

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

Society's ChRonological Astronomical PaperS



From the Chair

By Bob "Rain Cloud" Arr

I had hoped to announced our new insurance coverage in this issue, but instead I have to report that the Astronomical League and the new insurers have had a rupture. Details are sketchy, but it seems clear that there has been a failure to communicate. Chuck Allen, the president of AL, says that they will continue to pursue affordable insurance, but as of right now, they're back to square one.

The impact on SMAS of this turn of events is simple: we will not advertise either our star parties or our monthly meetings. We will conduct them, of course. But no advertising; we don't have the insurance to cover the liability that goes with advertising.

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Judging from recent star parties, the AL club participation is really popular. We will make time for the AL clubs to have progress meetings during the regular meeting after the main presentation.

Presentation for June: "Stories from the Milky Way"

The first half of the 20th Century ushered in the devices and research that established modern astronomy's foundations. The quest to learn what the Milky Way really was lead scientists all over the world to search the skies and their laboratories for clues. No one country provided all the answers, but the American effort spearheaded by the Harvard College Observatory and the Mt Wilson Observatory at Pasadena played key roles. Bob Arr reprises some of the individual struggles and triumphs that brought the light of knowledge to the light of the stars.

The Discovery of the Galilean Satellites

By Ron Baalke

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Probably the most significant contribution that Galileo Galilei made to science was the discovery of the four satellites around Jupiter that are now named in his honor. Galileo first observed the moons of Jupiter on January 7, 1610 through a homemade telescope. He originally thought he saw three stars near Jupiter, strung out in a line through the planet. The next evening, these stars seemed to have moved the wrong way, which caught his attention. Galileo continued to observe the stars and Jupiter for the next week. On January 11, a fourth star (which would later turn out to be Ganymede) appeared. After a week, Galileo had observed that the four stars never left the vicinity of Jupiter and appeared to be carried along with the planet, and that they changed their position with respect to each other and Jupiter. Finally, Galileo determined that what he was observing were not stars, but planetary bodies that were in orbit around Jupiter. This discovery provided evidence in support of the Copernican system and showed that everything did not revolve around the Earth. (Continued on Page 2.)

The Discovery of the Galilean Satellites (continued)

Galileo realized that the telescope had applications that reached beyond astronomy:

"Most Serene Prince. Galileo Galilei most humbly prostrates himself before Your Highness, watching carefully, and with all spirit of willingness, not only to satisfy what concerns the reading of mathematics in the study of Padua, but to write of having decided to present to Your Highness a telescope ("Occhiale") that will be a great help in maritime and land enterprises. I assure you I shall keep this new invention a great secret and show it only to Your Highness. The telescope was made for the most accurate study of distances. This telescope has the advantage of discovering the ships of the enemy two hours before they can be seen with the natural vision and to distinguish the number and quality of the ships and to judge their strength and be ready to chase them, to fight them, or to flee from them; or, in the open country to see all details and to distinguish every movement and preparation."

Galileo's Observations of Jupiter's Moons

Galileo published his observations in *Sidereus Nuncius* in March 1610:

"I should disclose and publish to the world the occasion of discovering and observing four Planets, never seen from the beginning of the world up to our own times, their positions, and the observations made during the last two months about their movements and their changes of magnitude; and I summon all astronomers to apply themselves to examine and determine their periodic times, which it has not been permitted me to achieve up to this day . . . On the 7th day of January in the present year, 1610, in the first hour of the following night, when I was viewing the constellations of the heavens through a telescope, the planet Jupiter presented itself to my view, and as I had prepared for myself a very excellent instrument, I noticed a circumstance which I had never been able to notice before, namely that three little stars, small but very bright, were near the planet; and although I believed them to belong to a number of the fixed stars, yet they made me somewhat wonder, because they seemed to be arranged exactly in a straight line, parallel to the ecliptic, and to be brighter than the rest of the stars, equal to them in magnitude . . . When on January 8th, led by some fatality, I turned again to look at the same part of the heavens, I found a very different state of things, for there were three little stars all west of Jupiter, and nearer together than on the previous night."

"I therefore concluded, and decided unhesitatingly, that there are three stars in the heavens moving about Jupiter, as Venus and Mercury around the Sun; which was at length established as clear as daylight by numerous other subsequent observations. These observations also established that there are not only three, but four, erratic sidereal bodies performing their revolutions around Jupiter."

Simon Marius claimed to have observed Jupiter's moon as early as late November 1609 (about five weeks prior to Galileo) and had begun recording his observations in January 1610 at about the same time Galileo was first making his observations. However, since Marius did not publish his observations right away as Galileo had done, his claims were impossible to verify. Since Galileo's work was more reliable and extensive, he is generally given the credit for discovering the moons of Jupiter. In 1614, Marius did provide the names of the Jupiter's moons that we are familiar with today, based on a suggestion from Johannes Kepler:

"Jupiter is much blamed by the poets on account of his irregular loves. Three maidens are especially mentioned as having been clandestinely courted by Jupiter with success. Io, daughter of the River, Inachus, Callisto of Lyncæon, Europa of Agenor. Then there was Ganymede, the handsome son of King Tros, whom Jupiter, having taken the form of an eagle, transported to heaven on his back, as poets fabulously tell I think, therefore, that I shall not have done amiss if the First is called by me Io, the Second Europa, the Third, on account of its majesty of light, Ganymede, the Fourth Callisto"

"This fancy, and the particular names given, were suggested to me by Kepler, Imperial Astronomer, when we met at Ratisbon fair in October 1613. So if, as a jest, and in memory of our friendship then begun, I hail him as joint father of these four stars, again I shall not be doing wrong."

Galileo originally called the Jupiter's moons the "Medicean planets", after the Medici family and referred to the individual moons numerically as I, II, III and IV. Galileo's naming system would be used for a couple of centuries. It wouldn't be until the mid-1800's that the names of the Galilean moons, Io, Europa, Ganymede and Callisto, would be officially adopted, and only after it became very apparent that naming moons by number would be very confusing as new additional moons were being discovered.

MAY MEETING

by Lee Erickson

The SMAS Meeting was held May 10, 2002 at the Discovery Center. There were 15 members in attendance. There were three visitors: Wesley Tipton, Erik Iverson and Angela Quick. Erik and Angela have since become members. Welcome Erik and Angela!

Paul Lewis described the planetary probes of the Jet Propulsion Laboratory (a.k.a. JPL) in the month's program. Paul recounted the history of increasingly sophisticated robotics spacecraft from Pioneer to Voyager to Galileo. Paul also demonstrated the recent planetary alignment with the PC program, Starry Night.

Charles Ferguson presented "The Night Sky". This month familiarized us with the "big kitty cat in the sky", Leo. This mighty cat stands in some tall grass straight under the bottom of the Big Dipper. Within Leo, Charles suggested we try to find the galaxies M64, M65 and M105.

Old Business:

Bill Burgess reported on the current status of Telescopes for Kids Project. Three telescopes are ready and so three organizations were chosen: The Boys and Girls Club of Seville, Central High School, and Heritage High School. The next step will be to contact these organizations and ask them to select a recipient. The date of the next telescope building day is to be announced.

New Business:

We discussed forming teams to work on the Astronomical League Observing Club awards. After a show of interest, the meeting broke up into smaller groups to plan activities and share information and copies of the Observing Club lists.

Messiers Times 2 by Steve Rothschild

I just came across an article in the magazine "Astronomy" that I thought might have some interest to our club members. There is very little creativity in this article, just a lot of editing to keep it down to a reasonable size. So why am I putting this article before you? Some of you may not have access to this periodical and would benefit from its contents. So there! The title of the article is "Two for One Messier Viewing". Boiled down, this piece shows us where there is more than one object worth viewing once the Messier object is located.

1. M7: Near the cluster's western edge (6" scope or better) is a 10th mag GC NGC6453.
2. M8: East of center (6" scope again) within the nebula is NGC 6530.
3. M13: within 1 degree are 3 galaxies: 12th mag NGC 6207 28' NE of center. (6" scope), NGC 6196 needs an 8". Found 51' SW of cluster-about 1/2 size of NGC 6207, and IC 4617 (requires an 18" scope) found NE of cluster. More details available upon request.
4. M31: NGC 206 An enormous cloud of stars and nebulosity within M31 requires at least a 6"scope-found 40' SW of of core. Using at least a 12" scope there are at least 5 GCs within M31's central core.
5. M33: NGC 604 (3" scope or better) NE of core, NGC 595 W of core and not as easy as 604
6. M35: NGC 2158 found 1/2 degree SW using at least 4" scope.
7. M46: NGC 2438 found with at least a 6" scope. 10th mag found N of cluster using at least 150x to pick it out.
8. M51: NGC 5195 appears as a lump on the N edge of galaxy. Use at least a 3" scope or binos to view, 6" adds luminous arms.
9. M81/82: NGC 2976 1.4 degrees SW of 81 Need 6" or better, NGC 3077 found 45'ESE of 81 using at least a 4" scope, NGC 2959 is W of 81. You'll need at least 14"to see this 14 mag galaxy.
10. M84/86: Using at least 8" scope find mag 12 NGC 4387 11' S, NGC 4388 an 11 mag edge on spiral is a little further S., NGC 4402 is 10 arcmin N of 86, NGC 4413 is 21' S of 86, NGC 4425 is 20' SE of 86. NOTE: Look in this entire area for more.

That's all they wrote. I have the article and will be more than happy to fill in any details I left out, if you would like them. Call me at 379-5251 or email me at srsigns@msn.com. I hope you enjoy finding these little gemules. Others call them "AFGS" (Another faint, gray spot).

CCDs VERSUS FILM FOR ASTRONOMICAL IMAGING PART 2 BY MIKE LITTLETON

Is Using Film a Thing of the Past?

Accurate focusing is vital to good astronomical photographs. Even the small changes from expansion and contraction of the telescope with temperature will change focus. Focusing is relatively simple in astrophotography with 35-mm single lens reflex (SLR) cameras because there is access to the image plane. In addition, a number of SLR cameras have magnifying viewfinders to aid in obtaining an accurate focus. There is no access to the image plane of a CCD. Focusing is an iterative process of imaging an object, adjusting focus, and repeat imaging. A variation in the method is to cover the objective with a mask with two holes, then repeat focus and image until a single image is observed.

The first table shows the size of a 35-mm film frame to the size of amateur CCD detectors, field of view at the prime focus of a 80" focal length telescope (e.g. 8" SCT) and approximate camera cost with the listed detector. The table shows most CCDs detectors are much smaller than a 35-mm film frame except those that exceed the budget of all except the most dedicated or wealthy amateur astronomers. Film's image plane is so large that aiming the telescope during imaging is relatively simple. The only equipment needed is a guide telescope with rough alignment of its optical axis to the optical axis of the telescope doing the imaging or an off-axis guider. The small size of the CCD detector makes imaging an object more difficult. Acquiring the object visually and then installing the CCD is usually unsuccessful because the telescope will move when adding the additional weight of the CCD. A well-aligned guide scope with at least 20 power and an illuminated reticule attached to the imaging telescope is needed to aim the telescope at an object for CCD imaging. The mounts of many mass-produced portable telescopes cannot handle the additional weight of the guide scope and CCD and the amateur astronomer must acquire a heavier and consequently less portable mount. Also, note the angular size compared to the size of some common imaging targets.

Detector	Dimensions (mm)	FOV (arcmin.)	Cost
TC-255	3.2 x 2.4	5.4 x 4.1	\$895
TC-237	4.9 x 3.7	8.3 x 6.3	\$1,295
KAF-0401E	6.9 x 4.6	11.7 x 7.8	\$2,650
KAF-1602E	13.8 x 9.2	23.4 x 15.6	\$5,995
KAF-3200E	14.9 x 10	25.2 x 16.9	\$7,695
35 mm camera	36 x 24	60.9 x 40.6	\$200

Object	Size (arcmin.)
Moon	30 x 30
M 31 And. Galaxy	189 x 62
M 57 Ring	15.2 x 15.2
M [°] 42 Grt. Nebula	66 x 66
M 8 Lagoon	90 x 90
M [°] 20 Triffid	29 x 29

CCD imaging is a significant improvement for the amateur astronomer. It permits imaging of objects so dim as to be formerly outside the reach of most amateur telescopes. Even with the increasing degradation of the night sky with light pollution by outdoor lighting, it allows imaging without traveling to remote locations. The shorter exposure time of CCDs lessens the need for accurate polar alignment. One major disadvantage of the CCD is its high cost compared to photography. Unless the amateur has an observatory, CCD photography also requires a laptop computer and an external power supply. Aiming and focusing is difficult and the less expensive CCDs have a small field of view. The weight of the additional equipment on the telescope may require the acquisition of a heavier mount. The total cost for CCD imaging may be two or more times the cost of the primary telescope.

Photography is inexpensive. An amateur can affix a 35-mm camera and off-axis guider on a mass-produced 8-inch SCT and produce deep-sky images for \$200 or less. The detector is large which permits imaging of the common astronomical targets in a single frame. Using digital processing, the amateur can produce excellent pictures with the ubiquitous home computer for just a few hundred additional dollars and avoid the tedium of the darkroom. Unfortunately, the amateur must load telescope and camera and transport to a dark location unless they live in rural New Mexico or a similar location. Exposures are long for the dim objects and manual or automatic tracking is required (using a CCD). Still, even with its drawbacks, photography will be used for astronomical imaging for some time to come.

For Sale or Wanted

10" f/10 LX200 with custom Milburn equatorial wedge, dew heater, dew/light shield, focal reducer and counterbalance system for sale. 13.1" f/4.5 Coulter Odyssey \$400.00 Red Tube design with original accessories. For more info please contact Mike Fleenor at 675-5488 or mflenor@tds.net

June Star Parties by Shawn Grant

The star parties will be a treat for June. On June 8th the star party will be held at Hooper's Bald. It is about an hour and a half drive and directions can be found at <http://www.smokymtnastro.org/smas/directions.htm>. The skies at Hooper's Bald are probably the best you will ever see in East Tennessee. You can see stars of 7th to 7.5 magnitude easily with the naked eye. Those of you who are working on some of the harder AL certificates such as the Herschel or the Herschel II be sure to take advantage of this opportunity to observe the fainter objects on your list.

Instead of heading out an hour before sunset, be sure to spend the whole afternoon touring the area. Hooper's Bald is in the Cherokee National Forest with many sights equal to the Smokies. There are two waterfalls on the way: Bald River Falls and Falls Branch Falls. Bald River Falls is the most spectacular waterfall in east Tennessee. There are several parking areas with grand mountain scenic vistas.

We have other star parties this month as well: June 1st and June 29 at Look Rock.

Shawn Grant
www.shawngrantsworld.com

Editor's Note: The star party on June 1st at Look Rock encountered intermittent clouds. There was good observing during the cloud breaks. Everyone decided to quit about 12:30, but the skies cleared after everyone had packed up and called it a night. Bob Arr led a group up to Hooper's Bald. His luck was 2 for 2 for Hooper's Bald as well as the star party last month at Big South Fork-clouds. With the weather this time of year, let us hope for good skies on the 29th.

Sky Conditions BY THE WIZ

Dear Wiz,

The other night I heard two guys talking about seeing and transparency. Why do they have to make this stuff complicated? It's either a good night or not, right? I. S. Bliss

Dear Ignorance,

Wrong. Don't you understand the difference between seeing something small, and seeing something blurred? "Seeing" refers to how small a star you can see naked eye. Typically, mag 6 is the limit. If you can see all 7 stars in the Little Dipper, that's great seeing.

"Transparency" is how much the atmosphere blurs the stars (makes them twinkle, or makes Jupiter's bands dissolve and reappear a minute later). Mostly, air turbulence ruins transparency, and there's little you can do about it except be patient--it comes and goes, usually in less than a minute.

You can also create air turbulence inside your telescope if you haven't left it outside long enough to equalize its temperature with the air. Put it outdoors (in the shade) a couple hours before you go stargazing.

Keep your ear to the ground. The Wiz

PUMP UP YOUR MIND!

Share your astronomical experience with the rest of SMAS and everyone on the Internet by writing an article for SCRAPs. Contact Mike Littleton at (865) 671-1022 or email littlem@ix.netcom.com.



June 2002

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Treasurer:
Janice Erickson

Star Party Organizer:
Shawn Grant

SCRAPS Editor:
Mike Littleton

SUN	MON	TUE	WED	THU	FRI	SAT
						1 Star Party
2 Last Qt	3	4	5	6	7 UTK	8 Star Party
9	10 New Moon	11	12	13	14 SMAS	15
16	17 1st Qt.	18	19	20	21 UTK	22
23	24 Full Moon	25	26	27	28	29 Star Party
30						

SCHEDULE OF EVENTS

- **6/1/02** Star Party at Look Rock
- **6/7/02 and 6/21/02** Public observing from the roof of the Physics Building at UTK
- **6/14/02** SMAS meeting 7 PM at the Discovery Center
- **6/15/02** Venus sets at 11:26 PM; Mars sets at 10:10 PM; Jupiter sets at 10:36 PM; Saturn sets at 8:23 PM
- **6/29/02** Star party at Look Rock

SMAS Website:
<http://www.smokymtnastro.org/>

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