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MIRA

NEWSLETTER



The Weaver Student Observatory is Back in Business

(See photos and text, pp.4-5)

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This feature is inspired by the questions we have received over the years from interested readers. If you have a question about an astronomical topic, please send it to us.

Milena Chioibasu asks, via the Internet,

I am a producer at the History Channel and we are doing a documentary on darkness and how over the years light pollution has affected different societies and the way they live. I have a question that I am having a bit of a hard time answering and I wondered if you might be able to help. To prove a point, I am trying to find out if a person was to travel by sea from Los Angeles west on the Pacific Ocean, how many miles would it take for that person to no longer see the Los Angeles coast and the light pollution in the air? Complete darkness? And how does one calculate that answer?

Dr. Bruce Weaver responds,

As you might expect, there is no simple answer to your question. In particular, it depends on the amount of aerosols, cloud cover, types of lights, etc. Also, it depends on what you mean by "see the light pollution." Finally, there are no very accurate, well-confirmed models of this.

I used what I think is the best model, based on empirical measures of light pollution at a distance for a variety of California cities. I used the population of L.A. County since, at a distance, the cities all blend together and there are both theoretical and observational reasons to believe that you have to consider the suburbs. I assumed a population 10 million.

The minimum perceptible brightness difference varies quite a bit between individuals and it increases quickly at the faintest and brightest sources. In general, for medium light sources, 20% is the minimum perceptible difference.

So, at 45 degrees above the horizon, an increase of 20% in sky brightness for the L.A. County population would occur at about 220 kilometers.

Now the issue of it being visible on the horizon is more complex and, at shorter ranges, the brightness increases dramatically as the zenith distance approaches 90 degrees. There are no measurements that I know of right offhand but accounting for the curvature of the earth suggests a distance

Calendar of Events

Saturday, April 18 Free public lecture with Dr. Ben Zuckerman of UCLA speaking on "Seeing is Believing: Imaging Extra-Solar Planets." **7:30pm Monterey Peninsula College Lecture Forum 102.**

Sunday, May 17 2:30pm Free tour of the Oliver Observing Station, subject to re-opening of Los Padres National Forest. **Reservations are required: 883-1000.**

July 12-23 MIRA Eclipse Tour to China (and Tibet!). Call 883-1000 to join the tour.

of 500 to 600 kilometers before you would not be able to discern L.A. on the horizon. Of course, at that range, L.A. would be well below the horizon.

I hope this helps and it would always be nice to credit MIRA with the calculations.

On the Cover

As *Newsletter* readers may remember, the Weaver Student Observatory was recently updated with an entirely new telescope mount and control system (see the Summer 2008 issue, p. 4). We have used the facility for several school groups since then; see pages 4 and 5 for more story and pictures.

The photo below illustrates another improvement: modification of the Ash dome's two-part shutter. Formerly, the astronomer had to reposition the lower door according to which part of the sky was to be observed.

Recently, MIRA volunteer Steve Evans and Dr. Arthur Babcock installed a special kit that allows the lower door to hinge outward. Now the entire sky from horizon to zenith is available throughout the observing session, without adjusting the shutter.



MIRA Photo

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Learning at MIRA

Odile deFaymoreau brings the Rainbow Room (grades 1-3) from the Linscott Charter School in Watsonville to the Hamming Astronomy Center.

Photos by Andrew Cohen.



Dr. Bruce Weaver explains something really big.

February 12, 2009
 Dear Mr. Weaver
 Thank you for teaching us about space. I learned that if we pollute the earth it will come to an end. I loved the library.
 From
 Kaitlyn



Above, Kaitlyn in position as Earth.

February 18, 2009
 Dear Dr. Weaver,
 Thank you for teaching us about the universe. I learned how the world will end. I liked being a planet. I also liked looking at the sun. Going to mira was fun.
 From,
 Martin



Left, Martin, assisted by Dave Huntley, looks at the sun through the 14" Weaver Student Observatory telescope (with an appropriate solar filter, naturally).

February 18/2009
 Dear Dr. Weaver
 Thank you for teaching us about space. Thank you for telling us that earth is going to end in 500 years.
 From,
 Sophia

Below, Sophia displays a tektite. (The situation of the earth is not quite so dire as Sophia wrote in her thank-you letter, left.)



Kids at MIRA Demonstrate Distances in Solar System



Dr. Bruce Weaver teaches distances and sizes in the Solar System by asking students to play the sun and the planets by holding scale models of each at scale distances. At left, Sophia holds the “sun”; at right, Andres shows off the seed which represents Mars. Below, Sophia, Kira, Kaitlyn, and Andres show the inner Solar System as far as Mars at about 1.4 Astronomical Units (Mercury is omitted).



At 5.2 AU, Reid, as Jupiter, looks inward at the group of students and teachers near the fence, representing the asteroid belt. At right, Dave Huntley holds up Saturn at 9.5 Astronomical Units from the sun. (MIRA's property isn't big enough to include Uranus, at 19 AU, and Neptune, at 30 AU.)



The Spring Sky

by Rod Norden

Spring 2009 brings many very special opportunities for the observer. Many of them in our solar system, but don't forget that spring is *the* season to find galaxies. There are fine examples in Virgo, Leo, Coma Berenices, and in our focus constellation for this spring, Ursa Major. Go out with your favorite star charts and start exploring.

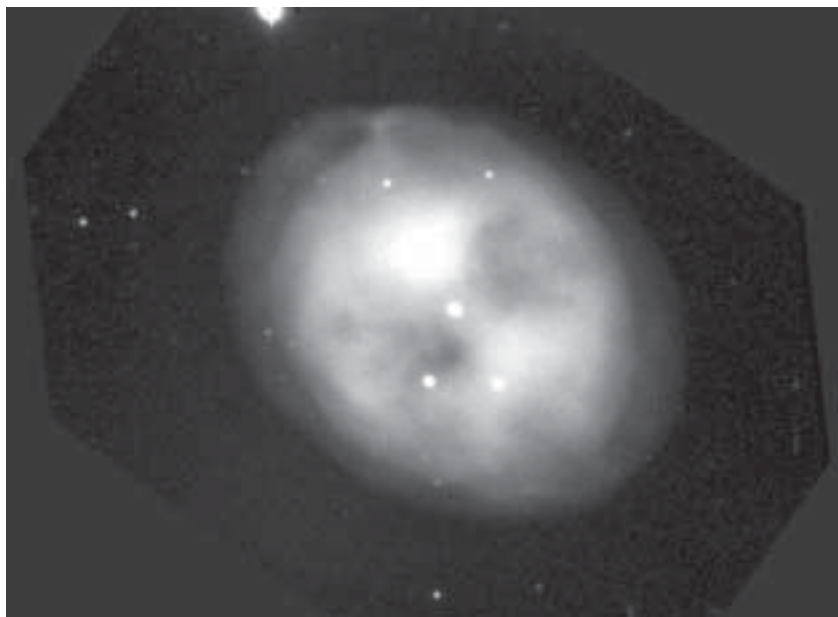
Fixed Stars

The Big Dipper asterism dominates the northern part of the sky in spring. Its constellation, Ursa Major, contains many fine objects to observe for amateur astronomers at all levels.

The first galaxies I remember observing with my small telescope after M31 in Andromeda back in the late 1950s were M81 and M82, just off the bowl of the Big Dipper. M81 and M82 form a close pair of galaxies that have gravitationally interacted. The gas in the central region of M82 was strongly affected by the near pass of M81, causing gas turbulence and extensive new star formation. Over 100 young globular clusters have been found in M82 with the Hubble Space Telescope. M82 is also the brightest galaxy in the sky in the infrared. Both of these objects were discovered 18 months before the signing of the Declaration of Independence.

Just below the bowl of the Dipper are some very fine deep sky objects. My favorite is the Owl Nebula (M97), a fine planetary nebula with two dimmer "eyes" best seen with an OIII filter. M97 actually appears to be a toroid with the hollow poles forming the "eyes." Just

0.8 degree away is the nearly edge-on spiral galaxy with a distinct mottled very dusty center, M108, close to Beta Ursae Majoris. At the other end of the bowl less than a degree from Gamma is the 9th magnitude spiral galaxy M109. Both M108 and M109 were added to Messier's list in 1953 after research on original manuscripts and period letters from Messier's assistant. All three objects were discovered about six months before the end of the American Revolution.



The Owl Nebula, imaged with the MIRA 36-inch telescope.

Planets

Mercury is at greatest eastern elongation (evening views) on 26 April, providing the best view for Northern Hemisphere observers this year. It remains in the evening sky through mid-May.

Venus is at superior conjunction on 27 March and is moving into the morning sky throughout the period. It is at greatest western elongation on 5 June shining very brightly indeed. Near dawn on 22 April, Venus will be occulted by the Moon. You will need a low eastern horizon to see the event. Venus will disappear behind the moon about 5:11am PDT, and reappear at 6:05am. Venus will be very bright and very low in the east, and will appear as a large thin crescent.

Earth has summer solstice occurring at 5:45 UT on 21 June (10:45pm PDT on the 20th).

The Moon will occult Antares on the evening of 6-7 June for most of the rest of the country. We will be very close the limit of where the occultation is supposed to occur. As the moon is rising, watch carefully to see if

Antares emerges from behind the eastern limb of the full moon.

Mars remains a morning object all year, moving from Aquarius to Aries. On 15 April, Mars passes within 0.5 degree of Uranus. Mars and Venus chase each other around the morning sky through the period.

Jupiter is a morning object rising earlier each night, and from mid-May until July, Jupiter and Neptune will be within 1 degree of each other. There are a few double shadow transits on Jupiter visible from our area beginning on 16-17 June at 3:39am PDT (10:39UT).

Saturn remains visible in Leo most of the night as it has passed opposition in early March. Some very special events occur only near Saturn's rare ring plane crossing. Titan's very tiny shadow (0.85") will take about 5 hours to transit across Saturn in the plane of the ring, and closer to a pole beginning at: 12-13 April 12:22am PDT (7:22UT), 28-29 April 11:22pm PDT (6:22UT), 14-15 May 10:26pm PDT (5:26UT), 30-31 May 9:32pm PDT (4:32UT), and 15-16 June at 8:40pm PDT (3:40UT).

Uranus is in Pisces near the sun through the entire period.

Neptune is in eastern Capricorn within a degree of Jupiter from mid-May onward. A good experiment is to compare the sizes of Jupiter's moon Ganymede (1.7") with Neptune (2.35").

Pluto is at opposition on 23 June but is still only at 14th magnitude in Sagittarius, and is moving through the most crowded part of the Sagittarius star clouds M-23 and M-24. Locating the planet should be very challenging. It may be best to wait until Pluto clears these very rich areas unless you love to pattern match on star fields.

Meteor Showers

The maximum of the **Lyrid** meteor shower is very favorable this year on the morning of 22 April. The radiant is near Vega and the shower normally shows about 20/hour, but very rarely can produce a burst of 90/hour or so. An added bonus this year is the occultation of Venus by the Moon, which occurs later at dawn. These events should be a fine reason to stay out of bed after midnight.

The 6 May maximum of the **Eta Aquarids** is reasonably favorable this year since it occurs a few days before the full moon, which will set before dawn leaving a bit of dark sky for the shower.

Comets

There are two comets visible during the period. **C/2007 N3 (Lulin)** is fading from 6th to 11th magnitude through the period moving straight away from the earth in Gemini.

C/2003 W3 (Christensen) could be as bright as 8th magnitude as it moves through Pegasus-Cygnus border.

Don't forget that 30 June is the 101st

anniversary of the Tunguska Impact Event in Siberia.

Eclipses

There will be no eclipses visible from Central California this spring period.

On a better note, MIRA is planning a benefit trip to China to see the 22 July 2009 eclipse in which totality will last nearly 7 minutes, one of the longest possible. It will be the longest solar eclipse until the 22nd century! There is an optional extension to Tibet. Please contact Tami at MIRA at (831) 883-1000 for more details.



*The irregular galaxy M82.
Image by Adam Block/NOAO/AURA/NSF*

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