

## S.C.R.A.P.S.

Society's Chronological Astronomical PaperS



### Tennessee Star Party Text and Photos By Shawn Grant

Ever wanted to go to the Winter Star Party or the Texas Star Party? Well Tennessee finally has its own star party. It isn't quite the caliber of the parties mentioned above, but it is still a very good star party. On October 18-21 the Barnard Seyfert Astronomical Society (BNAS) sponsored a regional star party at Fall Creek Falls State Park. The location was chosen because it is the same distance from Knoxville, Nashville and Chattanooga. It is 90 miles away from all three cities. Also, the park has some of the darkest skies in Tennessee making Fall Creek Falls the perfect location for a regional star party.

The facilities at the star party were great! BSAS reserved a camp at the park. The camp included several bunk houses that slept 6 to 8, a kitchen with a large dining room, bathrooms with hot showers and a meeting hall. In the center of the camp was a field where everyone set up their telescopes. The facilities were hard to beat. Many other star parties are more primitive.

We had three great nights of clear skies. That is very rare for Tennessee, but October is usually the best month for clear skies. The limiting magnitude was around 7<sup>th</sup> magnitude. Dark enough for some serious deep sky work. There were probably 100 to 120 attendees and maybe 50 or so scopes. There were scopes of all sizes and types. There were a few refractors such as a Tak and Bill Burgess's built 80-mm. Of course, there were the large dobbs with an 18-inch Obsession as the showpiece. There were also a few people with computer-controlled telescopes doing CCD imaging. There was something for everyone. The companionship was very rewarding. Everyone was helpful and friendly. People were willing to share their knowledge and give advice to others. Advice was given on how to improve telescope performance such as adding baffles to enhancing CCD images. There was a lot to learn and a lot was learned. There was a lot of joke telling and many life-long friends were made.



During the day there were several talks. Many of the talks were from renowned astronomers giving talks on their specialty. The talks included Douglas Hall on the "The Wonderful Wide World of Variable Stars", Dr. Klumpe on "Interstellar Space Travel" and Didier Sauman on "Dark Matter of a White Kind". There were also some in the field presentations. An interesting one was Tut Campbell on CCD Imaging and Clark Higgins on radio astronomy. Each talk was very informative.



There were also non-astronomy related activities to do. Fall Creek Falls is a hidden treasure in the state of Tennessee. There are 6 waterfalls. One of them is Fall Creek Falls, which is the tallest waterfall east of the Rockies at 256 feet. Other notable falls are Cane Creek Falls, Rockhouse Falls, Piney Creek Falls and Cane Creek Cascades. Waterfalls may be the main reason to visit, but there are other sights. One is Buzzard Roost. It is a Virginia Pine shaped like an African umbrella tree on the edge of a steep cliff. You probably have seen a photo of this tree in a calendar. There is a loop road that has majestic vistas of rolling hills. The park is truly a wonder!

It would be hard to ask for a better star party than The Tennessee Star party. Great park, facilities, variety in scopes and good friends. Hope to see you there next year.

## ASTRONOMY CORNER GRAVITATIONAL WAVES (PART 2)

### *How do we detect them?*

By Michael Littleton

In last month's issue, we looked at the potential uses of gravity wave telescopes. Gravity waves are ripples in the fabric of spacetime generated by the interactions of massive objects such as the collision of two neutron stars. Gravity waves were predicted by Einstein and demonstrated to exist in observations of the decay of the orbit of a binary pulsar. In this issue, we will discuss schemes to detect gravitational waves directly.

**Resonant-Mass Detectors:** The late Joseph Weber of the University of Maryland made the earliest attempt to detect gravitational waves in the late 1960's. He looked for deformation of 1 and 2 ton aluminum cylinders as gravitational waves alternately stretched and shrank them. If the gravitational wave frequency were near the natural frequency of the cylinder, the cylinder would "ring". This type of detector is called a *resonant-mass detector*. The size of the cylinder was usually chosen to have a natural frequency near 1000 Hz, which is the expected frequency of the maximum energy from supernovae explosions and the merger of neutron binaries. These experiments' sensitivity was limited by thermal and mechanical noise, which masked any contribution from gravitational waves. Weber was unable to solve all the engineering problems to make the detector capable of detecting such small changes in length. While sensitivity has improved in current generation resonant-mass detectors, they have not yet detected gravitational waves.

**Ground-Based Laser Interferometry:** Ground-based laser interferometry works using suspended weights that are free to move horizontally at the ends of two long evacuated tubes (arms). The arms are at right angles to one another. A passing gravitational wave will change the distance between the weights in one arm and then the other. The distance between the weights is measured by splitting a laser beam between the two arms and bouncing the beams between mirrors on the weights in each arm many times. The beams from the two arms are combined at a photodetector. Normally, the beams destructively interfere with each other and cancel each other out, but if the length of one arm changes, the light beams produce an interference pattern. The photodetector "sees" an increase in brightness. One of the major problems with ground-based facilities is the reduction of seismic noise, which has peak frequencies between 0.1 and 10 Hz. Seismic noise limits ground-based observatories to between 10 to 1000 Hz. One ground-based gravitational wave observatory is the Laser Interferometer Gravitational Wave Observatory (LIGO). It is under construction in the seismically quiet area near Hanford, WA on the US DOE Site. It has a sister facility in Livingston, LA. LIGO consists of two 4-km long arms. Currently, installation of the interferometers is in progress

**Space-Based Laser Interferometry:** One of the advantages of spaced-based interferometry is freedom from seismic noise. This allows detection of gravitational waves between  $10^{-4}$  Hz and  $10^{-1}$  Hz and makes it suitable to look for gravitational waves from binary stars and supermassive black holes. Space-based interferometry also allows much longer baselines increasing sensitivity. In space-based interferometry, one of the major design problems is isolation of the test masses from forces that will change the distance between the masses such as solar radiation pressure. One such space experiment is the Laser Interferometer Space Antenna (LISA). LISA is a joint project of the European Space Agency and the NASA. It consists of three spacecraft in an equilateral triangle with 5 million km sides. The center of the triangle will be at 1 AU from the Sun, in the ecliptic plane, and about  $20^\circ$  behind the Earth. Lasers in each spacecraft will measure the distance between each other with an accuracy of  $2 \times 10^{-11}$  m. The spacecraft is designed to isolate the test masses from external forces except gravitational waves, which allows this extreme measurement accuracy. LISA is scheduled to launch in 2008.

**The Need for Gravitational Wave Astronomy:** If gravitational waves are detected, what purpose will the discovery serve? Critics may say that this research is expensive, may fail and is taking funds from more fruitful areas. It may also succeed. Astronomy using electromagnetic radiation generally is only looking at the outer layers of an object. Gravitational wave astronomy may allow astronomers to look deeper. This may offer us new insights into areas and processes previously not observed. This research is risky, but it may expand our knowledge about the birth of black holes, the early universe, and who knows what else. In another developing research area in the 1960's, who could have foreseen the noise heard on that horn-shaped antenna by Arno Penzias and Robert Wilson was the whisper of Creation?

## CALENDAR

- 11/01/01 Full Moon
- 11/09/01 SMAS Meeting at the Discovery Center at 8:00 PM
- 11/15/01 Venus rises at 6:00 AM. Jupiter rises at 8:48 PM. Saturn rises at 6:36 PM. Mars sets at 11:08 PM.
- 11/15/01 New Moon
- 11/18/01 SMAS Star Party at Gary Nolan's place and Leonid Meteor Shower peaks
- 11/22/01 First Quarter Moon
- 11/24/01 Lunar Wars at Gary Nolan's place
- 12/01/01 Alternate Lunar Wars date

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### Warm Moon in the Winter by John "Sparky" Sparks

October proved to be an eventful month in Astronomy with the Tenn. Star Party, but Lunar Wars was put off due to cloudy weather. It actually cleared up later, but by then, everyone (including me) gave it up. So, I will try to do better on this in November by rescheduling Lunar Wars with a backup date plus our regular SMAS Starparty.

The Great Square of Pegasus and Andromeda are near the zenith at sunset and Mars is soon to leave our skies for a couple years. Saturn is rising and Jupiter will soon follow. The Perseus Double cluster and the M31 galaxy are glorious views with the binoculars and telescope. Meanwhile, Cassiopeia's "W" leads the observer to more open clusters than about any place in the sky. A favorite of these is NGC457, the "Owl/ET Cluster". One good competitor for open clusters is Cygnus with its Northern Cross.

If this sounds interesting to you, I invite you to Gary Nolan's house on November 17<sup>th</sup>. To get there from Knoxville, take Chapman Highway (Hwy 441) into Seymour, TN. Take a right at the Hardees to Hwy 411 going to Maryville and stop at the BP service station to the right and call 681-6993 because the directions get confusing after turning off from Hinkle unless you have already been there. Or you can follow a SMAS member who knows where to go. Gary lives on an unmarked alley off of Nails Creek Rd., which is also unmarked, last I knew. This is one of the closest observing sites from Knoxville SMAS has ever used but the skies are surprisingly good. Best of all, he offers us a place to warm up during the winter months.

On the 24<sup>th</sup>, we will return to Gary's for Lunar Wars and the winner is all who come to discover that the moon is the best ½ degree to view in the sky. A ribbon will be presented to the winner. Perhaps Bill Burgess will have his new scope ready by this time? We were clouded out on the Moon (usually the only time it's clear) last month, but I am offering a backup date should this happen again. If the 24<sup>th</sup> is clouded out, we will hold Lunar Wars on December 1<sup>st</sup>. Shoot, I already bought the ribbon so I'm determined to award it!

Clear skies: "Sparky!"

### WANTED: AUTHORS FOR SCRAPS-NO EXPERIENCE NECESSARY!

Have you made a modification to your telescope that you are proud of? Find a piece of sky that is overlooked in *Burnham's Celestial Handbook*? Have you just attended the Cleveland Star Stare? Share your experience with the rest of SMAS and potentially anyone with access to the Internet by writing an article for SCRAPS. It doesn't have to be Shakespeare and the SCRAPS editor will clean up the grammar if needed. Contact Mike Littleton at (865) 671-1022 or email [littleton@ix.netcom.com](mailto:littleton@ix.netcom.com).

## OCTOBER MEETING BY LEE ERICKSON

### PHOTOS BY MIKE FLEENOR

The SMAS meeting was held on October 12, 2001 at the Discovery Center. Tom Rimmell was unavailable and Vice Chair Bob Arr presided. There were about 15 persons in attendance. There were no guests.

#### Old Business

There was no old business (September was a **Gastronomy** event.)

#### New Business

Bob Arr reminded us to start planning for the Christmas party. Discussions and voting resulted in a choice to again have the party at the Great American Steak House. Bill Burgess nominated Tammy Burgess to coordinate the Christmas party. Since Tammy was not present, she was unanimously accepted as the coordinator. The Christmas party is scheduled for December 7th.

There was a discussion on the need, cost, and the uses for the club's dues. No motions resulted from this discussion.



October's star party was Lunar Wars. (Unfortunately, it was weathered out and rescheduled for November.) During Lunar Wars we will compare the performance of different telescopes on the Moon and the effect of different filters to improve viewing of the Moon. A nice tie into the discussion of lunar observing was the presentation to Ron Dinkins of an ALCOR Lunar Observing Club Certificate. Ron says it is the easiest club certificate to earn. To earn the certificate, you must observe different lunar features with a combination of the unaided eye, binoculars and with a telescope.

Ken Ferguson announced that the Discovery Center is discussing how to promote astronomy. He requested SMAS's help. Bob Arr committed us to help.

#### Presentation

Bill Burgess displayed some new items, which he is marketing. There was a massive, cast equatorial telescope mount with a GO TO system rated at supporting a 35-pound telescope. He also had eyepieces, which look like Meade eyepieces with nice two-piece plastic cases to protect them. He also displayed a 80-mm refracting telescope of his own design and construction. It was made of turned aluminum and beautiful. Bill's web site is [www.burgessoptical.com](http://www.burgessoptical.com).

