July 2007

The Observer

East Valley Astronomy Club

Volume 21 Issue 7

Inside this Issue:

From the Desk of the President

by Claude Haynes

Star Parties galore. It is fun to talk to members who have been able to combine vacation with astronomy. Perhaps not the same way that Howard Israel does on cruise ships, but it is fun to get away to a dark place and spend some quality time looking at faint things we don't get to see in the city. The Grand Canyon was certainly a break from the heat of the desert, and the mix of people who came to gaze was amazing. It is always a treat to see very senior citizens respond with the thrilled "oohs" of a child when they look through a telescope.

The All Arizona Star Party isn't that far off. Remember to reserve October 12 and 13. We will need some volunteers to help with the party, so if you are coming and can offer a little time to assist let me or David Hatch know. It is always a great gathering.

Our speaker this month is Steve Coe, who has vast experience and unlimited energy when talking about astronomy. He has two books published, his latest being on nebulae. Be sure to join us and keep looking up.

The Backyard Astronomer

North Rim Grand Canyon Star Party by Bill

This was my fifth consecutive North Rim star party trip. Several past South Rim visits led my wife and me to decide that June is no time to be there – too darn many people. They say the north rim gets only 10% of the tourists the south rim gets. In my view, that's still too many. As lovely and serene as this location is, I'd like to see that number drop to 5% (!). The star party this year ran only five nights instead of the usual eight – don't ask why, it's very complicated. Weather this year bothered us a tad, with partly clouded skies my first two nights and an annoying cold wind kicking up around 10 pm every night. On average we had nine scopes each evening. I brought my venerable orange C-8; "L.A. Bob" had his 18" JMI newt; "California Bob", a 15" Discovery Dob and Jerry from North Carolina had his Televue 85 on a Vixen alt-az mount. These usual suspects are regulars at the north rim. A friend of "LA Bob" brought a C-11 on a Losmandy G11 Gemini GOTO, a sweet looking machine. Other nights saw various gazers dropping in for a night or two. Among the luminaries to be seen were Jane Jones and John Dobson, who gave evening slide shows in the lecture hall. EVAC's John and Cathy Matthews, and Butch and Mary Miller were also spotted by the paparazzi.

I always give the dou-

Continued on page 2

Upcoming Events:

Local Star Party at Boyce Thompson – July 7

Public Star Party in Gilbert – July 13

Deep Sky Star Party at Vekol Road – July 14

General Meeting at Southeast Regional Library – July 20

The Backyard Astronomer

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ble-double Nu Scorpii a shot when here. The C-D pair is easy at 2.3", but the A-B pair at 1.3" is challenging. My notes show I split it here in 2005 with the C-8 at 290x. In 2006, no deal. This year, deal or no deal? No deal. Another interesting gem I stumbled across was NGC 6281, also in Scorpius, just east of Mu 1 and 2, that neat naked eye optical double above the glorious NGC 6231/Collinder 316/ Trumpler 24 "Table of Scorpius" complex. This loose open cluster is easily overlooked because of the "Table" goodies to its south. I found the arrowhead-like shape fascinating (See Kepple/Sanner's Night Sky Observer's Guide, Vol.2, page 339 for A.J. Crayon's drawing and page 334 for its description).

On the positive side, more lights were turned off for us than ever before. On the negative side, bureaucracy continues to erode the life style we had been accustomed to. Like last year, a fire lane was required through our observing area on the lodge veranda. This reduced by 1/3 our already smallish area for setting up telescopes. Scope owners were required to fill out and hand in two forms, one stating we were volunteers and one listing how many people were estimated to have looked through our telescopes each night. An introduction cover letter suggested we avoid getting involved in religious conflicts with the public. A synopsis was required for any planned evening lecture. Finally, and this was the stake in my heart, laser wars with the south rim were prohibited. (There was also a nasty rumor that in the future, only five telescopes would be allowed on the veranda).

The lodge restaurant is still a very pleasant dining experience. Adjacent to the restaurant is the only other dining option, the so-called "Deli in the Pines", a misnomer if I ever heard one. That place really needs a makeover (And I'm being kind here).

I tip my hat to SAC's Margie Williams, who as our liaison with the Canyon powers to be, still made the star party a fun and successful experience. Every night we were literally overwhelmed by crowds who gasped in amazement at the sights they beheld in our telescopes. It was standing room only on our little veranda. Though some might think this report should be titled, "Whining at the North Rim", I certainly don't want to leave readers with the impression that I did not have a good time. Quite the opposite, I assure you. The star party, seeing old friends, the exquisite dark skies, the sound of the wind through the trees, and of course the CANYON, made for an exhilarating experience as always at the North Rim.

The North Rim of the Grand Canyon
©2007 Roy Tennant, FreeLargePhotos.com

◑Last Quarter Moon on July 7 at 09:54

○New Moon on July 14 at 05:04

◐First Quarter Moon on July 22 at 23:29

●Full Moon on July 29 at 17:47

The Equivalence Principle
by Patrick Barry

Standing on the Moon in 1971, Apollo 15 astronaut Dave Scott held his hands out at shoulder height, a hammer in one hand and a feather in the other. And as the world looked on via live television, he let go.

It was an odd sight: the feather didn't drift to the ground, it plummeted, falling just as fast as the hammer. Without air resistance to slow the feather, the two objects hit moondust at the same instant.

Astronaut Dave Scott drops a feather and hammer on the moon.

"What do you know!" exclaimed Scott.

"Mr. Galileo was right."

Scott was referring to a famous experiment of the 16th century. Depending on who tells the story, Galileo Galilei either dropped balls from the top of the Leaning Tower of Pisa or he rolled balls down slopes at home. Either way, the result was the same: Although the balls were made of different materials, they all reached bottom at the same time.

Today, this is known as "the equivalence principle." Gravity accelerates all objects equally regardless of their masses or the materials from which they are made. It's a cornerstone of modern physics.

But what if the equivalence principle (EP) is wrong?

Galileo's experiments were only accurate to about 1%, leaving room for doubt, and skeptical physicists have been "testing EP" ever since. The best modern limits, based on, e.g., laser ranging of the Moon to measure how fast it falls around Earth, show that EP holds within a few parts in a trillion (10^{12}). This is fantastically accurate, yet the possibility remains that the equivalence principle could fail at some more subtle level.

"It's a possibility we must investigate," says physicist Clifford Will of Washington University in St. Louis, Missouri. "Discovering even the slightest difference in how gravity acts on objects of different materials would have enormous implications."

In fact, it could provide the first real evidence for string theory. String theory elegantly explains fundamental particles as different vibrations of infinitesimal strings, and in doing so solves many lingering problems of modern physics. But string theory is highly controversial, in part because most of its predictions are virtually impossible to verify with experiments. If it's not testable, it's not science.

The equivalence principle could offer one way to test string theory.

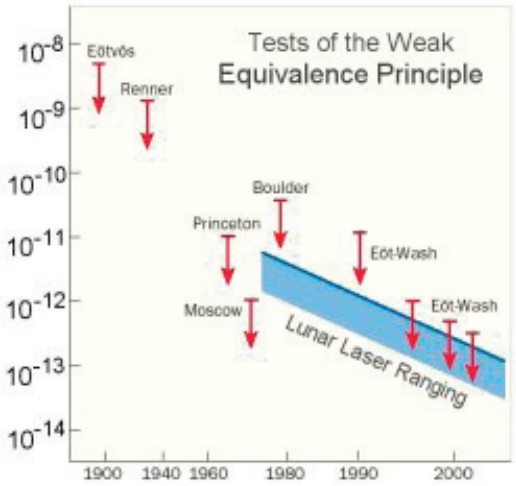
"Some variants of string theory predict the existence of a very weak force that would make gravity slightly different depending on an object's composition," says Will. "Finding a variation in gravity for different materials wouldn't immediately prove that string theory is correct, but it would give the theory a dose of supporting evidence."

This new facet of gravity, if it exists, would be so astonishingly weak that detecting it is a tremendous challenge. Gravity itself is a relatively weak force–it's a trillion trillion trillion (10^{36}) times more feeble than electromagnetism. Theorists believe the new force would be at least ten million million (10^{13}) times weaker than gravity.

Just as magnetism acts on objects made of iron but not plastic, the new force wouldn't affect all matter equally. The force's pull would vary depending on what the object is made of.

For example, some versions of string theory suggest that this new force would interact with the electromagnetic energy contained in a material. Two atoms that have the same mass can contain different amounts of electromagnetic energy if, say, one has more protons, which have an electric charge, while the other has more neutrons, which have no charge. Traditional gravity would pull on both of these atoms equally, but if gravity includes this new force, the pull on these two atoms would differ ever so slightly.

No experiment to date has detected this tiny difference. But now three groups of scientists are proposing space-borne missions that would hunt for this effect with greater sensitivity than ever before.



Modern tests of the Equivalence Principle. Figure based on a similar diagram in a review article from Physics World.

"What you want to do is take two test masses made of different materials and watch for very small differences in how fast they fall," Will says. "On Earth, an object can only fall for a short time before it hits the ground. But an object in orbit is literally falling around the Earth,

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From the Editor's Desk

by Peter Argenziano

I've often heard it said that the only constant is change.

While the club newsletter isn't exactly in a state of flux, I do make a conscious effort to keep improving both the content and presentation so that our club can have a newsletter we can all be proud of. I hope you perceive my efforts as successful.

After serving as EVAC's president for two years (2003-04) I decided to take on the role of newsletter editor. Having worked in the printing and publishing industry for the past quarter century I felt I could make a positive contribution to the club in this capacity.

I inherited a very nice publication from my predecessor, John Matthews. One of my first editorial decisions was to settle on the software application I would employ for the creative process. Not wanting to expose the club to a big expense for my inaugural issue, I decided to use software that I already owned: Microsoft Publisher 2002. I also utilized Adobe Acrobat Professional 6 to convert the native Publisher documents into the ubiquitous PDF files.

Initially, one thing that struck me as odd was that the club's newsletter didn't have a name. I began looking around the country at other astronomy clubs, and sure enough, their newsletters had a name. I looked at other hobby clubs and, you guessed it, they all had a named newsletter. Not wanting to be late publishing my first issue, the January 2005 newsletter was simply called 'EVAC News'. I chose this knowing that it would only be a temporary moniker. My quest for a new name was officially underway. I queried the governing body for potential names, and then the membership at large. It seemed that either nobody had any ideas or maybe they had no interest in the topic. That didn't deter me. The February 2005 issue marked the first EVAC newsletter with a name: The Voyager. I named it after the spacecraft launched in 1977 that provided us with the first detailed images of Jupiter and Saturn. The Voyager's masthead even included a caricature of the ringed planet.

The Voyager continued for a total of 23 issues, ending its reign in December 2006. I had been kicking around a few new names and decided mid-year on a new one: The Observer. I decided to wait until the new year to debut the new newsletter. The Observer premiered in January 2007. By this time the publication was being prepared with Microsoft Publisher 2003 and Adobe Acrobat Professional 7. My professional colleagues snickered at my choice of creative applications. After all, while being easy to use, relatively inexpensive and wildly popular, no professionals use Publisher for layout design and typography. Beginning with the July 2007 Observer, the creative process will now employ Adobe InDesign CS2 and Acrobat Pro 7. One (of many) advantages that InDesign offers over Publisher are the extensive typography tools. I can now design using OpenType fonts! And I can design in a CMYK color space too! But I digress...

The June 2007 issue was a transition from Publisher to InDesign. I badly wanted to begin using the new typefaces (with cool features like discretionary ligatures) so I decided to create the masthead using the Adobe Caslon Pro typeface in a graphic image created with Adobe Illustrator. I wound up using the new typeface quite badly. The image was created with insufficient resolution for the size it scaled to when placed inside the Publisher file. Yikes! An impending business trip meant that this one would have to be published as is. Needless to say, all future issues will have a typeset masthead.

In a nutshell, that covers the evolution of the design of our newsletter for the first 2½ years of my tenure. Now on to content.

The Observer features some recurring elements such as the lunar cycle schedule; event calendar; meeting schedule and maps; membership application and liability waiver; classified ads; and Deep Sky Object of the Month chart. Regular articles include From the Desk of the President; Bill Dellinges' Backyard Astronomer; Fulton Wright Jr's If It's Clear; NASA's Space Place guest speaker bio; and the monthly meeting minutes. Occasionally we even publish a member photo. To our regular contributors I extend my sincere appreciation. For the remainder of the content I turn to you, the readers of this newsletter. Lately, I have been relying too much on NASA to fill the pages. Sure, they have lent us some enjoyable articles but I'd much rather fill the pages with words penned by our own members. So, consider this a solicitation for contributions. If it's astro-related and would be of general interest to our members, send it along. A general rule of thumb regarding length would be to stay in the range of 500 to 700 words. I thank you in advance.

Please send all submissions to news@eastvalleyastronomy.org

July Guest Speaker: Steve Coe

Steve Coe has been has been an avid amateur astronomer for the past couple of decades, observing the night skies from here in Arizona and from the southern hemisphere as well. During this time Steve has accumulated a wealth of knowledge, observations, hints and tips that are sure to be of use to all fellow amateurs, regardless of experience.

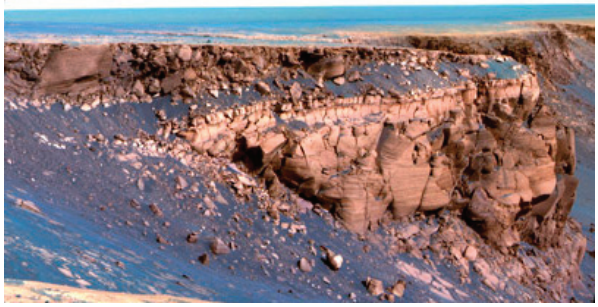
Much of this information was presented in his first book, *Deep Sky Observing - The Astronomical Tourist.*

Earlier this year Steve published his second book, *Nebulae and How to Observe Them*. In this tome Steve uses his engaging style to present current and detailed descriptions and categorizations of nebulae. He also discusses, in parctical terms, how best to successfully observe and record nebulae. This observing guide should be on all deep sky observer's must-read list.

Steve's topic for this talk will be, what else, observing nebulae!

Risky Descent

NASA's Mars rover Opportunity is scheduled to begin a descent down a rock-paved slope into the Red Planet's massive Victoria Crater. This carries real risk for the long-lived robotic explorer, but NASA and the Mars Rover science team expect it to provide valuable science.



Cape St. Vincent, one of many promontories that jut out from the walls of Victoria Crater.

Opportunity already has been exploring layered rocks in cliffs around Victoria Crater. The team has planned the descent carefully to enable an eventual exit, but Opportunity could become trapped inside the crater or lose some capabilities. The rover has operated more than 12 times longer than its originally intended 90 days.

The scientific allure is the chance to examine and investigate the compositions and textures of exposed materials in the crater's depths for clues about ancient, wet environments. As the rover travels farther down the slope, it will be able to examine increasingly older rocks in the exposed walls of the crater.

"While we take seriously the uncertainty about whether Opportunity will climb back out, the potential value of investigations that appear possible inside the crater convinced me to authorize the team to move forward into Victoria Crater," said Alan Stern, NASA associate administrator, Science Mission Directorate, NASA Headquarters, Washington. "It is a calculated risk worth taking, particularly because this mission has far exceeded its original goals."

The robotic geologist will enter Victoria Crater through an alcove named Duck Bay. The eroding crater has a scalloped rim of cliff-like promontories, or capes, alternating with more gently sloped alcoves, or bays.

A meteor impact millions of years ago excavated Victoria, which lies approximately 4 miles south of where Opportunity landed in January 2004. The impact-created bowl is half a mile across and about five times as wide as Endurance Crater, where Opportunity spent more than six months exploring in 2004.

The rover began the journey to Victoria from Endurance 30 months ago. It reached the rim at Duck Bay nine months ago. Opportunity then drove approximately a quarter of the way clockwise around the rim, examining rock layers visible in the promontories and possible entry routes in the alcoves. Now, the rover has returned to the most favorable entry point.

"Duck Bay looks like the best candidate for entry," said John Callas, rover project manager at NASA's Jet Propulsion Laboratory. "It has slopes of 15 to 20 degrees and exposed bedrock for safe driving."

If all of its six wheels continue working, engineers expect Opportunity to be able to climb back out of the crater. However, Opportunity's twin rover Spirit lost the use of one wheel more than a year ago, diminishing its climbing ability.

"These rovers are well past their design lifetimes, and another wheel could fail on either rover at any time," Callas said. "If Opportunity were to lose the use of a wheel inside Victoria Crater, it would make it very difficult, perhaps impossible, to climb back out."

"We don't want this to be a one-way trip," said Steve Squyres, principal investigator for the rovers' science instruments, Cornell University, Ithaca, N.Y. "We still have some excellent science targets out on the plains that we would like to visit after Victoria. But if Opportunity becomes trapped there, it will be worth the knowledge gained."

Article and image courtesy of Science@NASA

Classified Ads

Orion ShortTube 80T Refractor

Telescope features an 80mm objective lens, a 45° erecting prism, and a 6x26 finder scope. Also included in the sale are two eyepieces (10mm and 25mm) and a nice LowePro bag to carry it in. A great 'scope for someone that wants a very portable telescope. Add a tripod and "Have telescope, Will Travel!"

Asking price $150.

Peri Cline
480-981-5203 between 6 pm and 9 pm weekdays
peri_cline@cox.net

Touring the Solar System with Dr. G

A self-guided tour through our solar system, on CD and in book form. Take a scale-modeled tour of our solar system with an introduction to each planet, the dwarf planets, asteroids and much more.

What happened to the planet Pluto?

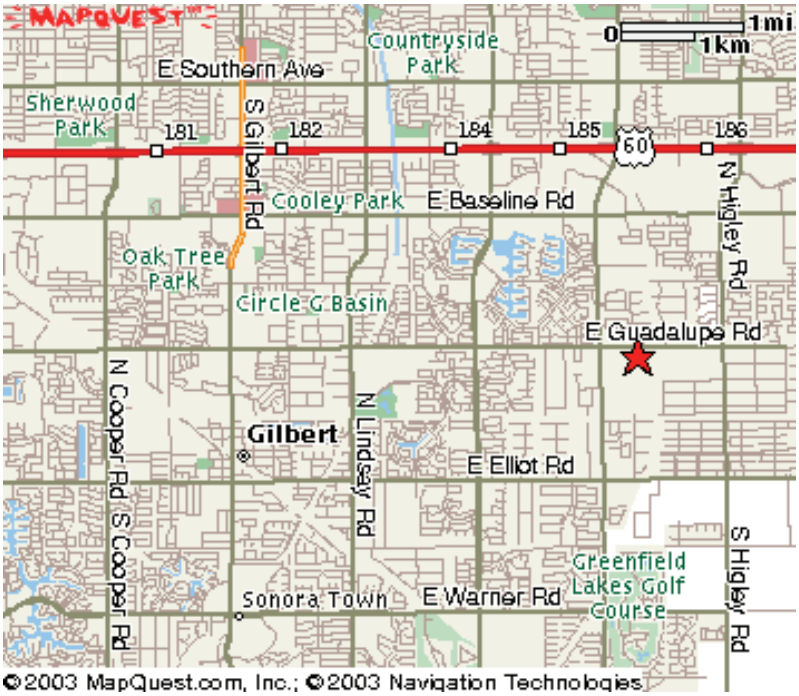
Why do we see only one face of our moon?

Learn this and more while traveling faster than the speed of light!

Cost is $15 plus $4 shipping and handling.

Gary Hyde
480-861-8044
g.n.hyde@att.net

More ads on page 10

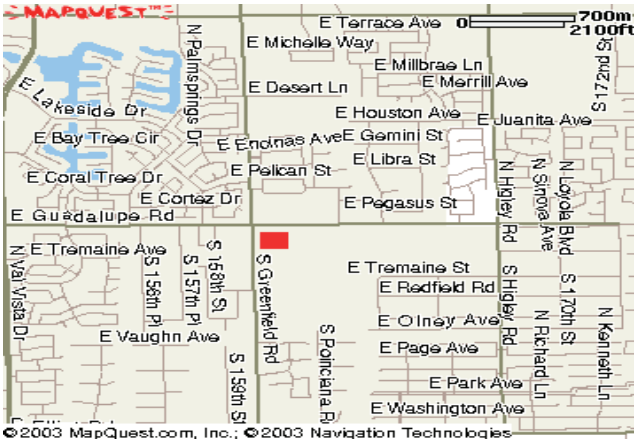


The monthly general meeting is your chance to find out what other club members are up to, learn about upcoming club events and listen to presentations by professional and well-known amateur astronomers.

Our meetings are held on the third Friday of each month at the Southeast Regional Library in Gilbert. The library is located at 775 N. Greenfield Road; on the southeast corner of Greenfield and Guadalupe Roads.

Meetings begin at 7:30 pm.

Visitors are always welcome!



2007 Meeting Dates

July 20

August 17

September 21

October 19

November 16

December 21

Southeast Regional Library
775 N. Greenfield Road
Gilbert, Az. 85234

All are welcome to attend the pre-meeting dinner at 5:30 pm. We meet at Old Country Buffet, located at 1855 S. Stapley Drive in Mesa. The restaurant is in the plaza on the northeast corner of Stapley and Baseline Roads, just south of US60.

Old Country Buffet
1855 S. Stapley Drive
Mesa, Az. 85204

Likewise, all are invited to meet for coffee and more astro talk after the meeting at the Village Inn restaurant located on the northeast corner of Gilbert and Baseline Roads in Mesa.

Village Inn
2034 E. Southern Avenue
Mesa, Az. 85204

July 2007

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	**7**
8	9	10	11	12	**13**	**14**
15	16	17	18	19	**20**	21
22	23	24	25	26	27	28
29	30	31				

July 7 - Local Star Party at

July 13 - Public Star Party at Riparian Preserve in Gilbert

July 14 - Deep Sky Star Party at Vekol Road

July 20 - Monthly Meeting at Southeast Regional Library in Gilbert

Meeting Minutes

June 15, 2007

The meeting was called to order at 7:30 pm by President Claude Haynes.

Bill Houston delivered the Treasurer's report which included income of $352 and expenses of $633.33 for the month of May. This resulted in a bank balance for the club of $8,558.15.

Randy Peterson spoke about upcoming events, including a star party for teachers at ASU Polytechnic and local Gilbert and club parties.

Martin Thompson reported that the observatory attendance remains strong each weekend. He encouraged volunteers to check their email for the latest schedule, and to update their email address if it is incorrect or has changed.

Gene Lucas presented a short report on the Society for Astronomical Sciences conference that preceded the RTMC in Big Bear, California. Gene and Steve Gifford made presentations, and Gene shared information about seminars held or attended by other local Phoenix astronomers.

Following the break, Howard Israel delivered a presentation on how to become a cruise ship lecturer. Howard has developed a recent career as a lecturer on astronomy, and explained the process to apply for similar positions. He also outlined the responsibilities, requirements and compensation for various lecture jobs onboard a cruise ship. He followed this with a sample presentation that he delivers on Mayan Astronomy. Howard traced the history of Mayan observation as recorded on their stone calendars and few remaining written documents. He also explained how the Mayans divided the year and larger astronomical cycles into observations that matched the 26,000 year precession of the Earth as it "wobbles" on its axis. The next great cycle was predicted by the Mayans to begin on December 21, 2012, which coincides with the Winter Solstice and with the sun positioned in Sagittarius directly over the center of the Milky Way. The precision of their observation skill using simple observation and reasoning is amazing.

The meeting adjourned at 9:40 pm.

East Valley Astronomy Club -- 2007 Membership Form

Please complete this form and return it to the club Treasurer at the next meeting or mail it to EVAC, PO Box 2202, Mesa, Az, 85214-2202. Please include a check or money order made payable to EVAC for the appropriate amount.

IMPORTANT: All memberships expire on December 31 of each year.

Select one of the following:

☐ New Member ☐ Renewal ☐ Change of Address

New Member Dues (dues are prorated, select according to the month you are joining the club):

☐ **$30.00 Individual** January through March

☐ **$35.00 Family** January through March

☐ **$15.00 Individual** July through September

☐ **$17.50 Family** July through September

☐ **$22.50 Individual** April through June

☐ **$26.25 Family** April through June

☐ **$37.50 Individual** October through December

☐ **$43.75 Family** October through December

Includes dues for the following year

Renewal (current members only):

☐ **$30.00 Individual** ☐ **$35.00 Family**

Magazine Subscriptions (include renewal notices):

☐ **$34.00** Astronomy ☐ **$33.00** Sky & Telescope

Name Badges:

☐ **$10.00** Each (including postage) Quantity: _____

Name to imprint: _____

Total amount enclosed: ☐

Please make check or money order payable to EVAC

☐ Payment was remitted separately using PayPal ☐ Payment was remitted separately using my financial institution's online bill payment feature

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Name: ☐ Phone: ☐

Address: ☐ Email: ☐

☐ Publish email address on website

City, State, Zip: ☐ URL: ☐

How would you like to receive your monthly newsletter? (choose one option):

☐ Electronic delivery (PDF) *Included with membership* ☐ US Mail **Please add $10 to the total payment**

Areas of Interest (check all that apply):

☐ General Observing ☐ Cosmology

☐ Lunar Observing ☐ Telescope Making

☐ Planetary Observing ☐ Astrophotography

☐ Deep Sky Observing ☐ Other

Please describe your astronomy equipment:

Would you be interested in attending a beginner's workshop? ☐ Yes ☐ No

How did you discover East Valley Astronomy Club? ☐

PO Box 2202
Mesa, AZ 85214-2202
www.eastvalleyastronomy.org

All members are required to have a liability release form (waiver) on file. Please complete one and forward to the Treasurer with your membership application or renewal.

Classified Ads

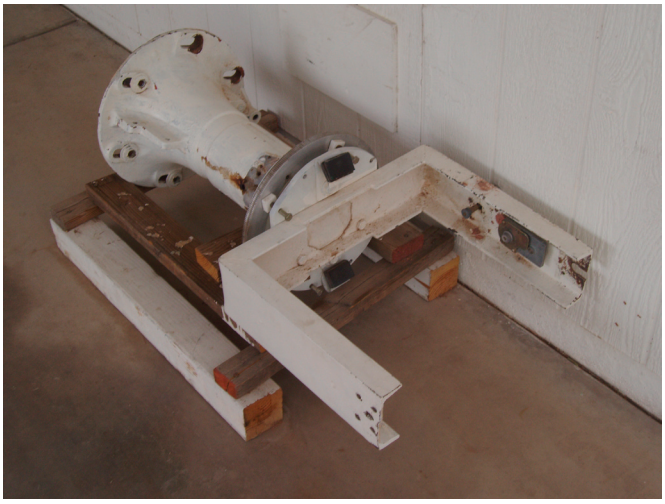
For Sale by EVAC

The club has for sale two items to be sold to highest bidder.

Optical tube assembly – Newtonian with focal ratio F7, includes one helical and one Crayford style focuser. There is some chipping on the mirror and quite a bit of dust. Tube is 18½" in diameter and 64" in length
$75 or best offer

Mount – HEAVY duty mount build from a tractor axle casing
$25 or best offer

Email bids to president@eastvalleyastronomy.org – deadline for bids is July 31



10" Deep Space Hunter

A very nice Dobsonian from Hardin Optical. Included in the sale are a finder scope and Telrad. Three eyepieces are also included: 9mm and 25mm (1¼" diameter) and 32mm (2" diameter).
Asking price $400.

Peri Cline
480-981-5203 between 6 pm and 9 pm weekdays
peri_cline@cox.net

NASA's Space Place

Chew on This

by Diane K. Fisher

The Mars robotic rovers, Spirit and Opportunity, are equipped with RATs, or Rock Abrasion Tools. Their purpose is to abrade the surface patina off the Mars rocks so that the alpha x-ray spectrometer can analyze the minerals inside the rocks, rather than just on the surface.

But future robotic missions to Mars will be asked to go even further below the surface. Scrapers and corers will gather rock samples of substantial size, that, in order to be analyzed by a spectrometer, will need to be crushed into a fine powder.

Crushing rocks on Mars? Now there's a problem that brings to mind a multitude of possible approaches: Whack them with a large hammer? Squeeze them until they explode? How about just chewing them up? It was with this latter metaphor that the planetary instrument engineers struck pay dirt—so to speak.

Thanks to NASA's Planetary Instrument Definition and Development Program, a small group of NASA engineers came up with the Mars Rock Crusher. Only six inches tall, it can chew the hardest rocks into a powder.

The Mars Rock Crusher has two metal plates that work sort of like our jaws. One plate stays still, while the other plate moves. Rocks are dropped into the jaw between the two plates. As one plate moves in and out (like a lower jaw), rocks are crushed between the two plates. The jaw opening is larger toward the top and smaller towards the bottom. So when larger rocks are crushed near the top, the pieces fall down into the narrower part of the jaw, where they are crushed again. This process repeats until the rock particles are small enough to fall through a slit where the two plates are closest.

Engineers have tested the Mars Rock Crusher with Earth rocks similar to those expected to be found on Mars. One kind of rock is hematite. The rusted iron in hematite and other rocks help give Mars its nickname "The Red Planet." Another kind of rock is magnetite, so-called because it is magnetic. Rocks made by volcanoes are called basalts. Some of the volcanoes on Mars may have produced basalts with a lot of a mineral called olivine. We call those olivine basalts, and the Rock Crusher chews them up nicely too.

Visit www.jpl.nasa.gov/technology to read the latest about other NASA technologies for exploring other planets and improving life on this one.

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

Looking down on the jaws of the Mars Rock Crusher, we see a magnetite rock get crushed into smaller and smaller particles. down on the jaws of the Mars Rock Crusher, we see a magnetite rock get crushed into smaller and smaller particles.

If It's Clear…

by Fulton Wright, Jr.
Prescott Astronomy Club

July 2007

Shamelessly stolen information from Sky & Telescope magazine, Astronomy magazine, and anywhere else I can find info. When gauging distances, remember that the Moon is 1/2 a degree or 30 arc minutes in diameter. All times are Mountain Standard Time unless otherwise noted.

On Sunday, July 1, about 8:30 PM, you can still see Venus and Saturn less than a degree apart.

On Tuesday, July 3, from 8:57 to 11:09 PM, you can see Io's shadow on Jupiter.

On Friday, July 6, from 9:29 PM to 12:03 AM, you can see Europa's shadow on Jupiter.

On Friday, July 13, (lucky you) it is new moon, so you can hunt for faint fuzzies all night.

On Saturday, July 14, from 8:41 to 11:02 PM, you can see Ganymede's shadow on Jupiter.

On Monday, July 16, about 8:30 PM, you can see the thin crescent Moon between Venus and Saturn. With binoculars, look low in the west for the trio. That's Regulus above the line joining Venus and the Moon. While you are there, take a look with a telescope near the equator of the Moon. That area is tipped toward us by libration.

On Thursday, July 26, from 9:11 to 11:22 PM, you can see Io's shadow on Jupiter.

On Sunday, July 29, at 7:26 PM (11 minutes after sunset) the full moon rises spoiling any chance of seeing faint fuzzies for the whole night.

This dramatic view of Jupiter's Great Red Spot and its surroundings was obtained by Voyager 1 on February 25, 1979, when the spacecraft was 5.7 million miles (9.2 million kilometers) from Jupiter. Cloud details as small as 100 miles (160 kilometers) across can be seen here. The colorful, wavy cloud pattern to the left of the Red Spot is a region of extraordinarily complex and variable wave motion. To give a sense of Jupiter's scale, the white oval storm directly below the Great Red Spot is approximately the same diameter as Earth. Photograph courtesy of NASA.

The Equivalence Principle

Continued from page 3

so it can fall continuously for a long time." Tiny differences in the pull of gravity would accumulate over time, perhaps growing large enough to be detectable.

One test mission, called the Satellite Test of the Equivalence Principle (STEP), is being developed by Stanford University and an international team of collaborators. STEP would be able to detect a deviation in the equivalence principle as small as one part in a million trillion (10^{18}). That's 100,000 times more sensitive than the current best measurement.

An artist's concept of STEP in orbit.

STEP's design uses four pairs of test masses instead of just one pair. The redundancy is to ensure that any difference seen in how the test masses fall is truly caused by a violation of the equivalence principle, and not by some other disturbance or imperfection in the hardware.

"When trying to measure such a miniscule effect, you have to eliminate as many external disturbances as possible," Will explains. STEP's design places the test masses inside a large tank of liquid helium to insulate them from external temperature fluctuations, and surrounds the masses with a superconducting shell to shield them from magnetic and electrical interference. Microthrusters counteract the effects of atmospheric drag on the orbiting satellite, making the free fall of the test masses nearly perfect.

In this pristine environment, each pair of test masses should stay perfectly aligned with each other as they fall around the Earth—that is, if the equivalence principle holds. But if this new component of gravity does exist, one test mass will fall at a slightly different rate than its partner, so the pair will drift slightly out of alignment over time.

Currently, STEP is still in the design phase. Another satellite-based experiment, the French-developed Micro-Satellite à traînée Compensée pour l'Observation du Principe d'Equivalence (MICROSCOPE), is scheduled to launch in 2010. MICROSCOPE will have two pairs of test masses instead of four, and will be able to detect a violation of the equivalence principle as small as one part in a million billion (10^{15}).

The third experiment is the Italian satellite Galileo Galilei ("GG" for short), which will operate in much the same way as STEP and MICROSCOPE, except that it uses only one pair of test masses. To improve its accuracy, the Galileo Galilei satellite will spin about its central axis at a rate of 2 rotations per second. That way, any disturbances within the spacecraft will pull in all directions equally, thus canceling themselves out. The experiment should be able to achieve a sensitivity of one part in a hundred million billion (10^{17}).

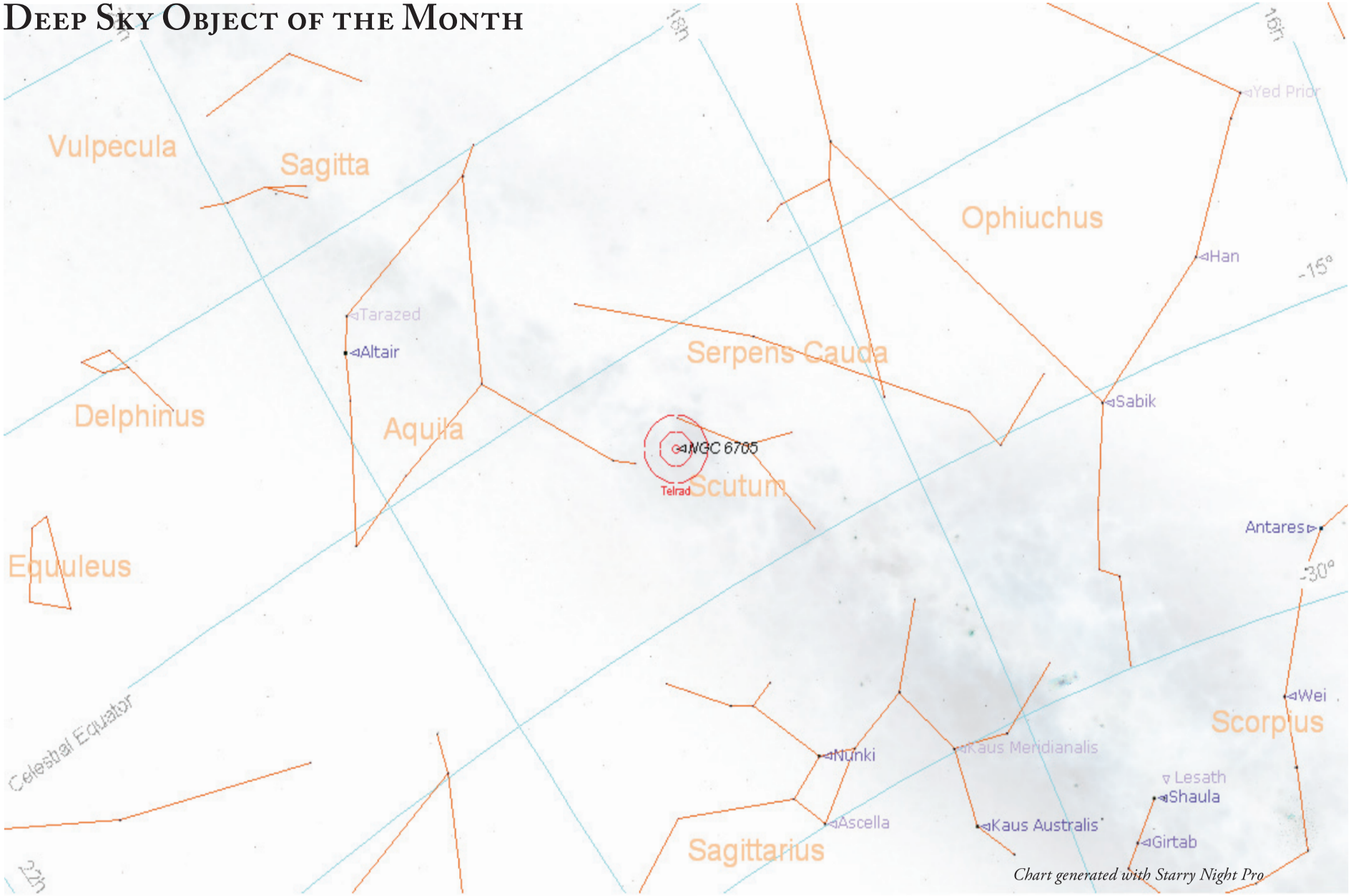
Whether any of these missions stand a chance of detecting a violation of the equivalence principle is hard to say. Will says that he expects the experiments won't find any deviation, in part because finding one would be such a major revolution for modern physics. And string theory makes a range of predictions about how strong this new force would be, so it's possible that the effect would be too small for even these space-borne instruments to detect.

Finding no deviation would still be helpful: it would rule out some variants of string theory, inching physicists toward the correct "Theory of Everything." But finding a deviation, however small, would be a giant leap.

Article courtesy of Science@NASA

Editor's note:

The Satellite Test of the Equivalence Principle (STEP) is a joint European-U.S. space program to investigate one of the most fundamental principles in physics, the equivalence of inertia and passive gravitational mass. Isaac Newton first recognized the identity between these two distinct properties, which represent the quantity of matter in an object, and its weight. A direct consequence of this Equivalence Principle is the 'universality of free fall' such that all objects fall with exactly the same acceleration in the same gravity field. The Equivalence Principle was reinterpreted by Albert Einstein as a consequence of an even broader equivalence between the laws of physics in different accelerated reference frames, a principle which Einstein made the basis for his general theory of relativity. STEP will advance the sensitivity of Equivalence Principle tests by five or six orders of magnitude, into regions where the principle may break down. A violation of Equivalence at any level would have significant consequences for modern gravitational theory.



NGC 6705 aka M11, The Wild Duck Cluster Open Cluster in Scutum

RA 18h 51m 06.0s DEC -06° 16' 00" Magnitude: 5.8 Size: 13.0' 682 Stars

NASA 101

NASA, the National Aeronautics and Space Administration, was created by Congress in 1958 "to provide for research into the problems of flight within and outside the Earth's atmosphere, and for other purposes." Led by Administrator Michael Griffin, the Agency is headquartered in Washington, D.C., with ten field centers, and other facilities around the nation.

NASA's mission is to understand and protect our home planet, to explore the universe and search for life, and to inspire the next generation of explorers ... as only NASA can. The Agency is transforming itself to meet the challenges of the Vision for Space Exploration -- which calls for a return to the Moon, followed by journeys to Mars and beyond.

If you are interested in a particular topic, you can use the following guidelines to determine which field center to investigate:

Ames Research Center, located at Moffet Field in California's Silicon Valley, provides leadership in astrobiology; robotic lunar exploration; technologies for CEV, CLV, and HLV; the search for habitable planets; supercomputing; intelligent/adaptive systems; advanced thermal protection; and airborne astronomy.

Dryden Flight Research Center, located at Edwards AFB, is NASA's primary center for atmospheric flight research and operations. NASA Dryden is critical in carrying out the agency's missions of space exploration, space operations, scientific discovery, and aeronautical research and development.

Glenn Research Center, located next to Cleveland Hopkins International Airport, specializes in spaceflight systems, propulsion, power, communications, turbomachinery, microgravity science and human research.

Goddard Space Flight Center, located outside of Washington, DC, is home to the Nation's largest organization of combined scientists and engineers dedicated to learning and sharing their knowledge of the Earth, solar system, and Universe. Projects include Hubble Space Telescope, Chandra Space Telescope, MESSENGER and Aura.

Trailblazing has been the business of ***Jet Propulsion Laboratory*** since it was established by the California Institute of Technology in the 1930s. America's first satellite, Explorer 1, was created at JPL. Projects include solar system exploration, earth science, Mars exploration rovers, Cassini-Huygens, Genesis, Spitzer Space Telescope, and Galaxy Evolution Explorer (GALEX).

Johnson Space Center in Houston is home to the NASA astronaut corps and is responsible for training space explorers from the United States and our space station partner nations. The Mission Control Center at Johnson Space Center directs all space shuttle missions, including international space station assembly flights.

Kennedy Space Center, located on Florida's eastern coast, is America's spaceport, launching all US human space flight missions from the early days of Project Mercury to today's Space Shuttle launches and landings, to the next generation of vehicles.

Langley Research Center, in Hampton, Virginia, was established as the nation's first civilian aeronautics laboratory in 1917. Langley leads NASA initiatives in aviation safety, quiet aircraft technology, small aircraft transportation and aerospace vehicles system technology. It supports NASA space programs with atmospheric research and technology testing and development.

The Marshall Space Flight Center in Huntsville, Ala., is one of NASA's largest and most diversified installations. Today, the Marshall Center is contributing its collective expertise, inge nuity and energy as NASA and the nation carry out the Vision for Space Exploration, which seeks to extend human presence across the solar system. The Marshall Center has been a key contributor to numerous significant NASA programs during the Agency's 45-plus-year history -- from the 1961 flight of the first U.S. astronaut into space, to the Apollo missions exploring the moon, to development and operation of America's space shuttle fleet, and construction of and scientific discovery on board the space station.

Stennis Space Center in southern Mississippi has served as NASA's rocket propulsion testing grounds for more than 40 years.

Coming in August… our guest speaker will be Steven Aggas. Steven's presentation is entitled *The Making of a Monster: Construction of a 36" F4.5 Telescope*. 'Nuff said.

Star Party Disclaimer

The East Valley Astronomy Club (EVAC) is not responsible for the property or liability of any star party participant, nor will the club be held liable for their actions or possessions. EVAC is not responsible for any vehicular damage, theft, or mechanical difficulties that may occur while attending a star party. EVAC strongly recommends adherence to the doctrine of 'safety in numbers' when it comes to remote observing sites. In the interest of safety it is recommended that you don't go to remote sites alone and that someone knows where you have gone each time you go out observing.

The Observer is published monthly by the East Valley Astronomy Club and made available electronically as an Adobe PDF document the first week of the month. Printed copies are available at the monthly meeting. Mailed copies are available to members for a slight surcharge.

Please send your contributions, tips, suggestions and comments to the Editor at: news@eastvalleyastronomy.org
Contributions may be edited.

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Keep Looking Up!

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