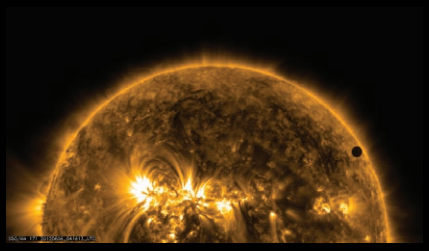
PRIMEFOCUS

Tri-Valley Stargazers

July 2012



TVS Tri-Valley Stargazers

Meeting Info

What:

Part 1: Member Eclipse Photos

Part 2: Lecture: Saturn V-The First 700 Seconds

Who:

Mr. Faride Khalaf

When:

July 20, 2012
Doors open at 7:00 p.m.
Member Photos at 7:30 p.m.
Featured Speaker at 8:00 p.m.

Where:

Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

Inside

July Meeting

Saturn V-The First 700 Seconds
Faride Khalaf

Caption: Your TVS Newsletter editor standing behind the business end of the first stage of the the Saturn V at Johnson Space Center. Photo Credit: Karen Harris

As we witnessed each launch of the Apollo program, we would forever remember the countdown, ignition sequence, images of the Saturn V rocket engines billowing out vast, fast and furious hot gas, and then lift off. We'll never forget those sheets of ice breaking off the exterior and raining down on the launch pad as the rocket cleared the tower. What we saw, what we remember, and the extent of what was broadcast on the daily news is a very small fraction of all that led to NASA's greatest achievements. Highlighting some of the interesting and little known technical aspects of the various missions, Faride Khalaf will take you down memory lane and visit the Apollo program in a unique way. We will focus on some of the details starting from launch preparation to the last rocket blast that sent the gallant crew and their spacecraft to the moon. In this presentation, you'll find answers to questions that Walter Cronkite never thought to ask! Come join us and relive the oldest of human dreams, a dream worth revisiting.

Faride Khalaf began his aviation career as a skydiver in 1982. He received his FAA Airframe and Powerplant license from the College of Alameda in 1985, and became an Inspection Authorization (Officer) in 2001. He was an Aircraft Mechanic Instructor at the late Sierra Academy in Oakland for several years beginning in 1986. He was a General Mechanic at United Airlines for a decade. During two of those years he was a Mechanic Instructor teaching structural repairs, and for two years was a Fuel Systems Specialist. He's been a Private Pilot for 25 years, and is the sole owner of a 1947 Cessna 120.

Member Eclipse Photos

May and June were very exciting times for observers and astrophotographers, with the May 20 annular solar eclipse, and the June 5 Venus transit. TVS members traveled long distances to capture stunning photos of these celestial events. Come and share your experiences of witnessing these one-in-a-lifetime (in the case of the Venus transit) events with your fellow club members.

News & Notes

2012 TVS Meeting Dates

The following lists the TVS meeting dates for 2012. 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**
Jul. 20	Jul. 23	
Aug. 17	Aug. 20	Jul. 27
Sep. 21	Sep. 24	Aug. 31
Oct. 19	Oct. 22	Sep. 28
Nov. 16	Nov. 19	Oct. 26
Dec. 21	Dec. 24	Nov. 30

Money Matters

Treasurer David Feindel indicates that as of July 8, 2012 the TVS checking account balance is $12,302.78

Star Party Requests/Participation

July 19th, Pleasanton Library: Dr. Kevin Manning presenting Astronomy for Everyone: Size & Scale of the Universe. His talk will be from approximately 7:00 to 9:00, after which he will invite people to look through his telescope on the front lawn. He welcomes any TVS members who want to bring their scopes too. For more information, contact Wayne Miller, TVS Star Party Coordinator.

August 14, Oregon Star Party: If you want more information, contact Todd Billeci, TVS Vice-President and Program Director. Todd says that he would be happy to organize a caravan.

I apologize for misstating the dates of the TVS Yosemite trip in last month's newsletter. I hope no one missed out on this event, which took place in June.

Please contact me, Ken Sperber, directly, or through the TVS Yahoo Users Group, with announcements of club-relevant time-sensitive events that you would like published in the newsletter.

Journal Club by Ken Sperber

Chemical Evolution in the Early Universe

Hydrogen, helium, and a trace of lithium were the elements synthesized in the Big Bang. Many of the elements up through iron are produced by fusion in cores of stars, with others and those heavier than iron being synthesized during supernova explosions. The first stars, believed to be massive behemoths 100 or more solar masses in size, began seeding the cosmos with these heavy elements. As subsequent generations of stars exploded, the concentrations of the heavy elements increased. Two important question are: How quickly was the universe seeded with metals (in astronomy, "metal" is a generic term for all elements heavier than hydrogen), and how does the concentration change as we look back in time?

To investigate "how chemically evolved" a galaxy is, measurements of two or more emission lines of different elements are needed. The ratio of the fluxes of the two emission lines is a measure of metallicity. Bright emission lines are needed, with the most favored lines being those that occur at visible wavelengths. Lines associated with OIII and SII are typical candidates for assessing metallicity (Nagao et al. 2006, Astronomy & Astrophysics, 459, 85-101). Most of you are familiar with these emission lines, as many of you use OIII filters to observe Planetary Nebulae, and SII is a popular emission line for astroimaging. The problem with these emission lines is that they become more and more red-shifted as evermore distant galaxies are observed. For galaxies that are about 10 billion light years away or more, these emission lines are shifted into the infrared and they are not observable from the ground.

So what do you do if you want to estimate metallicity in the very distant universe? ALMA to the rescue! ALMA is the Atacama Large Millimeter/submillimeter Array that is located in the Chilean Andes. Presently, ALMA consists of 18 twelve-meter radio antennas. When completed there will be 66 antennas.

Nagao et al. (2012, Astronomy & Astrophysics, 542, L34, doi: http://dx.doi.org/10.1051/0004-6361/201219518) used ALMA to help assess the metallicity of submillimeter galaxy LESS J033229.4–275619, located at z=4.76 (~12.4 billion light years away). A submillimeter galaxy is a type of galaxy that "forms stars at an extremely high rate." They tend to be cloaked in large amounts of dust, which, in addition to redshift, eliminates the use of visible emission lines because the dust blocks the visible wavelengths. The authors used ALMA to measure the emission due to NII, which at the distance of 12.4 billion light years is located at submillimeter wavelengths. The CII emission of this galaxy was measured previously as part of the Atacama Pathfinder experiment (DeBreuck et al. 2011, Astronomy & Astrophysics, 530, L8, doi: http://dx.doi.org/10.1051/0004-6361/201116868). Typically, both the CII and the NII emission lines arise in regions of star formation (known as HII regions), with the former line "being one of the strongest in the whole electromagnetic Spectrum." In order to have confidence in their estimate of the metallicity, the authors had to determine if the active galactic nucleus of the galaxy was contributing to the far-infrared emission. By

Header Image: Third contact of Venus as seen by the Solar Dynamics Observatory at a wavelength of 171 Angstroms. If I have interpreted the SDO literature correctly, this emission line is associated with the Fe IX transition. For more information see: http://sdo.gsfc.nasa.gov/ Image Credit: NASA/SDO and the HMI and AIA science teams.

Journal Club (continued)

evaluating different emission lines of CO (carbon monoxide) they determined that "the AGN contribution to the heating and excitation of the interstellar medium in LESS J0332 is not significant." Their results indicate that the [NII]/[CII] ratio is 0.043+/-0.008. Interestingly, this value is consistent with that measured in the local universe, where, for example, the value is 0.050 for M82. This result indicates that this distant and very young galaxy is highly chemically evolved.

As usual, the story is a bit more complicated than the aforementioned "conclusion." As it turns out, the velocity profiles of the NII and CII flux densities are different. An exciting possibility is that the difference in velocity profiles indicates that the system is not chemically homogeneous. This suggests that LESS J0332 is a merging system with "a chemically enriched galaxy that is merging with a metal poor galaxy."

As the ALMA array continues to be extended to its final 66-dish configuration, the sensitivity of the array will increase dramatically. This increased sensitivity will allow the detection of other key emission lines and provide for the investigation of dimmer objects in the quest to understand galaxy evolution in the early universe. Such searches should be bolstered by the James Webb telescope, with its unobstructed view of the infrared universe.

For a personal accounting of this research project by Prof. Nagao and colleagues, see: http://www.kyoto-u.ac.jp/en/news_data/h/h1/news6/2012/120612_1.htm Also see: http://alma.mtk.nao.ac.jp/e/news/pressrelease/20120621124.html, http://www.universetoday.com/95929/early-elemental-galaxy-found-12-4-light-years-away/

The Astronomy & Astrophysics journal is freely available online: http://www.aanda.org/

Calendar of Events

July 18, 7:00pm

What: The Geology of the Terrestrial Planets: Perspectives on the Earth
Who: Jim Head, Planetary Geosciences Department, Brown University
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

The dynamic nature of the Earth (erosion and plate tectonics) has largely destroyed the record of the formative years of our own Home Planet. Revealed on the other Earth-like planetary bodies (Moon, Mercury, Mars, and Venus) are startling and diverse landscapes recording the geological record of this early history, the very chapters that are missing from Earth. Results from the first half-century of solar system exploration have unveiled a vision of our formative years, where we have been, and indeed, where we may be going in the future.

For more information see: http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

July 18, 20, 25, 27, 1:00pm and 6pm

What: Simulated Space Missions
Who: You
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: Guests: $10 + General Admission, Members: $10, Register online or call (510) 336-7373

Blast-off on a simulated space mission in our Challenger Learning Center.® Guided by an experienced flight director you use problem solving skills, team work and decision making as you learn what it takes to man a space craft and lead a

team of astronauts from mission control. Ages 8+

For more information see: http://www.chabotspace.org/events.htm

July 21, 8:30pm

What: Astrobiology Investigates Life in the Context of Space
Who: Dr. David J. Des Marais, NASA-Ames Research Center
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

How does life begin and evolve? Does life exist beyond Earth? What is our future, here and beyond? Research and space exploration effectively pursue these questions in inspiring ways.

For more information see: http://www.mttam.net/astronomy/schedule.html

July 25, Noon-1:00pm

What: Life in the Multiverse
Who: Andrei Linde, Stanford University
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Cosmological observations show that the universe is very uniform on the maximally large scale accessible to our telescopes, and the same laws of physics operate in all of its parts that we can see now. The best theoretical explanation of the uniformity of our world was provided by inflationary theory, which was proposed 30 years ago.

Rather paradoxically, inflationary theory also predicts that on a very large scale, much greater than what we can see now, the world may look totally different. Instead of being a single spherically symmetric balloon, our universe may look as a "multiverse", a collection of many different exponentially large balloons ("universes") with different laws of physics operating in each of them.

In the beginning, this picture looked more like a piece of science fiction rather than a scientific theory. However, recent developments in inflationary cosmology, particle physics, and string theory provided strong evidence supporting the new cosmological paradigm. It changes the standard views on the origin and the global structure of the universe and on our own place in the world.

For more information see: http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

July 27, 6:00pm

What: Moonlight Hike
Who: Hiking Guide
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: $7, RSVP recommended, Register online or call (510) 336-7373

Hike through the redwoods in twilight and moonlight on a moderately strenuous 4-5 mi hike. Trail walks are led by an experienced hiker and Chabot educator and feature discussions about the natural environment and events and objects in the sky. Hike will take place rain or shine.

For more information see: http://www.chabotspace.org/events.htm

August 6, 7:30pm

What: Planets or Stars? - The Dark Universe of Brown Dwarfs
Who: Prof. Adam Burgasser, Center for Astrophysics and Space Science, UC San Diego
Where: California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA
Cost: Adults $12, Seniors $10, Academy members $6. Reserve a Space Online or call 415-379-8000

For thousands of years, humans have distinguished two types of bright celestial lights: the firmament of the fixed stars and the clockwork machinations of the wandering planets. With the discovery of a vast population of brown dwarfs - low-mass objects exhibiting both stellar and planetary characteristics - these long-held distinctions have been upended, revealing a continuum of gas giants spanning Jupiter to the Sun. Prof. Burgasser will describe the history of brown dwarf science, from their prediction as dark matter candidates in the 1960s to their discovery as the Sun's nearest neighbors in the 1990s. He'll then reveal their many fascinating properties, from interiors of metallic hydrogen to storms of molten iron, and report on the recent discovery of "room-temperature" stars with the WISE infrared satellite mission.

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

August 1, Noon-1:00pm

What: Neutrinos from Hell: the Dawn of Neutrino Geophysics
Who: Giorgio Gratta, Stanford University
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Seismic waves have been for a long time the only messenger reporting on the conditions deep inside the Earth. While global seismology provides amazing details about the structure of our planet, it is only sensitive to the mechanical prop-

erties of rocks and not to their chemical composition. In the last few years KamLAND and Borexino have started measuring anti-neutrinos produced by Uranium and Thorium inside the Earth.

Such "Geoneutrinos" double the number of tools available to study the Earth's interior, enabling a sort of global chemical analysis of the planet, albeit for two elements only.

Dr. Gratta will discuss the results of these new measurements and put them in the context of the Earth Sciences.

For more information see: http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

August 8, Noon-1:00pm

What: Using the topography of icy satellites to understand their internal structure and thermal history
Who: Noah Hammond, SETI Institute
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

The icy moons of Saturn boast a wide variety of topographic features, including the deep Herschel crater on Mimas, the prominent equatorial ridge on Iapetus and the famous "tiger stripes" of Enceladus. The lesser known moons, Rhea and Dione, also display complex topography, including impact basins, normal faults and ridges. The rich diversity of surface features on these moons is in part due to differences in their thermal histories. High resolution digital elevation models of such features can be used to gain insight into these thermal histories, as well as their internal structures and orbital histories.

For instance, the depths of craters reduce over time through a process called viscous relaxation, which increases in efficiency with the surface heat flux. Thus by measuring the current depth and estimating the initial depth, the amount of viscous relaxation a crater has undergone can be calculated and the heat flux at the surface can be inferred. Additionally, ridges and normal faults impose loads on the lithosphere, causing it to bend in response. The width and the amplitude of this bending, called flexure, is in part controlled by the elastic thickness, the portion of the ice shell that behaves elastically.

We use digital elevation models of the moons Rhea and Dione to measure crater depth and the topography of ridges and normal faults. With this data we calculate elastic thicknesses and infer heat fluxes that are much greater than those expected for a body heated solely from radioactive decay. Our results suggest that both Rhea and Dione underwent significant tidal heating and that both moons may have had sub-surface oceans early in their history.

For more information see: http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

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

All times Pacific Daylight Time.

July

14	Sat	Crescent Moon below Pleiades and above Jupiter (Pre-dawn)
15	Sun	Crescent Moon, Venus, Jupiter, and Aldebaran form a quadrangle (Pre-dawn)
18	Wed	New Moon (9:24pm)
21	Sat	Io's shadow falls on Jupiter's eastern limb at 2:51am, just before Europa's shadow leaves Jupiter's western limb. Europa southwest of Io's shadow
24	Tue	Crescent Moon, Saturn, Spica, and Mars form a quadrangle (Evening)
26	Thu	First-Quarter Moon (1:56am)
28	Sat	Io and Europa cast their shadows on Jupiter from 4:45 to 5:33am

August

1	Wed	Full Moon (8:27pm)
3	Fri	Jupiter 5 degrees north of Aldebaran
6	Mon	Uranus 5 degrees south of Moon
9	Thur	Last Quarter Moon (11:55am)
10	Fri	Moon at apogee
11	Sat	Jupiter 0.1 degree north of Moon
11-12	Sat-	Perseid Meteor Shower peaks after midnight
13-14	Mon-	Mars passes between Saturn and Spica low in the west-southwest
14-27	Tue	Mercury more than 10 degrees above the eastern horizon (half-hour before sunrise)
17	Fri	New Moon (8:54am)
21	Tue	The crescent Moon, Mars, Saturn, and Spica make a quadrilateral low in the western sky (late twilight)

How Many Discoveries Can You Make in a Month?

By Dr. Tony Phillips

This year NASA has announced the discovery of 11 planetary systems hosting 26 planets; a gigantic cluster of galaxies known as "El Gordo;" a star exploding 9 billion light years away; alien matter stealing into the solar system; massive bullets of plasma racing out of the galactic center; and hundreds of unknown objects emitting high-energy photons at the edge of the electromagnetic spectrum.

That was just January.

Within NASA's Science Mission Directorate, the Astrophysics Division produces such a list nearly every month. Indeed, at this very moment, data is pouring in from dozens of spacecraft and orbiting observatories.

"The Hubble, Spitzer, Chandra, and Fermi space telescopes continue to make groundbreaking discoveries on an almost daily basis," says NASA Administrator Charlie Bolden .

NASA astrophysicists and their colleagues conduct an ambitious research program stretching from the edge of the solar system to the edge of the observable Universe. Their work is guided in large part by the National Research Council's Decadal Survey of Astronomy and Astrophysics, which identified the following priorities:

Finding new planets—and possibly new life—around other stars.

Discovering the nature of dark energy and dark matter.

Understanding how stars and galaxies have evolved since the Big Bang.

Studying exotic physics in extreme places like black holes.

Observing time on Hubble and the other "Great Observatories" is allocated accordingly.

Smaller missions are important, too: The Kepler spacecraft, which is only "medium-sized" by NASA standards, has single-handedly identified more than 2300 planet candidates. Recent finds include planets with double suns, massive "super-Earths" and "hot Jupiters," and a miniature solar system. It seems to be only a matter of time before Kepler locates an Earth-sized world in the Goldilocks zone of its parent star, just right for life.

A future astrophysics mission, the James Webb Space Telescope, will be able to study the atmospheres of many of the worlds Kepler is discovering now. The telescope's spectrometers can reveal the chemistry of distant exoplanets, offering clues to their climate, cloud cover, and possibilities for life.

That's not the telescope's prime mission, though. With a primary mirror almost 3 times as wide as Hubble's, and a special sensitivity to penetrating infrared radiation, Webb is designed to look into the most distant recesses of the universe to see how the first stars and galaxies formed after the Big Bang. It is, in short, a Genesis Machine.

Says Bolden, "We're on track in the construction of the James Webb Space Telescope, the most sophisticated science telescope ever constructed to help us reveal the mysteries of the cosmos in ways never before possible." Liftoff is currently scheduled for 2018.

How long will the list of discoveries be in January of that year? Stay tuned for Astrophysics.

For more on NASA's astrophysics missions, check out http://science.nasa.gov/astrophysics/. Kids can get some of their mind-boggling astrophysics questions answered by resident Space Place astrophysicist "Dr. Marc" at http://spaceplace.nasa.gov/dr-marc-space.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

[1]Bolden made these statements in an April 20th editorial he co-authored with John Holdren, Director of the Office of Science and Technology Policy: http://blogs.nasa.gov/cm/blog/bolden/posts/post_1334967201693.html

Caption: Artist's concepts such as this one are based on infrared spectrometer data from NASA's Spitzer Space Telescope. This rendering depicts a quadruple-star system called HD 98800. The system is approximately 10 million years old and is located 150 light-years away in the constellation Crater. Credit: NASA/JPL-Caltech/T. Pyle (SSC)

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

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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.