PRIMEFOCUS

Tri-Valley Stargazers

May 2010

Meeting Info
What:
New Views of the Sun

Who:
Prof. Phil Scherrer

When:
May 21, 2010
Doors open at 7:00 p.m.
Lecture at 7:30 p.m.

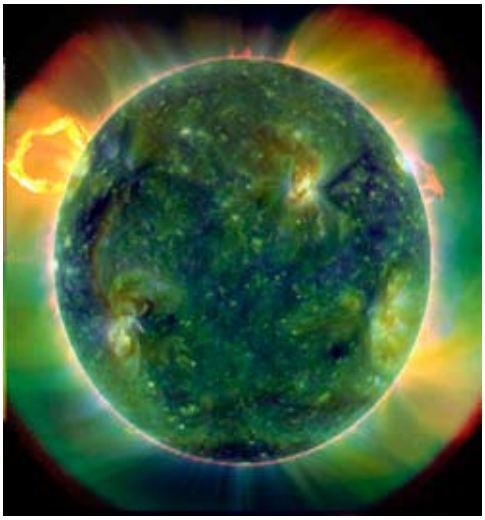
Where:
Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

Inside

May Meeting

New Views of the Sun

Prof. Phil Scherrer



SDO image of the Sun on 30 March 2010. Red: ~60,000K, Green and Blue: >1,000,000K. Credit: Science@NASA

The Solar Dynamics Observatory was launched on 11 February 2010 and after 6 weeks was ready to begin science commissioning. Data is expected to be open to all with a short lag for processing by mid to late May. There are three instruments onboard:

* Helioseismic and Magnetic Imager (HMI - Stanford University solar group with Lockheed-Martin collaboration);

* Atmospheric Imaging Assembly (AIA - Lockheed Martin Solar and Astrophysics Lab);

* Extreme ultraViolet Experiment (EVE - LASP, Univ Colorado).

HMI observes in a visible spectral line (FeI 617.3nm) to measure the motion of the photosphere (Doppler shift) and magnetic field (Zeeman effect) with a 4k x 4k pixel camera. 24 Images in a set of polarizations and closely spaced wavelengths are made each 45 seconds. AIA consists of 4 telescopes each with two halves coated for specific ultraviolet or EUV wavelengths. AIA obtains images in 8 wavelengths each 10-12 seconds. AIA has sensitivity to coronal lines formed in plasma from 10 thousand to 10 million degrees K. EVE makes high resolution EUV spectra but with no imaging.

All of the HMI and AIA data arrive at Stanford for archiving and processing and distribution. The primary science investigation for HMI is also expected to be led by the Stanford group. I will show a short overview of the HMI instrument and some first results from HMI and AIA.

Phil Scherrer is a professor of physics at Stanford University. He is the Principal Investigator of SDO/HMI and SOHO/MDI, and fortunately for us he is also a long-time member of TVS!

News & Notes

2010 TVS Meeting Dates

The following lists the TVS meeting dates for 2010. The lecture meetings are on the third Friday of the month, with the Board meetings on the Monday following the lecture meeting.

Lecture Meeting	Board Meeting	Prime Focus Deadline
May 21	May 24	April 30
June 18	June 21	May 28
July 16	July 19	June 25
Aug. 20	Aug. 23	
Sept. 17	Sept. 20	
Oct. 15	Oct. 18	
Nov. 19	Nov. 22	
Dec. 17	Dec. 20	

Money Matters

Treasurer David Feindel indicates that as of the May 17, 2010 the TVS account balances are:

Checking	$5,130.32	
CD #1	$3,761.41	rolled over 5/17/2010
CD #2	$2,654.36	rolled over 2/27/2010

New Members

Please welcome Jean-Michel DiNicola and Tiffany Jarman, the newest members of TVS.

TVS Volunteers Needed

We still need a volunteer to take on the duties of the club Secretary. We also could use more members on the Board of Directors. If you wish to help with any of these positions, please contact any officer or board member.

TVS Yosemite Dates

TVS' annual public star party weekend at Glacier Point will take place on July 9th - 10th. TVS puts on a star party both nights in exchange for free camping at the Bridalveil Campgrounds. This year we lucked out--we got a New Moon weekend!

H2O Open House Dates

TVS' Open House dates for the club observing site, H2O, have been decided: Saturday, June 5th and Saturday, July 3rd. Our Open Houses are meant to give members an idea of what our dark sky site is like, and to be able to get a guided tour (of sorts) of the site.

For those members who have yet to check out the site, it is about an hour's drive south of Livermore, along a very windy road. It is a primitive site—no water or electricity, with a couple of outhouses. What it lacks in amenities, it makes up for in dark skies.

Plan to meet at the corner of Mines and Tesla at 6:45 p.m. The caravan will depart at 7:00.

Golden State Star Party Dates

The Golden State Star Party is now taking advance (discounted) reservations for their star party which runs from Saturday July 10th through Wednesday July 14th up at Adin, CA (near Mt. Lassen). For more info, go to http://www.goldenstatestarparty.org/.

Journal Club by Ken Sperber

Using the Sloan Digital Sky Survey and the Chandra X-Ray observatory, Jonker et al. (2010, Monthly Notices of the Royal Astronomical Society, in press) report what appears to be a supermassive black hole that is located 3.2 kiloparsecs off-center from the core of the host galaxy (see photo on page 3). The object emits >2 x 10^{41} erg/s at X-Ray wavelengths, comparable to supermassive black holes than inhabit other galaxies. The strength of the source indicates that the black hole is feeding. The material in the accretion disk collides and is heated to very high temperature, thus giving off copious amounts of X-Rays. Numerical models indicate that the merging of two supermassive black holes can result in the newly created object being flung away from the merge location. The other possibilities are that the object is an unusually blue Type IIn supernova. Given that supernova brightness typically fades over the course of months, repeat observations should ascertain of the object is a supernova. The other possibility is the object is an ultra-luminous X-ray source with a bright optical component.

For more information see: http://arxiv.org/abs/1004.5379 and http://www.universetoday.com/2010/05/11/black-hole-gets-kicked-out-of-galaxy/

Newsletter header image: The Sun, as imaged by the Solar Dynamics Observatory on April19, 2010.

This image is part of a movie that spans 4 hours. The new data have supplied insight into the phenomenon of "coronal rain," which are blobs of plasma within a prominence that fall back to the surface of the Sun. SDO data reveals that the coronal rain falls more slowly than expected due to buoyancy from underlying hot gas. For more information see the SDO website: http://sdo.gsfc.nasa.gov/

Image Credit: Science@NASA

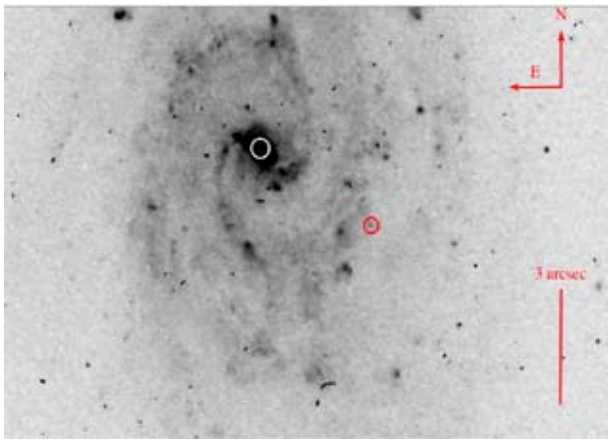


Image of the galaxy that hosts a possible off-center supermassive black hole (red circle). The galactic center is denoted by the white circle. Credit Image: STScI / NASA

So you thought such strange goings on were reserved for remote galaxies that you'd never likely see? Well, right in our own backyard, 10 million light years away to be (almost) exact, M82 is host to a newly discovered off-center object unlike any that has been observed before, even in the Milky Way! Dr. Tom Muxlow and colleagues observed the object "turn-on" at radio wavelengths in May 2009. M82 is a starburst galaxy, in which supernova go off every 20-30 years, a much higher rate than in the Milky Way in which one supernova per century is the norm. The object was initially thought to be a supernova, but the object has shown no signs of dimming, and it has shown evidence of movement at superluminal speeds, which is typically not seen in supernova. The prevailing explanation is the object is micro-quasar with relativistic jets. While phenomenologically similar in behavior to X-Ray binaries seen in the Milky Way, the necessary brightness to be seen at the distance of M82 belies its unprecedented nature.

For more information see: http://www.ras.org.uk/index.php?option=content&task=view&id=1747&Itemid=2

Calendar of Events

May 19, 7:00 - 8:30 pm

What: Hearts of Darkness: Black Holes in Space
Who: Dr. Alex Filippenko, UC Berkeley
Where: Foothill College, Los Altos Hills
Cost: Free, but $2 parking fee

Black holes are regions of space where gravity is so strong that nothing—not even light—can escape. No longer confined to the imaginations of science-fiction writers and theoretical physicists, black holes have recently been discovered in large numbers by observational astronomers. Smaller black holes can form during the deaths of some types of massive stars, and super-massive black holes are found at the centers of many galaxies, including our own. By attending the lecture, you'll learn about the remarkable properties of these bizarre objects from one of the finest explainers in the field of astronomy.

Visitors must purchase a campus parking permit for $2 from yellow dispensers in student lots. Parking lots 1, 7 and 8 provide stair and no-stair access to the theatre. For more information, access www.foothill.edu or call (650) 949-7888.

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tvs@trivalleystargazers.org

Eyes on the Skies

Eyes on the Skies is a robotic solar telescope run by Mike Rushford (rushford@eyes-on-the-skies.org). You may access it by visiting www.eyes-on-the-skies.org.

TVS E-Group

So how do you join the TVS e-group, you ask? Just send an e-mail message to the TVS e-mail address (trivalleystargazers@gmail.com) asking to join the group. Make sure you specify the e-mail address you want to use to read and post to the group.

Calendar of Events continued

May 22, 8:30pm

What: Dark Energy and the Runaway Universe
Who: Dr. Alex Filippenko, UC Berkeley
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Observations of very distant exploding stars (supernovae) show that the expansion of the Universe is now speeding up, rather than slowing down due to gravity as expected.

May 26, 12:00 - 1:00 pm

What: The Maunder Minimum: Astrophysical Connection to Climate Change
Who: Dan Lubin, SETI Institute
Where: SETI in Mountain View
Cost: Free

The Maunder Minimum refers to an abrupt drop in solar luminosity of less than 1% during the mid-17th Century, which had profound impacts on global climate. We may be due for another solar "grand minimum" later this century. Dr. Lubin will discuss the implications of such a grand minimum during the era of anthropogenic global warming, and will also discuss astrophysical research efforts to determine how frequently a Maunder Minimum event occurs in nature.

This lunchtime talk is part of the SETI Institute Colloquium Series. Location is 515 N. Whisman Road, Mountain View, CA 94043. For more info, visit their web site http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

June 2, 12:00 - 1:00 pm

What: The 'soot line': Destruction of pre-solar polycyclic aromatic hydrocarbons in the terrestrial planet-forming region of disks
Who: Monika Kress, Department of Physics and Astronomy, San Jose State University
Where: SETI in Mountain View
Cost: Free

No details of this talk are available.

This lunchtime talk is part of the SETI Institute Colloquium Series. Location is 515 N. Whisman Road, Mountain View, CA 94043. For more info, visit their web site http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

June 16, 12:00 - 1:00 pm

What: Don't Rain on my Planet: The Importance of Clouds and Hazes for Understanding Exoplanets and Brown Dwarfs
Who: Mark Marley
Where: SETI in Mountain View
Cost: Free

Clouds and hazes shape the observed spectra of exoplanets and brown dwarfs. Yet we know from Earth that clouds and hazes are inherently difficult to model and are the leading source of uncertainty in terrestrial GCM forecasts of global warming. Dr. Marley will review what we know about the chemistry and physics of clouds in substellar atmospheres and discuss some pathways to haze formation in exoplanet atmospheres. In the future determining if extrasolar earthlike planets are habitable--or inhabited--will ultimately depend on an understanding of the role clouds play in their atmospheres, so we can expect to be hearing about these issues for some time to come.

This lunchtime talk is part of the SETI Institute Colloquium Series. Location is 515 N. Whisman Road, Mountain View, CA 94043. For more info, visit their web site http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

June 19, 8:30pm

What: WHY WE NEED TO COLONIZE SPACE
Who: Dr. Seth Shostak, Seti Institute
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Everyone talks about colonizing space, but is it just a pipe dream? If at least some of us aren't off this planet within a half-century or so, our lifestyles are going to be less than commodious!

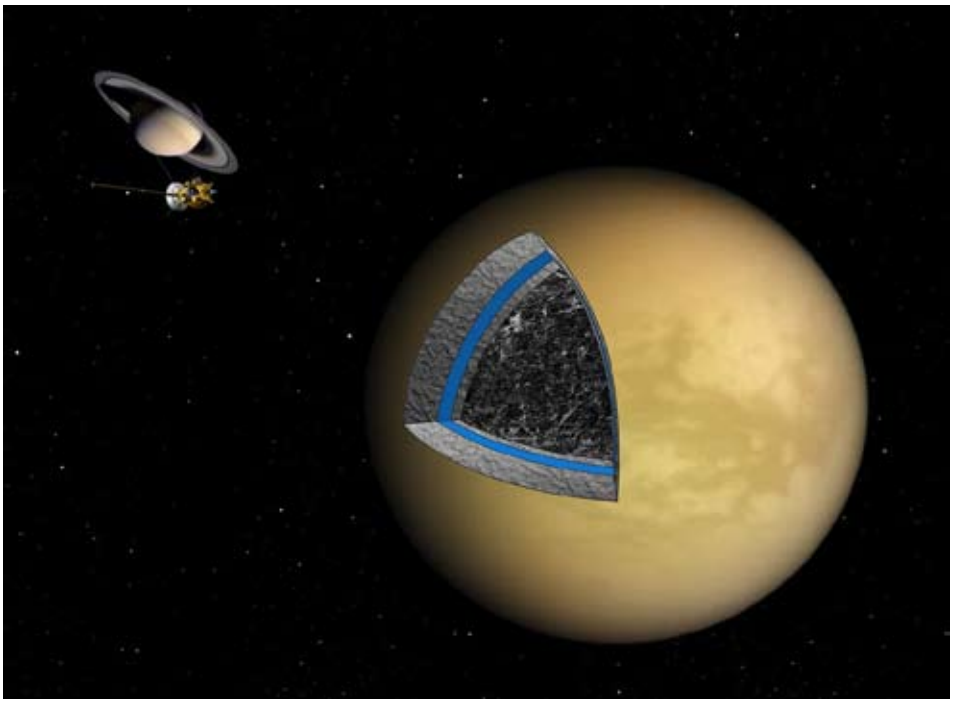
Mission Update by Ken Sperber

Cassini

The Cassini spacecraft has been orbiting Saturn since 2004. The primary mission ended in June 2008, but with a healthy spacecraft and the prospect for many more discoveries its mission was extended through 2010; the so-called "Equinox Mission." Not surprisingly, this coincided with the transition of the rings through the plane of the ecliptic, the imaginary plane in which Saturn orbits the Sun, as Saturn undergoes its seasonal cycle.

The good news continues as a second extension has been approved, through 2017 as part of the "Solstice Mission." Extending the mission will allow Cassini to observe the transition from winter (summer) to summer (winter) in the northern (southern) hemisphere. This leg of the mission will consist of 155 additional orbits of Saturn, that includes 54 flybys of Titan, and 11 flybys of Enceledus. During these last 7 years of the mission, before Cassini is sent plunging into Saturn's atmosphere to ensure that Titan and Enceledus will remain uncontaminated, Cassini will have to operate on 25% of the fuel that it consumed in the first 6 years of its mission. The flybys of Titan in particular are key to reorienting the orbit of Cassini as it pursues it mission objectives. Not only do we get great photos of the moons during close flybys, but by accurately observing the Doppler shift of the spacecraft radio signal the gravity field of the moon can be deduced. In the case of Titan the gravity field imparted perturbations to the spacecraft motion that were measured to an accuracy of 0.2 thousandths of an inch per second! Four flybys, two that passed over the equator, and two that covered the region 60N-60S latitude, were used to determine the gravity field, the shape, and the moment of inertia of Titan. The results indicate that overall Titan is a 50-50 mix of ice and rock. The most probable solution indicates that of Titan's 2,576km radius, the outer 500 km is composed of almost pure ice. Deeper down the interior is a mix of ice and rock, indicating that Titan was gradually assembled and thus never had the chance to heat up enough to cause the denser rock to sink to the moons center. The authors indicate that models with 3 or more layers are not ruled out by the available data. However, these models require the proposed rocky core to be of unusually low density.

For more details see: http://saturn.jpl.nasa.gov/news/newsreleases/newsrelease20100311/ and http://saturn.jpl.nasa.gov/index.cfm



Schematic diagram of the interior structure of Titan as deduced by the Cassini radio science team. Image credit: NASA/JPL.

What's Up by Ken Sperber

All times Pacific Daylight unless otherwise noted.

May

13	Thur	New Moon (6:04pm)
15-16	Sat-	Crescent Moon and Venus in conjunction.
20	Thur	First-Quarter Moon (4:43pm)
27	Thur	Full Moon (4:07pm) is within 1-2 degrees of Antares.

June

4	Fri	Last-Quarter Moon (3:15pm)
5	Sat	TVS open house at H20 (See p. 2 for details)
10-11	Thur-	Mercury visible in the east one-half hour before dawn
12	Sat	New Moon (4:15am)
18	Fri	First Quarter Moon (9:29pm)
18	Fri	Ceres at opposition, visible all night

A Rock Hound is Born

It's tough to be a geologist when you can't tell one rock from another. Is that a meteorite or a chunk of lava? A river rock or an impact fragment? Houston, we have a problem!

It's a problem Spirit and Opportunity have been dealing with for the past six years. The two rovers are on a mission to explore the geology of the Red Planet, yet for the longest time they couldn't recognize interesting rocks without help from humans back on Earth.

Fortunately, it is possible to teach old rovers new tricks. All you have to do is change their programming—and that's just what NASA has done. "During the winter, we uploaded new software to Opportunity," says Tara Estlin, a rover driver, senior member of JPL's Artificial Intelligence Group, and the lead developer of AEGIS, short for Autonomous Exploration for Gathering Increased Science. "AEGIS allows the rover to make some decisions on its own."

Estlin and her team have been working for several years to develop and upload increasingly sophisticated software to the rovers. As a result, the twins have learned to avoid obstacles, identify dust devils, and calculate the distance to reach their arms to a rock.

With the latest upgrade, a rock hound is born. Now, Opportunity's computer can examine images that the rover takes using its wide-angle navigation camera (NavCam) and pick out rocks with interesting colors or shapes. It can then center its narrower-angle panoramic camera (PanCam) on targets of interest for close-up shots through various color filters. All this happens without human intervention.

The system was recently put to the test; Opportunity performed splendidly.

At the end of a drive on March 4th, the rover settled in for a bit of rock hunting. Opportunity surveyed the landscape and decided that one particular rock, out of more than 50 in the NavCam photo, best met criteria that researchers had set for a target of interest: large and dark.

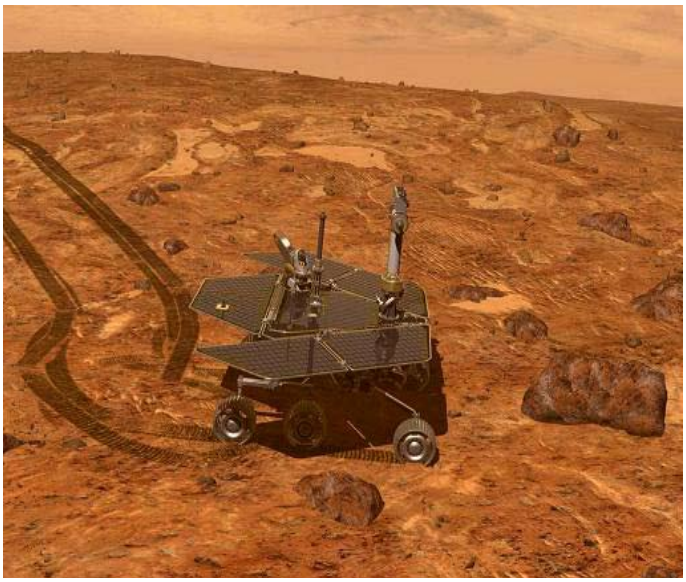
"It found exactly the target we would want it to find," Estlin says. "It appears to be one of the rocks tossed outward onto the surface when an impact dug a nearby crater."

The new software doesn't make humans obsolete. On the contrary, humans are very much "in the loop," setting criteria for what's interesting and evaluating Opportunity's discoveries. The main effect of the new software is to strengthen the rover-human partnership and boost their combined exploring prowess.

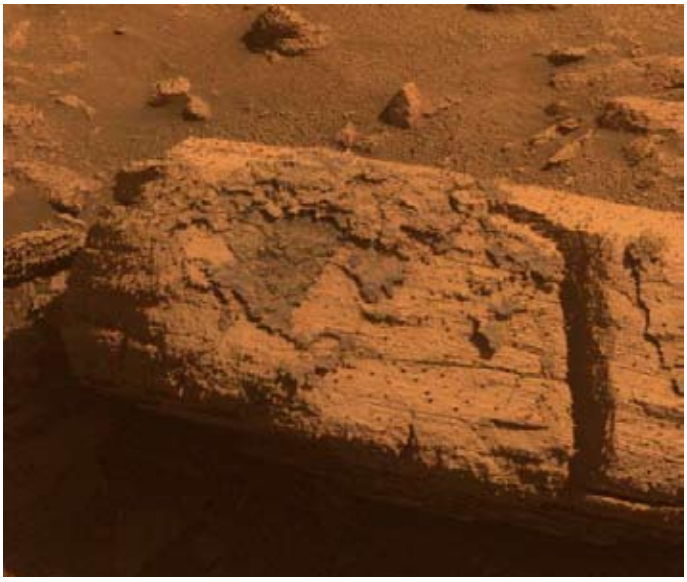
Mindful that Opportunity was only supposed to last about six months after it landed in 2004, Estlin says "it is amazing to see Opportunity performing a brand new autonomous activity six years later."

What will the rock hounds of Mars be up to six years from now? Stay tuned for future uploads!

Learn more about how the AEGIS software works at http://scienceandtechnology.jpl.nasa.gov/newsandevents/newsdetails/?NewsID=677. If you work with middle- or high-school kids, you'll find a fun way to explore another kind of robot software—the kind that enables "fuzzy thinking"—at http://spaceplace.nasa.gov/en/educators/teachers_page2.shtml#fuzzy.



Artist's concept: Opportunity spots a rock with its NavCam that its AEGIS software says meets all the criteria for further investigation.



On February 6, 2010, Opportunity photographed a rock called "Chocolate Hills" at the edge of a young crater called "Concepción."
Credit: NASA/JPL-Caltech/Cornell University.

Tri-Valley Stargazers
P.O. Box 2476
Livermore, CA 94551

PRIMEFOCUS

Tri-Valley Stargazers Membership Application

Member agrees to hold Tri-Valley Stargazers, and any cooperating organizations or landowners, harmless from all claims of liability for any injury or loss sustained at a TVS function.

Name _____ Phone _____ e-mail _____

Address _____

Do not release my: _____ address, _____ phone, or _____ e-mail information to other TVS members.

Membership category:
_____ $5 Student.
_____ $30 Basic. You will receive e-mail notification when the PDF version of Prime Focus is available for download off the TVS web site.
_____ $10 Hidden Hill Observatory (H2O) yearly access fee. You need to be a key holder to access the site.
_____ $20 H2O key holder fee. (A refundable key deposit—key property of TVS).
_____ $40 Patron Membership. Must be a member for at least a year and a key holder.
_____ $34 One year subscription to Astronomy magazine.
_____ $60 Two year subscription to Astronomy magazine.
_____ $32.95 One year subscription to Sky & Telescope magazine. Note: Subscription to S&T is for new subscribers only. Existing subscribers please renew directly through S&T.
$ _____ Tax deductible contribution to Tri-Valley Stargazers.

$ _____ TOTAL – Return to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551

Membership information: Term is one calendar year, January through December. Student members must be less than 18 years old or still in high school.