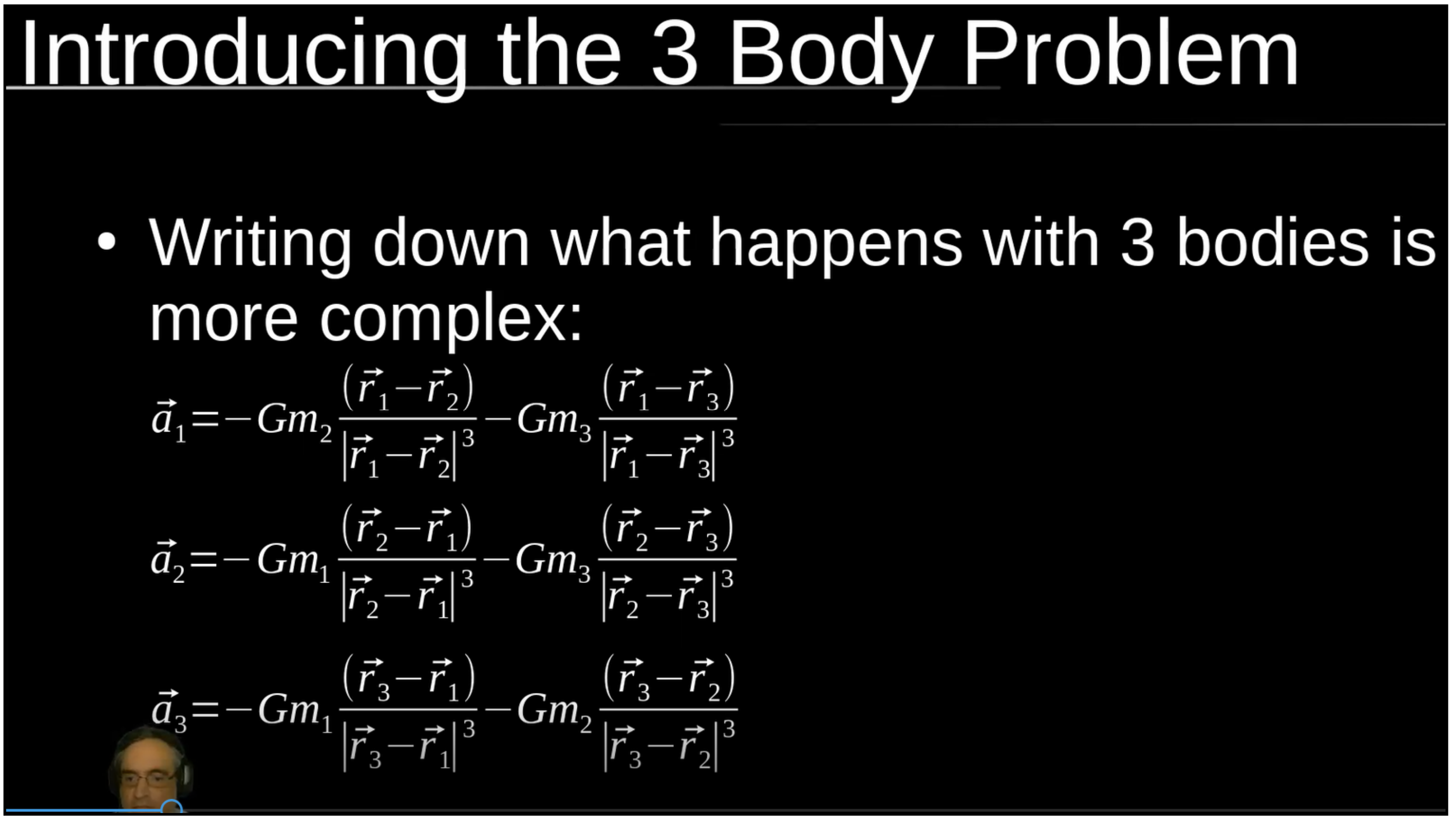
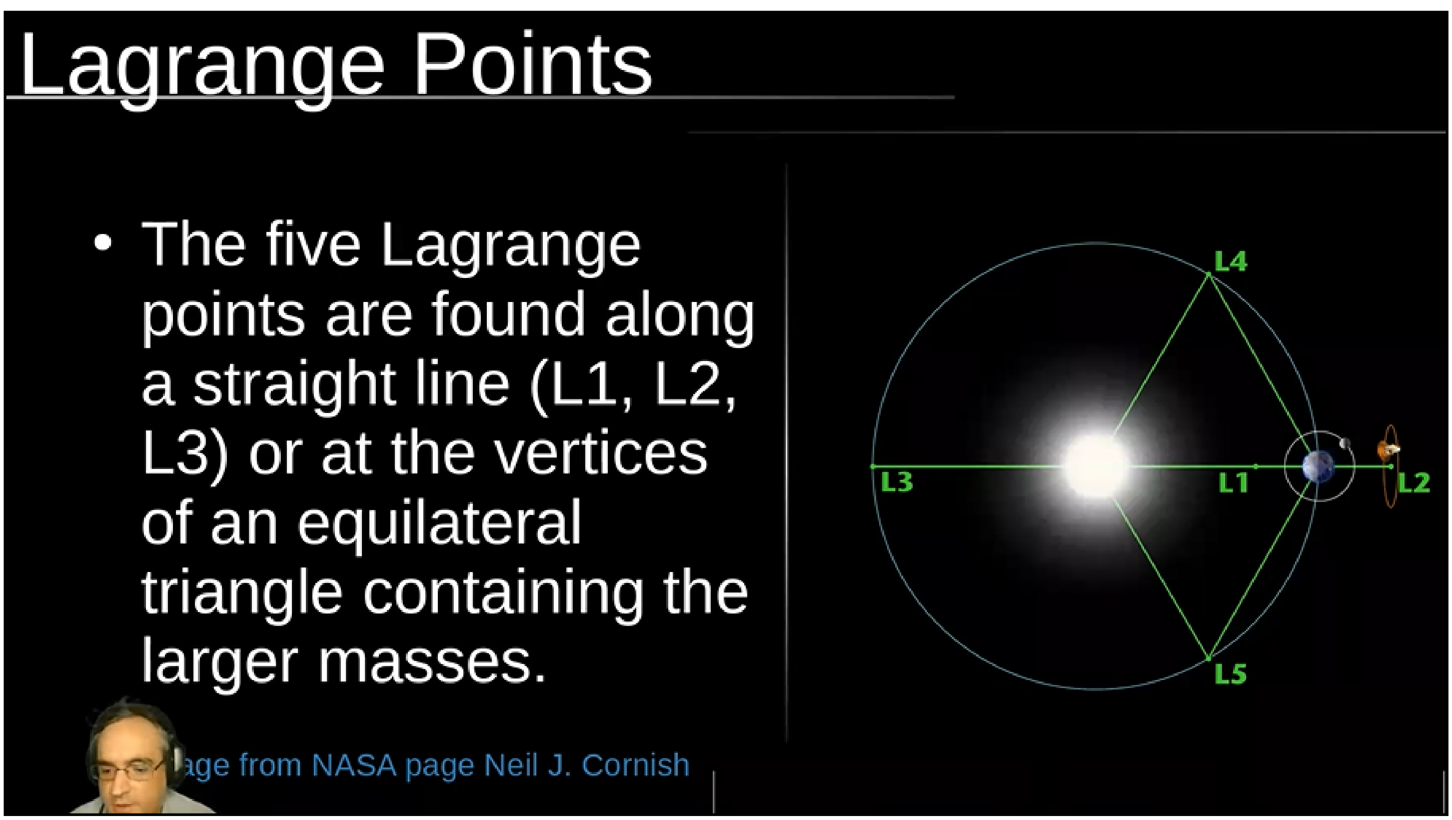
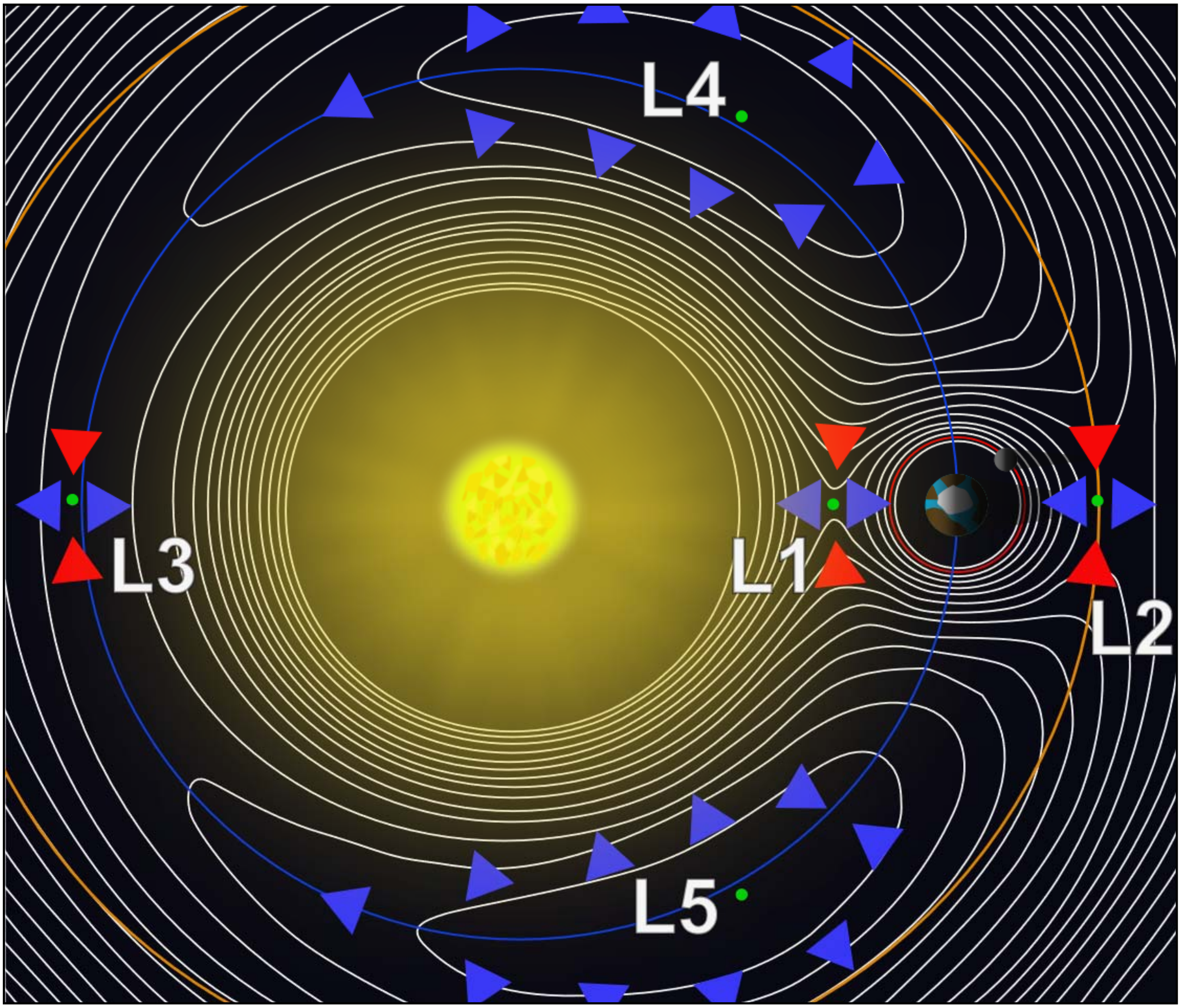


The math starts to get complex when you have 3 of more objects.





By Lagrange_points.jpg: created by NASAderivative work: Xander89 (talk) - Lagrange_points.jpg, CC BY 3.0,

Club Events Calendar

Oct 22 **General Meeting – Tim Thompson**
“James Webb Space Telescope”

Nov 6 **Star Party – GMARS**
Nov 10 **Board Meeting**
Nov 19 **General Meeting (presentation: TBD)**

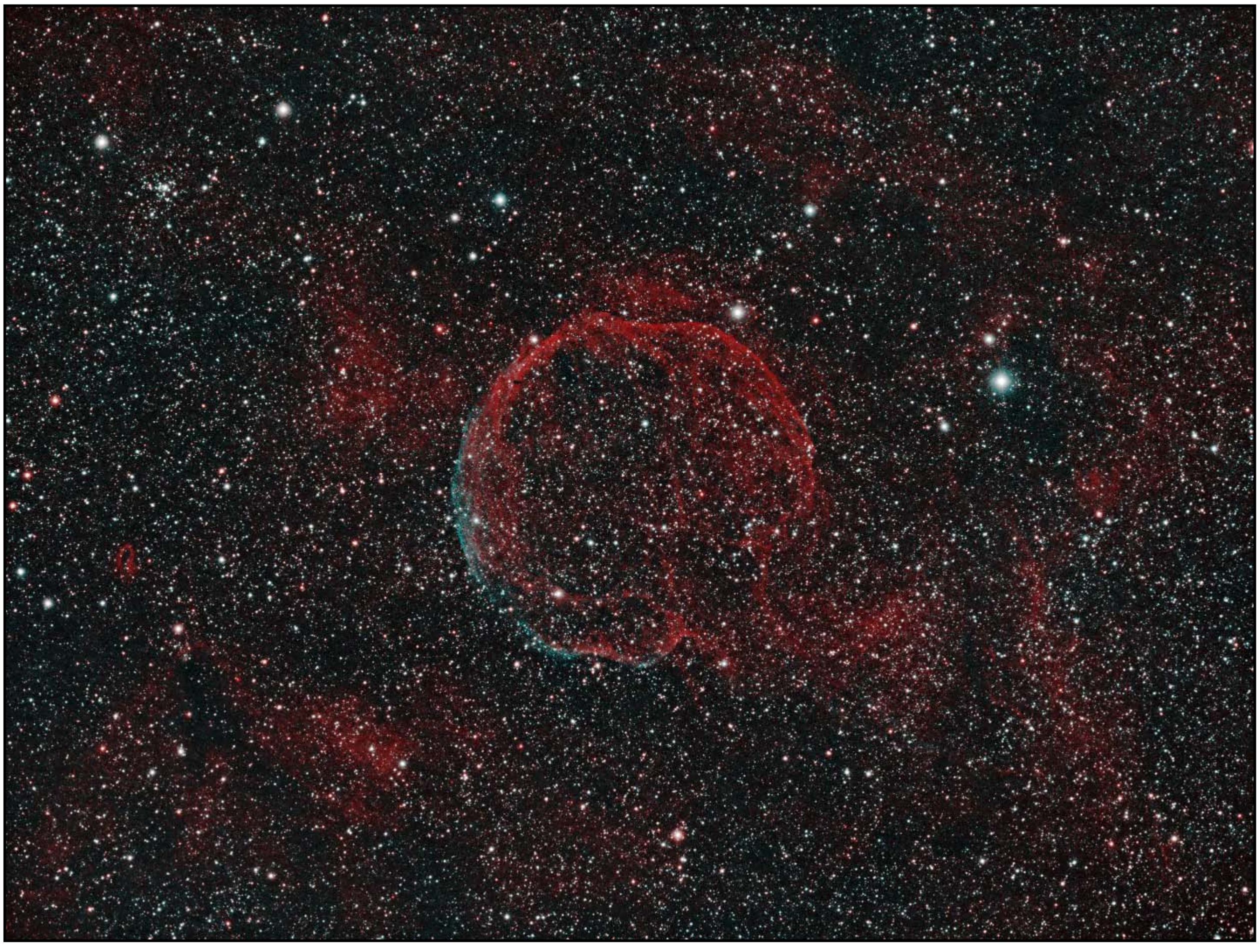
Dec 11 **Christmas Party**

Abell 85

We went camping October 8-10, the weekend right after the new moon this month. The campground reopened after being closed last month due to the high fire danger. Unfortunately, Friday night was completely cloudy. Apparently too many people bought new equipment, which all astronomers know, causes clouds! Saturday night was very clear and so I was able to capture some data. Because I could only get one night under dark skies, I contemplated shooting a star cluster, but at the last minute, I settled on my original target figuring I could take some data from home in narrowband.

The target for the month was Abell 85, or CTB 1, a supernova remnant in Cassiopeia. Abell 85 was initially believed to be a planetary nebula, formed by an expanding star puffing of layers of gas in its dying phase, but was later determined to actually be the result of a supernova. While not common names, I've also seen Abell 85 called the Popped Balloon nebula and the Garlic nebula. The nebula is thought to be just under 10,000 light years away, spans about 90 light years, and about 10,000 years old. At that distance and size, the nebula occupies an area about the size of the moon and is extremely faint. Even taking 10-minute exposures, I could only barely tell it was there in the H-alpha frames and couldn't see it at all in the O-III frames.

What a tough target Abell 85 is! I managed 7 hours of OIII data the night of October 9 at the dark site. I could only barely see the target, granted there is only a thin sliver in OIII. It wasn't until I combined the 5 hours of H-alpha data taken at home the following night that I discovered just how bad the seeing was the first night. The OIII stars were nearly double the size of the H-alpha stars, resulting in blue-green halos around all the stars when all the data was combined. I had no choice but to reshoot OIII from home.



The final image is an HOO picture using 12 hours of H-alpha frames (72 frames of 10 minutes each) over two nights and 14 hours of OIII frames (84 frames of 10 minutes each) over two nights. The H-alpha and OIII frames were combined separately, initially stretched, and some noise reduction was applied before combining into the color image. I tried to remove the stars and process the nebula separately, but the result was not to my liking, having a very mottled background. Through careful stretching in Photoshop, I was able to keep the stars from becoming overwhelming while pulling out the nebula from the background but the stars were still too bright and numerous for my taste, so I had to resort to reducing the star size, something I normally don't like to do. I believe this is about the best I can do with this data. The target really does demand a lot of data from a dark site to do it justice, nevertheless, I hope you enjoy my effort.

Until next month . . .

Ron Ugolick

https://www.astrobin.com/users/ruccdu/

NASA Night Sky Notes November 2021

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Measure the Night Sky

David Prosper

Fall and winter months bring longer nights, and with these earlier evenings, even the youngest astronomers can get stargazing. One of the handiest things you can teach a new astronomer is how to measure the sky – and if you haven't yet learned yourself, it's easier than you think!

Astronomers measure the sky using degrees, minutes, and seconds as units. These may sound more like terms for measuring time - and that's a good catch! – but today we are focused on measuring ***angular distance***. **Degrees** are largest, and are each made up of 60 **minutes**, and each minute is made up of 60 **seconds**. To start, go outside and imagine yourself in the center of a massive sphere, with yourself at the center, extending out to the stars: appropriately enough, this is called the **celestial sphere**. A circle contains 360 degrees, so if you have a good view of the horizon all around you, you can slowly spin around exactly once to see what 360 degrees looks like, since you are in effect drawing a circle from inside out, with yourself at the center! Now break up that circle into quarters, starting from due North; each quarter measures 90 degrees, equal to the distance between each cardinal direction! It measures 90 degrees between due North and due East, and a full 180 degrees along the horizon between due North and due South. Now, switch from a horizontal circle to a vertical one, extending above and below your head. Look straight above your head: this point is called the *zenith*, the highest point in the sky. Now look down toward the horizon; it measures 90 degrees from the zenith to the horizon. You now have some basic measurements for your sky.

Use a combination of your fingers held at arm's length, along with notable objects in the night sky, to make smaller measurements. A full Moon measures about half a degree in width - or 1/2 of your pinky finger, since each pinky measures 1 degree. The three stars of Orion's Belt create a line about 3 degrees long. The famed "Dig Dipper" asterism is a great reference for Northern Hemisphere observers, since it's circumpolar and visible all night for many. The Dipper's "Pointer Stars," Dubhe and Merak, have 5.5 degrees between them - roughly three middle fingers wide. The entire asterism stretches 25 degrees from Dubhe to Alkaid - roughly the space between your outstretched thumb and pinky. On the other end of the scale, can you split Mizar and Alcor? They are separated by 12 *arc minutes* - about 1/5 the width of your pinky.

Keep practicing to build advanced star-hopping skills. How far away is Polaris from the pointer stars of the Big Dipper? Between Spica and Arcturus? Missions like Gaia and Hipparcos measure tiny differences in the angular distance between stars, at an extremely fine level. Precise measurement of the heavens is known as ***astrometry***. Discover more about how we measure the universe, and the missions that do so, at nasa.gov.

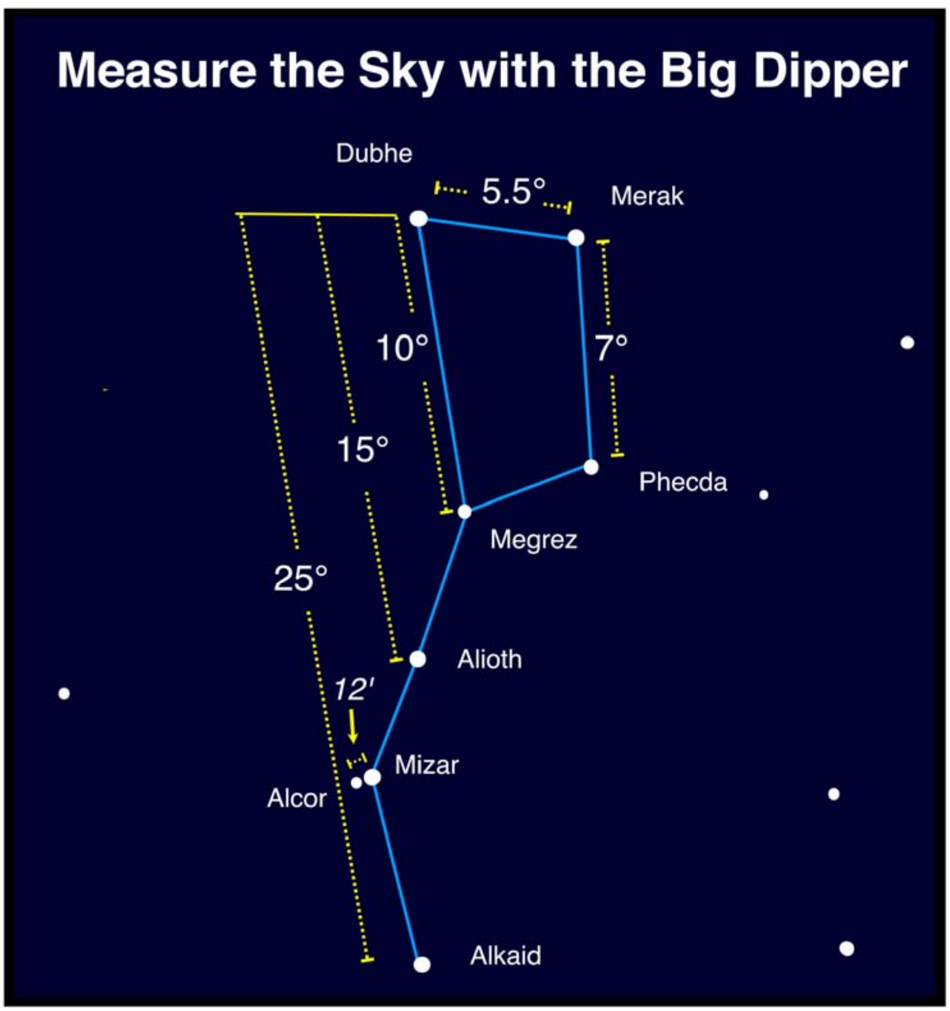


Image created with assistance from Stellarium