

## Smoky Mountain Astronomical Society

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

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## July 14th SMAS MEETING

PSTCC, Main Campus,  
Hardin Valley Road  
7:30 pm, Alexander Bldg, Room 223



### From the President - Lee Erickson

July and hot weather is upon us.

This will be a great time to escape the heat of the Tennessee Valley and visit the summer skies from the clearer altitudes of the Foot Hills Parkway and the Cherohala Skyway. Remember that it gets cooler with altitude. You will need to dress appropriately by bringing along something to put on as it gets cooler.

A little atmospheric lecture: Air cools as it expands, or as the pressure is reduced. Higher altitudes have lower pressure and, while not obvious, this also means that there is a typical temperature gradient with altitude. For air that is not saturated with humidity the rate is referred to as the ADIABATIC LAPSE RATE. It is measured to 5.5 degrees Fahrenheit per 1000 feet. Our observing location on Look Rock on the Foot Hills Parkway is about 750 feet higher than the valley so it should be about 4 and 1/8 degrees cooler. For Unicoi Crest on the Cherohala Skyway the altitude is over 4000 feet higher than the valley. It will be about 22 degrees cooler. 22 degrees can turn an evening unpleasantly cold if you are not dressed appropriately. It may seem funny to be bringing a sweat shirt and jacket out on a July night, but doing so may make the difference between observing in comfort versus a shivering retreat down the mountain. Incidentally, the lapse rate changes once the humidity reaches 100%. If that happens our telescopes will be too wet with due care that the lapse rate has reduced to only about 3 degrees per 1000 feet. It will be time to pack up and start heading home. When applying these rules, remember the lapse rates are for an atmosphere that is not disturbed by strong winds, or the arrival of a front of another air mass. In other words there will be exceptions.

I hope to see you out under the Milky Way at a star party soon. (I may even bring some hot chocolate.)

**SMAS Picnic June 3rd, 2006 @ Tamke-Allan Observatory**



## The Wiz

Hey Wiz,

Whur ya bin? Ain't hurd from ya in two months (plesunt tho). How come it don't get dark up at Unicoi Crest like it shud?

A. Dyte

Deer Arrow,

Ya hurda sweets fer the sweet? This heers composed speshul fer ya.

Ya no the earth's tilted 23.5 degrees from the plane of its orbit. Course the plane itself passes thru the sun. 'Nuther words, Dec 21 the sun's 23.5 degrees under the plane, June 21 it's 23.5 degrees over the plane. Shucks, thass 47 degrees diffurnce. So whut, huh?

By rats, at midnight that durn sun outta be on the oppersit side of the earth, right? But it ain't. Well, it is and it ain't. It ain't diametrically oppersit. Ifn it wuz, we'd have lotsa black skies.

Me'n yous in the north hemisphere, rat? This time a year, the sun is too. Hit's clumb up within 66.5 degrees of the north pole 'causa the tilt. Heck, we're just about 54 degress south of the north pole, so weer only about 120 degrees from the sun at midnight. That durn sunlight is spillin over the north pole at us!

Ats why Unicoi in June only gets a few good hours a dark (11-2, about). Spring 'n fall drops ol sol down bout 23 degrees, and we gets lotsa dark hours up thar.

I bin busy with m'young uns, grankids that is. Thanks fer askin. Injoyd tawkin w'ya.

Da Wiz



## From Thunderstorms to Solar Storms...

by Patrick L. Barry

When severe weather occurs, there's a world of difference for people on the ground between a storm that's overhead and one that's several kilometers away. Yet current geostationary weather satellites can be as much as 3 km off in pinpointing the true locations of storms.

A new generation of weather satellites will boost this accuracy by 2 to 4 times. The first in this new installment of NOAA's Geostationary Operational Environmental Satellites series, called GOES-N, was launched May 24 by NASA and Boeing for NOAA (National Oceanic and Atmospheric Administration). (A new polar-orbiting weather satellite, NOAA-18, was launched May 2005.)

Along with better accuracy at pinpointing storms, GOES-N sports a raft of improvements that will enhance our ability to monitor the weather—both normal, atmospheric weather and “space weather.”

“Satellites eventually wear out or get low on fuel, so we've got to launch new weather satellites every few years if we want to keep up the continuous eye on weather that NOAA has maintained for more than 30 years now,” says Thomas Wrublewski, liaison officer for NOAA at NASA's Goddard Space Flight Center.

Currently, GOES-N is in a “parking” orbit at 90° west longitude over the equator. For the next 6 months it will remain there while NASA thoroughly tests all its systems. If all goes well, it will someday replace one of the two active GOES satellites—either the eastern satellite (75°W) or the western one (135°W), depending on the condition of those satellites at the time.

Unlike all previous GOES satellites, GOES-N carries star trackers aboard to precisely determine its orientation in space. Also for the first time, the storm-tracking instruments have been mounted to an “optical bench,” which is a very stable platform that resists thermal warping. These two improvements will let scientists say with 2 to 4 times greater accuracy exactly where storms are located.

Also, X-ray images of the Sun taken by GOES-N will be about twice as sharp as before. The new Solar X-ray Imager (SXI) will also automatically identify solar flares as they happen, instead of waiting for a scientist on the ground to analyze the images. Flares affect space weather, triggering geomagnetic storms that can damage communications satellites and even knock out city power grids. The improved imaging and detection of solar flares by GOES-N will allow for earlier warnings.

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So for thunderstorms and solar storms alike, GOES-N will be an even sharper eye in the sky.

Find out more about GOES-N at [goespoes.gsfc.nasa.gov/goes](http://goespoes.gsfc.nasa.gov/goes). Also, for young people, the SciJinks Weather Laboratory at [scijinks.nasa.gov](http://scijinks.nasa.gov) now includes a printable booklet titled “How Do You Make a Weather Satellite?” Just click on Technology.

*This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*



*New GOES-N satellite launches, carrying an imaging radiometer, an atmospheric sounder, and a collection of other space environment monitoring instruments.*

**|spacetime⟩ + |emitecaps⟩** by Peter Bush

I just finished a book by John Gribbin called, *Schrodinger's Kittens and the Search for Reality*. It had a very interesting, if not somewhat paradoxical, perspective on the nature of light and photons.

According to Mr. Gribbin, the theory of light proposed by the fifth century BC natural philosopher Empedocles, supposed that light originated in the eyes and reached out to the darkness like the beam of a flashlight, "or the stick of a blind person, to "feel" the nature of the world at large." It was an idea that persisted for centuries.

It wasn't until the middle-ages, when the Arab scientist Alhazen debunked the idea in favor of a theory that light entered the eye from the outside world. His arguments in favor of this theory included the affects of "after images" that had burned bright images onto the eye that were retained even after the eyes were closed. And also his work on the 'camera obscura' (darkened chamber or dark room). In order to see the 'camera obscura' at work, place a heavy cloth with a small pinhole in it over a bright window on a sunny day. Now standing in the suitably darkened room you will observe projected on a 'screen' opposite the pinhole the inverted image of the outside world projected through it. Alhazen reasoned from this that light must travel in one direction, outside > in, and that it traveled in straight lines with upper objects outside crossing the pinhole and showing up at the bottom of the screen, while lower objects outside crossed the threshold to find themselves at the top. Rene Descartes, centuries later proved that this is also true of the human eye. We actually see things upside down and the brain corrects the image for us.

The 'new' theory of light was built up to a full-fledged idea of electromagnetic waves by many brilliant scientists, not the least of them being James Clerk Maxwell. But it wasn't until Einstein, that this idea was challenged. Einstein placed himself in the position of the photon itself to determine how it must move with respect to everything else. He proposed that the speed of light is constant in **all** frames of reference, thus the human constructs of time and distance are measured by our relative motion through the heavens. For the photons, there is no time to get from here to there, nor any distance to traverse. The photon is instantaneously in both places - it could be said to be everywhere and every'now' - only our relative motion gives it the 'perceived' depth of time and distance.

This is a difficult concept to come to terms with, but it's actually supported by quantum mechanics via the double-slit experiment. If light goes through a single slit, it produces a pattern of intensity on an observing screen beyond it, but if it's directed at two slits side-by-side then the resulting pattern on the screen contains interference where the light overlaps and cancels each other out - the resulting image will appear stripped. The curious thing is this is true regardless

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of how many photons go through the two holes at a time. Even if one photon were directed at the holes at a time, it would choose one of them and then interfere with itself at the screen on the other side. Amazing! This could only occur if it knew the outcome before it happened. The electromagnetic wave that carries the photon is said to emit a wave in two directions - one as we would expect into the future and towards the experiment with two holes. The other wave is not so intuitive. It travels backwards in time - back from the observing screen, through the double slits and back to the emitter. This is supported by Relativity Theory. The photons can actually be in two time/space positions at the same instance. It's only our relative motion that gives the illusion of a paradox.

This brings us full circle in light theory. Empedocles and Alhazen were both right. The next time you look at a distant galaxy you are seeing the light (in terms of photons) that set out on a journey thousands or millions of light-years ago. You are also sending out a few of your own - from this moment, today, that are making the entangled journey back to that distant galaxy. Those same photons are both here today and millions of light years distant - at the same instant. Perhaps that helps explain why it's such a moving experience to view the heavens. The connection is more than it might seem.

And just when you thought you knew what those distant galaxies looked like, remember you're also seeing them upside-down (as proven by Descartes) and backwards (in time).

*The title of this article is in quantum notation. The line/arrow brackets indicate the contents of a quantum object. Inside the brackets I have spelled "spacetime" forwards and backwards. Thus, the equation might indicate a quantum event going forwards and backwards in spacetime, simultaneously.*

### **Presidents notes on future meetings and related activities:**

The July 14th. meeting will feature Dr. David Fields speaking to us on radio astronomy.  
Business item: Holiday banquet announcement and confirmation.  
Bill Dittus will present the Night Sky for July.

The August 11th. meeting will be devoted to amateur telescope making with emphasis on the Galilean telescope.  
Featured speaker Gary Noland.  
*Any volunteers for presenting the Night Sky for August?*

September 8th. will be a working meeting where we will make up posters and other materials for support of the October Great Smoky Mountain Star Party in Cades Cove. Get your blunt nose scissors, some tape or glue sticks, and start looking now to identify some magazine photos to contribute.

October 14th. Public Star Gazing in the Great Smoky Mountains.

# July 2006

SUN	MON	TUE	WED	THU	FRI	SAT
25	26	27	28	29	30	1 TAO
2	3	4 Independence Day	5	6	7 UTK	8
9	10	11 <i>Full Moon</i>	12	13	14 SMAS Meeting PSTCC Rm 223 7:30 pm	15 TAO
16	17	18	19	20	21 UTK	22 SMAS Star Party Unicoi Crest
23	24	25 <i>New Moon</i>	26	27	28 Delta Aquarid Meteor Shower	29 SMAS Star Party Look Rock #4
30	31	1	2	3	4 UTK	5 TAO