

# PRIMEFOCUS

Tri-Valley Stargazers



October 2014



## Meeting Info

### What:

Galaxy Morphology and Composition

### Who:

John Martin

### When:

October 17, 2014  
Doors open at 7:00 p.m.  
Lecture at 7:30 p.m.

### Where:

Unitarian Universalist  
Church in Livermore  
1893 N. Vasco Road

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## October Meeting

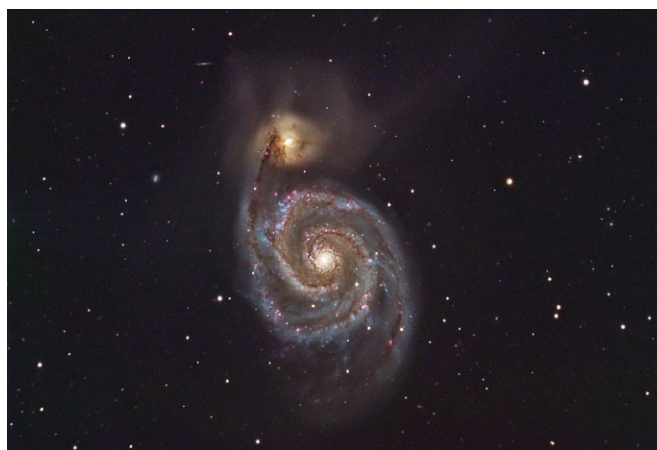
### Galaxy Morphology and Composition

#### John Martin

Through presentation of Edwin Hubble's galaxy classification scheme, John will talk about galaxy morphology, composition, and evolution. John plans to investigate the issue of why the various types of galaxies look like they do, including discussing recent research and theories. He will also trace how some ideas about galaxies have changed over the past seventy-or-so years. His presentation will also point out how some galaxies that have led righteous lives have halos, whereas others that have gone over to the Dark Side are full of Dark Matter (hey, a little humor never hurts!).

John will bring along his copy of Arp's "Atlas of Peculiar Galaxies" in its original 1966 format (published as a supplement to the *Astrophysical Journal*), as well as his copy of the Allan Sandage's "Hubble Atlas of Galaxies."

John is hoping for questions, but also input from the members as regards to the various theories of galaxy morphology and evolution.



Caption: M51 as imaged by Hilary Jones with a 10" Meade RCX400 using an SBIG ST-10XME CCD camera. The total imaging time was 205 minutes with LRGB=100:35:35:35.

John Martin, a retired attorney, has had a lifelong fascination with and interest in astronomy. As a child, he attended meetings with the St. Petersburg Astronomy Club, and has since belonged to a variety of astronomy organizations in California, including the High Desert Astronomical Society in San Bernardino County (where he served a Program Director and Vice-President), and the Astronomical Society of the Pacific. Since early youth, Mr. Martin has tenaciously pursued everything Galaxy, and he closely follows the ever-changing theories and improved understanding regarding galaxy formation, composition, change, and demise. To further his knowledge of galaxies, John has read voraciously, including *Astrophysical Journal* articles and papers from International Astronomical Society galaxy symposia, and he has also taken courses in classical and quantum physics.

## News & Notes

### 2014 TVS Meeting Dates

The following lists the TVS meeting dates for 2014. 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
Oct. 17	Oct. 20	
Nov. 21	Nov. 24	Oct. 31
Dec. 19	Dec. 22	Nov. 28

### Money Matters

Treasurer Roland Albers indicates that as of September 22, 2014 the TVS checking account balance is: \$12,799.71.

### Partial Solar Eclipse

On Thursday, October 23 there will be a partial solar eclipse visible from the Bay area. The Sun's disk will be approximately 39% obscured. The eclipse begins at 1:54pm, with maximum eclipse at 3:17pm, ending at 4:33pm.

See [eclipse.gsfc.nasa.gov/OH/OH2014.html](http://eclipse.gsfc.nasa.gov/OH/OH2014.html) for more details about the eclipse. See [skypub.com/observing/celestial-objects-to-watch/eclipses](http://skypub.com/observing/celestial-objects-to-watch/eclipses) for tips on observing and imaging eclipses.

### September TVS Meeting a Success

Last month's meeting, a member "Show and Tell" affair, was highly successful. Ken Sperber spoke about his experiences with Astronomical League Observing Programs, and his development of an Arp Galaxy Observing Guide ([http://www.trivalleystargazers.org/arp\\_observing\\_list.pdf#zoom=100&pagemode=none](http://www.trivalleystargazers.org/arp_observing_list.pdf#zoom=100&pagemode=none)) to facilitate completion of the Astronomical League Arp Observing Program.

Hilary Jones presented a discussion of the different classifications of Arp Peculiar Galaxies. Their morphologies were nicely illustrated with images he has taken from his backyard observatory.

Roland Albers showed a new focussing aid, the Bahtinov mask, that was developed by Pavel Bahtinov in 2008. Placed over the front of your telescope, it is a quick matter to obtain sharp focus while viewing a bright star by aligning the 3 diffraction spikes produced by the mask.

Gert Gottschalck presented his images of recent solar activity ([http://www.trivalleystargazers.org/gert/sun\\_2014/solar\\_campaign\\_2014.html](http://www.trivalleystargazers.org/gert/sun_2014/solar_campaign_2014.html)). He also discussed different brands of hydrogen-alpha telescopes and filters, including a discussion of the different filtering approaches taken by Coronado and Lunt.

Don Dossa shared his initial impressions of an Orion zoom eyepiece. Fortunately, no one dropped the eyepiece that Don graciously passed around for examination.

With the success of the format, a dedicated member "Show and Tell" meeting might become part of the annual TVS lexicon.

## Calendar of Events

### October 14, Noon-1:00pm

What: Climate Change and West Antarctica  
Who: David H. Bromwich, Byrd Polar Research Center, Ohio State University  
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA  
Cost: Free

The West Antarctic Ice Sheet contains the ice equivalent of 5 meters of sea level and it is slowly adding to the rise of global ocean levels. It is now thought that the ice sheet is undergoing irreversible marine ice sheet collapse. The primary cause is bottom melting of coastal ice shelves in the Amundsen Sea sector driven by oceanic and/or atmospheric factors. In addition, the air temperature over the ice sheet interior has risen substantially over the past 50 years at a rate comparable to that recorded on the adjacent Antarctic Peninsula. There are many tropical and high latitude influences at play governing the atmospheric and oceanic behavior in this part of the world. The talk will lay out what is happening to West Antarctica at present and what may happen in the future as worldwide temperatures continue to increase.

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.

### October 17 and November 14, 6:00pm

What: Civilian Space Exploration: Personalizing Your Access to Space!  
Who: Thomas Atchison, Founder of Mavericks Civilian Space Foundation  
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619  
Cost: \$12; does not include admission to the Center  
Reservations: (510) 336-7373

Thomas Atchison is helping ignite the next space race among the general public. Through the creation of space exploration STEM education and professional development programs and research projects, Mavericks is helping students of all ages discover a passion for space exploration and create the new technologies that will lower costs and increase availability for the next generation. Learn about the history of space exploration, Mavericks' current programs, research projects

Header Image: Total lunar eclipse of October 8, 2014 taken at about 4:12am at H2O by Ken Sperber. The exposure was 4 seconds at ISO 400 using a Nikon D80 at prime focus of a Takahashi FS-102.

## Calendar of Events (continued)

and flight missions and be inspired to build and launch your own rocket or space mission in your community, with your friends and family.

See <http://www.chabotspace.org/events.htm> for more information, or call (510) 336-7373.

### October 21, 7:00pm

**What:** Summary of Workshop on Interspecies Communication  
**Who:** Laurance Doyle, Lori Marino, Denise Herzing, SETI Institute, The Kimella Center, Wild Dolphin Project  
**Where:** SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA  
**Cost:** Free

In this event, a group of interdisciplinary scientists will participate in a SETI colloquium to summarize and discuss a two-day workshop held to explore nonhuman communication research. Participants for this two-day workshop include scientists who currently work in one of three areas: animal communication, information theory, or astrobiology/intelligence.

The panel will explore and discuss the implications for SETI and astrobiology at this colloquium, including ideas about new tools and techniques that may provide insight into advanced communication systems and intelligence. This summary will be followed by a panel discussion and open to the public for questions.

If we can define complex communication systems on Earth, we may be able to develop tools for potential future assessments of life on other planets. It is expected that this initial workshop and colloquium on nonhuman communication will lead to a working group and future workshops to continue to address this important area of exploration.

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.

### October 25, 7:30pm

**What:** The Top Tourist Sights of the Solar System  
**Who:** Andrew Fraknoi, Foothill College  
**Where:** Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area  
**Cost:** Free

Where will Bill Gates' Great-Granddaughter go on her honeymoon? Using spectacular space photos we will explore the most intriguing future "tourist destinations" among the planets and moons in our cosmic neighborhood. Co-produced with Wonderfest-part of Bay Area Science Festival.

For more information see: <http://www.friendsofmettam.org/astrology/schedule>

### October 28, Noon-1:00pm

**What:** Extending the search for ETI communication to near-infrared wavelengths  
**Who:** Shelley Wright, University of Toronto  
**Where:** SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA  
**Cost:** Free

We are poised to take advantage of a remarkable confluence of technological advances and scientific opportunity. For the first time, very fast, wide bandwidth, high-gain, low noise near-infrared avalanche photo diode (APDs) detectors are available and reasonably priced. We are designing and constructing a new SETI instrument to search for direct evidence of interstellar communications via pulsed laser signals at near-infrared (900 - 1700 nm) wavelengths. The new instrument design builds upon our past optical SETI work, and is

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#### **Officers**

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**Refreshment Coordinator:**  
Laurie Grefsheim

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[www.trivalleystargazers.org](http://www.trivalleystargazers.org)  
[info@trivalleystargazers.org](mailto:info@trivalleystargazers.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 ([info@trivalleystargazers.org](mailto:info@trivalleystargazers.org)) 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)

the first step toward a new, more versatile, and more sophisticated generation of very fast optical and near-infrared pulse search devices.

Dr. Wright will discuss the advantages of SETI searches at near-infrared wavelengths. She will also present the instrument layout, including an overview of the opto-mechanical design, detector selection and characterization, signal processing, and integration procedure. Finally, Dr. Wright will describe our initial observational setup and search strategies for SETI targets and other astronomical studies.

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.

### November 3, 7:30pm

What: Mapping the Heavens: Celestial Cartography Through the Ages

Who: Nick Kanas M.D. Fellow, Royal Astronomical Society

Where: California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA

Cost: Advanced ticketing required. Academy members \$8, Seniors \$10, General \$12. Reserve a space online or call 1-877-227-1831.

Initially, Earth was seen as the center of the universe surrounded by orbiting planets and stars. Then, the Sun became the center of the cosmos. Finally, there was no center but instead a vast array of galaxies with individual stars, some with their own retinue of planets. In recent years, there has been an increased interest in our Solar System prompted by the launching of giant orbiting telescopes and space probes, which have made once unimaginable discoveries. In this presentation, Kanas will share with us the ways in which humans have been fascinated by the night sky for thousands of years. We have populated it with images of imaginary beasts, gods and goddesses that reflected important aspects of our various cultures. Both constellation maps and maps of the solar system will be illustrated from antiquity to modern times. Through a historical examination from the perspectives of the people who made them, these images will tell us much about our ancestors and how we got to where we are today. Author of: *Solar System Maps: From Antiquity to the Space Age*. Book signing to follow the talk.

See <http://www.calacademy.org/events/lectures/> for lecture and reservation information.

### November 4, Noon-1:00pm

What: Lakes, Fans, Deltas, and Streams: Geomorphic Constraints on the Hydrologic History of Gale Crater, Mars

Who: Marisa Palucis, UC Berkeley

Where: SETI Headquarters, 189 N. Bernardo Ave.,

Mountain View, CA

Cost: Free

It has been proposed that in Gale Crater, where the Curiosity rover landed in August 2012, lakes developed to various depths after the large central mound (informally referred to as Mt. Sharp) had evolved to a form close to its current topography. Using a combination of CTX and HiRISE imagery and CTX, HiRISE and HRSC topography, we have documented a sequence of rising and falling lake levels, thereby providing a possible relative timeline of the hydrologic events within Gale crater. This has implications for understanding regional paleo-climates on Mars after the Noachian, as well as providing context for the geology and sedimentology along the Curiosity rover traverse.

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.

### November 18, Noon-1:00pm

What: Rise of the Machines: Mining the Kepler Data for Astrobiology

Who: Lucianne Walkowicz, Princeton University

Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA

Cost: Free

Since its launch in 2009, NASA's Kepler Mission has transformed our knowledge of exoplanetary system demographics. Kepler's primary mission goal-- to quantify the occurrence rate of habitable zone Earth-size planets around Sun-like stars-- has a clear connection to astrobiology. However, in addition to its planet-finding capabilities, the Kepler data may also be used to study other questions of astrobiological interest. In this talk, I will discuss my work on two such ongoing projects: the quantification of the stellar flare rate, which influences planetary habitability through its influence on atmospheric photochemistry and escape; and the detection of anomalous stellar variability as a form of signal-agnostic optical SETI. Both of these lines of research employ machine learning techniques, making them applicable to the current and future large datasets that now dominate the astronomical landscape.

For more information see: <http://www.seti.org/csc/lectures>, e-mail [info@seti.org](mailto:info@seti.org), or phone 650-961-6633.



Caption: Sriram Raghavan took this star trail photo at H2O during August's open house. It is a composite of 358 images taken with a Nikon D-90 with the 18-55mm lens set to 18mm f/3.5. Each exposure was 30 seconds at ISO 800.



Caption: Roland Albers took this image of M17 from his Pleasanton backyard. He used an AT6RC 6-inch f/9 astrograph, an unmodified Canon T3i, a Celestron Advanced VX mount, and an Orion 50mm guide scope with a StarShoot Auto-Guider. The total exposure time was 45 minutes (nine 5-minute exposures). M17 is one of the brightest emission nebulae in the sky, making it a good target for unmodified DSLR cameras (which are not very sensitive to the deep-red hydrogen emission line).

## What's Up by Ken Sperber (adapted from S&T and The Year in Space)

Pacific Daylight Time through November 2, 2am. Thereafter, times are Pacific Standard Time.

### October

- 15 Wed Last-Quarter Moon (12:12pm)
- 17-18 Fri- Jupiter and the Moon make a nice pairing (Dawn)
- 20-22 Mon- Orionid meteor shower (Dawn)
- 20-04 Mon- Zodiacal light visible in the east from dark locations (120 - 80 minutes before sunrise)
- 23 Thu New Moon; Partial Solar Eclipse (1:54pm - 4:33pm; see p.52 October S&T)
- 25 Sat Saturn to the lower-right of the crescent Moon (Dusk)
- 30 Thu First-Quarter Moon (7:48pm)

### November

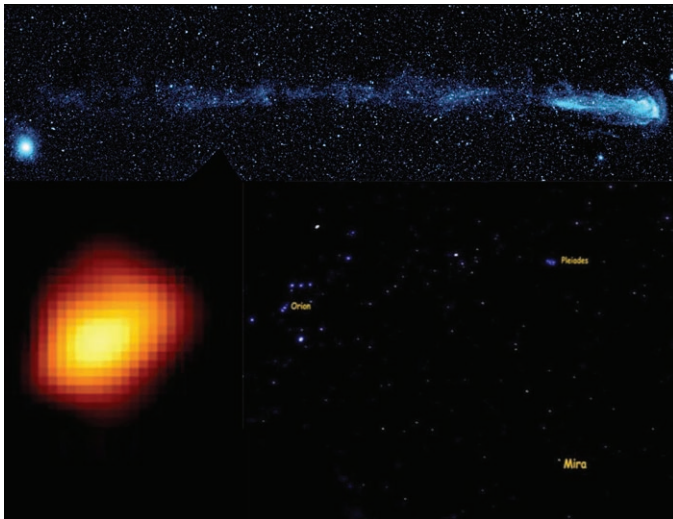
- 2 Sun Algol at minimum brightness for 2 hours centered on 7:07pm PST
- 2 Sun Pacific Standard Time begins at 2am.
- 6 Thu Full Moon (2:23pm)
- 14 Fri Last-Quarter Moon (10:16am)
- 17-18 Mon- Leonid Meteor Shower visible on the mornings of the 17th and 18th (see p.50 November S&T)
- 22 Sat New Moon (4:32am)
- 22 Sat Algol at minimum brightness for 2 hours centered on 8:50pm PST
- 25 Tue Mars to the left of the crescent Moon (Dusk)
- 29 Sat First-Quarter Moon (2:06am)



## Twinkle, Twinkle, Variable Star

By Dr. Ethan Siegel

As bright and steady as they appear, the stars in our sky won't shine forever. The steady brilliance of these sources of light is powered by a tumultuous interior, where nuclear processes fuse light elements and isotopes into heavier ones. Because the heavier nuclei up to iron (Fe), have a greater binding energies-per-nucleon, each reaction results in a slight reduction of the star's mass, converting it into energy via Einstein's famous equation relating changes in mass and energy output,  $E = mc^2$ . Over timescales of tens of thousands of years, that energy migrates to the star's photosphere, where it's emitted out into the universe as starlight.



Images credit: NASA's Galaxy Evolution Explorer (GALEX) spacecraft, of Mira and its tail in UV light (top); Margarita Karovska (Harvard-Smithsonian CfA) / NASA's Hubble Space Telescope image of Mira, with the distortions revealing the presence of a binary companion (lower left); public domain image of Orion, the Pleiades and Mira (near maximum brightness) by Brocken Inaglory of Wikimedia Commons under CC-BY-SA-3.0 (lower right).

There's only a finite amount of fuel in there, and when stars run out, the interior contracts and heats up, often enabling heavier elements to burn at even higher temperatures, and causing sun-like stars to grow into red giants. Even though

the cores of both hydrogen-burning and helium-burning stars have consistent, steady energy outputs, our sun's overall brightness varies by just ~0.1%, while red giants can have their brightness's vary by factors of thousands or more over the course of a single year! In fact, the first periodic or pulsating variable star ever discovered—Mira (omicron Ceti)—behaves exactly in this way.

There are many types of variable stars, including Cepheids, RR Lyrae, cataclysmic variables and more, but it's the Mira-type variables that give us a glimpse into our Sun's likely future. In general, the cores of stars burn through their fuel in a very consistent fashion, but in the case of pulsating variable stars the outer layers of stellar atmospheres vary. Initially heating up and expanding, they overshoot equilibrium, reach a maximum size, cool, then often forming neutral molecules that behave as light-blocking dust, with the dust then falling back to the star, ionizing and starting the whole process over again. This temporarily neutral dust absorbs the visible light from the star and re-emits it, but as infrared radiation, which is invisible to our eyes. In the case of Mira (and many red giants), it's Titanium Monoxide (TiO) that causes it to dim so severely, from a maximum magnitude of +2 or +3 (clearly visible to the naked eye) to a minimum of +9 or +10, requiring a telescope (and an experienced observer) to find!

Visible in the constellation of Cetus during the fall-and-winter from the Northern Hemisphere, Mira is presently at magnitude +7 and headed towards its minimum, but will reach its maximum brightness again in May of next year and every 332 days thereafter. Shockingly, Mira contains a huge, 13 light-year-long tail -- visible only in the UV -- that it leaves as it rockets through the interstellar medium at 130 km/sec! Look for it in your skies all winter long, and contribute your results to the AAVSO (American Association of Variable Star Observers) International Database to help study its long-term behavior!

Check out some cool images and simulated animations of Mira here: [http://www.nasa.gov/mission\\_pages/galex/20070815/v.html](http://www.nasa.gov/mission_pages/galex/20070815/v.html)

Kids can learn all about Mira at NASA's Space Place: <http://spaceplace.nasa.gov/mira/en/>



Tri-Valley Stargazers  
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[www.trivalleystargazers.org](http://www.trivalleystargazers.org)

## Tri-Valley Stargazers Membership Application

(or apply for membership online: [www.trivalleystargazers.org/membership.shtml](http://www.trivalleystargazers.org/membership.shtml))

### Contact information:

Name: \_\_\_\_\_ Phone: \_\_\_\_\_

Street Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

Email Address: \_\_\_\_\_

Status (select one): \_\_\_\_\_ New member \_\_\_\_\_ Renewing or returning member

**Membership category** (select one): Membership term is for one calendar year, January through December.

\_\_\_\_\_ Student member (\$5). Must be a full-time high-school or college student.

\_\_\_\_\_ Regular member (\$30).

\_\_\_\_\_ Patron member (\$70). Patron membership grants use of the club's 17.5" reflector at H2O. You must be a member in good standing for at least one year, hold a key to H2O, and receive board approval.

**Hidden Hill Observatory Access** (optional):

\_\_\_\_\_ One-time key deposit (\$20). This is a refundable deposit for a key to H2O. New key holders must first hear an orientation lecture and sign a usage agreement form before using the observing site.

\_\_\_\_\_ Annual access fee (\$10). You must also be a key holder to access the site.

**Magazine Subscriptions** (optional): Discounted subscriptions are available only to new subscribers. All subsequent renewals are handled directly with the magazine publishers.

\_\_\_\_\_ One-year subscription to Sky & Telescope magazine (\$32.95).

\_\_\_\_\_ One-year subscription to Astronomy magazine (\$34).

**Donation** (optional):

\_\_\_\_\_ Tax-deductible contribution to Tri-Valley Stargazers

**Total enclosed:** \$ \_\_\_\_\_

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. TVS will not share information with anyone other than other club members and the Astronomical League without your express permission.

Mail this completed form along with a check to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551.