The Otter Creek Astronomical Observatory

The Observer

January 2009 (#17)

UPCOMING PUBLIC PROGRAMS

Due to Otter Creek Park being closed there is not a current regular schedule of public programs. However, on **January 10** there will be a public program in honor of the *International Year of Astronomy 2009* at our new location in Harrison County, Indiana!

Schedule of events is as follows:

3-5 PM: Solar/Daytime Observations

5-6 PM: Closed (supper)

6-11 PM: Night Observations

Details about the status of Otter Creek Observatory and the new Harrison County observatory are all in this newsletter, so read on!

Visit the Otter Creek Observatory web page at

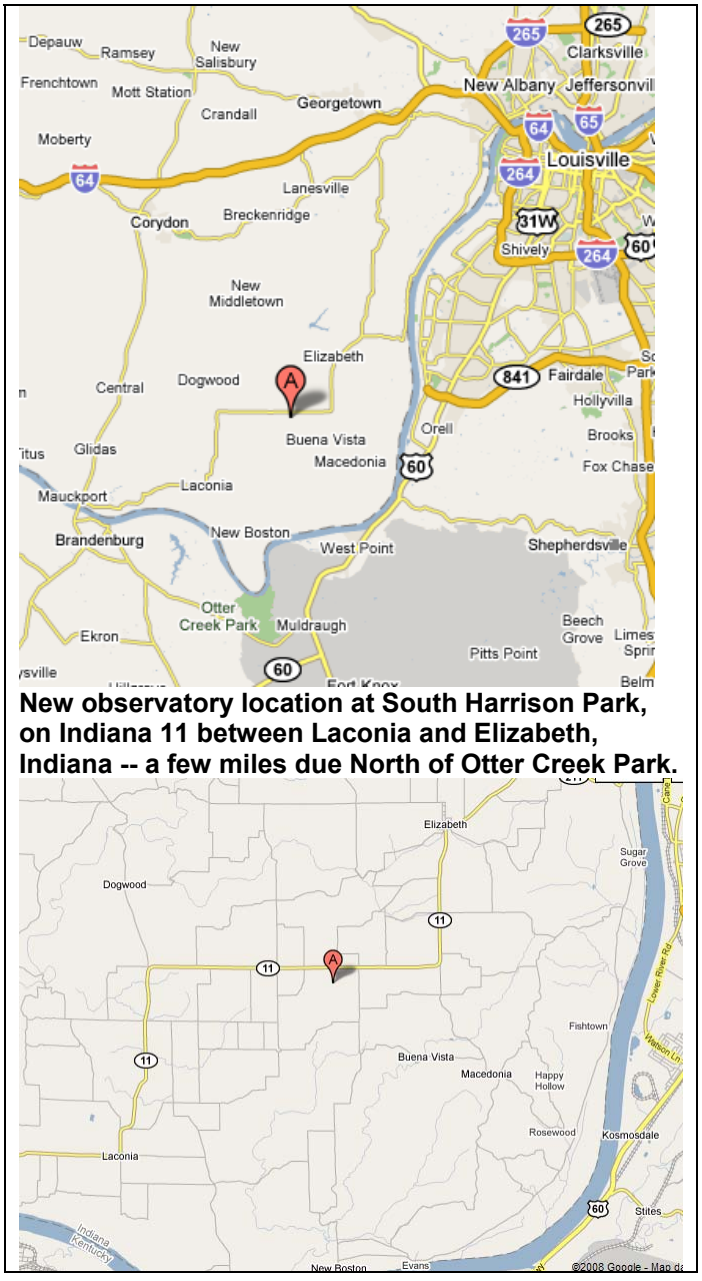
www.jefferson.kctcs.edu/observatory

Observatory Closing To The Public!
Observatory Opening To The Public!

As of the beginning of 2009 the mayor of Louisville has closed Otter Creek Park as part of an effort to balance the Louisville budget. Time will tell the ultimate fate of Otter Creek Park, but the observatory at Otter Creek is being permanently affected by the park closure. Otter Creek Observatory will continue operation, but only as a Jefferson Community & Technical College (JCTC) facility for research, classes, and other college business. It will no longer open for monthly public programs. In fact, the general public will not have access to the observatory so long as Otter Creek Park remains closed.

So what about public programs? What about public astronomy? Most people receiving this newsletter do so because they have come to public programs. Public astronomical outreach is the major function of the observatory. Does the closing of Otter Creek Park mean the end of the observatory as a public resource?

No, it does not, we are happy to say. Some doors close, but others open. A new observatory is opening in Harrison County, Indiana, a few miles southwest of the town of Elizabeth. This is happening in large part due to the alertness of the Louisville Astronomical Society (LAS), and in particular the LAS president, Ken Alderson. Alderson knew that Harrison County was building an observatory at South Harrison Park, and needed equipment to stock it and expertise to run it. When he heard about Otter Creek Park's closing he contacted Chris Graney of JCTC and put Graney in touch with Claudia Howard of Harrison County Parks & Recreation. As of this writing (January 5, 2009) there is much that remains to be finalized, but it is pretty clear that Jefferson Community & Technical College will be supporting



New observatory location at South Harrison Park, on Indiana 11 between Laconia and Elizabeth, Indiana -- a few miles due North of Otter Creek Park.

Harrison county's observatory in much the same way as it has supported Otter Creek's. Currently Otter Creek Observatory astronomer Henry Sipes is putting a great deal of effort into getting the Harrison facility up and running. He will be the astronomer for the South Harrison observatory. The South Harrison observatory is a nice facility. It is another “roll-off roof” observatory, similar in many ways to the building at Otter Creek. Regardless of what ultimately happens at Otter Creek Park, Harrison will be a great new resource for astronomy in the Louisville region.

The new observatory at South Harrison Park -- with roof on and off.

In fact, there is already a public program scheduled for the South Harrison observatory! On January 10, in celebration of the launch of the International Year of Astronomy 2009, and to introduce the new South Harrison observatory, there will be a double public program -- both a daytime/solar program and an evening program. Details are on page i of this issue of this newsletter.

At the moment we are not quite ready to post a regular schedule of public programs. The closure of Otter Creek Park occurred during the end of the fall semester and final exams for JCTC. Right after that came JCTC's winter break. From a college standpoint, the timing could not be worse, as this is the time of year when the college shuts down and college faculty and staff all have vacations. Both Graney and JCTC's president, Anthony Newberry, have taken time from their vacations to give attention to the observatory. Much work still remains to be done; many details still must be ironed out. However, the college re-opened today (January 5), so things will progress more rapidly from here out. It is safe to say that there will continue to be a public observatory in the Louisville area, and that you are most definitely invited to continue to visit and support that observatory at its new location in South Harrison Park!

Directions to South Harrison Park (for those who which to map this on the internet, the address is South Harrison Park Dr SE Laconia, IN 47135).

From Louisville:
Take I-64 West out of Louisville, getting off at Indiana 111 (the route to the casino boat). Follow IN-111 for 12.1 mi, going past the casino boat, until you reach Indiana 211. Turn right at IN-211 and go 2.0 mi until you reach Indiana 11. Follow IN-11 for 1.7 miles into

the town of Elizabeth. In Elizabeth IN-11 will turn left. Continue to follow IN-11 for 4.6 mi. Turn left at S Harrison Park Drive -- there will be signs for South Harrison Park.

From Brandenburg:
Cross the Ohio River bridge at Brandenburg and then take Indiana 11. Follow IN-11 for 7.1 miles to S Harrison Park Drive. Turn right -- there will be signs for South Harrison Park.

Update on Research at Otter Creek Observatory

We are pleased to announce continued progress in the area of research at Otter Creek Observatory. The paper “But Still, It Moves: Tides, Stellar Parallax, and Galileo's Commitment to the Copernican Theory”, by Otter Creek Observatory astronomer Chris Graney, was published in the journal *Physics in Perspective* in September 2008. This paper discusses contradictions between Galileo's observations of double stars and his support of the theory of Copernicus which said that the Earth revolved about the sun. It compares those contradictions to the contradictions involved in Galileo's theory that the Earth's motion causes the tides of the oceans.

Most people tend to view science as a steady march of ideas, and to view scientists as being people who knew all the right answers. Galileo was a great scientist. However, like every scientist, he was wrong about some things, too.

For example, with his telescope Galileo was able to determine that the sun rotates. At the time, those who believed Copernicus was right were hard pressed for a way to explain what could make the Earth move (those who believed the Earth was the center of the universe did not have that problem -- they thought the Earth was stationary). Galileo argued that the rotation of the sun might power the movement of the entire solar system, including the Earth. In fact, Galileo thought that if the sun stopped turning, all the planets would stop their motions as well. He even went into a fairly detailed discussion about how this idea would explain the stopping of the sun described in the biblical book of Joshua:

> [12]Then spake Joshua to the LORD in the day when the LORD delivered up the Amorites before the children of Israel, and he said in the sight of Israel, Sun, stand thou still upon Gibeon; and thou, Moon, in the valley of Ajalon. [13]And the sun stood still, and the moon stayed, until the people had avenged themselves upon their enemies. Is not this written in the book of Jasher? So the sun stood still in the midst of heaven, and hasted not to go down about a whole day. (King James Version, Joshua 10:12-13)

Galileo argued that when the Bible describes the sun as standing still in the sky, it wasn’t that the sun was orbiting around a stationary Earth and stopped its movement, making the day last longer. No, according to Galileo, what happened was that the sun stopped turning, and that stopped everything else -- the turning of the Earth, the moon, etc., which made the day last longer. This was one idea of Galileo's that was really a bad one. We know today that the rotation of the sun does not power the movement of

the planets at all (they move because of gravity and momentum -- principles of physics), and stopping the sun's turning (if that were possible) would not stop the Earth's or moon's motions.

Another example where Galileo was wrong was the ocean tides. Galileo thought that since the Earth both circled the sun and rotated about its own axis, that double motion would cause the oceans to slosh back and forth. The sloshing was what we see as the

High tide and low tide at the Bay of Fundy in Canada. The Bay of Fundy has some of the most dramatic tides in the world. Galileo thought that this twice-daily rise and fall of the levels of the oceans was caused by the oceans sloshing back and forth due to Earth's circling the sun and spinning on its own axis -- much like people on a "Scrambler" ride are whipped back and forth as the ride circles and spins around.

ocean tides -- the rise and fall of the sea level that occurs twice a day at any beach. Galileo was so sure of himself he even made fun of the ideas of another famous scientist, Johannes Kepler, who had said the moon caused the tides. In fact Kepler was right -- the moon does cause the tides and the tides obviously follow the moon in their pattern. Galileo was very wrong there.

It turns out that another area where Galileo was also wrong was the stars. Galileo was wrong about the stars in many ways. He thought he could measure the distances to the stars using his telescope. He was the first person to really use a telescope to study the heavens, so he did not understand that stars were so far away that telescopes could not form true images of them, so any measurement he made of a star was false. (In fact it took astronomers another couple centuries to figure all that out.) If you have been receiving this newsletter for a while, you may recall the October 2008 and February 2008 issues which discussed some of this stuff -- including all kinds of stuff about just how good Galileo was with his telescopes.

“But Still, It Moves” goes into detail about the implications of Galileo's study of stars -- including how, because of something called “parallax”, Galileo's study of stars could have undermined the entire idea that the Earth moved. “But Still, It Moves” is available through Ebsco Host at the Louisville Free Public Library, the JCTC library, and other libraries that subscribe to Ebsco.

Graney and Otter Creek Observatory astronomer Henry Sipes (South Harrison, too!) are continuing work on this idea -- taking a good hard look at what Galileo would have seen through his telescopes when he studied the stars and what conclusions he could have drawn from those studies. They are just now finishing up a paper that they will submit for publication shortly.

If you are interested in learning about where astronomers got it right and where they got it wrong over the centuries -- and how they eventually figured things out, check out Otter Creek Observatory’s free on-line book at www.jefferson.kctcs.edu/observatory/iya2009. Learn about the history of astronomy -- learn not just *what* we know about astronomy but *why* we know it and *how* we figured it out!

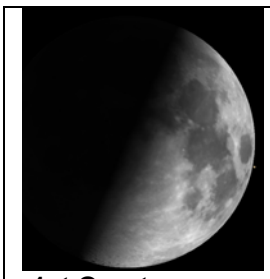
How Did They Know That?

As part of the IYA 2009, this newsletter is going to include some basic explanations of how early astronomers knew basic things about the heavens -- and how you can figure them out, too. We will start with this -- how can you tell that the moon is much closer to Earth than the sun? You learn in books that the moon is closer, but if you just look up in

the sky they both look like big lights in the heavens that rise and set. How can you tell for yourself that those books are right?

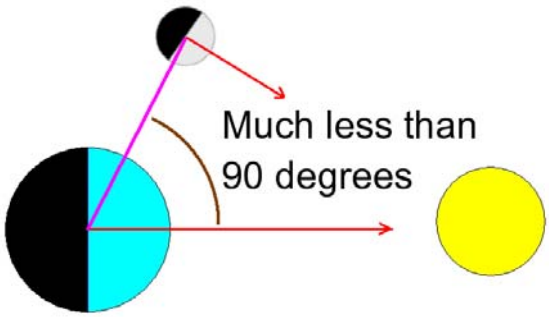
Here's how. We know the Earth is lit by the sun -- the sun lighting the Earth is what makes day and night. We also see that the moon is lit by the sun. There is clearly a "lit" and an "unlit" side of the moon; the "lit" side always faces the sun.

So, let us suppose the sun was just a little bit farther away than the moon. Keep in mind that the lit side of the moon always has to face toward the sun. Now, look at the diagram at the bottom of this page. The diagram shows that if the sun was just a little farther away than the moon, then when we saw the moon in the sky as being half-lit, half-unlit (what astronomers call "1st Quarter"), the angle between the sun and the moon would be a good deal less than 90 degrees. This means that, if the sun was just a little bit farther away than the moon, we would see a 1st Quarter moon being in the southwest at the time of sunset.

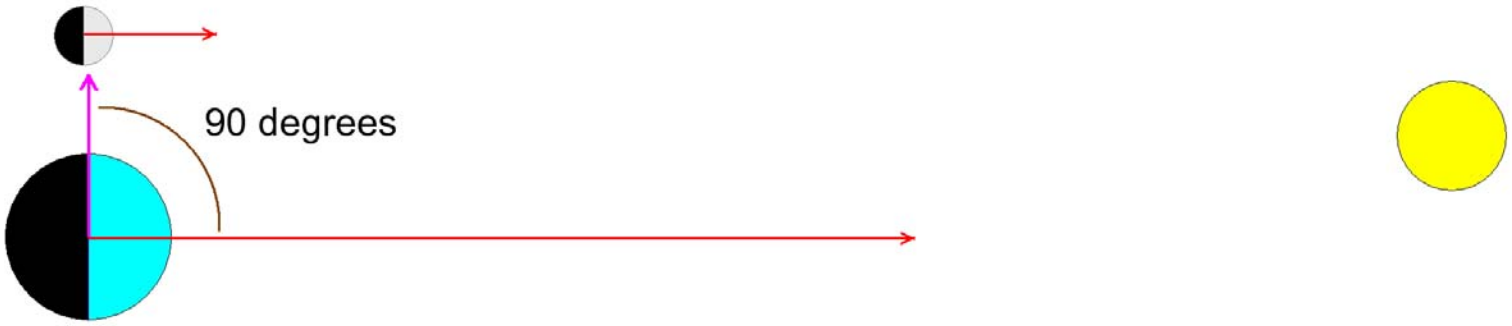


1st Quarter moon

The Earth and moon are both lit by the sun.



Now let us suppose that the sun was a lot farther away than the moon. Take a look at the diagram below. If the sun is far away, then the lit sides of the Earth and moon both face in the same direction. For us to see a 1st Quarter moon in this case, the angle between the sun and the moon would be just about 90 degrees. So when the moon was at 1st Quarter, it would be in the southern sky when the sun set in the west (there are 90 degrees between South and West).



In general, the farther the sun is away, the near the angle between sun and moon at 1st Quarter will be to 90 degrees. The closer the sun is to us, relative to the moon, the smaller the angle.

So, what do we see? What is the angle actually?

Well, start watching for the moon at sunset. When it gets to be 1st Quarter, look at where it is in the sky while the sun is setting. You will see that the moon is in the south. Point at the sun with your right hand and point at the moon with your left hand. Look at your arms. They make an “L” shape -- a 90 degree angle! So, ***ta-da***, you've just seen for yourself that the moon is a lot closer than the sun!

Moreover, since the sun and moon both look to us like they about the same size, more or less, the only way the sun can look the same size as the moon while being much farther away is if the sun is much BIGGER than the moon. Double ***ta-da*** -- you've determined for yourself that the sun is both much father than the moon, ***and*** much bigger. You don't need to rely on a book to tell you this now -- you know it from your own experience!