PRIMEFOCUS
Tri-Valley Stargazers

August 2007

Meeting Info:

What
Very High-Energy Gamma-Ray Astronomy with VERITAS

Who
David Williams,
UC Santa Cruz

When
August 17, 2007
Doors open at 7:00 p.m.
Lecture at 7:30 p.m.

Where
Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

Inside

August Meeting

Very High-Energy Gamma-Ray Astronomy with VERITAS

David Williams, UC Santa Cruz

VERITAS (the Very Energetic Radiation Imaging Telescope Array System) is a new system of four 12-m aperture optical reflectors used to study sources very high-energy gamma rays, with energy greater than about 100 billion electron-volts (GeV). It is located at the base camp of the Whipple Observatory in Amado, Arizona, south of Tucson. The reflectors, each with a 500-pixel camera constructed from photomultiplier tubes, image the flash of light produced in the atmosphere when a high-energy gamma ray interacts, a technique pioneered at the Whipple Observatory using a single 10-m aperture telescope built 30 years ago.

VERTIAS complex at the Whipple Observatory

The study of very high-energy gamma-ray sources is entering a new era. The new observatories such as VERITAS, as well as similar facilities HESS and MAGIC, are yielding a wealth of data and discovering numerous sources, both galactic and extragalactic. High-energy gamma rays result from some of the most powerful phenomena in the Universe, such as supernova shocks and high-energy jets from the massive black holes at the center of active galaxies. Some X-ray binaries have recently been discovered to produce very high-energy gamma-rays as well. David will discuss the experimental methods used to detect high-energy gamma rays from these sources, some of the key results, and the outlook for the future.

David Williams has been at the Santa Cruz Institute for Particle Physics at the University of California, Santa Cruz since 1987 and has been a member of the Physics Department there since 1993. He received his Ph.D. in particle physics from Harvard University in 1987, and initially continued research in that field. In 1990, he began applying the instrumentation techniques used at accelerators to study high energy particles from the cosmos and has been studying high-energy gamma-ray sources ever since. His particular interest is the high-energy emission from AGN and the search for potential high-energy emission from gamma-ray bursts.

News & Notes

2007 TVS Meeting Dates

The following lists the TVS meeting dates for the next few months. The lecture meetings are on the third Friday of the month, with the Board meetings on the Monday following the lecture meeting. The *Prime Focus* deadline applies to that month's issue (e.g., the August 5th deadline is for the August issue).

Lecture Meeting	**Board Meeting**	***Prime Focus* Deadline**
Aug. 17	Aug. 20	Aug. 5
Sept. 21	Sept. 24	Sept. 9

Money Matters

At our July board meeting, Treasurer **David Feindel** left word of the TVS account balances (as of July 23, 2007):

Checking	$3,359.57	
CD #1	$3,629.19	matures 08/17/07
CD #2	$2,557.42	matures 08/27/07

We've paid our annual Astronomical League membership dues ($360), so TVS members will continue to receive the *Reflector* from the AL.

Total Lunar Eclipse

The Bay Area will be able to view a total lunar eclipse in the early morning hours of Tuesday, August 28. See *What's Up* on page 6 for details.

Yosemite & White Mountain Star Parties

Time is running out for reserving spots at the two most popular club star parties.

The Yosemite Star Party takes place during the Labor Day weekend (August 31st through September 2nd). In exchange for hosting a public star party, TVSers get to camp at Yosemite for free. Great views (terrestrial and celestial) from atop Glacier Point.

The White Mountain/Barcroft high altitude trip is from September 4th through the 15th, with a final departure date of the 16th. You'll experience very dark skies, with the Milky Way casting shadows. The cost is $63 per person per day, which includes room and board. Attendees can choose how many days they would like to stay.

If you need more information, or want to sign up for either trip, contact **Dave Rodrigues** at 510-483-9191.

Astro Events

Jupiter Transits

The following are a few listings of transit times for various Jupiter related objects. The abbreviations are fairly straight forward: G=Ganymede, C=Callisto, I=Io, E=Europa, GRS=Great Red Spot, and if you see a 's' next to one of the moons, it means its shadow (e.g., Cs=Callisto's shadow); na means Jupiter is below the horizon or it is daylight at that time.

August

Thurs 9	I	11:50p	12:55a	na
Fri 10	GRS	12:50a	na	na
	GRS	8:55p	10:40p	12:25a
Sat 11	Is	na	na	9:36p
Sun 12	GRS	10:10p	12:10a	na
Mon 13	GRS	na	8:08p	10:10p
Tues 14	E	9:20p	10:38p	11:56p
	Es	11:48p	12:49a	na
	GRS	11:53p	na	na
Wed 15	GRS	na	9:40p	11:40p
Fri 17	GRS	9:30p	11:20p	na
Sat 18	GRS	na	na	9:10p
	I	8:09p	9:14p	10:22p
	Is	9:25p	10:17p	11:32p
Mon 20	GRS	na	8:53p	10:53p
Wed 22	GRS	8:38p	10:30p	12:30a
Fri 24	GRS	10:10p	12:04a	na
Sat 25	GRS	na	8:06p	9:55p
	I	10:04p	11:07p	12:15a
	Is	11:19p	12:11a	na
Sun 26	Gs	8:36p	9:37p	11:00p
Mon 27	GRS	na	9:40p	11:37p
Wed 29	GRS	9:30p	11:15p	na

September

Sat 1	Es	na	na	8:53p
	GRS	na	8:46p	10:49p
Sun 2	G	na	8:35p	9:52p
Mon 3	I	na	7:34p	8:39p
	Is	7:43p	8:36p	9:50p
	GRS	8:40p	10:25p	na
Sun 9	GRS	na	8:00p	10:10p

Newsletter header image: The Snake Nebula (B72).

The Snake Nebula, located in the constellation Ophiuchus, is a good example of a "dark nebula"—a cloud of dust that blocks the light from stars that are behind it.

The image was taken at the Henry Coe State Park using a William Optics Megrez refractor and a Canon 20Da digital camera. Total exposure time is 75 minutes.

Credit: Conrad Jung

Calendar of Events

August 18, 8:30 p.m.
What: *Weighing the Dark Matter in the Universe with Gravitational Lensing*
Who: Dr. Joseph F. Hennawi (UC Berkeley)
Where: Mt. Tam Mountain Theatre
Cost: Free

A description of the mysterious problem of Dark Matter in the Universe which has confounded astronomers and physicists for nearly half a century, and recent progress on understanding it based on one of the predictions of Einstein's theory of general relativity.

Carpool with your friends, bring flashlights and dress warmly. It can be cold sitting on rocks! All programs are free, and we encourage you to bring students and family members of all ages. Telescope viewing will follow the program, weather permitting, until about 11:00 p.m. in the Rock Springs Parking Lot.

If the weather is questionable on the day of the program, call the SFAA hotline at 289-6636 (the Astronomy hotline will not be changed on this program). Usually the program goes even if the sky is not inviting for observing. And remember that when the fog comes in we are usually above it and welcome it to block out the lights of San Francisco.

Programs sponsored by your State Park, organized by the Mount Tamalpais Interpretive Association with viewing conducted by the San Francisco Amateurs. More information and directions are at www.mttam.net.

August 24, 8:00 - 11:00 p.m.
What: *Lunar Lounge Express*
Who: You
Where: Chabot Space & Science Center, Oakland
Cost: Lunar Lounge: $15 Adult, $10 Student, $8 Member
Lunar Lounge + Mission: $23 Adult, $18 Student, $16 Member.
For reservations, call 510-336-7373

Bring your friends and come party under the stars at Chabot's monthly nocturnal celebration—The Lunar Lounge Express!

The Lunar Lounge Express
Featuring live music, refreshments, activities and fun! The Lunar Lounge Express gives you full access to the Chabot Space & Science Center's interactive exhibits and includes the Planetarium program SonicVision (a new alternative music show), as well as telescope viewing at the Observatory Complex.

Special coffee tastings provided by the AfricaJack Foundation. The AfricaJack Foundation provides resources and funding to build Learning Centers at HIV orphanages in Sub-Saharan Africa.

The musical act for the evening is Mitch Tobias. Mitch and his three guitars have a fun and reaching sound. Part classical, part jazz and frequently progressive.

You can purchase food from the Celestial Café, and enjoy $3 micro-brews from Buffalo Bill's Brewery and $3 wine from the cash bar.

August 27, 10:00 p.m.
What: *Total Lunar Eclipse*
Who: You
Where: Chabot Space & Science Center, Oakland
Cost: By August 15: $10 Adult

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What's Up *by Debbie Dyke*

All times Pacific Daylight Time.

August

5 Sun Mercury at perihelion.
Last Quarter Moon. 2:20 p.m.

8 Wed Mercury in front of the Pleiades. 6:00 a.m. (Doubtful M45 will be visible.)

10 Fri Venus at aphelion.

11 Sat 1877 Asaph Hall Sr. discovers Mars' moon Deimos.

12 Sun **New Moon**. 4:02 p.m.
Perseid meteor shower peaks. 10:00 p.m.

13 Mon Neptune at opposition. 11:00 a.m.

15 Wed Mercury at greatest heliocentric latitude north, and is in superior conjunction. 1:00 p.m.

17 Fri **Tri-Valley Stargazers general meeting**. 7:30 p.m. at the Unitarian Universalist Church, 1893 N. Vasco Road, Livermore.
Venus in inferior conjunction (8° south of the Sun). 9:00 p.m.
Spica 2.5° north of the Moon. 8:00 p.m.
1877 Asaph Hall discovers Mars' other moon, Phobos.

18 Sat Moon at apogee (250,863 miles). 8:00 p.m.

19 Sun **Tri-Valley Stargazers discussion meeting**. 2:00 p.m. at the Round Table Pizza on 1024 E. Stanley Blvd., Livermore. Discuss astro stuff with your fellow members.

20 Mon **Tri-Valley Stargazers Board meeting**. 7:00 p.m. at the Round Table Pizza in Livermore.
First Quarter Moon. 4:54 pm.

21 Tue Saturn in conjunction with the Sun. 3:00 p.m.
The Moon occults Tau Scorpii (2.81 mag). The star disappears at 8:02 p.m. and reappears at 9:30 p.m.
Jupiter 6.6° north of the Moon. 9:00 p.m.
Antares 2.5° north of the Moon. 9:30 p.m.

23 Thur Mars 5° north of Aldebaran. 5:00 a.m.

26 Sun The Moon 3.6° N of Neptune. 9:30 p.m.

27 Mon The almost full Moon is 1.6° north from Neptune. 4:00 a.m.

28 Tues **Full Moon. 3:35 a.m.**
Total Lunar Eclipse visible from the Bay Area. The penumbral phase (very slight darkening) starts at 12:53 a.m. on the 28th. The umbral phase (the darkest phase) starts at 1:51 a.m. Totality begins at 2:52 a.m. and lasts until 4:22 a.m. The umbral phase ends at 5:23 a.m.; The penumbral phase ends at 6:21 a.m. The Moon sets at 6:48 a.m.
The Moon is 1° from Uranus. 11:00 p.m.
1864 William Huggins discovers that nebulae are gas clouds.

30 Thur Moon at perigee (225,786 miles). 5:00 p.m.

September

1 Sat Venus at greatest heliocentric latitude south.
Aurigids meteor shower peaks. 5:00 a.m.

2 Sun **The Moon rises within the Pleiades**. 11:00 p.m.

3 Mon **Labor Day**.
Last Quarter Moon. 7:32 p.m.
1976 Viking 2 lands on Mars at Utopia Planitia.

4 Tue The Moon 5.5° north from Mars. 5:00 a.m.

Tones from the Deep

by Patrick Barry and Tony Phillips

Now is an exciting time for space enthusiasts. In the history of the Space Age, there have never been so many missions "out there" at once. NASA has, e.g., robots on Mars, satellites orbiting Mars, a spacecraft circling Saturn, probes en route to Pluto and Mercury—and four spacecraft, the Voyagers and Pioneers, are exiting the solar system altogether.

It's wonderful, but it is also creating a challenge.

The Deep Space Network that NASA uses to communicate with distant probes is becoming overtaxed. Status reports and data transmissions are coming in from all over the solar system—and there's only so much time to listen. Expanding the network would be expensive, so it would be nice if these probes could learn to communicate with greater brevity. But how?

Solving problems like this is why NASA created the New Millennium Program (NMP). The goal of NMP is to flight-test experimental hardware and software for future space missions. In 1998, for instance, NMP launched an experimental spacecraft called Deep Space 1 that carried a suite of new technologies, including a new kind of communication system known as Beacon Monitor.

The system leverages the fact that for most of a probe's long voyage to a distant planet or asteroid or comet, it's not doing very much. There's little to report. During that time, mission scientists usually only need to know whether the spacecraft is in good health.

"If you don't need to transmit a full data stream, if you only need some basic state information, then you can use a much simpler transmission system," notes Henry Hotz, an engineer at NASA's Jet Propulsion Laboratory who worked on Beacon Monitor for Deep Space 1. So instead of beaming back complete data about the spacecraft's operation, Beacon Monitor uses sophisticated software in the probe's onboard computer to boil that data down to a single "diagnosis." It then uses a low-power antenna to transmit that diagnosis as one of four simple radio tones, signifying "all clear," "need some attention whenever you can," "need attention soon," or "I'm in big trouble—need attention right now!"

These simple tones are much easier to detect from Earth than complex data streams, so the mission needs far less of the network's valuable time and bandwidth, Hotz says. After being tested on Deep Space 1, Beacon Monitor was approved for the New Horizons mission, which is currently on its way to Pluto, beaming back a simple beacon as it goes.

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

This artist's concept shows the New Horizons spacecraft during its planned encounter with Pluto and its moon, Charon. The spacecraft is currently using the beacon monitor system on its way to Pluto. *Credit: Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute (JHUAPL/SwRI)*

Calendar of Events *continued*

$7 Student/Youth/Senior
After August 15: $13 Adult
$9 Student/Youth/Senior
For reservations, call 510-336-7373

Looking for a truly special last hurrah for the summer? Look no further! Come to Chabot Space & Science Center to celebrate a beautiful celestial event that only happens once in a Red Moon.

A total lunar eclipse will occur in the wee morning hours of August 28 and we'll be watching it at Chabot! Come take a special Full Moon hike; enjoy a Planetarium presentation on eclipses; engage in make-and-take lunar activities; and view the eclipse through our large telescopes! There's simply no better way to enjoy this stunning astronomical phenomenon. Don't miss it!

September 29, Noon to Midnight

What: *AANC Conference 2007*
Who: You
Where: College of San Mateo
Cost: Varies by Package

The AANC is the Astronomical Association of Northern California. It's an umbrella organization which encompasses the astronomy clubs in Northern California (TVS included).

The conference will have a series of lectures geared toward the amateur astronomer, scopes on display (and in use) all day and evening long, planetarium shows, family activities, mirror grinding demos, and the ever popular raffle!

For more information, visit the conference web site: http://aancstars2007.org.

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.
_____ $40 Regular. You will receive a paper version of *Prime Focus* in the mail.
_____ $32.95 One year subscription to *Sky & Telescope* magazine.
_____ $34 One year subscription to *Astronomy* magazine.
_____ $60 Two year subscription to *Astronomy* magazine.
_____ $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.
$_____ 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.