

# The Focal Point

The Atlanta Astronomy Club  
Established 1947  
July 2008

Vol. 21 No. 2

Editor: Tom Faber

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## July General Meeting

by Keith "Kosmic Kow" Burns, AAC President

The July meeting of the Atlanta Astronomy Club will be held on July 18th, 2008. We have shifted the meeting schedule to follow more closely with the lunar calendar. July 18th is Full Moon. The meeting will take place in room 207 of White Hall on the Emory University Campus. Directions are on page 7 of the Focal Point and on our website. The best thing about our meetings is the socializing that goes on, plus we also love to hear the latest on new discoveries in science. The last several years we have also started to include several short talks before the main talk geared towards beginners or anyone wanting ideas on objects to look for when out under the stars with their telescopes.

There will be a 5-minute segment on an Astronomical League observing club. For those who use the sentence, "There's nothing to see," well the series on just that topic is presented every month to give you ideas on stuff to look for and where to look. We save the best for last. The main talk of the night this month features Dan Llewellyn who will speak on video imaging used to capture that perfect planetary image. Dan's program is actually a talk and workshop on the basics of video camera, planetary camera, & web camera imaging and processing.

### Speaker Biography

Dan Llewellyn is a native from Decatur. He graduated from Shamrock High School and Florida State University, and attended the University of Mississippi Law School before turning his attention to cartography. Dan is the owner of Bradford Map Company, a local map and globe store. Dan was one of the first people in the southeast to produce a digital map that was output to a plotter instead of conventional printing. He currently has developed a 5-digit zip code boundary file that is sold by subscription to such notables as Ticketmaster and The Weather Channel.

Dan joined the AAC in 2001 and began planetary imaging with a video camera. In those days you had to hold or mount the video camera at the eyepiece, then use a video grabber to get it into your computer. Technol-



ogy changed, and soon you were able to record on a digital 8-camera and firewire it into your computer. USB interface was also becoming a standard, and soon desktop web cameras were made to broadcast your mug on the Internet. At the same time, surveillance cameras were being used to get video streams, and were being converted to USB.

All of this bode well to the planetary imager, as a camera that could record at a high frame rate had a good chance of freezing the seeing. That is, during a 30 frames per second capture, which is the rate of your old VHS video camera as well as new ones, a handful of frames would be crystal clear. By saving those and discarding the blurry ones, you could create a high-resolution image of the planets. Dan showed off this technology when he served as Observing Chairman of the AAC in 2003-2004 during Mars' closest approach to Earth in 60,000 years.

After that tenure, Dan started Telescope Atlanta, a retail store that sells telescopes and accessories. Most recently, Dan has teamed up with David Roberts to manufacture a portable 16-inch Dobsonian telescope named the T-1. The website is [www.telescopeatlanta.com](http://www.telescopeatlanta.com). Dan's planetary imaging has continued and his images have been featured in Sky & Telescope, Photonics Spectra, Point Grey Insights, Astronomy Cameras Newsletter, and the AAC's Focal Point.

Dan continues to use the latest technology for planetary imaging, which is ever evolving. Most of his images are taken through a C-14, but he does use a 20-inch Starmaster Dob on occasion. Dan's talk will be focused on the beginning to intermediate planetary imager. Cameras and capture techniques will be discussed, and we will process an image from start to finish with Registax and Photoshop.

### August-October Meeting Announcements

August 15th: Dr. Amy Lovell of Agnes Scott College will do a talk titled "Comets and the Meteor Shower Connection."

September 19th: Dr. Chris Sirola of Southern Miss will give a talk titled "Happy 100th Birthday Tunguska!"

October 17th: Dr. Angela Sarrazine of Fernbank Science Center will speak on "Open Cluster Research: Strengthening the Cosmic Distance Ladder."

# AAC June General Meeting Minutes

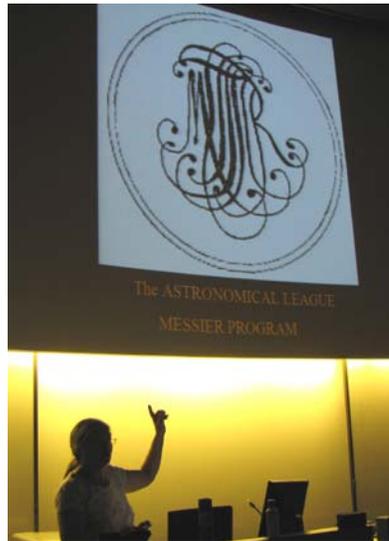
by Richard Jakiel, AAC Recording Secretary

Meeting photos by Tom Faber

The General Meeting of the AAC began promptly at 8 PM on June 20th, with newly elected president Keith Burns (photo right) presiding. Over forty AAC members and guests were in attendance. After a short introduction and mentioning up coming events, Keith turned the floor over to Dave Lumpkin, Observing Chair and 2nd VP. Dave set out dates for next couple DSOs, and asked the membership several questions regarding possible changes in location and setting of observing events. Possibilities include relocating at least some of the beginner events closer to the city, and targeting other popular venues for sidewalk astronomy. Also discussed was the use of car pooling as the price of gas soars.



Art Zorka discussed the upcoming elections in the Astronomical League and leading candidates for each position. As they were unopposed, a simple show of hands was recorded for the AAC's vote in the election. Sharon Carruthers gave a short ten minute summary of the highlights and requirements for the AL's Messier Program (photo left). This was shortly followed by Keith's "There is Nothing to See" tour of the observing highlights in and around the constellation of Coma Berenices (photo below). This included a couple globular clusters, several Messier galaxies and the Coma Galaxy Cluster.



The main program was given by Keith Burns on this past April's MidSouth Star Gaze and the Rainwater Observatory at



French camp, Mississippi (photo above - Keith being introduced by Peter Macumber). There were plenty of interesting images to see, including a number of "blackmail" shots of fellow Astro-Stooges - Rich Jakiel (Curly), Dave Lumpkin (Moe), Dan Llewellyn (Shemp) and David Roberts (Curly Joe). Many of the telescopes of the Rainwater Observatory were shown, along with a good selection of those brought by amateurs to the star gaze.

After the slide blitz, PSSG chairman Peter Macumber updated the membership on how well this year's PSSG is progressing. Most of the speakers and programs are already set, though dates and other finer points are still in the works.

## Parking at Emory

by Alex Langoussis

A year late, Emory is finally ready to start construction on the underground parking deck behind the B Jones building on July 7, thus closing the parking lot that most of us use for the monthly club meetings. In addition, you can expect occasional disruptions on the street in front of White Hall, as they realign the street in anticipation of the county constructing a traffic circle at the entrance intersection. Expect those parking spaces to disappear too. Plenty of free parking is still available nearby in the Fishburn and Peavine decks. Of course, when the underground deck is completed in 14 months, parking will no longer be an issue. For additional info - Parking: [http://www.cll.emory.edu/maps/emory\\_map.htm](http://www.cll.emory.edu/maps/emory_map.htm) - Dowman Drive Road Closure and Oxford Rd. Construction: <http://www.construction.emory.edu/>

## The Astronomical League

As a member of the **Atlanta Astronomy Club** you are automatically also a member of the **Astronomical League**, a nation wide affiliation of astronomy clubs. Membership in the AL provides a number of benefits for you. They include:

- \* You will receive *The Reflector*, the AL's quarterly newsletter.
- \* You can use the Book Service, through which you can buy astronomy-related books at a 10% discount.
- \* You can participate in the Astronomical League's Observing Clubs. The Observing Clubs offer encouragement and certificates of accomplishment for demonstrating observing skills with a variety of instruments and objects. These include the Messier Club, Binocular Messier Club, the Herschel 400 Club, the Deep Sky Binocular Club, and many others.

To learn more about the Astronomical League and its benefits for you, visit <http://www.astroleague.org>

## Charlie Elliot Meeting Minutes

by Ken Poshedly, CE Recording Secretary

(Minutes have been edited for space constraints.)

The June 7 meeting of the CE Chapter of the AAC began at 5:20 p.m. Present were 28 members and guests, with an additional 5 persons arriving at the observing field afterwards. This being a potluck, business was suspended until mealtime was over. Official proceedings resumed at 6:15 p.m. with the following CE chapter announcements:



*Some members and guests enjoying the quarterly Pot Luck dinner before the meeting. Photo by Larry Owens*

Larry Owens said that there has been no new progress on the Byers Truss Tube scope project. Jon Wood stated that the 12.5 in. Optical Craftsman Newtonian reflector may be outfitted with a new drive corrector soon. The CE chapter may help with an upcoming summer camp event at the CEWMA. The CE chapter may host a group of Mansfield fourth graders at the January 2009 meeting.

CEWMA rep Alesia Rast announced that CEWMA management is keeping tabs on and welcomes the apparently increased activity by the CE chapter with CEWMA and other events; of all the various groups currently meeting at CEWMA, the CE chapter is the most active.

The next session in "Top Gun Imaging" by Larry Owens will concentrate on acquiring and keeping the object on the CCD chip.

The CE chapter meeting schedule for the rest of 2008 is July 26 (topic: "Solar System Probes" by Fred Buls), August 30, September 27, October 25, November 29 and December 27.

Theo Ramakers and several others discussed improvements to the chapter's website operated by Larry Owens, including personal blogs. The remainder of the evening included the following presentations: - "Observing the Moon, Part II", Theo's follow-up presentation on Moon observation. - A review about the free software program "Virtual Moon Atlas", available at [www.ap-i.net/avl/en/start](http://www.ap-i.net/avl/en/start). - "Observing 101" by Jon Wood.

The meeting was adjourned at 8:30 p.m.

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## Charlie Elliott Future Meetings

by Clevis Jones, CE Recording Secretary

The next Charlie Elliott Chapter meeting is on July 26th. Future meetings are on: Aug. 30, Sep. 27, Oct. 25 (set CE meeting schedule for 2009), Nov. 29, Dec. 27. For meeting updates and other information please check the CEastronomy website: <http://www.CEastronomy.org>

## Woodruff Summer Scout Camping Volunteers Still Needed!!!

Hi Folks,

The Woodruff Summer Camping program started in June. For over 7 years, the AAC has gone up one evening a week to give the campers in the Nature Program who are working on their Astronomy Merit badge a chance to look through a real telescope. If you could spare one evening this summer to help out with this valuable program that reaches out to so many youngsters, we would appreciate it.

Help is needed on the following Thursdays: July 3rd, July 10th, July 17th, July 24th. If you can help on one or more of these days contact me or post on the AstroList. If you have any questions about the program, e-mail me at [Treasurer@AtlantaAstronomy.org](mailto:Treasurer@AtlantaAstronomy.org); or call me at 404-843-9610 (work).

Thank You!

Sharon Carruthers

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## How Many Moons?

By Phil Danneman

With the number of new moons being discovered each year, one might wonder how many moons might ultimately be discovered in the Solar System. One also might wonder which planet will end up being the "King of the Moons". Since the early 1600's the planet with the most known moons chronologically has been Earth, Jupiter, Saturn, Jupiter, Saturn, Uranus, Jupiter, Saturn, now Jupiter.

The current tally of moons of planets is: Jupiter - 63, Saturn - 60, Uranus - 27, Neptune - 13, Pluto - 3 (if we still include Pluto), Mars - 2, Earth - 1, Venus and Mercury - 0. Currently Jupiter is king in three ways. It has the largest moon in the Solar System, Ganymede. It also has the largest mass in moons. The combined mass of Ganymede and Callisto is greater than the mass of all the moons of the other planets combined. Neither of these records is likely to be broken. Jupiter also has the largest number of moons, which is likely to change any day. Saturn has 3 unconfirmed moons in addition to its 60.

When considering the number of moons discovered, Jupiter has the advantage of being closer to us than the other giants. Neptune is nearly seven times farther than Jupiter. The smallest known moon of Neptune is 40 km in diameter. Jupiter has 2 moons that are only 2 km. So, if we count only the moons of the giant planets that are 40 km or larger, we can reduce or eliminate the distance factor.

The new tally of the moons of the giants would be: Jupiter - 9, Saturn - 13, Uranus - 19, Neptune - 13. This new tally is quite different. Neptune is now tied for second place.

Something to consider in Neptune's favor is a gravitational sphere around a planet called the Hill Sphere, defined by the nineteenth astronomer, George William Hill. The Hill Sphere is the sphere around a planet in which the planet can hold moons in stable orbits. Outside this sphere, a moon will eventually be lost to the sun's orbit.

A planet's mass and its distance from the sun determine the size of its Hill Sphere. Greater mass and greater distance from the sun define a larger Hill Sphere. With this in mind, one's first assumption would probably be that Jupiter, with such a large mass, has the largest Hill Sphere. However, this is not the case.

The Hill Sphere diameters in thousands of kilometers are: Mercury - 900, Venus - 4,000, Earth - 6,000, Mars - 4,300, Jupiter - 213,000, Saturn - 265,000, Uranus - 276,000, Neptune - 475,000, Pluto - 23,000.

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With this information, it is easy to see that Neptune has a much larger sphere to hold moons in orbit. With a Hill Sphere more than twice the diameter of Jupiter's, there might be hundreds of moons less than 40 km orbiting Neptune. Although the size of the Hill Sphere is not the only factor that indicates how many moons might orbit a planet, it is obviously a factor to consider. This is probably a reason why Mercury and Venus have no moons.

Eventually, astronomers will need to define a minimum size for a moon. If they do not, the numbers could go well into the thousands. Several 100-meter objects in Saturn's rings are already being called "moonlets." It will probably be decades before there is a final tally of moons, but for now, what they discover is what we have.

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## 100 Years of Space Rock: The Tunguska Impact

NASA/JPL News Release - June 27, 2008

At around 7:17 on the morning of June 30, 1908, a man based at the trading post at Vanavara in Siberia is sitting on his front porch. In a moment, 40 miles from the center of an immense blast of unknown origin, he will be hurled from his chair and the heat will be so intense he will feel as though his shirt is on fire. The man at the trading post, and others in a largely uninhabited region of Siberia, near the Podkamennaya Tunguska River, are to be accidental eyewitnesses to cosmological history.



Image Credit: NASA/JPL

"If you want to start a conversation with anyone in the asteroid business all you have to say is Tunguska," said Don Yeomans, manager of the Near-Earth Object Office at NASA's Jet Propulsion Laboratory. "It is the only entry of a large meteoroid we have in the modern era with first-hand accounts."

While the impact occurred in 1908, the first scientific expedition to the area would have to wait for 19 years. In 1921, Leonid Kulik, the chief curator for the meteorite collection of the St. Petersburg museum led an expedition to Tunguska. But the harsh conditions of the Siberian outback thwarted his team's attempt to reach the area of the blast. In 1927, a new expedition, again lead by Kulik, reached its goal.

"At first, the locals were reluctant to tell Kulik about the event," said Yeomans. "They believed the blast was a visitation by the god Ogdy, who had cursed the area by smashing trees and killing animals."

While testimonials may have at first been difficult to obtain, there was plenty of evidence lying around. Eight hundred square miles of remote forest had been ripped asunder. Eighty million trees were on their sides, lying in a radial pattern.

"Those trees acted as markers, pointing directly away from the blast's epicenter," said Yeomans. "Later, when the team arrived at ground zero, they found the trees there standing upright - but their limbs and bark had been stripped away. They looked like a forest of telephone poles."

Such debranching requires fast moving shock waves that break off a tree's branches before the branches can transfer the impact momentum to the tree's stem. Thirty seven years after the Tunguska blast, branchless trees would be found at the site of another massive explosion - Hiroshima, Japan.

Kulik's expeditions (he traveled to Tunguska on three separate occasions) did finally get some of the locals to talk. One was the man based at the Vanara trading post who witnessed the heat blast as he was launched a few yards. His account:

Suddenly in the north sky... the sky was split in two, and high above the forest the whole northern part of the sky appeared covered with fire... At that moment there was a bang in the sky and a mighty crash... The crash was followed by a noise like stones falling from the sky, or of guns firing. The earth trembled.

The massive explosion packed a wallop. The resulting seismic shockwave registered with sensitive barometers as far away as England. Dense clouds formed over the region at high altitudes which reflected sunlight from beyond the horizon. Night skies glowed, and reports came in that people who lived as far away as Asia could read newspapers outdoors as late as midnight. Locally, hundreds of reindeer, the livelihood of local herders, were killed, but there was no direct evidence that any person perished in the blast.

"A century later some still debate the cause and come up with different scenarios that could have caused the explosion," said Yeomans. "But the generally agreed upon theory is that on the morning of June 30, 1908, a large space rock, about 120 feet across, entered the atmosphere of Siberia and then detonated in the sky."

It is estimated the asteroid entered Earth's atmosphere traveling at a speed of about 33,500 miles per hour. During its quick plunge, the 220-million-pound space rock heated the air surrounding it to 44,500 degrees Fahrenheit. At 7:17 a.m. (local Siberia time), at a height of about 28,000 feet, the combination of pressure and heat caused the asteroid to fragment and annihilate itself, producing a fireball and releasing energy equivalent to about 185 Hiroshima bombs.

"That is why there is no impact crater," said Yeomans. "The great majority of the asteroid is consumed in the explosion."

Yeomans and his colleagues at JPL's Near-Earth Object Office are tasked with plotting the orbits of present-day comets and asteroids that cross Earth's path, and could be potentially hazardous to our planet.

Yeomans estimates that, on average, a Tunguska-sized asteroid will enter Earth's atmosphere once every 300 years. On this 100th anniversary of the Tunguska event, does that mean we have 200 years of largely meteor-free skies?

"Not necessarily," said Yeomans. "The 300 years between Tunguska-sized events is an average based on our best science. I think about Tunguska all the time from a scientific point of view, but the thought of another Tunguska does not keep me up at night."

*Editor's Note: Our speaker at the September 19th meeting, Dr. Chris Sirola of Southern Miss, will give a talk titled "Happy 100th Birthday Tunguska!"*

# NASA Spacecraft Reveal Largest Crater in Solar System

JPL News Release - June 25, 2008

PASADENA, Calif. -- New analysis of Mars' terrain using NASA spacecraft observations reveals what appears to be by far the largest impact crater ever found in the solar system.

NASA's Mars Reconnaissance Orbiter and Mars Global Surveyor have provided detailed information about the elevations and gravity of the Red Planet's northern and southern hemispheres. A new study using this information may solve one of the biggest remaining mysteries in the solar system: Why does Mars have two strikingly different kinds of terrain in its northern and southern hemispheres? The huge crater is creating intense scientific interest.



Artist's concept of Mars Reconnaissance Orbiter. Image credit: NASA/JPL

The mystery of the two-faced nature of Mars has perplexed scientists since the first comprehensive images of the surface were beamed home by NASA spacecraft in the 1970s. The main hypotheses have been an ancient impact or some internal process related to the planet's molten subsurface layers. The impact idea, proposed in 1984, fell into disfavor because the basin's shape didn't seem to fit the expected round shape for a crater. The newer data is convincing some experts who doubted the impact scenario.

"We haven't proved the giant-impact hypothesis, but I think we've shifted the tide," said Jeffrey Andrews-Hanna, a postdoctoral researcher at the Massachusetts Institute of Technology in Cambridge.



Artist concept of Mars Global Surveyor. Image credit: NASA/JPL

Andrews-Hanna and co-authors Maria Zuber of the Massachusetts Institute of Technology, and Bruce Banerdt of NASA's Jet Propulsion Laboratory in Pasadena, Calif., report the new findings in the journal *Nature* this week.

A giant northern basin that covers about 40 percent of Mars' surface, sometimes called the Borealis basin, is the remains of a colossal impact early in the solar system's formation, the new analysis suggests. At 8,500 kilometers (5,300 miles) across, it is about four times wider than the

next-biggest impact basin known, the Hellas basin on southern Mars. An accompanying report calculates that the impacting object that produced the Borealis basin must have been about 2,000 kilometers (1,200 miles) across. That's larger than Pluto.

"This is an impressive result that has implications not only for the evolution of early Mars, but also for early Earth's formation," said Michael Meyer, the Mars chief scientist at NASA Headquarters in Washington.

This northern-hemisphere basin on Mars is one of the smoothest surfaces found in the solar system. The southern hemisphere is high, rough, heavily cratered terrain, which ranges from 4 to 8 kilometers (2.5 to 5 miles) higher in elevation than the basin floor.

Other giant impact basins have been discovered that are elliptical rather than circular. But it took a complex analysis of the Martian surface from NASA's two Mars orbiters to reveal the clear elliptical shape of Borealis basin, which is consistent with being an impact crater.

One complicating factor in revealing the elliptical shape of the basin was that after the time of the impact, which must have been at least 3.9 billion years ago, giant volcanoes formed along one part of the basin rim and created a huge region of high, rough terrain that obscures the basin's outlines. It took a combination of gravity data, which tend to reveal underlying structure, with data on current surface elevations to reconstruct a map of Mars elevations as they existed before the volcanoes erupted.

"In addition to the elliptical boundary of the basin, there are signs of a possible second, outer ring -- a typical characteristic of large impact basins," Banerdt said.

JPL manages the Mars Reconnaissance Orbiter for NASA's Science Mission Directorate, Washington. For more information about the mission, visit: <http://www.nasa.gov/mro>.

## Phoenix Returns Treasure Trove for Science

NASA/JPL News Release - June 26, 2008

NASA's Phoenix Mars Lander performed its first wet chemistry experiment on Martian soil flawlessly yesterday, returning a wealth of data that for Phoenix scientists was like winning the lottery.

"We are awash in chemistry data," said Michael Hecht of NASA's Jet Propulsion Laboratory, lead scientist for the Microscopy, Electrochemistry and Conductivity Analyzer, or MECA, instrument on Phoenix. "We're trying to understand what is the chemistry of wet soil on Mars, what's dissolved in it, how acidic or alkaline it is. With the results we received from Phoenix yesterday, we could begin to tell what aspects of the soil might support life."

"This is the first wet-chemical analysis ever done on Mars or any planet, other than Earth," said Phoenix co-investigator Sam Kounaves of Tufts University, science lead for the wet chemistry investigation.

About 80 percent of Phoenix's first, two-day wet chemistry experiment is now complete. Phoenix has three more wet-chemistry cells for use later in the mission.

"This soil appears to be a close analog to surface soils found in the upper dry valleys in Antarctica," Kounaves said. "The alkalinity of the soil at this location is definitely striking. At this specific location, one-inch into the surface layer, the soil is very basic, with a pH of between eight and nine. We also found a variety of components of salts that we haven't had time to analyze and identify yet, but that include magnesium, sodium, potassium and chloride."

"This is more evidence for water because salts are there. We also found a reasonable number of nutrients, or chemicals needed by life as we know it," Kounaves said. "Over time, I've come to the conclusion that the amazing thing about Mars is not that it's an alien world, but that in many aspects, like mineralogy, it's very much like Earth."

Another analytical Phoenix instrument, the Thermal and Evolved-Gas Analyzer (TEGA), has baked its first soil sample to 1,000 degrees Celsius (1,800 degrees Fahrenheit). Never before has a soil sample from another world been baked to such high heat.

TEGA scientists have begun analyzing the gases released at a range of temperatures to identify the chemical make-up of soil and ice. Analysis is a complicated, weeks-long process.

But "the scientific data coming out of the instrument have been just spectacular," said Phoenix co-investigator William Boynton of the

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University of Arizona, lead TEGA scientist.

“At this point, we can say that the soil has clearly interacted with water in the past. We don’t know whether that interaction occurred in this particular area in the northern polar region, or whether it might have happened elsewhere and blown up to this area as dust.”

Leslie Tamppari, the Phoenix project scientist from JPL, tallied what Phoenix has accomplished during the first 30 Martian days of its mission, and outlined future plans.

The Stereo Surface Imager has by now completed about 55 percent of its three-color, 360-degree panorama of the Phoenix landing site, Tamppari



*This image shows a microscopic view of fine-grained material at the tip of the Robotic Arm scoop aboard NASA's Phoenix Mars Lander on June 20, 2008. The image shows small clumps of fine, fluffy, red soil particles.*

said. Phoenix has analyzed two samples in its optical microscope as well as first samples in both TEGA and the wet chemistry laboratory. Phoenix has been collecting information daily on clouds, dust, winds, temperatures and pressures in the atmosphere, as well as taking first nighttime atmospheric measurements.

Lander cameras confirmed that white chunks exposed during trench digging were frozen water ice because they sublimated, or vaporized, over a few days. The Phoenix robotic arm dug and sampled, and will continue to dig and sample, at the “Snow White” trench in the center of a polygon in the polygonal terrain.

“We believe this is the best place for creating a profile of the surface from the top down to the anticipated icy layer,” Tamppari said. “This is the plan we wanted to do when we proposed the mission many years ago. We wanted a place just like this where we could sample the soil down to the possible ice layer.”

The Phoenix mission is led by Peter Smith of The University of Arizona with project management at JPL and development partnership at Lockheed Martin, located in Denver. International contributions come from the Canadian Space Agency; the University of Neuchatel, Switzerland; the universities of Copenhagen and Aarhus, Denmark; Max Planck Institute, Germany; and the Finnish Meteorological Institute. For more information on the Phoenix mission, link to <http://www.nasa.gov/phoenix> and <http://phoenix.lpl.arizona.edu>.

## Mars Air Once Had Moisture, New Soil Analysis Says

University of California-Berkeley News Release - Posted: June 26, 2008

A new analysis of Martian soil data led by University of California, Berkeley, geoscientists suggests that there was once enough water in the planet's atmosphere for a light drizzle or dew to hit the ground, leaving tell-tale signs of its interaction with the planet's surface. The study's conclusion breaks from the more dominant view that the liquid water that once existed during the red planet's infancy came mainly in the form of upwelling groundwater rather than rain.

To come up with their conclusions, the UC Berkeley-led researchers used published measurements of soil from Mars that were taken by various NASA missions: Viking 1, Viking 2, Pathfinder, Spirit and Opportunity. These five missions provided information on soil from widely distant sites surveyed between 1976 and 2006.

“By analyzing the chemistry of the planet's soil, we can derive important information about Mars' climate history,” said Ronald Amundson, UC Berkeley professor of ecosystem sciences and the study's lead author. “The

dominant view, put forward by many now working on the Mars missions, is that the chemistry of Mars soils is a mix of dust and rock that has accumulated over the eons, combined with impacts of upwelling groundwater, which is almost the exact opposite of any common process that forms soil on Earth. In this paper, we try to steer the discussion back by re-evaluating the Mars data using geological and hydrological principles that exist on Earth.”

The final version of the study will appear online in *Geochimica et Cosmochimica Acta*, the journal of the International Geochemical Society, by the end of June, and in a print issue in August.

Martian soil has made headlines in recent weeks as NASA's Phoenix lander began sampling soil from the planet's north pole and analyzing its chemical elements. The goal of the tests is to determine whether Mars was once capable of supporting life, an idea that got a boost on June 20 when Phoenix scientists announced the discovery of ice underneath the Martian soil. While the UC Berkeley-led study does not delve directly into evidence of life on Mars, it does suggest what kind of climate that life, if it existed, might have encountered.

The planet is currently too cold for water to exist in a liquid state, but scientists generally agree that during the planet's earliest geological period, known as the Noachian epoch and dating 4.6 billion to 3.5 billion years ago, there were enough atmospheric greenhouse gases to warm the air and support lakes and flowing rivers. But unlike Earth, Mars does not have plate tectonics to help generate volcanoes and other terrestrial sources of greenhouse gases to sustain heat, explained Amundson. He said that many scientists believe that by the time the planet moved from the Noachian epoch to the Hesperian epoch, dating from 3.5 billion to 1.8 billion years ago, water on Mars had either frozen or evaporated. (The planet is now in its third geological time period, the Amazonian epoch, which started about 1.8 billion years ago.) The new study, however, suggests that liquid water existed in the Martian atmosphere into the Hesperian era.

To support this view, the team showed that soil at the Viking, Pathfinder and Spirit landing sites had lost significant fractions of the elements that make up the rock fragments from which the soil was formed, a sign that water once moved downward through the dirt, carrying the elements with it. Amundson also pointed out that the soil records a long period of drying, as evidenced by surface patterns of the now sulfate-rich land. The distinctive accumulations of sulfate deposits are characteristic of soil in northern Chile's Atacama Desert, where rainfall averages approximately 1 millimeter per year, making it the driest region on Earth.

“The Atacama Desert and the dry valleys of Antarctica are where Earth meets Mars,” said Amundson. “I would argue that Mars has more in common geochemically with these climate extremes on Earth than these sites have in common with the rest of our planet.”

Amundson noted that sulfate is prevalent in Earth's oceans and atmosphere, and is incorporated in rainwater. However, it's so soluble that it typically washes away from the surface of the ground when it rains. The key for the distinctive accumulation in soil to appear is for there to be enough moisture to move it downward, but not so much that it is washed away entirely.

The researchers also noted that the distribution of the chemical elements in Martian soil, where sulfates accumulate on the surface with layers of chloride salt underneath, suggest atmospheric moisture.

“Sulfates tend to be less soluble in water than chlorides, so if water is moving up through evaporation, we would expect to find chlorides at the surface and sulfates below that,” said Amundson. “But when water is moving downward, there's a complete reversal of that where the chlorides move downward and sulfates stay closer to the surface. There have been weak but long-term atmospheric cycles that not only add dust and salt but periodic liquid water to the soil surface that move the salts downward.”

Amundson pointed out that there is still debate among scientists about the degree to which atmospheric and geological conditions on Earth can be used as analogs for the environment on Mars. He said the new study suggests that Martian soil may be a “museum” that records chemical information about the history of water on the planet, and that our own planet holds the key to interpreting the record. “It seems very logical that a dry, arid planet like Mars with the same bedrock geology as many places on Earth would have some of the same hydrological and geological processes operating that occur in our deserts here on Earth,” said Amundson. “Our study suggests that Mars isn't a

*Continued on next page*

planet where things have behaved radically different from Earth, and that we should look to regions like the Atacama Desert for further insight into Martian climate history.”

The study co-authors are Stephanie Ewing, Mendhall Fellow at the U.S. Geological Survey; William Dietrich, UC Berkeley professor of geomorphology; Brad Sutter, research scientist at NASA's Johnson Space Center; Justine Owen, UC Berkeley graduate student of ecosystem sciences; Oliver Chadwick, professor of geography at UC Santa Barbara; Kunihiko Nishiizumi, Senior Space Fellow at UC Berkeley's Space Sciences Laboratory; Michelle Walvoord, research hydrologist at the U.S. Geological Survey; and Christopher McKay, planetary scientist at the NASA Ames Research Center. NASA, the National Science Foundation and the UC Agricultural Experiment Station helped support this research.

## Georgia Astronomy in State Parks (GASP) Events

The following are the GASP events scheduled for the remainder of this year:

**August 30** - John Tanner State Park.

**November 8** - Red Top Mountain State Park.

For more information about these events, contact Keith Burns at [Keith\\_B@bellsouth.net](mailto:Keith_B@bellsouth.net) or 770-427-1475.



*The GASP volunteers at FDR State Park on Labor Day weekend 2004 - From left to right: Joanne Cirincione, Keith Burns, Harold and Claudia Champ with Ginger, Peter Macumber, Sharon Carruthers, Tom Faber, Kat Sarbell, and Holly and John Ritger. Photo by Holly Ritger.*

## Atlanta Astronomy Club Website

While this newsletter is the official information source for the Atlanta Astronomy Club, it is only up to date the day it is printed. So if you want more up to date information, go to our club's website. The website contains pictures, directions, membership applications, events updates (when available) and other information. <http://www.atlantaastronomy.org>

The **Atlanta Astronomy Club, Inc.**, the South's largest and oldest astronomical society, meets at **8:00 P.M.** on the third Friday of each month at Emory University's White Hall or occasionally at other locations or times. Membership is open to all. Membership fees are **\$30 (\$35)** for a family or single person membership. College Students membership fee is **\$15 (\$20)**. These fees are for a one year membership (\$5 per year extra charge to receive the *Focal Point* mailed).

Magazine subscriptions to *Sky & Telescope* or *Astronomy* can be purchased through the club for a reduced rate. The fees are **\$33** for *Sky & Telescope* and **\$34** for *Astronomy*. Renewal forms will be sent to you by the magazines. Send the renewal form along with your check to the Atlanta Astronomy Club treasurer.

**The Club address:** Atlanta Astronomy Club, Inc., P.O. Box 76155, Atlanta, GA 30358-1155.

AAC Web Page: <http://www.AtlantaAstronomy.Org>. Send suggestions, comments, or ideas about the website to [webmaster@AtlantaAstronomy.org](mailto:webmaster@AtlantaAstronomy.org). Also send information on upcoming observing events, meetings, and other events to the webmaster.

## AAC Officers and Contacts

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**Webmaster Atlanta Astronomy:** Peter Macumber 770-941-4640 [pmacumber@nightsky.org](mailto:pmacumber@nightsky.org)

## Directions to White Hall at Emory

Our meetings are generally held in a classroom in White Hall. To get to White Hall, turn onto Dowman Drive from North Decatur Road at the five way intersection (across from Everybody's Pizza). White Hall is located across from the new Science & Math building. Parking is available along Dowman Drive on both sides of the road. **The parking lot on the left behind the Admissions Building may be closed.** Additional parking is available in two parking decks near White Hall. For maps to the decks see <http://map.emory.edu>. For more detailed directions to Emory University, visit [www.atlantaastronomy.org](http://www.atlantaastronomy.org) or go to the Emory web site.

## Calendar by Tom Faber (All times EDT unless noted)

- July 1st, Tuesday: Mercury Greatest Western Elongation.  
July 2nd, Wednesday: New Moon.  
July 4th, Friday: Earth at Aphelion.  
July 5th, Saturday: Moon near Mars, Saturn, and Regulus.  
July 8th, Tuesday: Jupiter at Opposition.  
July 9th, Wednesday: Mars near Saturn.  
July 10th, Thursday: Moon First Quarter.  
July 18th, Friday: **AAC Meeting at White Hall, 8PM, Emory University. Full Moon.**  
July 19th, Saturday: **Telescope & Instr Workshop - Contact Sharon Carruthers for details.**  
July 25th, Friday: Moon Last Quarter. **Focal Point Deadline.**  
July 26th, Saturday: **CEC Meeting - See pg 3 for details.** Delta Aquarid Meteors.  
July 29th, Tuesday: Mercury at Superior Conjunction.  
July 31st, Thursday: New Moon.  
August 2nd, Saturday: **DSO at Brasstown Bald - Contact Dave Lumpkin for details.** Moon near Venus & Regulus.  
August 8th, Friday: Moon First Quarter.  
August 12th, Tuesday: Perseid Meteors.  
August 13th, Wednesday: Mercury, Venus, Saturn grouping next several nights.  
August 15th, Friday: **AAC Meeting at White Hall, 8PM, Emory University.**  
August 16th, Saturday: **Telescope & Instr Workshop - Contact Sharon Carruthers for details.** Full Moon.  
August 22nd, Friday: **Focal Point Deadline.**  
August 23rd, Saturday: **DSO at DAV - Contact Dave Lumpkin for details.** Moon Last Quarter.  
August 28th, Thursday: Moon near M44 - Morning.  
August 30th, Saturday: **CEC Meeting - See pg 3 for details.** GASP at John Tanner State Park - **See pg 7 for details.** New Moon.

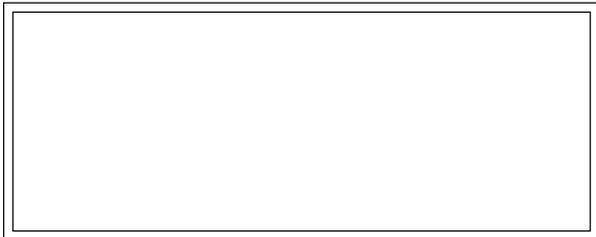
## Atlanta Astronomy Club Listserve

Subscribe to the Atlanta Astronomy Club Mailing List: The name of the list is: AstroAtlanta. The address for messages is: AstroAtlanta@yahoogroups.com . To add a subscription, send a message to: AstroAtlanta-subscribe@yahoogroups.com . This list is owned by Lenny Abbey.

## Focal Point Deadline and Submission Information

Please send articles, pictures, and drawings in electronic format on anything astronomy related to Tom Faber at focalpoint@atlantaastronomy.org. Please send images separate from articles, not embedded in them. Articles are preferred as plain text files but Word documents are okay. You can submit articles anytime up to and including the deadline date. **The deadline for August is Friday, July 25th at 4:00 PM .... Submissions will no longer be accepted after the deadline.**

FIRST CLASS



Newsletter of The Atlanta Astronomy Club, Inc.

FROM:

Tom Faber

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Alpharetta, GA 30022

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