

NOVA



Official Newsletter of the Salt Lake Astronomical Society
Volume 50 Number 3 March 2020

SLAS's Newsletter's 50th year of publication.

Please Welcome The Newest SLAS Members!

Allred, Lydia

Hall, Cynthia

Langford, Jefferson

Sorensen, Audra

Chinchinada, Divya

Kearns, Donovan

Oslapas, Christian

Westlind, Bill

Freerksen, Chris



Don Colton made this image of NGC 1961 with data taken remotely on 25 January 2020 using the University of Utah's Willard L. Eccles Observatory on Frisco Peak in southern Utah.

CALENDAR UPDATED

SLAS Sec/Treas John Drabik has added all of this year's meetings and public star and Sun parties to the online calendar.

<http://slas.us/CALENDAR.ASP>

MINUTES OF THE SALT LAKE ASTRONOMICAL SOCIETY TRANSITIONAL BOARD MEETING

12 February 2020

Location: Denny's Restaurant, 250 W 500 S, Salt Lake City

Board Members in Attendance: Luke Moses, Rodger Fry, John Drabik, Daland Speirs

General Members in Attendance: Jim Keane, Joan Carman, Daland Speirs, Charlie Green, Patrick Wiggins, Ken Warner, Leslie Fowler

President Luke Moses called the meeting to order: 6:45 PM

(Short discussion about prior year sales tax receipts that might be reimbursable by the State of Utah. 2019 has been submitted. None of the officers have outstanding prior-year receipts.)

Luke spoke with insurance broker earlier today; he should have a cost breakdown next week, including property insurance for SPOC.

Rodger discussed possible mount for the Jachmann refractor. He gave info on a mount found online, and reviewed by Rodger, Charles Hards, and John Drabik. The mount costs \$1,100, will have about a \$200 packing charge, and an unknown shipping cost (estimated at \$500). Additional construction will be needed to create a sturdy but movable base, estimated at \$1,000-\$2,000. The estimated total could go as \$5,000. Rodger noted that no fundraising effort has started yet to purchase the mount. There was related discussion about allocation of SPOC funds under the new budgeting model. Rodger will send out a fundraising email to the general membership tomorrow.

Motion by Rodger: At the General meeting next week, present request for approval to allocate funds only to purchase the mount and ship it to SPOC, not including the additional construction costs, with reimbursement of the purchase and shipping costs from the fundraiser before allocating additional funds for construction. Second by Daland. Unanimous approval by the Board.

Goal is to raise enough fund for the mount, shipping, and constructing the base. John suggested that we provide the general membership with the estimated total so that they will be aware that additional funding requests will be made later. Rodger agreed to do that, with estimated total in the range of \$4,000 to \$5,000. This is also the fundraising target.

John presented the Secretary Treasurer report. Excerpts are:

- Received \$1,426.71 dues and fees in January plus \$1.04 interest. \$700 of the received funds are for two additional loaner telescopes for Provo County Library

- Current Bank balance is \$19,997.41; the PayPal balance is \$0 as of 2/12/2020 (funds transferred to bank). This matches the expected accounting balance.

- Major expenditures in January: reimbursed \$3,882 for 12 Provo loaner telescopes purchased in December, and \$100 for the Save A Star Foundation donation.

- Expected February expenditures: \$700 (two more telescopes for Provo Library)

- Utah Sales Tax refund request filed for 2019 receipts (total: \$625.99). A Notice of Change, for new secretary / treasure address, was also filed.

- Four new members added in January, and four so far February.

Welcome new members! Christopher Dadok, Paige Mirizzi, James Livsey, Christian Oslapsas, Chris Freerksen, Lydia Allred, Audra Sorensen, Cynthia Hall, Donovan Kearns.

Discussed difficulty with inadequate PayPal tagging on new/renewed memberships. Biggest impact is on SPOC and AL fees (which must be paid to AL). Not much we can do about it. Renewal date logic in web code may help. End of Secretary report.

Ken would like the Budget on the web site. John noted that the Budget (once approved, and rarely changed) should be kept separate from day-to-day accounting ("Books"). Two such spreadsheets exist now. John will send the current version of each to Patrick and Ken to get it online.

Daland noted that the Tooele Public Library would like to start to encourage their patrons to attend a Star party at SPOC. Daland will send them a list of SPOC star party dates. Rodger suggested that we could hold a small session on setup and use of telescopes. Others noted that Tooele is not asking for a specific star party, so the suggestion was rejected. [Note: the online star party and sun party schedule encourages interested persons to come to the parties a bit early to discuss telescopes with volunteers at the event.]

Rodger has not yet held SPOC Committee meetings and want to refrain from holding them until Committee members are assigned and activities are identified. The Committee membership has not been re-formed yet.

Rodger requested that we take the Salt Lake County "ZAP" funds logo off of our star party listings since we are not currently funded by ZAP. Consensus that this should be done (without motion). Rodger will remove the logo.

Joan noted that there have already been county library star party scheduling conflicts. However, they schedule far into advance and there is not much we can do to align our schedule to theirs. She noted that the County would like a printed schedule, preferably as a flyer. Rodger will prepare it and send to Joan for her to relay to the county.

Luke brought up new donations. SLAS has been offered a complete observatory including dome, mount, telescope, and more. Luke will send a description to the Board members.

Motion by Rodger that any donation can be accepted at the discretion of any Board member if there are no conditions on the donation, and that Board approval will be required if conditions are being placed on the donation. The Board will also determine disposition of the donation when approval is sought. Second by Luke. Unanimous approval by the Board. Luke will send a note to the donor tonight that we are interested in the observatory.

Luke asked if there was any old business. None raised.

Luke asked about new business. Rodger reminded the Board that next week's General meeting topic will be black holes. No further new business.

Officers' Reports

Luke Moses – nothing further to report

Rodger Fry – nothing further to report

John Drabik – nothing further to report

Other Member Input

Jim Keane – nothing further to report

Joan Carman – nothing further to report. Reminded attendees of the upcoming telescope prep session on March 7th

Patrick Wiggins – nothing further to report

Motion to adjourn by Luke, second by Daland. Unanimous approval.

Meeting Adjourned: 7:33 pm

MINUTES OF THE SALT LAKE ASTRONOMICAL SOCIETY GENERAL MEETING

19 February 2020

Location: Room 103 Calvin Rampton Technology Building at Salt Lake Community College

Attendance: 34

Board Members in Attendance: Luke Moses, Rodger Fry, John Drabik, Tom Sevcik, Daland Speirs

President Luke Moses called the meeting to order: 7:30 PM

As our guest speaker has not yet arrived, Luke proceeded directly to the Business section of the General meeting.

Luke opened with a discussion of a donated observatory and equipment. Rodger noted a possible site, north of the Wiggins building and west of the Clements pad at SPOC, or else between the Wiggins and Harmon's buildings. No further action need be taken at this time, Society members are working with the owner to transfer the observatory, telescope, and other gear.

Rodger then discussed the Jachmann telescope, to be built on a portable base and kept with the Clements telescope. He mentioned the possibility of merging aspects of the newly-donated observatory (possibly re-assigning the use of the pier) and the Jachmann. He described a heavy duty GEM mount that has been offered from a seller in North Carolina. The person making the offer is a well-known and highly rated seller on the Dark Skies website. The mount will cost \$1,000.00. Another \$200 is needed to crate the mount. The shipping costs, FOB NC, are estimated at an additional \$500-700. The total needed, excluding the cost of manufacturing a sturdy, movable base, are thus about \$1,700-2,000.00. It is estimated that the base could cost an added \$2,000-3,000 dollars, for a total emplacement cost of \$4,000-5,000.

Motion by Tony Serra to take \$2,000 from the General fund to pay for the mount, crating, and shipping only at this time. Second by Bill Alexander. Clarification by Rodger that a fund-raiser for the full \$5,000 estimate will be undertaken. Clarification by Luke that no additional Society funds will be used to construct the base or purchase components until the \$2,000 current need, and the estimated \$3,000 additional construction costs, have been replenished via a fund-raiser. Rodger started the fund raiser by pledging \$100. Motion brought to a vote, passed by near-unanimous consent of members.

During the vote, the guest speaker arrived: Professor Ben Bromley, University of Utah, on "Super Massive Black Holes (SMBH's). Rodger briefly introduced the guest speaker.

Professor Bromley provided background on himself. He has been working this field for many years, and will cover several specific and related topics this evening: space & time; gravity; stars & compact objects; what is a black hole?; and hunting for black holes.

SMBH's are found in the center of most galaxies. Prof Bromley discussed the implications of space-time, and deep time (since the formation of the universe approximately 14 billion years (BY) ago. He discussed classical approaches such as Newton's concepts of gravity (which are unstable), and Olber's paradox (which could not explain why the sky is dark, using Newton's methods). Newton thought the universe was infinite and [eternal] static, but this theory was in trouble even before Olber, Einstein, and others. The reason is that every light ray doesn't touch a star: if the universe was static and infinite, eventually every light ray would be found to originate on a star.

The Professor went on to discuss time. We can assign a time to any and every object in the universe, and he provided several examples.

Next were examples of speed. Earth rotates around the Sun at about 30 km/sec, our solar system goes around the center of the galaxy at about 250 km/sec, and for reference, light travels at about 300 K km/sec. This led to distance examples based on these speeds. Next were distance examples, and introduction of gravity interactions (from Newton, $F = GMm/r^2$). But this equation is missing an element - time. Einstein took this into account in the relativity theories, with the speed of light (c) limited to the 300 K km/sec above. Einstein's gravity predicted the curvature of space-time and the relationship to mass of bodies. He used his determination of space-time curvature to predict the precession of Mercury, bent starlight around the Sun, and - gravity waves! The latter was used for black hole studies.

He next discussed gravity in more detail and in particular he noted how gravity is not a force, but is instead a curvature due to mass. For example, astronauts appear to themselves to move in straight lines but their speed and rotation around the Earth result in curved paths. This led to a discussion of escape velocity, i.e., the speed needed for one body to escape the gravity "well" associated with a separate, larger body. This speed is: $V_e^2 = 2GM/r$. For Earth mass and radius, this works out to about 11 km/sec. For a mass of 1 Sun (instead of 1 Earth mass) but with the radius of Earth, this works out to about 6,000 km/sec. He then gave examples for white dwarfs and neutron stars.

We now consider black holes. If $V_e^2 = GM/R > c^2$, then the escape velocity is greater than the speed of light – a black hole. If we have a mass of about 4 million Suns within a radius about the size of Mercury's orbit, this would result in a black hole.

Implication:

- light shined outward as blue is gravitationally red-shifted to look very red (if it is visible at all). E.g., the intense curvature caused by gravity makes time run much slower, equivalent to lengthening the wavelength (red is longer wavelengths than blue)
- the "well" can also deflect the path of things like light (he showed an animation of a warped space-time "lens")
- an "event horizon" exists, and is defined as the distance from the BH from which objects cannot return, even light, however, this is not a fixed distance but is based on the speed and mass of the approaching object. So this is a "point of no return", not a physical point.

What if we cross the EH? Current physics cannot say what happens exactly, but there is a "singularity" (the Professor warned that if anybody claims to be able to explain a singularity, you should be very skeptical). Space and time get stretched out. Another possibility is a path that does not touch the singularity but instead becomes a worm-hole.

How big are astronomical BH EH's (for $V_e^2 = 2GM/r$) for a given mass?

If Earth : 1 cm (e.g., if the mass of Earth was within a 1 cm sphere)

If Sun : 3 km EH

If 1 billion Suns : 3 B km EH

If Galaxy (200 B Suns) : 200,000 AU (Jupiter orbit is about 5 AU)

Special properties of a BH:

- mass
- spin (helpful to determine what formed it, and how)
- charge (largely ignored)

Signatures that may lead to discovery: small point-light sources; rapid time variability; and/or huge luminosity values (e.g.: M87, Sagittarius A (Sgr A)).

Binary black holes are predicted based on the prevalence of binary stars in the universe. They may also be detected by locating microwave [synchrotron] radiation caused by accelerating charged particles that release radiation based on a curved path. The Professor showed several microwave "pictures" showing this effect. Dozens of binary BH's have been found now.

Supermassive black holes (SMBH's) are next: examples are NGC4647, M60, NGC 1277, and others. NGC 1277 has about 10 billion solar masses. He also showed more pictures, in particular, around Sgr A and a decade-long time-lapse movie of stars moving around a presumed black hole at the center of the Milky Way. This black hole is estimated to be about 4 million solar masses (tiny fraction of NGC 1277) and is in Sgr A.

Accretion disks form as material is pulled into the black hole (gas, dust, and eventually torn-apart stars). Accretion flows and the closeness to the EH are "seen" by Doppler shift, gravitational red-shift, and gravity lensing effects.

To continue discoveries, a very long baseline (VLB) "event horizon telescope" (EHT) has been constructed using facilities at a few points around the globe. The professor reminded participants why it is not necessary to have one giant mirror or antenna – we see this every day when looking at our own telescopes (which have their primary mirror partially occluded by the secondary reflector, or which are offset in some way). So far, the EHT has examined mainly M87, which has been determined to include about 6.5 billion solar masses, at a radius

of about 100 AU (e.g., with a volume only about 20 times the size of the radius of Jupiter's orbit around the Sun, or about the size of our solar system in radius!). He hopes to have more news on Sgr A "soon".

The professor then discussed ejection mechanisms, for example, he showed an animation of a binary star being "sling-shotted" out of the binary pair at a speed of greater than 1,700 km / sec, when the second binary is consumed by a black hole. These are called "hyper-velocity stars", and several have already been found.

Going forward, Professor Bromley suggested we pay attention to what is going on with gravitational wave astronomy. He feels much news is coming. He also reminded attendees that we still don't know where SMBH's come from, so there is still work to be done. He did note that there is a limit to the maximum spin of a BH, however, it does not appear there is a limit to the amount of mass that a BH (or SMBH) can have. The session ended with a Q&A discussion between several attendees and Professor Bromley.

The talk ended at 20:50. Luke asked if there was any additional new business (the primary business topics were addressed at the beginning of the evening). Attendees were reminded of the Bryce Canyon outing the 3rd weekend of June; they were also informed of the upcoming Eccles Remote Imaging Telescope session planned for February 22nd, starting at 6 PM.

There being no further business, Luke moved to adjourn, second by Rodger. Passed by show of hands.

The meeting was adjourned to Village Inn for "Advanced Training" at 8:55 pm



Patrick Wiggins took this shot of SN 2020dpw in NGC 6952 on 26 February 2020 at 10:01:22 UT. This was Wiggins' 7th supernova discovery.

SLAS Member Information

The SLAS Member Information file is available at <http://slas.us/slasbooks/NEWMEM.PDF>.

Loaner Telescopes For SLAS Members

SLAS has several scopes available for loan to current SLAS members. Check the SLAS website under "[Membership Benefits](#)" for details.

Contact Us slasinfo@slas.us

2020 SLAS Board of Directors

President	Luke Moses
Meetings	
Vice President	Rodger Fry
Publicity, PR and Web Content	
Secretary-Treasurer	John Drabik
Membership Dues & Renewals	
Board Member at Large	Tom Sevcik
SPOC Star Party Coordinator	
Board Member at Large	Daland Speirs
School & Special Star Parties	

Appointed Positions

Astronomical League Contact	Aleta Cox
Equipment Manager	Luke Moses
Historian	Patrick Wiggins
NASA Night Sky Ambassador	Ann House
Newsletter Editor	Patrick Wiggins
Observatory Director	Rodger Fry
Private Star Party Coordinator	Don Colton
Webmaster	Ken Warner
ZAP Grant Writer	Jim Keane

SPOC Advisory Committee

Chair through JAN 2021	Rodger Fry
Member through JAN 2021	Rodger Fry
Member through JAN 2021	Stan Eriksen
Member through DEC 2020	Larry Holmes
Member through FEB 2022	Leslie Fowler
Member through DEC 2020	Patrick Wiggins
Member through JAN 2021	Jim Keane
Member while SLAS President	Luke Moses
Member through FEB 2022	Tony Lau
Member as Obser. Dir. Emeritus	Bruce Grim
Member while Harmons Rep.	Vacant

SPOC Telescope Instruction Coordinators

Refractor	Marlene Egger
Ealing	Jim Keane
Grim	Rodger Fry
Clements	Leslie Fowler

Events Calendar

March 2020

- 11 Board Meeting at Denny's Restaurant, 250 W 500 S, 7:00 pm
- 18 General Meeting at SLCC's Rampton Technology Building, Taylorsville Campus, 7:30 pm

April 2020

- 03 Star party at Taylorsville Library, 4870 S 2700 W, dusk to 9:00 pm
- 04 Star party at SPOC, dusk to 9:00 pm
- 08 Board Meeting at Denny's Restaurant, 250 W 500 S, 7:00 pm
- 11 Sun party 6400 S 1100 W, 9:00 am to noon
- 15 General Meeting at SLCC's Rampton Technology Building, Taylorsville Campus, 7:30 pm
- 17 Star party at Wheeler Farm, 6351 S 900 E, dusk to 9:00 pm
- 18 Star party at SPOC, dusk to 9:00 pm

May 2020

- 01 Star party at Whitmore Library, 2197 E. Ft. Union Blvd, dusk to 10:00 pm
- 02 Star party at SPOC, dusk to 10:00 pm
- 13 Board Meeting at Denny's Restaurant, 250 W 500 S, 10:00 pm
- 09 Sun party 6400 S 1100 W, 9:00 am to noon
- 15 Star party at Wheeler Farm, 6351 S 900 E, dusk to 10:00 pm
- 16 Star party at SPOC, dusk to 10:00 pm
- 20 General Meeting at SLCC's Rampton Technology Building, Taylorsville Campus, 7:30 pm
- 30 Star party at SPOC, dusk to 10:00 pm

View a list of all SLAS events online on the [Events Calendar](#)

NOVA is a publication of the Salt Lake Astronomical Society, a non-profit organization. Nova contains minutes of meetings, Board member names & contact info, activities, reports and special club events. The editor of NOVA is appointed by the SLAS Vice-President. Members are encouraged to contribute content. Current editor is Patrick Wiggins, 4099wiggins@gmail.com.