

BULLETIN

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OUR 84th YEAR OF
ASTRONOMY IN LOS ANGELES
Los Angeles Astronomical Society
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Editor's Corner

*W*e're getting closer to resolving the issue of the use of portable stairs for the 26-inch telescope; the LAAS board has determined the size of the stairs, and where to store it. We hope to resolve this matter in a month or so. We'll keep everyone posted on our progress.

For those that missed it, the new RTMC date is posted on page 13. **NOTE that this is NOT Memorial Day weekend this year !** Many have expressed an issue with this date change away from its traditional date of Memorial Day weekend. If you have an issue with the date change, I strongly suggest you write to the RTMC organizing committee.

Articles, short news or story items, and photographs and images are welcome as long as they're focused on LAAS interests. Articles need to be 1,500 words or less. Please submit only a few images at one time, with a caption for each. Include such information as camera type, telescope or other equipment used, and exposure times, where pertinent. The deadline for submitting bulletin material is the 10th of each month. If possible, please submit electronically to: BulletinEditor@laas.org

Material may be sent to the LAAS address listed at the top of the column at left, but timely reception and publication cannot be guaranteed. ✧

David Nakamoto

New Members

The new members approved at the last board meeting are:

- John Hawk
- Brian Souter
- Sandy, Brianna, and Joshua Brown
- Derek Liu
- Bruce Gifford
- Richard Spear
- Martha Frost
- Niyant Krishnamurthi

Welcome to our club, and we hope you'll enjoy your Astronomy with all of

The Virgo Cluster

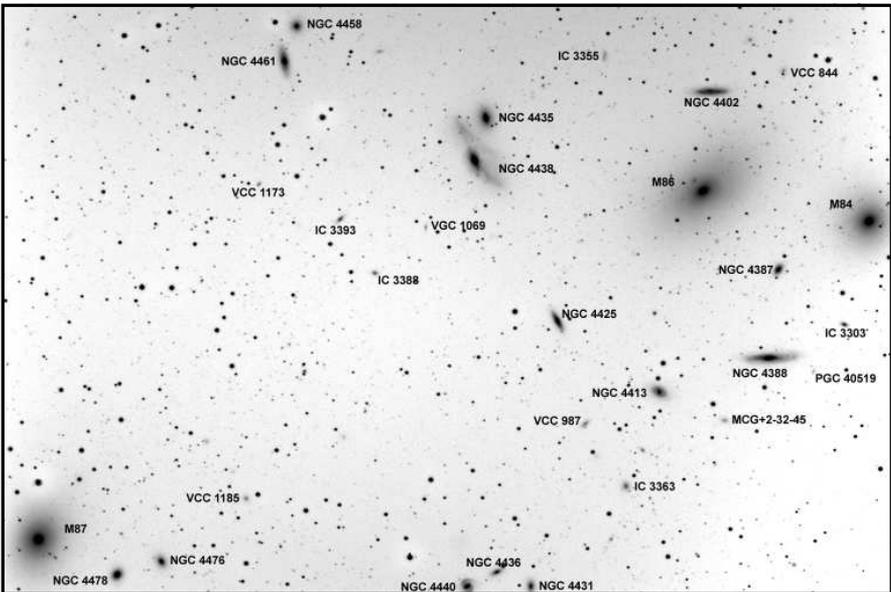
By Timothy Thompson

After recording the 91st entry in his list of things that are not comets, on 18 March 1781, Charles Messier made the following comment (in French, of course):

The constellation Virgo and especially the northern wing is one of the constellations which encloses the most nebulae. This catalog contains 13 which have been determined, viz. Nos. 49, 58, 59, 60, 61, 84, 85, 86, 87, 88, 89, 90 and 91. All of these nebulae appear to be without stars and can be seen only in a good sky and near meridian passage. Most of these nebulae have been pointed out to me by M. Mechain.

Together, Messier & Mechain had discovered the Virgo cluster of galaxies. This is the first written documentation of that discovery. Messier went on to add objects 98, 99 and 100 to his catalog, to total 16 objects from the Messier catalog in the Virgo cluster. Messier had written down the wrong coordinates for M91, and it was William C. Williams, an amateur astronomer from Texas, who figured out which galaxy in the cluster was actually M91, documented in a letter to the editor of *Sky and Telescope* in the December 1969 issue. So from 1781 until 1969, M91 was a "missing object" on the Messier list.

(Continued on page 4)



This image shows the heart of the Virgo cluster with the galaxies labeled. The upper right shows part of the Markarian chain, which is conspicuous in the Big Picture at Griffith Observatory, in the downstairs Gunther Depths of Space exhibit.

Image Credit: Paul and Liz Downing -

The Virgo cluster covers an area roughly enclosed between +13 and +20 degrees declination, and 12 to 13 hours right ascension. My Sky Atlas 2000.0 (Tirion & Sinnott, field version, 2nd edition) shows the Virgo cluster on page 14, and in the appendix at the end of the atlas on page B1. The cluster sits astride the boundary between Virgo and Coma Berenices, so it is also sometimes called the Coma-Virgo cluster.

The Virgo Cluster Catalog (VCC) was published in 1985, but remains the standard catalog still used today (*Studies of the Virgo Cluster II. A Catalog of 2096 Galaxies in the Virgo Cluster Area; Binggeli, Sandage & Tammann, The Astronomical Journal 90(9): 1681-1758, September 1985*). The catalog lists 1277 certain cluster members and an additional 574 possible cluster members (1851 altogether), along with 245 background galaxies that are all in the Zwicky catalog. They found no foreground galaxies. A paper from 2010 shows 2156 galaxies in the VCC+ catalog, of which 1175 are dwarfs and 414 are irregular or peculiar, but does not distinguish between certain and probable cluster members. Dwarf galaxies typically outnumber larger galaxies by about a factor of 10, so these numbers are reasonable. Our own small Local Group, with about 60 galaxies, has only 2 large spirals (Milky Way & M31), one small spiral (M33) and everything else is a dwarf

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galaxy.

The total mass of the Virgo Cluster is somewhere between 1014 and 1015 solar masses, depending on who is doing the reporting; the most recent determination I have seen, based on observations of 1792 galaxies falling into the cluster, can only give the range $2.7\text{-}8.9 \times 10^{14}$ solar masses. In any case, these are reasonable numbers for a large galaxy cluster; our own Local Group weighs in at a few times 10^{12} solar masses, including dark matter, making the Virgo cluster at least 100 to 300 times as massive as our Local Group.

Anywhere from 60% to 90% of the normal (*baryonic*, not dark matter) mass of a galaxy cluster is found in the intracluster medium (ICM) rather than in the galaxies themselves. The ICM is mostly tenuous and very hot gas. However, the galaxies in a cluster often make close passages by one another, or even collide. The result is that a lot of stars are stripped away from the galaxies and become wandering stars between the galaxies. These stars create a diffuse glowing light, called the *intracluster* light, between the galaxies within the cluster. There is a well studied intracluster light in the Virgo cluster and it is not strictly limited to normal stars; a large number of intracluster planetary nebulae have been observed as well. The intracluster light near M87 is particularly bright, indicating stars stripped away from the outer regions of the galaxy by the combined gravity of the rest of the cluster.

In 1926, Harlow Shapley and Adelaide Ames published a paper estimating the distance to the Virgo cluster as about 10,000,000 light years (ly), and they also speculated that the spiral nebulae in the cluster were stellar systems not unlike our own Milky Way galaxy. In research papers from the last year, the given distance to the cluster ranges from 15 to 20 megaparsecs (Mpc) or 48,900,000 to 65,200,000 ly. Since the cluster is an extended object, the near side being considerably closer to us than the far side, choosing a single distance is obviously as much of an art than a science. The depth of the cluster from our vantage point is anywhere from 2 to 6 Mpc (6,500,000 to 19,600,000 ly). There is a small group of 5 galaxies on the far side, about 23 Mpc (75,000,000 ly) that may be cluster members. M87 is the most massive galaxy in the cluster, roughly corresponds to the cluster center of mass, and lies at a distance about 16.1 Mpc (52,490,000 ly). The lenticular galaxies M84 & M86 are conspicuous at the fat end of the Markarian Chain of galaxies. M84 lies at a distance of about 18.4 Mpc (60,000,000 ly), while M86 lies at the somewhat closer distance of about 15.9 Mpc (51,800,000 ly). The giant elliptical galaxy M87 is the most massive galaxy in the cluster, roughly corresponds to its center of mass, and lies at a distance about 16.4 Mpc (53,460,000 ly). The large spiral galaxy M100 lies at a distance about 16.1 Mpc (52,490,000 ly).

Cosmologists make use of the cosmological redshift – distance relationship
(Continued on page 6)



The giant elliptical galaxy M87 is the most massive galaxy in the Virgo cluster. It is twice as massive as the Milky Way and hosts at least 14,000 globular clusters. The peppering of dots around the galaxy that look star-like are in fact globular clusters.

Image Credit: Robert Gendler -

to derive the distance to very distant galaxies. But the measured redshift is actually a combination of a redshift induced by the cosmological expansion plus a redshift, or blueshift, caused by the motion of the galaxy relative to its own local environment (this local motion is typically called *peculiar* motion). In most cases the peculiar motion is so small compared to the cosmological expansion that it can be ignored, but this is not the case for the Virgo cluster. At least 6 bright members of the cluster (M86, M90, M98, NGC 4318, NGC 4419 and IC 3258) show blueshifted spectra, but there are at least 60 cluster members known to show blueshifts. The record blueshift is IC 3258, heading this way at 517 km/sec. Likewise, some of the Virgo cluster galaxies exhibit extreme redshifts for galaxies so cosmologically nearby; i.e., M99, NGC 4168, NGC 4354, NGC 4388, NGC 4607 and IC 3453, all of which show redshifts in excess of 2300 km/sec, which if entirely cosmological would imply a distance in excess of about 110 million light years. These blueshifts, and excess redshifts, are due to the fact that the Virgo cluster is still in the process of forming. New galaxies are still falling into the cluster, so galaxies falling in from the opposite side naturally appear blueshifted, and galaxies falling in from the near side naturally appear excessively redshifted. Our Local Group is "falling" towards the Virgo cluster at about 240 km/sec, but the Virgo cluster is

(Continued on page 7)



The grand-design spiral M100 is the largest spiral galaxy in the Virgo cluster. The HST discovered Cepheid variable stars in M100 and determined its distance as 16.1 +/- 1.3 Megaparsecs.

Image Credit: European Southern Observatory -

“falling” away from us at about 1200 km/sec, so both the Local Group and the Virgo cluster are “falling” towards a greater mass that lies on the far side of the cluster.

M87, a giant elliptical galaxy, is the most massive galaxy in the cluster and roughly coincides with the cluster center of mass. Everything about M87 qualifies as big. The main body of the galaxy is about 120,000 ly across, compared to a diameter of about 100,000 ly for the Milky Way disc. While the stellar halo of the Milky Way might extend out as far as 300,000 ly, the stellar halo of M87 extends out about 490,000 ly. The main body of M87

(Continued on page 8)

weighs in with about 2.5×10^{12} solar masses, roughly equal to the combined mass of M31 and the Milky Way, and therefore most of the mass of our entire local group. The total mass of M87 is anywhere from 5×10^{12} to 10^{13} solar masses. While our Milky Way sports 158 globular clusters in the 2003 William Harris catalog, M87 is known host at least 14,000 globular clusters. Even our supermassive black hole does not measure up. The central black hole in the Milky Way carries about 4 million solar masses, while the central black hole for M87 is no smaller than 3 *billion* solar masses. That's roughly the same as the total mass of local group spiral galaxy M33.

In 1918, from Lick Observatory, Heber Curtis discovered "a curious straight ray" in the heart of M87. In 1954, Baade and Minkowski identified M87 as the optical counterpart of radio source Virgo A. We now know that the straight ray discovered by Curtis is a jet, extending perhaps 5000 ly, from the supermassive central black hole, and that's where most of the radio emission comes from. Jets of the type found in M87 are ubiquitous.

Since M87 is the closest giant elliptical galaxy to us, its jet can be studied in more detail than any other, so it becomes the surrogate study object for large-scale jets everywhere. M87 is one of the most intensely studied galaxies in the sky.

M100 is a face-on spiral galaxy with two conspicuous major arms looping around it, which defines the form typically called *grand design*. Grand design spirals are actually somewhat rare, more so than one might think after seeing them in every collection of galaxy images. M100 is about 3,600,000 ly from M87 and both are about the same distance from us. The stellar disk of M100 is about 113,000 ly in diameter, only slightly larger than the roughly 100,000 ly diameter Milky Way disk. I cannot find any determination of the mass of M100, but considering its size, it must be comparable to that of the Milky Way, about 10^{12} solar masses including dark matter.

The chief claim to fame for M100 is that it played a key role in the Hubble Key Project, using Cepheid variable stars to determine the true distance to distant galaxies. After determining Cepheid distances to the closer galaxies M81 and M101, the HST Key Project turned its attention to the Virgo cluster and M100. The distance they determined remains the most reliable, 16.1 ± 1.3 Mpc, or $52,490,000 \pm 4,240,000$ ly.

The Virgo cluster is prime hunting ground for amateur astronomers looking for galaxies. It is also prime hunting ground for professional astronomers who want to study galaxies, and the effect of the cluster environment on galaxy evolution; being the nearest galaxy cluster, its member galaxies can be observed with high resolution and are relatively bright. It is prominent in spring, and spring has sprung, so all you galaxy observers have something to keep you busy. ✧

In Memoriam

Over the last few months the Los Angeles Astronomical Society has lost several members.

Joe Addison, Lennis (Bud) Bartlett, Chuck Lunt and Betty Meyerdierks have all passed away since late last year.

Joe Addison was a regular in the public star parties at Griffith Observatory. He also donated the marvelous 8-inch refractor that is now mounted in the Garvey Ranch Park Observatory in Monterey Park.

Bud Bartlett was a member of the board for LAAS, a chemistry teacher at Arcadia High School and founder of the Arcadia High School Astronomy Club.

Chuck Lunt was a regular at the Steve Kufeld Astronomical Site in Lockwood Valley and chairman of the star members committee for many years.

Betty Meyerdierks was wife & faithful companion to **Herman Meyerdierks**, several times member of the board for LAAS. She was always with him at the annual LAAS banquets and other LAAS events.

It's the efforts of the members that make this or any other society work. We thank our old friends for their presence amongst us, and their service to the LAAS. They will all be sorely missed. ✧

Winners of the 2010 Messier Marathon

The following are the winners of the LAAS 2010 Messier Marathon:

- Honorable Mention: Carla Johns, 97 objects using a telescope and star hopping method.
- Honorable Mention: Michael Rudy, 109 objects using a telescope and computerized method.

Thanks to all who participated this year !

Michael Rudy

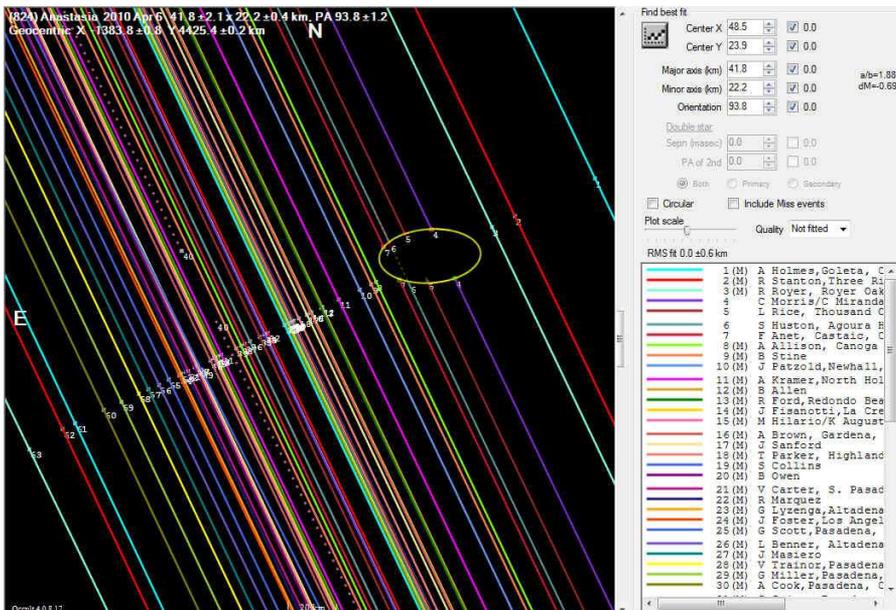
Asteroid Occultation . . . NOT!

Well, it was the brightest star to be occulted by an asteroid in recent memory. Zeta Ophiuchi, magnitude 2.5, disappears for up to 8 seconds as asteroid Anastasia glides over it. And Los Angeles county has a front row seat.

Well, this is the last time I try and see one of these at 3:34 AM (!!) in the morning. Or any other time when I'm supposed to sleep. It's hard to tell, but the graph below shows that the actual path was well west of where they predicted it. Only four observers in the Southern California area saw anything. I noticed a lot of familiar names on the list, including Jane Jones of JPL and Tony Cook of Griffith. And yes, they saw nothing too. I even took video, but it would have been a tough one, since Zeta was barely visible on the camera. Yes, the path of occultation was an estimate. Yes, the actual path was within 3-sigma of the predicted "centerline". And yes, the negative results also contributed to scientific studies of these objects.

And yes, I lost a lot of sleep.

David Nakamoto



This image of Mars was taken from the front lawn area at Griffith Observatory during the March 20th 2010 star party, using a 5-inch f/12 Maksutov telescope and a Philips CCD SPC900 camera. The image is a small section from a much larger one, the tiny globe of Mars being only 10-arc seconds across. The seeing conditions were poor; high cirrus clouds, heavy haze, and some turbulence, but some very large



features were visible through telescopes. However, more are seen in this image. The image is inverted. At the bottom is the north pole surrounded by its ring of darker terrain. Above and to the left of the pole is Mare Acidalium. The bright area in the center is Arabia. Just above center is Sinus Sebeus and Sinus Meridiani. The dark feature on the upper right portion of the limb is Syrtis Major.

David Nakamoto

Outreach Program

We've got a large number of requests despite the Recession and the cutback in school funding.

We especially need people living in the San Gabriel Valley to go to outreach events there. Nearly all of the regular volunteers live in the San Fernando Valley, so the need in the "other" valley is great.

Come on out to the school and show all the enthusiastic kids, parents, and teachers the night sky. They always appreciate it. And if you get WOW's when they look through you scope, you'll feel good. If no scope, come out anyway and help up set up or answer questions from the kids. So, Outreach volunteers, let's pitch in. I'm sure the kids and adults will appreciate our effort.

Thanks !

Outreach@laas.org (818) 891-3087 ✧

(Editors Note: Be aware that often these requests come with very little advanced notice. Therefore, we won't post any events in the bulletin. The best way to get news of these events is to use the Internet and either join the LAAS Yahoo group or access the LAAS website. To join the LAAS Yahoo group, see page 16.)

Don DeGregori

Griffith Observatory Public Star Party Procedure

If you arrive before 6:00pm, show your LAAS badge or card to the traffic control person at the fork at the top of Vermont road just before you reach the tunnel. You'll be allowed to drive up East Observatory Ave. After 6:00pm, no one is allowed to drive up East Observatory Ave, and you'll need to drive through the tunnel, up West Observatory Ave., and through the public parking lot to the traffic control person at the end of the lot. Show the person there your badge and they should let you through. Once at the U curve in front of the Observatory, temporarily park your car on the side nearest to the observatory and unload your equipment. Mary Brown will be available with a cart to facilitate moving your equipment. Unloaded your equipment at the spot where you wish to set up. Mary will oversee your equipment while you park along East Observatory Rd. Then set up your equipment.

Volunteers without equipment are also needed. We especially need help with crowd control with the 26-inch telescope.

Those who volunteer should remember that the main focus is to be of service to the patrons at Griffith Observatory and show them the nighttime sky. New Members are not expected to adhere to this policy.

Please check the LAAS website and Yahoo list for changes and updates in any LAAS event.

We still need more members trained in moving the 26-inch, setting it up and preparing it for moving. If you're interested, please attend one of the Griffith public star party events. We normally bring the telescope out around one hour before sunset so we have enough light to do so, weather permitting. We'd like as many members to be trained and comfortable handling the telescope, so that it will always be available for viewing by the public.

Have fun and enjoy! ✧

PJ Goldfinger & David Nakamoto

General Meeting Speaker Information

The Speaker for May will be Dr. Werner Dappen from USC, on the topic of helioseismology and the Sun. ✧

The 2010 RTMC

This year's RTMC dates are :

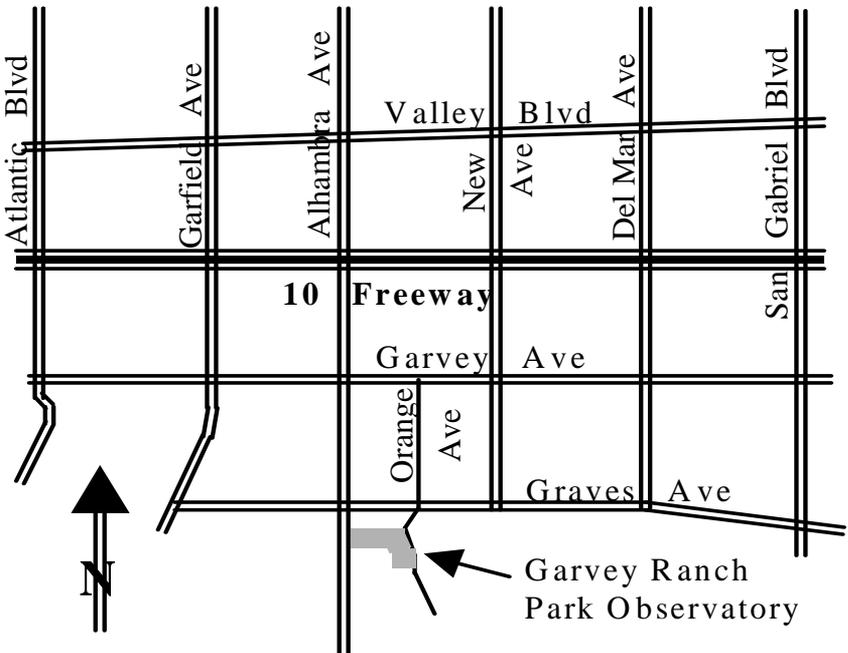
Friday May 14th through Sunday the 16th.

Note that this is a two-week shift in its traditional date of Memorial Day weekend. Make quick plans to attend if you intend to. In the past when I went, local inns and hotels are filled up by January, although since RTMC is not held on Memorial Day as it has in the past, it might be easier to find lodging. Still, don't delay. ✧

David Nakamoto

Map to Monterey Park Observatory

(The place to build your telescope)



LOANER CORNER

Despite the rain, the spring and summer star party season is sneaking up on us. Mars and Saturn are in view in the evening sky. Below are listed the telescopes that are currently available in the loaner program.

LAAS-1 - 4.5" f/8 Celestron reflector on a Polaris mount. This is an easily portable instrument that is still capable of good performance.

LAAS-5 - 6" f/6 Parks reflector on a Polaris clone equatorial mount with a clock drive.

LAAS-8 - 80mm Selsi refractor on an equatorial mount. This is a good telescope for planetary observation.

LAAS-9 - 80mm f/6.25 refractor with a University Optics objective on a heavy duty Celestron camera tripod with a pan-head mount. This RFT is good for the Messier marathon.

All telescopes are equipped with 3 eyepieces. Reflectors include a simple collimation tool and refractors come with a star diagonal

For more information call: David Sovereign at (626) 794—0646. ✧

David Sovereign

Telescope for Sale !

Nancy Stannard is selling a Meade DS-2000 telescope, 3 years old, but never used! She can be reached at (719) 237 - 6547. Asking \$250 or best offer. ✧

EVENTS CALENDAR

Date	Event	Location and Information
May 5th (Wed)	Board Meeting	Garvey Ranch Park Class Room. 8:00pm to 10:00pm
May 10th (Mon)	General Mtg	Griffith Observatory, Event Horizon Theater, 7:45pm to 9:45pm. Speaker information on page 11.
May 15th (Sat)	Dark Sky Night	Lockwood Valley
May 22nd (Sat)	Public Star Party	Griffith Observatory, 2:00pm to 10:00pm, See pg 12 for details on how to attend.
June 9th (Wed)	Board Meeting	Garvey Ranch Park Class Room. 8:00pm to 10:00pm
June 12th (Sat)	Dark Sky Night	Lockwood Valley
June 14th (Mon)	General Mtg	Griffith Observatory, Event Horizon Theater, 7:45pm to 9:45pm. Speaker information on page 11.
June 19th (Sat)	Public Star Party	Griffith Observatory, 2:00pm to 10:00pm, See pg 12 for details on how to attend.

Lost and Found

Last year a power cord was left at a public star party at Griffith Observatory. It has a "cigarette lighter" connector one end and a DC connector on the other that looks as if it goes with a go-to telescope.

A few months ago, also after a public star party, a 9mm 1.25" eyepiece was found next to the curb where we load and unload.

For further information call David Sovereign at (626) 794-0646 ✧

LAAS Yahoo Group—how to join

The group is private, and therefore does not come up in a search. To join, send email to: LAAS-subscribe@yahoogroups.com. Include your full name so the moderator can verify your LAAS membership. If approved, you will receive further instructions via email. ✧

Sky and Telescope Subscriptions

Sky and Telescope subscriptions renewals should be sent directly to Sky Publishing. To start a Sky and Telescope subscription, contact the LAAS Treasurer (see the contact information on page 2) directly to get the club rates, then thereafter send the renewal bills directly to Sky Publishing. ✧

Astronomy Magazine Subscriptions

For those that subscribe to Astronomy Magazine through the LAAS, the rate is \$34 a year, \$60 for two years. ✧

Membership Annual Dues:

Youth	\$ 20.00
Regular (18-65)	\$ 45.00
Senior Citizen (65 and up)	\$ 30.00
Senior Family	\$ 40.00
Family	\$ 60.00
Life	\$ 500.00

Additional fees:

Charter Star member	\$ 30.00
Star member, with pad	\$ 70.00
Star member, no pad	\$ 60.00
Printed Bulletin	\$ 15.00

(Membership due date is indicated on the mailing label)

HANDY PHONE LIST



LAAS Answering Machine	(213) 673-7355
Griffith Observatory	
Program.....	(213) 473-0800
Sky Report.....	unavailable for now
Lockwood Site	(661) 245-2106
	(not answered, arrange time with caller.
	Outgoing calls – collect or calling card)
Mt. Wilson Institute.....	(626) 793-3100



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LAAS Bulletin Online: http://www.laas.org/Resources_Newsletter.htm