Astronomy viewing night transcript

Occultation of Venus. Taken at Tolga. 9-10-15 at 4.00 AM.

I am Richard Hole and am an astronomy enthusiast. I am trying to get a group interested in astronomy viewing nights. I also have a telescope and monoculars that people can look through. Please see me at the end for more information and a paper I can give you on not only that but other groups and projects that will benefit many people.

When using these lasers it is important to lock them off after use and to remain aware of any aircraft so that you do not point near them. However, there is no danger or concern for aircraft from someone using a laser while they are flying overhead if the laser is pointed a few degrees away from the aircraft because the light beam is very narrow. Also, I do not like pointing any lower than an elevation of about 15 degrees.

One degree spans a distance of 1cm at a distance of 57cm or about 2 feet from your eye. It is almost in proportion for small angles. Therefore, 15 degrees spans about 15cm at a distance of 57cm from your eye. Also it is good to work out how many degrees your hand span is at arms length. Mine is about 17 and you can calculate yours from trigonometry.

It is very important to know where the celestial north and south poles are so you can work out where objects are in the sky and learn what they are. Also this helps us to work out where they appear to move. You can use these poles to tell the time either day or night. The celestial south pole is directly above the earth's south pole. If you were at the earth's south pole it would be vertically above you. It is at an arbitrary and infinite distance away out in space. Due to circular geometry and the spherical shape of the earth, the position of the celestial poles will change when you travel to a different latitude. In the southern hemisphere the celestial south pole will be above the horizon and the angle of elevation will be equal to the latitude of the location. It will always be towards the south. We are about 17 degrees south so the celestial south pole would be 17 degrees above the horizon as you can see from the pointer. The celestial north pole is 180 degrees from the celestial south pole. At our location it would be 17 degrees below the horizon and to the north.

It is important to know that all objects in the sky appear to rotate around these poles due to the rotation of the earth on its axis. Just imagine we are at 45 degrees south for a short time. This is so I can safely demonstrate how objects fully rotate around the pole without shining the laser too low. At 45 degrees south, the celestial south pole would be 45 degrees above the horizon and I am pointing to it now. An object like a star will remain a constant angle from the pole and rotate in a circle around it as you can see. Further out the radius will be greater. The paths I am tracing are traveling in a celestial west direction. If something travels in a celestial north direction it travels away from the celestial south pole. Below the pole, celestial north will be downward and the Southern Cross will appear upside down when it is there. Back to our location where the pole is 17 degrees above the horizon. I am now showing you how the southern cross will move across the sky throughout the night.

(Note less examples in the next paragraph will be shown on the viewing night.)

There are some examples I can show you of were two stars or points in the sky point to the celestial south pole and other star or point pairs point to the north pole. Others point close to the pole like the southern cross. It is also good to learn a few examples because the time and season or clouds can often prevent you seeing most of them. I am now showing you how to find the celestial south pole by projecting a line though the top and bottom of the cross until you reach a point that is 17 degrees above the horizon. The other way is to project the line 27 degrees past the southern star of the cross. You will also arrive at the same point by drawing a line at right angles to the two pointers. The celestial south pole will be 4 degrees to the left of this point. South will be directly below it. I will show you another example. Draw a line from Alfa Gruis (Alnair) through Beta Gruis and note the angle between them. Continue the line for half the angle again and select that point. Draw a line from Fomalhaut though that point and extend the line to an elevation of 17 degrees above the horizon to find the celestial south pole. Select Mirzam and draw a line through Canopus until it reaches 17 degrees above the horizon to find the celestial south pole. The two stars on the western side of the Great Square of Pegasus point almost exactly to celestial north pole. To

find it, draw a line through them and project it down to a point that is 17 degrees below the horizon. The two stars on the south side of the square are celestial east and west. Deneb is the most distance apparently bright star in night sky at about 2000 light years away. It forms a triangle with Vega and Altair which is easy to recognize by the small star named Tarazed nearby. Select a point one third the angle between Deneb and Vega. To find the celestial north pole, draw a line from Altair through that point and project it down to it is 17 degrees below the horizon. These methods to find north and south will work for other locations but you will need to replace the 17 degrees with the latitude of the location.

I am now pointing to the celestial equator which is also at an arbitrary and infinite distance out in space and is directly above the earth's equator. The sun appears to follow its path on the day of the equinox.

It is important to know where the ecliptic is because the planets are always very close to it and it helps you find them. The ecliptic is the apparent path the sun takes relative to the stars over the coarse of the year. The sun appears to move along it from west to east doing one circle each year. This is due to the earth's orbit around the sun. You can find it by identifying certain stars and constellations that are associated with astrology, star signs and the zodiac. I am running along the approximate path now. It passes through the star Regulus and goes about 2 degrees north of the star Spica. It passes through the northern side of the head of the Scorpion. It almost touches the south west corner of the Triffid Nebula. This is the exact point where the sun is during the December solstice.

Apart from Mercury, the planets remain less than 3 degrees from the ecliptic and the moon within 5. Mercury is less than 7. On the average, they all move from west to east along the ecliptic. However, when the outer planets are in opposition or on the opposite side of the earth to the sun, they move in retrograde motion or from east to west for a short time when the faster earth's orbit overtakes them. This is when these planets are closest to earth and is the best time to observe them.

(In the next paragraph I also suggest for people to use their monoculars or binoculars to find the deep sky objects by finding my laser's beam.)

This is the head of the scorpian. Its heart is Antares, a red giant star. I am now showing you the tail followed by the sting. If you draw a line through the sting, you will soon reach the Ptolemy Cluster. It is an open star cluster where stars are not closely bound by gravity. I am now tracing the teapot that is leaning on its side. The base is here. This is the handle and this is the spout. Select the centre of the base of the spout and draw a line through the tip of the spout and note the angle. Extend the line for the same angle again and you will find the centre of our galaxy. Draw a line from the top of the handle to the top of the teapot and note the angle. Extend the line the same angle again and you will be at the Lagoon Nebula. The Triffid Nebula is on the northern side and that is where the sun is near on the December Solstice. Nebula are areas of gas and dust in space. A globular cluster is a group of stars closely bound by gravity. You can find the M22 one 2.5˚ northeast of Kaus Borealis, the star at the top of the Teapot. It is 10000 light years away. Tucanae is the second brightest globular cluster in the sky and is near the small Small Magellanic Cloud. To find it, select a point half way between Achernar and the south celestial pole. The Tucanae cluster is about 5 degrees to the celestial west of that point. Mirach is the next bright star north east of the Great Square of Pegasus. 8 degrees NW of Mirach is the Andromeda Galaxy. At 2.5 million light years away, it is the most distant object visible to the naked eye. Draw a line though the two stars on the north western side of the southern cross and extend the line about 12 degrees past the top of the cross. You will then find Omega Centauri which is the largest and brightest globula cluster in the sky 17,090 light-years away. The Jewel Box is about 1 degree south east of Mimosa on the east side of the southern cross. The double star Alberio consists of a blue and orange star and is good to see through a telescope. To find it, select a point half way between Vega and Altair. Alberio is 5 degrees east of that point. TX Piscium is a very red visible star. This star's claim to fame is that it is the reddest celestial object that can be seen with the unaided eye. Select a point south of the Great square of Pegasis to form an equilatroral triangle with the southern side of it. Go east about 1/6 the width of the triangle. R Leporis is the most red seen star from a small telescope. Draw a line from the star on the west of Orions belt through Rigal and note the angle. Extend the line straight for 90% of the angle. Two stars in Lepus also point to it. There is a bright red Garnet star in Cepheus. To find it, Select Deneb and go slightly east of north for 18 degrees to find Alpha Cephei (Alderamin) which is the brightest star in Cepheus. The Garnet star is 4˚ to the south east of that. 4˚ to the east of that is Zeta Cephei. 3˚ east of that is Delta Cephei which is a special star as it is a Cepheid Variable which astronomers use to determine the distance to galaxies.

Please see me for a free paper regarding viewing nights and also information regarding many projects, new ideas and groups that would help many people in the community and around the world. Please let me know of anyone that could be interested.

Thank you for listening.

Please see the main page at tolga.info/astronomy explaining about the above and other facts where there are also diagrams. To make contact, call me on 4095 4354 or email richard.hole@truesolutions.info