The Otter Creek Astronomical Observatory

The Observer

October 2008 (#15)

Upcoming Evening Programs:

October 4th (6:30 pm), November 1st (6:30 pm), December 6th (6:30 pm)

Join the observatory staff for a tour of what is visible in the night sky, including the moon, stars, and planets. *All times are Eastern time zone. All evening programs are "weather permitting" -- if the sky is not clear enough for celestial objects to be visible the observatory will not be open.*

Upcoming Daytime (solar) Programs:

October 18th, November 15th, December 20th

Daytime programs are "open house" at the observatory. Come safely observe the Sun, with its prominences and sunspots. Walk the model solar system trail and get a sense of the size of things in space. Check out our telescopes and learn about the observatory -- after all, you can't really see what's in the observatory when it is dark. *Daytime programs begin at 11 AM. All times are Eastern time zone. Daytime programs are held "rain or shine" -- the observatory is open regardless of weather.*

Visit the Otter Creek Observatory web page at

www.ottercreekpark.org

Meet Karl Schmidt

If you come out to Otter Creek Observatory, especially if you come to a night program, you may find yourself talking to Karl Schmidt. Karl has been working with the observatory since its very beginning – he literally helped to lay its foundation.

Otter Creek Observatory under construction (photos thanks to Karl Schmidt.)

Karl's interest in astronomy began in the early 1980's when he was watching a spectacular fireworks show for the 4th of July. He noticed something bright shining high in the sky, and asked his mother what it was – she said it was a bright star. Later he found out it was the bright star Vega. He visited his grade school library and read all the astronomy books that he could get his hands on. Two books that particularly sparked his interest were *The Sky Observer's Guide* and *Stars* published by the Golden Guide Series. Every clear night Karl was out observing with the naked eye and learning the constellations. One evening, his father gave him a pair of binoculars. Karl was astounded by what he was able to see -- craters on the Moon, more stars, and faint fuzzy nebulae. His most vivid view was on a cold December night looking at the Orion Nebula. WOW!

Karl's real passion for astronomy started building in high school. Richard Crum was his Biology teacher at St. Francis DeSales High School in Louisville and an amateur astronomer who had an observatory in Lebanon, Kentucky. Karl used Crum's telescopes during a Science Club trip to Crum's farm. He remembers observing from sunset to sunrise. Ever since that amazing night Karl has been passionate about observing the night sky. As a member of the Science Club in high school, he built a refracting telescope with a 3 inch lens; for his senior year physics project he built a reflecting telescope with a 6 inch mirror. These telescopes enabled him to see more and understand more of the night sky.

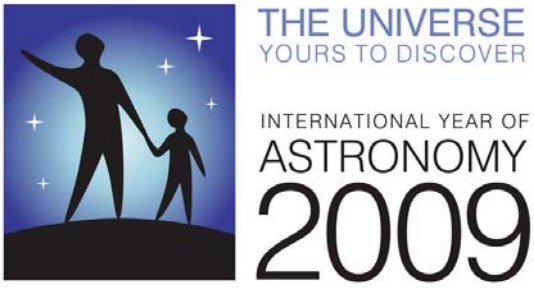
After high school, Karl went to college and studied Astronomy and Physics, earning a B.S. in Mathematics with a concentration in Physics from the University of Louisville. In 1991, Karl joined the Louisville Astronomical Society (of which he is currently Vice

President), and ever since has been involved with all avenues of public outreach in astronomy. In 1995, Karl helped to design and build Otter Creek Observatory. He spent many nights under the stars at Otter Creek with various groups teaching astronomy.

Karl currently enjoys observing the night sky with his new 12.5 inch telescope, which he uses to explore galaxies by observing and recording details that he sees through his telescope. He is waiting for the day when he discovers his first supernova in one these galaxies. Karl also enjoys going to gatherings of people with interest in astronomy such as the "Twin Lakes Star Party" held every year at Pennyrile Forest State Park near Dawson Springs, Kentucky. There he gets the chance to share and learn new techniques of his hobby. However, he never grows tired of going back to his roots of just looking up into the night sky and taking in all the light that his eyes can capture from home.

Karl's greetings to all: "Clear Skies!"

October 2 and the Invention of the Telescope

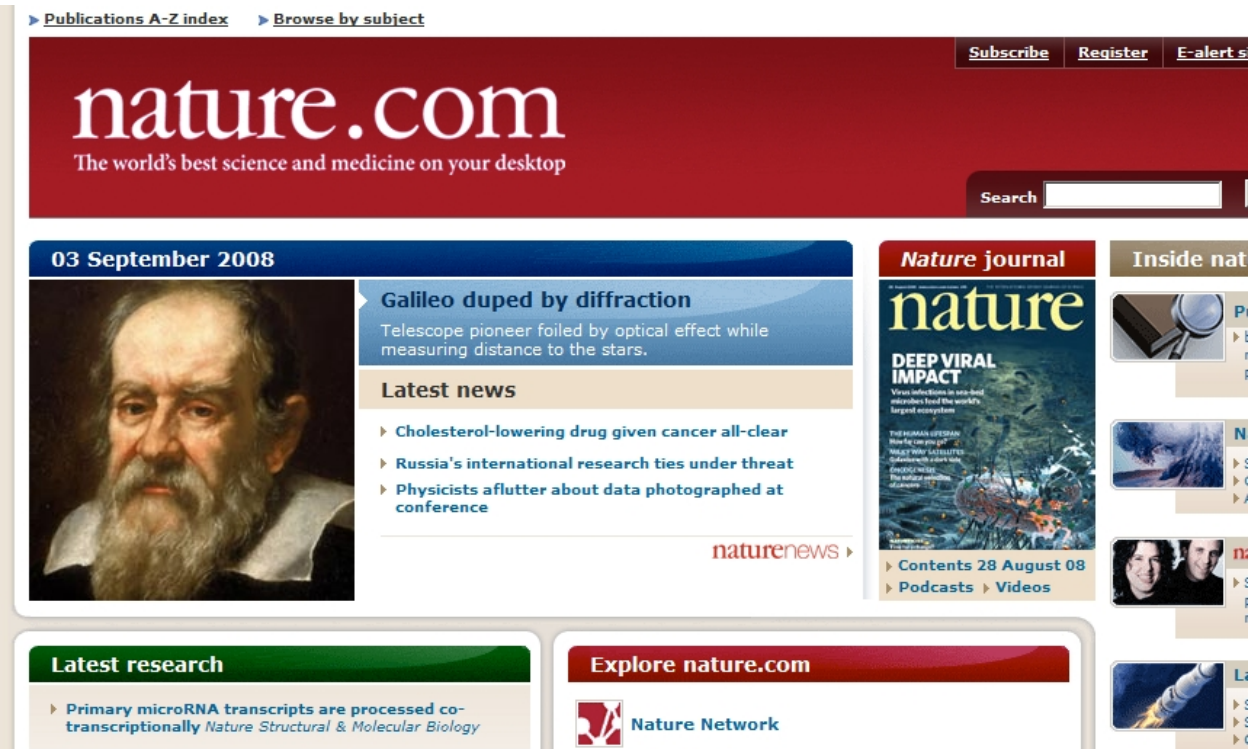


This month marks the 400th anniversary of the "invention" of the telescope. On October 2, 1608, Hans Lippershey (also spelled Lipperhey), a Dutch eyeglasses-maker, filed a patent application with the Dutch government for a telescope which he claimed to have invented. Lippershey demonstrated his invention to the government in The Hague, but he did not receive a patent because it was clear that the technology of the telescope was already known to others (two other men also were claiming to have invented it), and the principle behind the telescope's design was considered too easily imitated to award a patent. Nonetheless, Lippershey's patent application has been considered to be the first recorded design for a telescope.

Lippershey

However, recent research into the history of the telescope published in October 2008 issue of the magazine *History Today*, has yielded evidence that the telescope may actually have been invented by an eyeglasses-maker in Spain some years earlier; when news of the invention made it to The Netherlands, several Dutch eyeglasses-makers jumped on it at once, with Lippershey being the "quickest on the draw". The next time you see one of those "Lenscrafters" ads, remember that 400 years ago it was lens crafters who brought us the telescope! The lenses they made to correct peoples' vision became the basis of the telescopes that extended that vision for the first time.*

* Information for this article came from *www.inventionofthetelescope.eu* and *www.astronomy2009.org*.



Galileo Work from Otter Creek Makes Science Headlines

On September 3 work from Otter Creek was the headline news story of the Nature Publishing Group's www.nature.com, much to the delight and surprise of those of us at Otter Creek -- especially since Nature is probably the leading science news organization in the world. The short article read as follows:

GALILEO DUPED BY DIFFRACTION: Telescope pioneer foiled by optical effect while measuring distance to the stars.

By Katharine Sanderson

When Galileo Galilei used a new invention called the telescope to watch the heavens, he revolutionized astronomy. But his estimates of the distances to the stars were thousand of times too short.

A scientist has now taken a closer look at Galileo's seventeenth century results in an attempt to explain why the estimates were so far off the mark[1]. Christopher Graney, a physicist at Jefferson Community College in Louisville, Kentucky, argues in a paper posted to the preprint server arXiv that Galileo was tricked by a phenomenon that was only really understood two centuries later -- diffraction.

Graney says that Galileo was actually observing the diffraction pattern that the stars created in the telescope, instead of the stars themselves. Known as an Airy pattern, it arises when light from a point source such as a star passes through a hole. The pattern is made of concentric circles, with a bright 'Airy disk' in the middle -- which it seems that Galileo thought was the star.

For fainter objects, the edges of the disk are hard to see, making it look smaller, whereas brighter stars produce a larger Airy disk. Because Galileo thought that all stars were the same size and brightness as the Sun, he concluded that the smaller stars he observed through his telescope were simply further away.

So Galileo tried to infer the stars' relative distance from Earth, in terms of what we now call astronomical units (AU), by measuring their diameter. One astronomical unit is the distance from Earth to the Sun, about 150 million kilometres. He deduced that the stars were hundreds to thousands of AU away. In reality, the nearest stars are about 300,000 AU away.

To unravel Galileo's mistake, Graney calculated the intensity of the diffraction pattern for stars of different brightnesses. He then worked out Galileo's detection threshold and calculated the size of the Airy disk that each different star would have produced in Galileo's telescope.

Drawing a graph of the stars' brightness against the apparent diameter of the Airy disk gave Graney a roughly straight line that looked very much like Galileo's own data -- strong evidence, says Graney, that the astronomer was indeed being fooled by the Airy disk.

Historians have long known that Galileo was looking at spurious images of the stars. But Graney's work pinpoints exactly how diffraction could have tricked Galileo, says Noel Swerdlow, a historian of science at the University of Chicago, Illinois. "Showing the linear relationship between magnitude and apparent size does explain how Galileo could believe that," he says.

Although Galileo's assumptions about all stars being identical to the Sun turned out to be wrong, they were reasonable given the state of scientific knowledge in the seventeenth century, says Graney. "He would have seen nothing to contradict that point of view."

Astronomers now measure the distance to stars using the parallax technique, in which the apparent location of a distant star changes slightly as Earth orbits the Sun, allowing a distance to be deduced from the angle between those locations. This technique was first used in 1838 by German astronomer Friedrich Bessel.

Graney's work shows just how good Galileo was at taking measurements, says Don Salisbury, a physicist who teaches history of science courses focusing on Galileo at Austin College, Texas. "Galileo was indeed able to measure to an accuracy in which the diffracted image would be measurable," he says.

And Galileo's estimates were far larger than the distances to any astronomical bodies known at the time. "300 AU is close compared to modern ideas about the stars, but it is more than 10 times further than Neptune, and 30 times further than Saturn, the most distant planet known in Galileo's day," says Graney. "It's a long way, and I'm sure it seemed quite far to Galileo and his contemporaries."

1. Graney, C. M. Preprint at http://arxiv.org/abs/0808.3411 (2008).

Various news “wire” services picked up the story from www.nature.com and so the story appeared on various science-oriented web pages.

Otter Creek Observatory is proud to be contributing to the study of astronomy’s history during this time of the International Year of Astronomy 2009. Work on Galileo and his observations of stars continues at Otter Creek, and you will probably continue to hear about it and other activities related to IYA2009 in future newsletters throughout the coming year.

Recall from the September 2008 newsletter that in honor of IYA2009 Otter Creek Observatory has produced a book on astronomy for all its visitors and other patrons – and the book is free. Entitled *The Known Universe*, it tells the story of astronomy, and explains key ideas in astronomy, from a Kentucky perspective. *The Known Universe* assumes no prior scientific knowledge – it is written for anyone with an interest in understanding fundamental ideas in astronomy and how those ideas were developed. To request a free hardback copy, return the form attached to this newsletter. For an on-line version, go to www.jefferson.kctcs.edu/observatory/iya2009.

Free Hardbound Copy Request Form for *The Known Universe – An Otter Creek Observatory History of Astronomy for the International Year of Astronomy 2009*

Name: _____

Address: _____

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Did you know that you can obtain a free electronic copy of *The Known Universe* online at www.jefferson.kctcs.edu/observatory/iya2009?

Yes: _____ No: _____

A limited number of free hardbound copies of *The Known Universe* will be given away. Please indicate why you would prefer a hardbound copy as opposed to the electronic version:_____
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How long have you been interested in astronomy? _____

How long have you been interested in the history of astronomy? _____

How would you rate your knowledge of astronomy? _____ Use a scale of *1* to *5* where *1* is "I'm just getting started" and *5* is "I'm an advanced amateur astronomer or I have degrees in astronomy or a closely related field".

Would you be willing to return your copy so that another person could read it or would you prefer a copy of your own to keep?_____

Return this form by US Mail to

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1000 Community College Drive
Louisville, KY 40272

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