

PRIME FOCUS

Tri-Valley Stargazers

February 2009



Meeting Info:

What

Black Holes

Who

Philip Kahn

When

February 20, 2009
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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February Meeting

Black Holes

Philip Kahn

Black holes are a perverse kind of astronomical superstar. While their existence is incredibly well-known, misconceptions about them abound more than factual data. Why do people think that the LHS could produce a black hole that could consume the planet? The goal of this talk is to clear up some misconceptions about black holes, and enlighten as to some of their more under appreciated attributes; for example, when a black hole isn't black, feeding black holes, why no one can ever see you fall into a black hole, and how a black hole can let you time-travel. A brief investigation into these fascinating members of our universe shows the boundaries of physics, common sense, and the true nature of these staples of popular culture.



Artist's conception of a black hole.

Black hole cat



Black holes used in popular culture humor.



Hubble Space Telescope image of the Abell 1689 galaxy cluster. This image shows gravitational lensing—what happens when light from a distant background object gets warped by the gravity of a foreground object.

In this case, the background objects are galaxies over 13 billion light years away. The foreground object is the Abell cluster plus some dark matter, which creates a 2 million light year wide "lens" to refract the light.

The distant galaxies appear towards the edges of the image, stretched into curved shapes. For a larger view of this image, go to <http://hubblesite.org/news-center/archive/releases/2003/01/image/a>.

News & Notes

New Members

TVS would like to welcome our newest member, **Karthik Gururangan**.

2009 TVS Meeting Dates

The following lists the TVS meeting dates for the start of the year. The lecture meetings continue to be 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 March 8th deadline is for the March issue).

Lecture Meeting	Board Meeting	Prime Focus Deadline
Feb. 20	Feb. 23	Feb. 8
Mar. 20	Mar. 23	Mar. 8
Apr. 17	Apr. 20	Apr. 5

Money Matters

Treasurer David Feindel reported the TVS account balances as of January 19, 2009.

Checking	\$3,995.96	
CD #1	\$3,752.01	matures 2/17/09
CD #2	\$2,647.37	matures 2/27/09

Church rental was due in January, the H2O rental is due in February.

TVS Membership Renewal

If you haven't done so already, please consider renewing your membership for the 2009 membership year. With a Basic membership, you get an e-mail notification when the online version of the newsletter is available for download. With a Regular membership you will receive a hard copy of the newsletter in the mail.

You can find the renewal form on the back page of the newsletter. Please fill it out and send it in with your check (made out to Tri-Valley Stargazers) to PO Box 2476, Livermore, CA 94551. You can also give your check and form to our Treasurer, David Feindel, at the club meetings.

If you are a subscriber to *Sky & Telescope* magazine and need to renew, follow whatever instructions *S&T* sends you. If you are a new subscriber to *S&T*, fill out the membership renewal form and submit your payment to TVS. *Astronomy* magazine will continue to follow the procedure for subscribing or renewing through the club.

Rates continue to be \$32.95 for a 1-year subscription to *S&T*, and \$34/\$60 for a 1- or 2-year subscription to *Astronomy*. If you have questions regarding the subscriptions, contact club Treasurer David Feindel.

RASC Handbooks & Calendars

We still have copies of the RASC (Royal Astronomical Society of Canada) Handbooks and Calendars available for purchase. You can pick them up at the lecture meeting. The Handbooks are \$22, Calendars \$15. Cash or checks (made out to Tri-Valley Stargazers) accepted. For more info about the items, visit <http://www.rasc.ca/publications/index.shtml>.

Science Fun Fair

Once again, TVS will be volunteering at the Pleasanton School District's Science Fun Fair at the Alameda County Fairgrounds in Pleasanton. This year's Fair will be held on Tuesday, March 17th, from 6:00-9:00 p.m.

As we have done in the past, we'll have two volunteers at our booth in the Young California building. We'll also have volunteers outside with telescopes to show attendees whatever objects are easily visible. The Moon won't be up, but the Beehive Cluster and crowd favorite Saturn will be visible. If you wish to help, please contact Debbie Dyke at 925~461~3003 or astrodeb@comcast.net.

Comet Lulin

Comet Lulin is making its way from the Sun past Earth on its way back out into deep space. In early February, the comet will be visible early mornings (around 4:00 a.m.), but you'll need binoculars. At the



Comet Lulin. Photo: Conrad Jung

end of the month, the comet will be up in the evening and is expected to be naked eye brightness. It will pass by Saturn on the 24th, and the Beehive Cluster on March 3rd and 4th. It will be crossing the sky at over 5° per day.

Comet Lulin's orbit is a bit interesting; it's nearly parabolic and it's in the opposition direction from our solar system planets' orbit. Once the comet leaves our solar system, it won't be back for more than a thousand years.

A small chart plotting the location of the comet for the next month is on page 4. For more downloadable star charts showing where to look for the comet, and more information about the comet, visit Sky & Telescope's web site: <http://www.skyandtelescope.com/observing/highlights/35992534.html>.

Newsletter header image: The Moon

Our closest celestial neighbor, the Moon. Image taken February 1, 2009 with a 4" f8 APO and Canon 350D. Exposure time was 1/125 second. Photo: Gert Gottschalk

Calendar of Events

February 14, 1:30 and 3:30 p.m.

February 15, 1:30 and 3:30 p.m.

What: *Valentine's Day Love Mission*

Who: Couples

Where: Chabot Space & Science Center

Cost: \$85 per couple/\$80 Members
Get your tickets through the
Box Office at 510-336-7373.

Celebrate with your Valentine and take a simulated space mission to the Red Planet. Couples are stranded on a spacecraft and will need to use teamwork to fix it and continue to Mars. The Mars package includes an all access pass to Chabot, plus chocolates, fizzy Martian beverage, and a souvenir of your trip to outer space.

February 21, 11:00 a.m. - 12:00 p.m.

What: *Black Holes: Monsters Lurking at the Centers of Galaxies*

Who: Eliot Quataert

Where: UC Berkeley, Dwinelle Room 145

Cost: Free

Eliot Quataert works on the theoretical investigations of black holes, supernova explosions, and the formation and evolution of galaxies. An exceptional young scientist, he was appointed as a professor in the astronomy department at UC Berkeley at the age of 28. The recipient of Harvard University's Bok Prize, the American Astronomical Society's Warner Prize, and a Miller Research Professorship at UC Berkeley, he also regularly gives non-technical talks describing the physics of black holes to the general public.

Dr. Quataert will begin by describing what black holes are (and what they are not!). He will then discuss how big black holes at the centers of galaxies are discovered, how

they form, and how they give rise to some of the most remarkable and bizarre phenomena in the universe.

Doors open at 10:30 a.m. and seating is on a first come, first served basis. Limited hourly pay parking is available on weekends on and nearby campus—please check the signs. You are encouraged to take public transport—BART and bus lines are within walking distance.

February 23, 7:30 - 9:00 p.m.

What: *Asteroids, Evolution, and the Long-term Habitability of Earth*

Who: David Morrison (NASA Ames)

Where: Morrison Planetarium, San Francisco

Cost: Adults \$10, Seniors \$8, Members \$5
Tickets available at the door.

Long-term habitability of our planet is linked to external as well as internal influences. In particular, cosmic impacts are now recognized as a major factor in the biological history of the Earth. Most dramatic was the discovery that the end-Cretaceous mass extinction of 65 million years ago was caused by the impact of an asteroid or comet. Now that we recognize the importance of impacts, we can consider ways to protect our planet from future cosmic disasters. The first step is the Spaceguard Survey to discover and characterize potentially threatening near-earth-asteroids. We are also beginning to study technologies that could deflect future impactors before they hit. For the first time in history, we humans have the capacity to predict, and perhaps avoid entirely, the sort of catastrophe that wiped out the dinosaurs.

Reservations: Advance ticket is recommended. Please call 800-794-7576 for reservations. Tickets may be purchased at the door, but there is no guarantee of availability.

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Livermore, CA 94551

Lecture Meeting:

Unitarian Universalist Church
1893 N. Vasco Road, Livermore

Board & Discussion Meetings:

Round Table Pizza
1024 E. Stanley Blvd., Livermore

Web & E-mail

www.trivalleystargazers.org
trivalleystargazers@gmail.com

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.

What's Up *by Debbie Dyke*

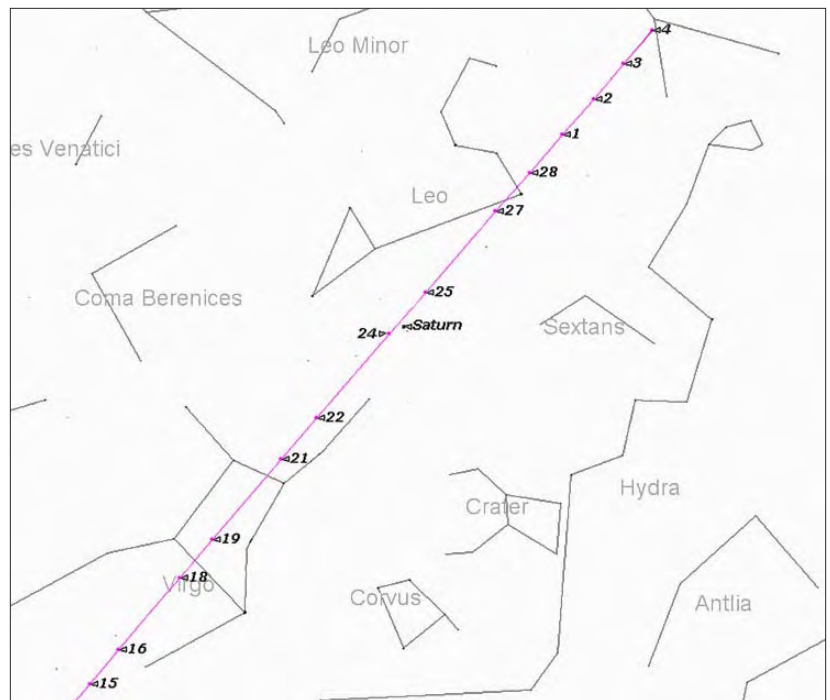
All times Pacific Standard unless otherwise noted.

February

- 12 Thur The Zodiacal Light will be visible for the next two weeks in the west after evening twilight.
- 13 Fri Mercury at greatest elongation west (26°). 1:00 p.m.
- 15 Sun 1564 Galileo Galilei born.
- 16 Mon **Last Quarter Moon.** 1:37 p.m.
1948 Gerard Kuiper discovers Miranda, a moon of Uranus.
- 17 Tue Mars 0.6° south of Jupiter. 7:00 a.m.
- 18 Wed 1930 Clyde Tombaugh discovers Pluto using the 13-inch scope at Lowell Observatory.
- 19 Thur Venus at greatest illuminated extent. 7:00 a.m.
Moon at apogee (251,179 miles). 9:00 a.m.
- 20 Fri **Tri-Valley Stargazers general meeting.** 7:30 p.m. at the Unitarian Universalist Church,
1893 N. Vasco Road, Livermore.
1962 John Glenn becomes the first American in orbit.
- 21 Sat Venus at perihelion.
- 22 Sun Low in the early southeast morning sky is a string of planets and the Moon. Mars is closest to the horizon,
followed by Jupiter 2.75° away; Mercury 2.5° from Jupiter; and a thin crescent Moon 2.5° from
Mercury. 7:00 a.m.
- 23 Mon **Tri-Valley Stargazers Board meeting.** 7:30 p.m. at the Round Table Pizza in Livermore.
Zodiacal Light will be visible in the west after evening twilight for the next two weeks.
- 24 Tue **New Moon.** 5:35 p.m.
Comet Lulin passes by Saturn.
- 27 Fri Venus just 1.5° from a sliver
of the Moon, low in the
early evening sky. 8:00 p.m.

March

- 2 Mon Moon 3° north of the
Pleiades (M45). 12:00 a.m.
- 3 Tue **First Quarter Moon.**
11:46 p.m.
- 5 Thur 1979 Voyager 1 flies past
Jupiter capturing the first
detailed images of it.
- 6 Fri 1986 Vega 1 spacecraft
encounters Comet Halley.
- 7 Sat Moon at perigee (227,550 miles).
7:00 a.m.
Moon $2^\circ 22'$ south of the Beehive
cluster (M44). 8:00 p.m.
1792 John Herschel born.
- 8 Sun **Daylight Saving Time begins.** 2:00 a.m.
Saturn at opposition. 1:00 p.m. PDT
- 9 Mon 1986 Vega 2 spacecraft encounters Comet Halley.
- 10 Tue Full Moon. 7:38 p.m. PDT
Saturn $7^\circ 20'$ north of the Moon. 9:00 p.m. PDT



Plotted path of Comet Lulin as it appears at 11:00 p.m. from February 15 through March 4.

Severe Space Weather

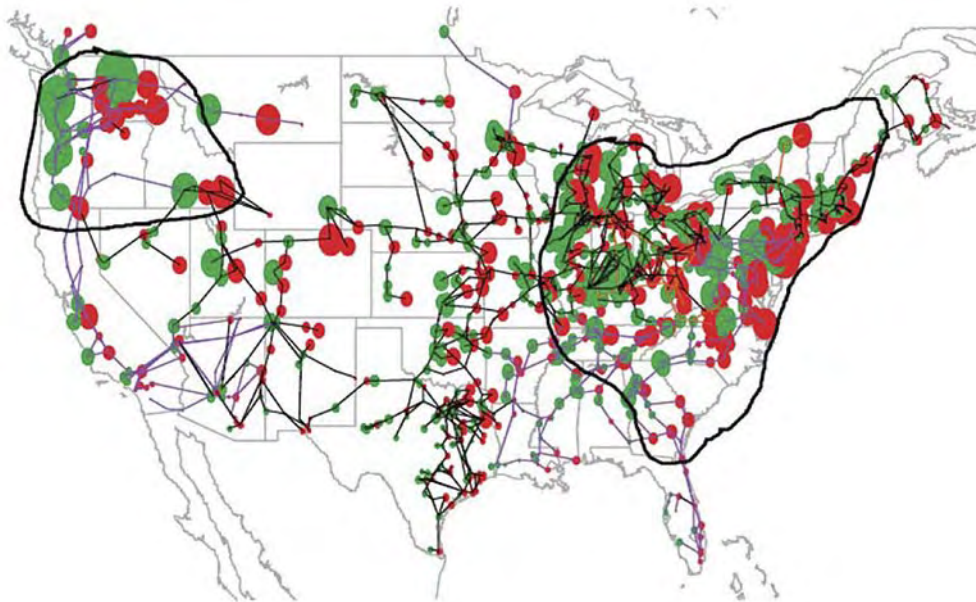
by Dr. Tony Phillips

Did you know a solar flare can make your toilet stop working?

That's the surprising conclusion of a NASA-funded study by the National Academy of Sciences entitled *Severe Space Weather Events—Understanding Societal and Economic Impacts*. In the 132-page report, experts detailed what might happen to our modern, high-tech society in the event of a “super solar flare” followed by an extreme geomagnetic storm. They found that almost nothing is immune from space weather—not even the water in your bathroom.

The problem begins with the electric power grid. Ground currents induced during an extreme geomagnetic storm can melt the copper windings of huge, multi-ton transformers at the heart of power distribution systems. Because modern power grids are interconnected, a cascade of failures could sweep across the country, rapidly cutting power to tens or even hundreds of millions of people. According to the report, this loss of electricity would have a ripple effect with “water distribution affected within several hours; perishable foods and medications lost in 12-24 hours; loss of heating/air conditioning, sewage disposal, phone service, fuel re-supply and so on.”

“The concept of interdependency,” the report notes, “is evident in the unavailability of water due to long-term outage of electric power—and the inability to restart an electric generator without water on site.”



On this power-grid map of the United States, the black-circled areas are regions especially vulnerable to collapse during an extreme geomagnetic storm. Inside those boundaries are more than 130 million people. *Credit: National Academy of Sciences report on severe space weather.*

It takes a very strong geomagnetic storm to cause problems on this scale—the type of storm that comes along only every century or so. A point of reference is the “Carrington Event” of August-September 1859, named after British amateur astronomer Richard Carrington who witnessed the instigating solar flare with his unaided eye while he was projecting an image of the Sun on a white screen. Geomagnetic storms triggered by the flare electrified telegraph lines, shocking technicians and setting their telegraph papers on fire; Northern Lights spread as far south as Cuba and Hawaii; auroras over the Rocky Mountains were so bright, the glow woke campers who began preparing breakfast because they thought it was morning!

“A contemporary repetition of the Carrington Event would cause ... extensive social and economic disruptions,” the report warns. Widespread failures could include telecommunications, GPS navigation, banking and finance, and transportation. The total economic impact in the first year alone could reach \$2 trillion (some 20 times greater than the costs of Hurricane Katrina).

The report concluded with a call for infrastructure designed to better withstand geomagnetic disturbances and improvements in space weather forecasting. Indeed, no one knows when the next super solar storm will erupt. It could be 100 years away or just 100 days. It's something to think about ... the next time you flush.

One of the jobs of the Geostationary Operational Environmental Satellites (GOES) and the Polar-orbiting Operational Environmental Satellites (POES) operated by NOAA is to keep an eye on space weather and provide early warning of solar events that could cause trouble for Earth.

You can keep an eye on space weather yourself at the National Weather Service's Space Weather Prediction Center, www.swpc.noaa.gov. And for young people, space weather is explained and illustrated simply and clearly at the SciJinks Weather Laboratory, scijinks.gov/weather/howwhy/spaceweather.

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

Tri-Valley Stargazers
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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.
_____ \$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.