

# THE EVENT HORIZON



## ST. LOUIS ASTRONOMICAL SOCIETY

*Devoted to the Interest and Advancement of the Science of Astronomy*

**VOLUME 26, Issue 5**  
**May, 2016**

### Exoplanets

by

**Dr. Heather Knutson**  
**California Institute of Technology**

Dr. Heather Knutson will be featured at the May meeting of the St. Louis Astronomical Society. The meeting will begin at 7:30 PM Friday, May 20, in McDonnell Hall, Room 162, on the Washington University campus, Saint Louis, MO 63130.

Exoplanets are planets in orbit around other stars. More than 3,000 such worlds have been discovered. More continue to be detected by both ground-based and space telescopes. Most of the first group of exoplanets were giant gas worlds, like Jupiter and Saturn. Improvements in technology have made it possible to detect even Earth-sized planets. Of greatest interest is the detection of Earth-sized planets at distances from their host stars suitable for life to exist. Dr. Knutson will talk about how ex-

oplanets are detected, the characteristics of some exoplanets, and how the composition of their atmospheres can be determined. The presence of certain chemicals in exoplanet atmospheres could indicate that life exists on those worlds.

Dr. Heather Knutson is an Assistant Professor in the Division of Geological and Planetary Sciences at the California Institute of Technology. She is a member of the Institute's Center For Planetary Astronomy. Dr. Knutson received the American Astronomical Society's Annie Jump Cannon Awards in 2012 for her outstanding research work. She is interested in the physics and chemistry of exoplanetary atmospheres, planet formation and migration, and the search for new low-mass eclipsing planetary systems.

### Upcoming Meetings:

June 17, 2016 - Meteorologist Mike Roberts  
July 15, 2016 - Jane Rix - Sketching the Night Sky  
August 20, 2016: 2017 Eclipse - One Year Out - John Wharton, SLSC

### Mid States Region



### Inside This Issue

President's Corner,	<b>2</b>
Photo Gallery	<b>3</b>
The Queen of Dark Matter	<b>4</b>
Volunteer hours	<b>7</b>
Photo Gallery	
Board Minutes	<b>8</b>
Financials	<b>9</b>
Events	<b>10</b>
Contact	<b>11</b>

## Mid-States Region of the Astronomical League

- Friday, June 3 - Sunday, June 5
- Columbia, MO
- Star B Q Friday 6 pm at Rockbridge HS with Planetarium Show by Melanie Knocke
- Tour of Laws Observatory
- Banquet Saturday 6 pm at University Center, Dr. Angela Speck, Keynote
- Tour of Morris Observatory after the banquet (Alvin Clark Refractor)
- Speakers: Dr. Mike Reynolds, Eclipse

and meteorite expert, Dr. Linda Godwin, NASA Astronaut

- Costs: Registration \$35, Star B Q \$20, Box Lunch \$11, Banquet \$40, Dorms (1/2 block away)
  - Single - 52.50
  - Double occupancy - 29.50 each

Link for the registration page:

<http://www.slsonline.org/msral2016reg.html>

Questions? Contact Jim Small or Cook Feldman

**Presidents Corner—Jim Small**

Just two weeks left for MSRAL registration. You can find information about the conference and a link to the registration page here: <http://www.slasonline.org/msral2016.html>

There is also a link on the home page of the SLAS website or you can find one in the story on the front page of the newsletter.

You may reserve a dorm room now. Cost will be 52.50 for a single and 29.50 each if the room is shared. Linens are included. Parking for the Discovery dorm is right across the street in the Virginia Avenue Garage. Contact is Matt Arnold at:

Phone: 573 882 4440

Email: [arnoldmt@missouri.edu](mailto:arnoldmt@missouri.edu)

We look forward to seeing you all at the conference! Be sure to register soon so we know you are coming! Please see me if you are interested in volunteering for any aspect of MSRAL 2016 to be held June 3-5 in Columbia, MO!

**ELECTIONS are this month.** We have a full slate of nominations for positions for this election. They are:

President - Jim Small

Vice President - Brad Waller

Treasurer - Bill Winningham

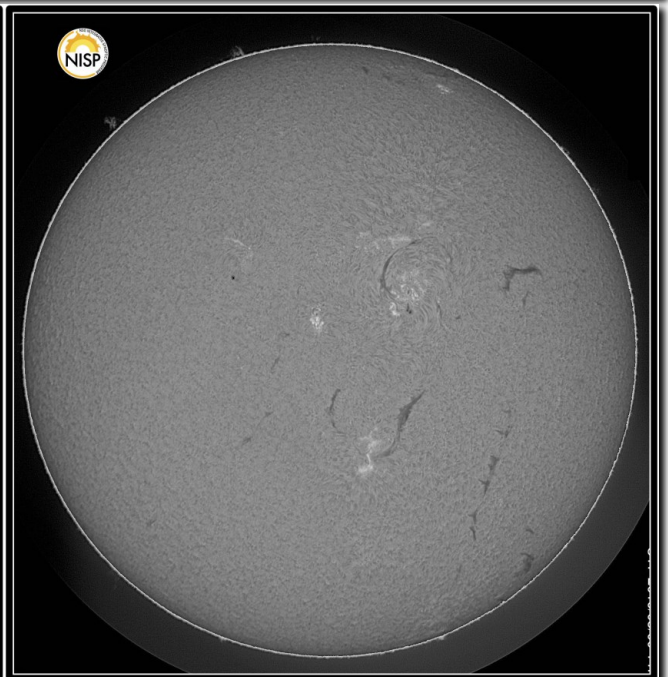
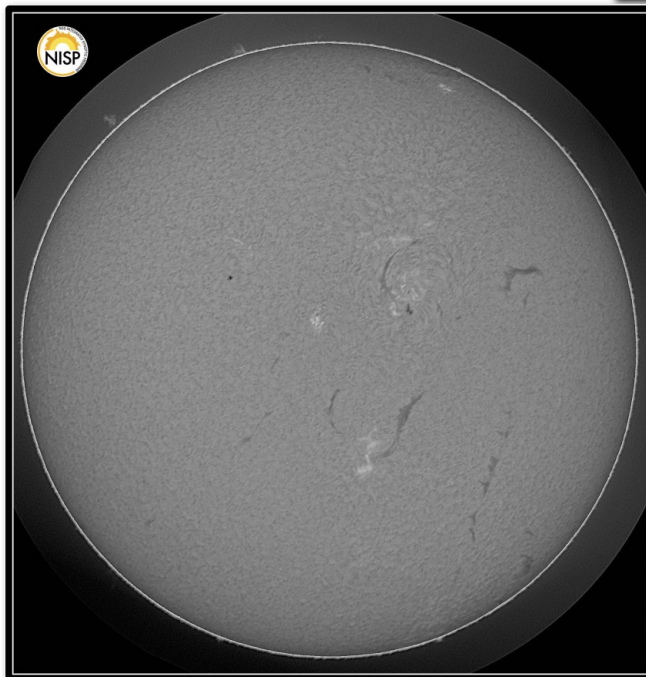
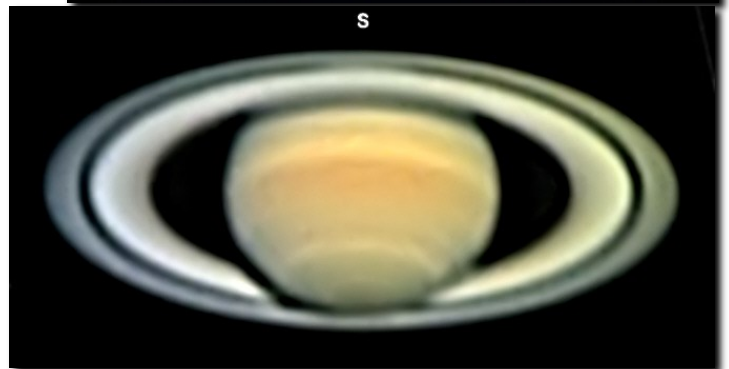
Secretary - Mark Jones

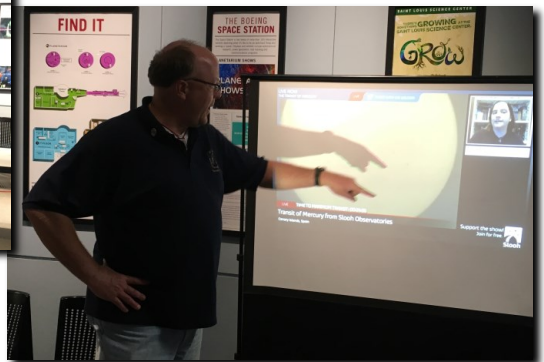
Hospitality - Larry Campbell

Board Member at Large - Rich Heuermann

There are photos from some of the myriad of events on the next page.

The photos on this page are from (top) John Beaury, (mid) Jim Melka on May 6, (bot) Grant Martin of the Mercury Transit. The transit photo is a stereo image and you can see mercury “floating” if you can adjust your eyes correctly to view a stereo image.





Clockwise from top left: Rich Heuermann at Air Show, Larry Campbell at Air Show, Brad Waller at Mercury Transit, Frank Mack at Astronomy Day, Cook Feldman at Air Show, Sharon Bertram and Mark Jones at Air Show, John Beaury at Astronomy day, Patrons at Night Skies over Babler Above. Our new table runner and vertical banner.



## The Queen of Dark Matter by Jim Small

*Editor's note: this article was written as part of a requirement for a History of Astronomy course from Swinburne University in 2013. The premise was to write about someone who didn't get their due in the history books. After the article in the June issue of Astronomy magazine "How Vera Rubin discovered dark matter" by Sarah Scoles, I have an urgent reason to publish it. I agree it's time to see if we can get Dr. Rubin a well-deserved Nobel Prize for her discoveries relating to dark matter. I hope you enjoy the article*

We've all heard about it. Dark matter. No one knows what it is, but it can be measured using gravity. We now know that it makes up much more of the universe than the luminous matter we can detect with electromagnetic radiation. But how was dark matter discovered and by whom? It would seem that the persons responsible for providing the first quality evidence for dark matter would be highly recognized in textbooks, especially since it makes up so much of the universe and is one of the biggest questions in astronomy and physics today, but they make little or no mention of them. I would like to introduce you to one of the first astronomers to provide strong evidence for dark matter and in so doing, give you insight into a great astronomer's life. Her name is Dr. Vera Cooper Rubin, and she one of the important astronomers of the 20th century and beyond and her life, work and accomplishments deserve notice.

I first "met" Vera Rubin when I was teaching an astronomy class at Valley Park High School. It was 1991 and the TV series "The Astronomers" aired on my local public broadcasting station. The episode was "Where is the Rest of the Universe" and featured John Dobson, Vera Rubin, and Tony Tyson. I am an amateur astronomer and was very interested in John Dobson, but the more I watched the program as I showed it to my students, the more Dr. Rubin impressed me. The statement that hit me the hardest, especially being a science teacher myself, was that her high school physics teacher, upon hearing that she would attend Vassar on a scholarship told her "as long as she stayed away from the sciences, she should be fine." I pride myself for encouraging women to enter science fields, and that struck me as a poor statement coming from any teacher. My father was as disappointed as I was on hearing about it as he is where I learned to be fair and encouraging to anyone wanting to further his or her education.

Vera Cooper Rubin had an interest in astronomy and built her first telescope in childhood. Being an amateur astronomer and working with other amateurs who have built their own equipment, I can vouch that this is a great way to get involved in astronomy. Nothing beats your observations

from a telescope you built yourself! During her Vassar experience in 1947, she said that she requested a graduate catalog from Princeton. In return, she was notified that Princeton did not accept women in graduate physics and astronomy. (Rubin, 1986) Rubin notes that Princeton did not accept women in graduate astronomy programs until the year I graduated from high school, 1975! This would turn out to be Princeton's loss however, as she was accepted to Cornell after graduating as Vassar's only astronomy major in 1948, and had classes with physicists such as Richard Feynman. She completed her degree in 1951 and her thesis was "Evidence for a rotating universe as determined from an analysis of radial velocities of external galaxies" (Cornellweb) Rubin presented her findings at the AAS meeting in December of 1950. They were not received well and her work was rejected for publication in both The Astronomical Journal and The Astrophysical Journal. (Rubin, 1996). Though not a pleasant start for a 22 year old woman with a baby, she was not to be deterred. This is a pattern you will find over and over with Vera Rubin as she manages to find people to work with and for during her career. Bob Rubin, her husband obtained a position in Washington and Vera applied for graduate work at Georgetown University. She worked on her doctorate under George Gamow (from George Washington University) and graduated from Georgetown in 1954, with a thesis that showed that galaxies were not evenly distributed, again not received well. She did her work under George Gamow at Georgetown while having 2 children, a feat not easily accomplished, but she had support from her husband and parents during that time. I teach students who attend night school and they have a tough time working, going to school, and raising a family. Vera Rubin had great perseverance to accomplish all she did while working on her PhD. After graduating at Georgetown, she worked at Montgomery County Junior College then Georgetown University as a lecturer. During her time at Georgetown, she had a paper accepted in The Astronomical Journal in which she concluded that "for  $R > 8.5\text{kpc}$ , the stellar curve is flat, and does not decrease as is expected for Keplerian orbits" (Rubin, 1962). In her Millennium Essay about 100 years of Rotating Galaxies, she states that there was no influence of the conclusion on anyone! Since she had first met with George Gamow at the Department of Terrestrial Magnetism at Carnegie Institute and thought she might like to work there someday (Rubin, 1996), in 1965, she applied at the Institute and began work in the astronomy program there. (DTM, 2013) One of the advantages of such a position is that you are in charge of your own research and you will have more freedom to work how you wish.

Spectroscopy in the early days was an extremely laborious procedure. The dim light from a spectrum took a very long

time to expose a photographic plate properly, which really slowed down work. When Rubin began work at the Department of Terrestrial Magnetism (DTM), another staff member named Kent Ford was working on a system to make taking spectra much faster. The new device was known as an image tube spectrograph and it makes obtaining spectra from very dim objects possible. They originally went back to Rubin's master's thesis topic and applied the spectrograph to galaxies in clusters. But the results from this work were met with great resistance, so they instead turned to individual galaxies. Rubin and Ford began observing spectra on gas clouds in galaxies at various distances from the center, starting with the Andromeda Galaxy. (see figure 1) When this data is obtained, a plot of the speed versus the radius from the center is created. This is known as a rotation curve, and the expected curve, based on Newton's laws, should be high at the beginning, and then tail off as the distance increases, indicating the stars far from the center should be moving much more slowly than others near the center.



Figure 1 Rubin observing spectra (photo courtesy Janice Dunlap)

But that is not what Rubin and Ford found. Instead, the rotation curves flattened out at a certain point and remained flat or nearly so all the way to the edge of the galaxy (see figure 2). This does not comply with predictions and indicates that stars and gas near the outer edge of the galaxy were moving around the galaxy at nearly the same speed as stars close by. They completed measurements of nearly sixty spiral galaxies and obtained similar results. The luminous matter measured in the galaxy could not account for this motion, so the only conclusion is that most of the mass responsible had to be invisible or "dark". This work complimented the work of Zwicky (1933), the first astronomer to coin the term "dark matter" after measurements of clus-

ters of galaxies did not match standard Newtonian mechanics. Now it would be applied within individual galaxies as well.

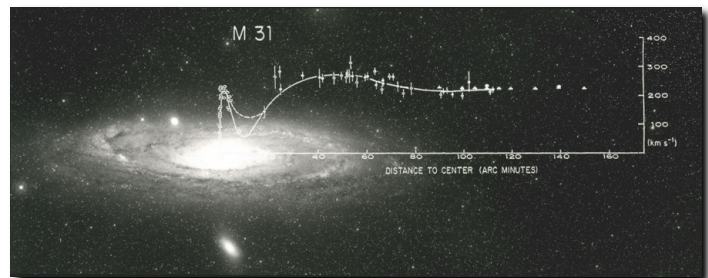


Figure 2. Photo from the Palomar Sky Survey. Combination of photo and graph created by Vera Rubin and Janice Dunlap, used with permission from Janice Dunlap.

This gives you a feel for the beginning of an illustrious career of dedicated research in astronomy by a remarkable person. Rubin goes on to work with Ford and others over the next decades on more galaxy measurements, including a study of Sc I galaxy velocities of the local group of galaxies. The results were that the galaxies were being pulled by something in the direction of Hydra and Centaurus. This became known as the Rubin—Ford effect. Another favorite is a study of NGC 4550, where Rubin found two counterrotating discs of stars in a single galaxy, one prograde and one retrograde. She also has several studies of low surface brightness galaxies. Over 257 papers have been authored or coauthored by Rubin, the latest being a work with Deidre Hunter and others on ultra deep H $\alpha$  imaging of two luminous spirals, published October, 2013. Hunter describes her coworker via personal communication "as a woman like the rest of us who had a major impact in astronomy by simply doing the research she loved." She goes on to say she did not "put up with politics" and was "untiring in promoting women in astronomy." Rubin is my kind of astronomer. Hunter said that one night they were observing at the 2.1 m telescope at Kitt Peak National Observatory and something broke. Rather than calling it a night because the telescope couldn't move, they used the telescope as a transit scope and took spectra of the night sky as it passed overhead. Rubin found some feature in the combined spectra that she didn't recognize, but worked hard at figuring out what it was. Hunter couldn't remember what the feature was, but this gives you an idea of the dedication of Rubin as an astronomer. Never waste a clear night.

The awards, honorary degrees, and recognitions for Vera Cooper Rubin are many. She was the first woman to observe at Palomar, and in 1993, President Bill Clinton presented Vera Rubin with the National Medal of Science, the highest award in science offered by the presidency to those

who have had a lifetime of contribution. She was only the third woman to receive this award. See Figure 3.



Figure 3. Rubin receives the National Medal of Science from President Clinton

She also received the Jansky Prize from the National Radio Astronomy Observatory in 1994 (Janskyweb),

and was the second woman to receive the Gold Medal from the Royal Astronomical Society in 1996 (the first was Caroline Herschel in 1828) (RASweb). She was awarded the Peter Gruber Foundation Cosmology Prize in 2002 (Gruberweb) and the James Craig Watson Medal in 2004 (NASweb) from the National Academy of Sciences. In 1994, Rubin delivered the Henry Norris Russell Lecture at the American Astronomical Society meeting (AASweb). Katy Garmany was in the audience for the Russell lecture and when Dr. Rubin was introduced as the “most revered and most loved” Katy said the audience resonated with that statement. Garmany also presented the Catherine Wolfe Bruce Gold Medal to Rubin in 2003. This is the highest honor from the Astronomical Society of the Pacific and is a lifetime achievement award. (ASPweb) Dr. Rubin also has honorary doctorates from Princeton (Princetonweb), Creighton, Harvard, Yale, Williams, Michigan, Georgetown and Ohio State (CWPweb)

Vera Cooper Rubin is married to Bob Rubin and they have four children, Judith, David, Karl, and Allan. All four are scientists and Judith Young represents one of the few mother—daughter astronomy teams. Perhaps they were inspired by the work that Rubin had to do at home while they were young. Dr. Rubin has mentored many young astronomers and has been a champion for women in astronomy. She would like everyone to be exposed to science and said at a Berkeley commencement address, “We need senators who have studied physics and representatives who understand ecology” (UCBweb). Of her work, when she was elected to the National Academy of Sciences, she said “Fame is fleet-

ing. My numbers mean more to me than my name. If astronomers are still using my data years from now, that's my greatest compliment.” Vera Rubin deserves to be remembered for so much more than her numbers. Those that have been inspired by her resolve and passion will continue her legacy for many years to come. I hope I can be as inspiring to my students as she has to the astronomy community.

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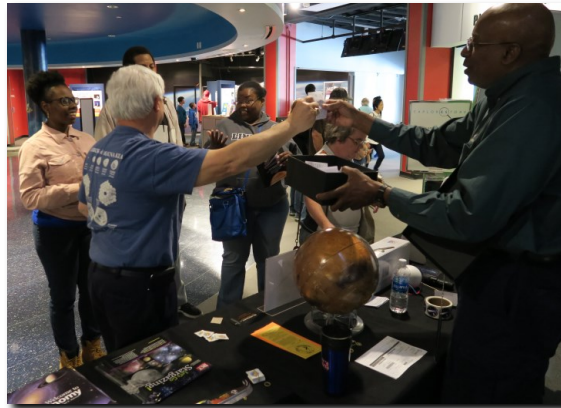
## Outreach Volunteer Hours For January - April 2016 by Mark Jones

So far in 2016, SLAS members have logged 408 hrs for 41 NSN outreach events.

Thank you to all our volunteers!  
 Donald Ficken 28 events; 61 hrs  
 Cook Feldman 15 events; 44.5 hrs  
 Mark Jones 12 events; 35 hrs  
 Larry Campbell 9 events; 27 hrs  
 James Small 7 events; 17 hrs  
 John Beaury 7 events; 24.5 hrs  
 Rich Heuermann 7 events; 23 hrs  
 Frank Mack 6 events; 11.5 hrs  
 Richard Fefferman 4 events; 10 hrs  
 Bill Biermann 3 events; 5.5 hrs  
 Rick Menendez 3 events; 8 hrs  
 Bill Breeden 2 events; 6 hrs  
 Dale Engelbrecht 2 events; 7.5 hrs  
 Gaylene Engelbrecht 2 events; 7.5 hrs  
 Jim Trull 2 events; 6 hrs  
 Richard Jennings 2 events; 4 hrs  
 Sharon Bertram 2 events; 10 hrs  
 Alan Sapia 1 event; 7 hrs  
 Ann Trull 1 event; 3 hrs  
 Doug Blum 1 event; 1.5 hrs  
 Edward Frey 1 event; 7 hrs  
 Gary Holt 1 event; 7 hrs  
 Gerald Hutchins 1 event; 7 hrs  
 Gregory Rigelman 1 event; 2.5 hrs  
 James Griffith 1 event; 2.5 hrs  
 Lynn Fee 1 event; 4.5 hrs  
 Mark Fedde 1 event; 4 hrs  
 Marlene Bopp 1 event; 8 hrs  
 Michael Callaghan 1 event; 1.5 hrs  
 Michael Malolepszy 1 event; 2 hrs  
 Michelle Birch 1 event; 8 hrs  
 Mike Saville 1 event; 7 hrs  
 Rita Breeden 1 event; 3 hrs  
 Robert Beebe 1 event; 6 hrs  
 Thomas Schloemann 1 event; 6 hrs  
 Wayne Clark 1 event; 6 hrs  
 William Neubert 1 event; 5 hrs  
 William Winningham 1 event; 2 hrs



Above left: Bob Drzymala showing off sunspots at the Air Show. Above: Jim Trull setting up his solar scopes. Left: it's good to be there when Larry Campbell draws the winner: LaShonda Roundtree, Below right. Below, three winners of Galileoscopes. All Winners included: LaShonda Roundtree, Helen Crabtree, Xiaoyan Li, Jeanne Rozycke, Daniel Fancote, Donald Glover, Tracy Groves, Stacy Rutledge, Mary Eplin, and William Nelson



Bottom: Enjoying GiveSTLDay with Louie and Dana Dean from Show Me St. Louis. SLAS had \$75 in donations for the day despite computer issues.



## SLAS Executive Board Meeting Minutes for April 7, 2016

**1. Opening Activities:** Read and approve minutes from March. Attendees: Jim Small, Larry Campbell, Brent Buch, Mark Jones, Tom Nickelson, Brad Waller Meeting opened at 7:06pm Minutes review and approved Brad second by Tom.

**2. External Business** SLSC/SLAS memorandum has forwarded to Cook and Don for review and final approval. Waiting to hear back from SLSC.

**Next board meeting:** May 12, June 9, July 7, Aug 10 (Wed), Sep 8, Oct 6, Nov. 10, Dec 7 (Wed).

### 3. Director Reports:

**President – Jim Small:** Nominations for Officers is in April and May. Elections are in May. Who is running? Jim Small will not be at the April 22<sup>nd</sup> SLAS meeting. Mark will run the meeting.

**MSRAL 2016:** Need to promote attendance at this year's MSRAL meeting. Get the word out about the conference! Are you coming? Have you registered yet?

Recognitions for April LTP.

**Give St. Louis Day May 3:** [www.givestlday.org](http://www.givestlday.org) Don Ficken set it up. One day only donations. Jim will link on our website to promote SLAS. The link for our page: <https://givestlday.org/npo/st-louis-astronomical-society>

**Zoom.us** webcasting software: Download the program in preparation for our program in May with Dr. Knutson

### Vice President –Paul Baldwin: No Report

**Secretary-Mark Jones:** First four lenses have been sold by Stone Cinema. See Treasurers report

**Treasurer-Bill Winningham** March 2016 financial reports sent prior to meeting. Summary as follows:

The Astro Mag Award proceeds have been spent prior to the April 10th deadline, the remaining balance is zero.

We received \$6,687 for the sale of the first batch of donated Boeing lenses. I have categorized the revenue as "other income" on the preliminary P&L report for now. This may change pending feedback from our SLAS accounting experts.

The insurance for 2016 has been paid (\$380 same as prior years).

The LTP-build expenses have all been settled. Bill W. is following up with Don Ficken to reconciling any minor differences between Bill and Don's records.

Form 990 e-postcard is due by May 15. Bill W. expects to file it within the next week and will notify the board when the filing has been completed. Bill will follow-up with the short program budget report that shows expenses to date vs. the full year budget (the attached reports compare to expected/prorated budget through March)

**Hospitality-Larry Campbell:** No report

### Board members at large

**Bradley Waller (2016):** My position is up for election this year. I plan to run for Vice-President.

Jim Lovell Talk on the 15<sup>th</sup>: Raffle for two tickets completed and winning ticket drawn at March meeting

New members meeting report. Still having trouble getting new members to respond to emails. It would be good to require phone numbers. No new members meeting planned for April

Tom returned one LTP scope he borrowed to look for a better switch on finder

MSRAL raffle started last month

### SLAS Meeting Speaker Line-up

April – Ian Redmount Cosmological Evolution, Bio has been sent.

May – Dr. Heather Knutson

June - Mike Roberts Brad will contact Paul.

July – Possibl speaker Gary Gackstaetter

August – John Wharton

**Astro 101 –** April 22: Mark Jones - Transit of mercury preview and planetary transit award

May 15: Brad is asking Grant and Bill N. to present their gadgets from Homemade Fest

Other options: Planetary toolkit

**Tom Nickelson: (2017)** Tom is working on repair of video camera for All-Ability Scope. Rick Menendez needs scope for April 13<sup>th</sup> Children's Hospital event.

**Brent Buch (2018)** Plan to upload March 2016 SLAS video to Youtube. Experimenting on the correct format for YouTube Jim will send SLAS header to Brent to load onto SLAS Youtube page.

### 4. Committee Reports: If needed

**Library Telescope Program:** All the new built LTP scopes have been delivered. Total is now 88

**Membership –** Need Brad to newsletter articles on upcoming raffles and membership initiatives events.

Membership recognition report. Larry presented name badge, Consensus is use lanyards.

Membership report for March 2016 sent out prior to Board meeting by Don Ficken. Our membership count is 157 members which is down by 2 members from last year's count of 159 members for the comparative period. We have fewer new members and more expirations than last year. Details of expired memberships are included in the report.

**Merchandise –** .No report. Remember you can to go Headz and Threads for embroidered merchandise.

**Newsletter –** Need articles for April newsletter

**Night Sky Network –** Telecons from NSN now use video streaming via zoom.us. New Planetary toolkit was received

**Dark Site –** Next dark sky event is this Saturday night

### Observing Programs –

Bill Biermann plans to help any members who want to work on their AL award for the "Universe Sampler". Bill Biermann, Bill Neubert and Mark Jones continue to Hos the Sky Orienteering events at Babler State Park

### Star Parties:

This is a list of key events; more detail is available on Night Sky Network.

**SLSC:** viewings on April 12 (Yuri's night); May 9 (Mercury Transit); Astronomy Day May 14

**Spirit of St. Louis Airshow** Setup Thursday, May 12 Booth on May 13, 14, 15 Great opportunity to contact many people!

**Astronomy Day:** Crestwood Star Party that night.

**5. Old Business -** Brad is looking at reflective vest idea for members to use at Public events.

**6. New Business** Brad contacted Mike Bush for his "Making a Difference" TV segment

**7. Closing Activities** Motion Brad second Mark meeting adjourned at 9:13pm



7:14 AM  
05/12/16  
Accrual Basis

**St. Louis Astronomical Society**  
**Profit & Loss Budget vs. Actual**  
January through April 2016

	<u>Jan - Apr 16</u>	<u>Budget</u>	<u>\$ Over Budget</u>
<b>Ordinary Income/Expense</b>			
<b>Income</b>			
Magazine Subscription	400.65	630.45	(229.80)
Membership Dues	1,380.00	1,350.00	30.00
Total Merchandise Sales	4.00	0.00	4.00
<b>Total Income</b>	<u>1,784.65</u>	<u>1,980.45</u>	<u>(195.80)</u>
<b>Cost of Goods Sold</b>			
Magazine Subscriptions	392.55	630.45	(237.90)
Total Merchandise	2.51	22.50	(19.99)
<b>Total COGS</b>	<u>395.06</u>	<u>652.95</u>	<u>(257.89)</u>
<b>Gross Profit</b>	<u>1,389.59</u>	<u>1,327.50</u>	<u>62.09</u>
<b>Expense</b>			
1-Programs & Events	398.87	653.33	(254.46)
2-Newsletter	58.80	66.67	(7.87)
3-Library expense		33.33	(33.33)
5-Loaner Scopes		12.50	(12.50)
7-Insurance	380.00	380.00	
8-Website	155.40	150.00	5.40
9-Administrative Expenses	199.09	470.00	(270.91)
<b>Total Expense</b>	<u>1,192.16</u>	<u>1,765.83</u>	<u>(573.67)</u>
<b>Net Ordinary Income</b>	<u>197.43</u>	<u>(438.33)</u>	<u>635.76</u>
<b>Other Income/Expense</b>			
<b>Other Income</b>			
<b>Donations</b>			
SLAS Club Members	0.05	0.00	0.05
Donations - Other	450.00	0.00	450.00
<b>Total Donations</b>	<u>450.05</u>	<u>0.00</u>	<u>450.05</u>
Eclipse Escrow Receipts	800.00	0.00	800.00
Interest Income	18.85	33.00	(14.15)
LTP Receipts	8,753.00	0.00	8,753.00
Proceeds from Lens Sales	6,687.00	0.00	6,687.00
<b>Total Other Income</b>	<u>16,708.90</u>	<u>33.00</u>	<u>16,675.90</u>
<b>Other Expense</b>			
Astro Mag Award Disbursements	472.76	0.00	472.76
Eclipse Escrow Disbursements	386.17	0.00	386.17
Eclipse Escrow Funding	800.00	800.00	0.00
LTP Disbursements	8,651.33	0.00	8,651.33
LTP Escrow Funding	1,000.00	1,000.00	0.00
<b>Total Other Expense</b>	<u>11,310.26</u>	<u>1,800.00</u>	<u>9,510.26</u>
<b>Net Other Income</b>	<u>5,398.64</u>	<u>(1,767.00)</u>	<u>7,165.64</u>
<b>Net Income</b>	<u>5,596.07</u>	<u>(2,205.33)</u>	<u>7,801.40</u>

**St. Louis Astronomical Society**  
**Balance Sheet**  
As of April 30, 2016

	<u>Dec 31, 15</u>	<u>Apr 30, 16</u>
<b>ASSETS</b>		
<b>Current Assets</b>		
Checking/Savings		
Astronomy Magazine Award**	465.72	0.00
Checking - First Bank	2,940.49	1,850.45
Deposit, Certificate of	20,108.23	20,125.87
Library Telescope Escrow*	444.55	597.48
Merchandise Change Fund	20.00	20.00
PayPal	82.51	0.00
Savings - First Bank	5,361.90	12,050.11
SLAS Eclipse Conference Escrow***	539.12	938.58
YMCA Trout Lodge Escrow	542.87	542.87
<b>Total Checking/Savings</b>	<u>30,505.39</u>	<u>38,125.34</u>
<b>Other Current Assets</b>		
Inventory Asset	1,410.53	1,408.02
Investment in Mid-States 2016	1,000.00	1,000.00
Undeposited Funds	55.00	33.63
<b>Total Other Current Assets</b>	<u>2,465.53</u>	<u>2,441.65</u>
<b>Total Current Assets</b>	<u>32,970.92</u>	<u>38,566.99</u>
<b>Fixed Assets</b>		
Total Fixed Assets	0.00	0.00
<b>TOTAL ASSETS</b>	<u>32,970.92</u>	<u>38,566.99</u>
<b>LIABILITIES &amp; EQUITY</b>		
<b>Equity</b>		
Opening Bal Equity	8,137.66	8,137.66
Retained Earnings	24,464.84	24,833.28
Net Income	368.42	5,598.07
<b>Total Equity</b>	<u>32,970.92</u>	<u>38,566.99</u>
<b>TOTAL LIABILITIES &amp; EQUITY</b>	<u>32,970.92</u>	<u>38,566.99</u>

\* Funds restricted for the Library Telescope Program. \$444.55 was carried over from the end of 2015. Reflects \$1,000 from the 2016 budget.

\*\* Funds from Astronomy Magazine Award, available until 4/10/2016 (funds have been spent).

\*\*\* Registration fees and donations for SLAS sponsored eclipse seminars. Also includes \$800 from the 2016 budget.

**Wanted: Newsletter Articles!**

**The Event Horizon needs articles from people like YOU!**

**Interviews, current astronomy topics, historical articles, you name it, we can use it! Send what you have to: [newsletter@slasonline.org](mailto:newsletter@slasonline.org)**

**Wanted: Volunteers!**

**Be sure to sign up on Night Sky Network for upcoming star parties. Lead volunteers need to know who will be there so they can tell where we are falling short. If you aren't sure how to RSVP, please ask anyone at the meeting and we can show you how on the computer after the meeting. Or contact any board or committee member to find out. See you at the next star party!**

## Upcoming Star Parties and Other Events

For details on these and other upcoming events, check out the Night Sky Network Calendar linked on the Home Page for SLAS at <http://www.slasonline.org>

**SLAS Executive Board Meetings** *Location will be at the Edward Jones YMCA* All meetings are on Thursdays unless noted.  
May 12, June 9, July 7, **Wed, Aug 10**, Sep 8, Oct 6, Nov. 10, Dec 7

**Dark Sky Observing Dates**  
See you in April!

**Francis Park Events:** These events are on Thursdays the week nearest the first quarter Moon  
6/8/2016, 7/6/2016, 8/10/2016, 9/7/2016, 10/5/2016

**SLSC Public Telescope Viewing Events:** These events are held the first Friday of the month  
Planetarium shows start at 7pm  
6/3/2016

**YMCA Edward Jones Star Parties** (generally third Mondays)

6/20/2016, 7/18/2016, 8/15/2016, 9/19/2016, 10/17/2016,

**Pattonville Observatory Public Viewing Dates**  
5/19/2016

**Broemmelsiek Astronomy Park Public Viewing**  
Every Friday night with ASEM members

**UMSL Observatory**  
For directions and map  
<http://www.umsu.edu/~physics/astro/directions.html>

All sessions include viewing of 1st quarter Moon with additional objects

**Skywatch Hotline: 314-516-5706**

**Saturdays:** 6/11, 7/9, 8/13, 9/10, 10/8, 11/5

### LET US KNOW YOU ARE COMING!

To RSVP for any of these events log in to the Night Sky Network and submit your RSVP. If the event is canceled, you will be notified immediately according to the preferences you have selected.

## SLAS EVENTS

May

20 Fri

21 Sat

21 Sat

21 Sat

22 Sun

27 Fri

28 Sat

SLAS regular meeting **ELECTIONS!**  
Sidewalk Solar Observing - SLSC  
Ballwin Family Campout  
Beaumont Cub Scout Pack 972  
Opposition of Mars - SLSC  
SLAM Underground  
Danville Observing

June

3 Fri

3-5 Fri-Sun

4 Sat

4 Sat

8 Wed

8 Wed

9 Thur

9 Thur

9 Thur

10 Fri

11 Sat

12 Sun

13 Mon

14 Tue

17 Fri

20 Mon

24 Fri

25 Sat

26 Sun

27 Mon

Public Telescope Viewing  
MSRAL Convention—Columbia, MO  
SLAS Dark Sky Observing  
Pack #314 Graduation Camp Out  
Beaumont  
Francis Park  
St Charles Kisker Road  
SLAS board meeting  
Brentwood Library  
Brentwood Library Solar Party  
Boy Scout UMSL STEM  
Great Rivers Greenway Festival  
Stargazing at the Gateway Arch  
St Charles Spencer Road Star Party  
Belleville Library Star Party  
SLAS regular meeting  
Edward Jones YMCA Star Party  
Vanderwall Montessori Summer Camp  
Great American Camp Out  
Des Peres Park  
SLAS Sky Orienteering Event  
Junior High Camp

### SLAS Merchandise Available

SLAS merchandise is now set up for embroidery at

Headz n Threadz at <https://hnt.threadthis.com/>

There are two locations:

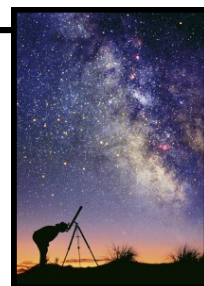
**Galleria:** 2495 St. Louis Galleria, St. Louis, MO 63117 Telephone: 314.862.2695  
galleria@headznthreadz.com

**Delmar:** 6662C Delmar Blvd St. Louis, MO 63130 Telephone: 314.863.2695 delmar@headznthreadz.com

[Delmar Map](#)

Simply take the garment, hat, etc you wish to have embroidered and they will take care of it. They have the SLAS logo on file. You may make modifications to the colors if you wish.

**SLAS Logo is also available at  
Infini-tees and Johnny Mac's**



# SLAS MEMBERSHIP APPLICATION



Name: Last \_\_\_\_\_  
 First, Middle Initial \_\_\_\_\_  
 Address \_\_\_\_\_  
 City, State, Zip Code \_\_\_\_\_  
 email address \_\_\_\_\_

Youth @ \$10.00 / 1 year (18 yrs or younger) \$ \_\_\_\_\_  
 Individual @ \$25.00 / 1 year \$ \_\_\_\_\_  
 Family @ \$40.00/1 year \$ \_\_\_\_\_  
**Publications with discount available with your SLAS membership:**  
 Sky and Telescope @ \$32.95 / 1 year \$ \_\_\_\_\_  
 (S&T may also be renewed at their website:  
<http://www.skyandtelescope.com>)  
 Astronomy @ \$34.00 / 1 year \$ \_\_\_\_\_  
**TOTAL ENCLOSED** \$ \_\_\_\_\_

Please send completed form with check (no cash please) made payable to  
 St Louis Astronomical Society  
 Don Ficken, Membership  
 13024 Barrett Crossing CT  
 St. Louis, MO 63122

Check all that apply:  
 Renewal  
 Address Change Only  
 Please send my newsletter by regular mail  
 **New Member!**

## SLAS OFFICERS

<b>President</b>	<b>Jim Small</b>	314-307-0692
president at slasonline.org		
<b>Vice President</b>	<b>Paul Baldwin</b>	314-781-4080
vicepresident at slasonline.org		
<b>Secretary</b>	<b>Mark Jones</b>	636-394-2342
secretary at slasonline.org		
<b>Treasurer</b>	<b>Bill Winningham, (Don Ficken - membership)</b>	636-225-0269
treasurer at slasonline.org		
<b>Hospitality</b>	<b>Larry Campbell</b>	636-244-2867
hospitality at slasonline.org		
<b>Board Members at Large:</b>		
	<b>Brent Buch</b>	314-239-0329
Board18 at slasonline.org		
	<b>Tom Nickelson</b>	314-346-9565
board17 at slasonline.org		
	<b>Bradley Waller</b>	314-481-7250
board16 at slasonline.org		
<b>ALCOR</b>	<b>Bill Winningham</b>	636-225-0269
(Astronomical League Correspondent ) treasurer at slasonline.org		
<b>MSRAL Rep.</b>	<b>Jim Small</b>	314-909-7211
msral_rep at astroleague.org		

## COMMITTEE CHAIRS

<b>Dark Site Coordinator</b>	<b>Mark Jones</b>	636-394-2342
darksite at slasonline.org		
<b>Librarian</b>	<b>Jim Small</b>	314-909-7211
librarian at slasonline.org		
<b>Library Telescope Program</b>	<b>Don Ficken</b>	636-851-9630
lirbrarytelescope at slasonline.org		
<b>Loaner Equipment</b>	<b>Greg Gaines</b>	314-277-3082
loaner at slasonline.org		
<b>Merchandise</b>	<b>Vacant</b>	
merchandise at slasonline.org		
<b>Membership</b>	<b>Don Ficken</b>	636-225-0269
membership at slasonline.org		
<b>Newsletter Editor</b>	<b>Jim Small</b>	314-909-7211
newsletter at slasonline.org		
<b>Observing Programs</b>	<b>Jerry Loethen</b>	314-329-8008
observing at slasonline.org		
<b>Publicity</b>	<b>Rich Heuermann</b>	314-962-9231
publicity at slasonline.org		
<b>Recognition</b>	<b>Larry Campbell</b>	636-244-2867
recognition at slasonline.org		
<b>'SLASdialogs' Moderator</b>	<b>Mark Jones, Rhonda Whelan</b>	
dialogsmoderator at yahoo.com		
<b>Star Party Coordinator</b>	<b>Bill Breeden</b>	314-276-3613
starparty at slasonline.org		
<b>Telescope Making</b>	<b>Bill Davis, Jim Melka</b>	314-469-3061
telescope at slasonline.org		
<b>Webmaster</b>	<b>Jim Small</b>	314-909-7211
webmaster at slasonline.org		

***Devoted to the Interest and Advancement of the Science of Astronomy***

**ST. LOUIS ASTRONOMICAL SOCIETY**

**We're on the Web!**  
<http://www.slasonline.org>

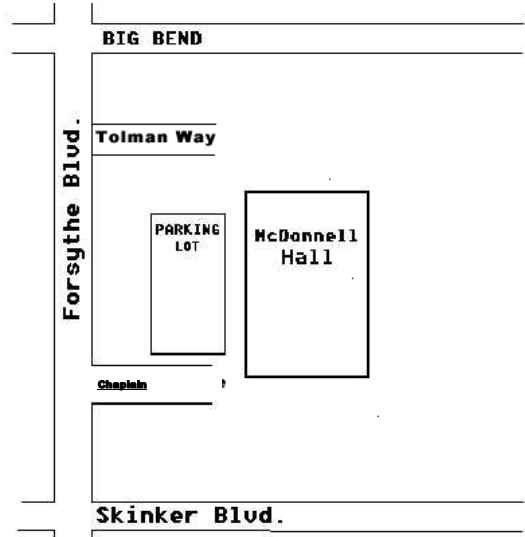


**Who We Are and What We Do**

St. Louis Astronomical Society is a not-for-profit organization established in 1936. SLAS is devoted to the interest and advancement of the science of astronomy. Our mission is to promote an understanding of the science of astronomy to our members and to the public. Membership is open to anyone with an interest in astronomy.

For more information contact any SLAS officer or visit our website listed above. SLAS is affiliated with the Astronomical League, Night Sky Network and the Mid-States Region of the Astronomical League.

Meetings are held the 3rd Friday of each month at McDonnell Hall at Washington University. See the map to the right for directions.



**St. Louis Astronomical Society**

Jim Small  
13128 Cozyhill Drive  
St. Louis, MO 63122

