

# The Sunset Gazette

*Serving the Tri-Cities since 1975*

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## Meeting information

Meetings are generally in the theater in the Delta College Planetarium in Bay City. The meetings will usually be on the 2nd Friday of each month at 7:00 PM. Watch the newsletter for changes in dates and times. Membership is not required to participate in meetings and activities. See last Page for this month's meeting site.

## Membership Information

Our club has switched to e-mailing our newsletters. For those wishing to receive a hard copy mailed an additional dues of \$10.00 per year is required.

## New Membership Rates:

**\$5 per Year**

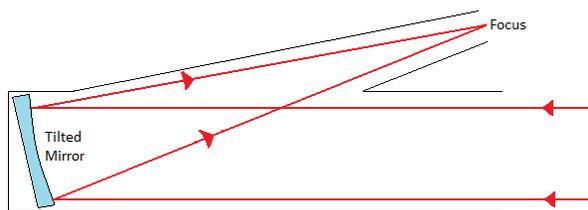
Treasurer's address for renewals and subscriptions:

Tom Smith, 3423 Hidden Road,  
Bay City, MI 48706-1243

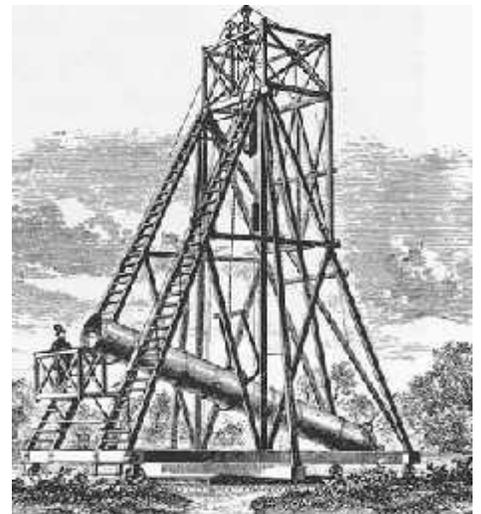
## Astronomy at Birr Castle

This new series tells the story about the astronomy undertaken at Birr castle in Ireland which started in 1827 and led to the construction of the largest telescope of its time, the great 72" Birr reflector who for more than 70 years was unsurpassed in its size. As we have heard in the previous issue Lord Rosse, after many failures, delays and disappointments, finally felt ready to begin work upon a really large telescope with a 36" mirror in diameter. It was in fact not the first Birr 36" mirror, but the first to be built by ever more perfected methods according to an trial and error principle and increasing experience of Lord Rosse. It was made in 1839 and erected in the same year on the castle grounds and soon known as the '3 foot telescope'.

It was mounted in the Herschel pattern (see left picture), but with some additional refinements which made it more convenient to use. The optical system was however unlike the tilted mirror principle which was used by Herschel (see drawing above). Unlike the Newton telescope the system does not use a flat sec-



Principle of the Herschelian reflector



ondary mirror and brings the image into focus at the top of the side of the tube. Due to distortions in the image and because the observer had to stay at the top of an open tube causing potential undesirable turbulence by his body warmth, Lord Rosse rejected this design.

So far Lord Rosse had mainly been concerned with the planning and construction of the telescope and could not claim to be an experienced observer (yet). It was naturally for him to call on people who were much more experienced than him and so he invited Dr. Thomas Romney Robinson, the director of the Armagh Observatory in Northern Ireland. With Robinson came Sir James South, a famous English astronomer who worked closely with Sir John Herschel and whose specialty was the observation and study of double stars. Together they stayed between the 29<sup>th</sup> October and 8<sup>th</sup> November 1839 at Birr castle testing out the new telescope.

As usual the weather was not great but they had enough opportunity to come to a very favorite review of the performance of the telescope. Especially the observation of the lunar surface led Robinson to make some enthusiastic comments: "It is scarcely possible to preserve the necessary sobriety of language, in speaking of the Moon's appearance with this instrument, which discovers multitudes of new objects at every point of its surface". Robinson wrote that in his view the telescope was the most powerful that had ever been made - better even than Herschel's 49" giant. Of course it is difficult to judge such a statement because the careers of both instruments did not overlap, but it is very much possible that Robinson was right.

It is to Lord Rosse's credit that he thought of the telescope to be used for the benefits of scientist not for his personal credit. So he spoke out an open invitation to any astronomer to take advantage of the telescope and its facilities at Birr castle for observations and further progress of science, and it was widely taken up. But Lord Rosse was not yet satisfied and so, as Robinson and South stood in the grounds of Birr castle marveling at the 36" telescope, plans for a much bigger telescope, one which would surpass any which had been made before were already taken shape in Lord Rosse's mind. In 1840 Robinson wrote that "Lord Rosse is about to construct a telescope of unequalled dimensions. He intends it to be 6 feet aperture and 50 feet focus..." - his confidence was justified and only 2 years later in April 1842 the huge 72" mirror was successfully cast.

The 36" was a magnificent telescope for its time and delivered everything one could wish for: The Moon could be observed at 900x magnification and many details could be observed never seen before (See also the previous issues of this newsletter "Mapping the Moon through the Ages" where the German astronomers Beer and Madler used a mere 3.75" inch refractor to draw the most accurate Moon map of their time). But the 36" was also used to observe nebulae and star clusters and here it is of special interest what Lord Rosse had to say about M27 (the Dumbbell nebula), M57 (the Ring nebula) and M31 (the Andromeda Nebula). He wrote that the nebulae "Messier 27, the annular nebular in Lyra, and, what is perhaps most curious, the edge of the great nebula in Andromeda, have shown evident symptoms of resolvability into star". Today of course we know that M27 and M57 are planetary nebula and the remnants of star material ejected from their stars during their evolution. But the Andromeda Nebula is indeed a galaxy and starry in nature. Of course Lord Rosse had a very scientific mind and was careful not to jump to conclusions and therefore the only way to find out the truth was to build an even bigger telescope!

Drawing of the Crab Nebula by William Parsons, the Third Earl of Rosse. This drawing gave rise to the name "Crab Nebula". It was created using the 36-inch reflector at Birr Castle about 1844. On the basis of this observation, Lord Rosse gave the following description: "... a cluster; we perceive in this [36-inch telescope], however, a considerable change of appearance; it is no longer an oval resolvable [mottled] Nebula; we see resolvable filaments singularly disposed, springing principally from its southern extremity, and not, as is usual in clusters, irregularly in all directions. Probably greater power would bring out other filaments, and it would then assume the ordinary form of a cluster. It is stubbed with stars, mixed however with a nebulosity probably consisting of stars too minute to be recognized. It is an easy object, and I have shown it to many, and all have been at once struck with its remarkable aspect. Everything in the sketch can be seen under moderately favorable circumstances."

There were two problems Lord Rosse was facing when planning the 72" telescope (and no, money was not one of them!): the optical problem how to cast the mirror and polish it and the mechanical problem how to mount it.

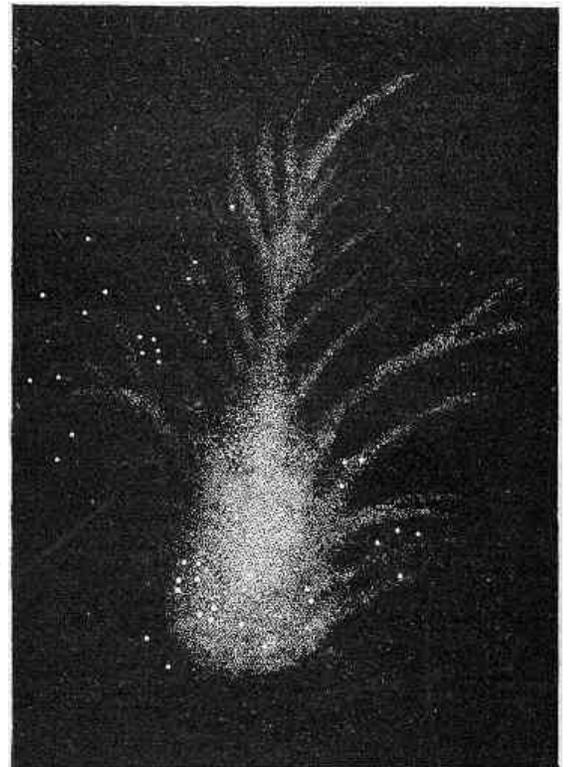
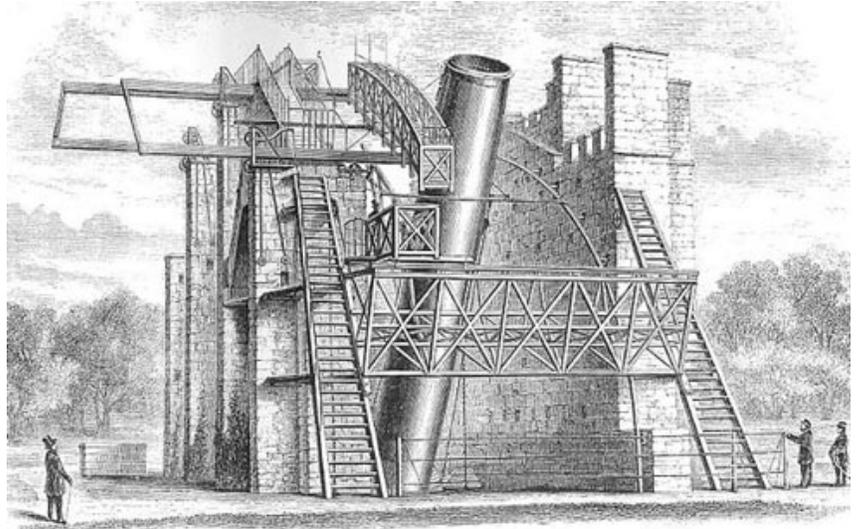


Fig. 438.

The first problem was an extension of the problem he faced when casting the 36" mirror. Due to the large amount of metal it was futile to try and melt the necessary quantity of metal in one crucible and so three crucible were used at once - each of them 24 feet across and weighing half a ton. More than 2000 cubic feet of turf had to be burned for a single casting and the furnaces had to heat up for 10 hours before they were ready to receive the metal. At this point Lord Rosse made an uncharacteristic mistake by using slightly less tin than he had planned to use, but no real harm was done and the casting was a success. The raw piece of metal was then put on the grinding machine and it was then when misfortune stroke: After ca 1 month into the grinding process an accident happened (the cause is not longer known) and the mirror was broken. But Lord Rosse was undaunted and immediate preparations were made to recast the mirror from the broken pieces. This time all went well and the speculum was completed: The mirror weighed a staggering 4 tons! One problem with reflectors and especially with ones made from speculum metal is that their mirrors tend to tarnish over time. Of course back then in the 1840s no coating was available and as the mirror was in the open the damp Irish climate took its toll. To reduce the downtime of the telescope when the mirror had to be taken out and re-polished Lord Rosse decided to make a second mirror: It took three casting attempts to finally make a second one which weighed 3.5 tons and so was slightly thinner than the first but with similar performance. By then Lord Rosse had easily become the best mirror maker of its time and it may be noted that in 1850 he made a mirror for the 15" reflector at Armagh Observatory where Romney Robinson was director. No difficulty were encountered when casting and polishing the secondary flat mirror.

The mounting was the second problem and it was a major undertaking in any sense of the term. A Herschel type mount like it was used with the 36" mirror (see pictures on the previous site and November issue of the newsletter) would have been state of the art at that time even if modern astronomers would find it very cumbersome to use. But this type of mount would be out of the question to use with the 72" reflector and any attempts would have been the height of folly with potential disastrous consequences: The mass of the 72" reflector would have been simply too great. At this point Lord Rosse showed true foresight in my opinion.



Instead of trying an elegant design he planned a mounting which would be unconventional, possibly awkward, and limited the range of the scope — but which would work. It would have been impracticable to swing a 58 feet tube around if it were not for the wind force alone and when the instrument would have swayed even moderately it would have been of no use for observation. Therefore the telescope would be mounted between two massive walls, each 70 feet long and 50 feet high. The telescope would be turned towards the sky which is close to the meridian = north south line. In practice this would mean that a star or any other object could only be followed for a limited period (the telescope was able to swing from east to west in a very limited manner). For example if the object was near or on the celestial equator the total viewing time was about an hour each night before it would be hidden by one of the walls. As unfortunate as this may sound it was not quite as disastrous because the star would be on its highest when observed close to its meridian and therefore less affected by atmospheric turbulence and the object would come into view the coming nights. The real restriction of the design was for planetary bodies.

**Next time in the SAS newsletter: The completion of the 72" Birr reflector**

SUNSET ASTRONOMICAL SOCIETY  
THE SUNSET GAZETTE  
SERVING THE TRI- CITIES SINCE 1975



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## Elected Officers for the SAS:

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|--|-------------------------------|
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| Vice President / Activities - Ed Borus | etbjr@chartermi.net           |
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This issue can be accessed in color on the website of the SAS!!!

<http://www.sunsetastronomicalsociety.com>

## SAS Meeting

**Start: 7:00 PM**

**Friday, Dec 14<sup>th</sup>, 2012**

**Delta Planetarium**

**Welcome members and guests**

**New and old business**

**Club Business**

**Treasure report**

**Refreshments Break**

**Presentation:**

**TBD**

**If clear we will observe on  
the observation deck.**

## What's up in the Sky

**Dec 2,3 All Night:** Jupiter is visible all night and at its brightest and biggest in the telescope!

**Dec 6:** Last Quarter Moon

**Dec 9-11 Dawn:** On the 9th look out for the waning crescent Moon very close to Spica, on the 10th look to the lower right of Saturn, on the 11th forming a very close pair with Venus, with Mercury to their lower left.

**Dec 13-14 Night:** The Geminid shower peaks on this moonless night with highest rates from 10 pm till dawn.

**Dec 13 :** New Moon

**Dec 21:** Winter begins in the northern Hemisphere at solstice 6:12 EST and the Mayan calendar turns over to an new **baktun** as it does every 144,000 days.

**Dec 20:** First Quarter Moon

**Dec 25 Evening:** Moon and Jupiter form a spectacular close pair with in Southern America the Moon actually occults Jupiter.

**Dec 28:** Full Moon

**Jan 2:** Earth at perihelion, its closets point to the Sun.

**Jan 4:** Last Quarter Moon

**Jan 5,6 Dawn:** The Moon is close to the right of Spica on the 5th and to the lower right of Saturn on the 6th.

**Jan 10 Dawn:** Venus can be seen shining a few deg from the thin crescent Moon very low in the southeast ca 1h to 1/2 hour before sunrise.

**Jan 11 :** New Moon

## UPCOMING EVENTS