

December 2006

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## December's Meeting

Our next meeting will be 8 PM  
Thursday Dec 7, 2006 at King of Kings  
Lutheran Church, 250 Harmony Rd. in  
Middletown.

Our program will be "The Search for  
Nearby Stars" by Dr. Sebastien Lepine.

## ALERT: SHUTTLE LAUNCH!

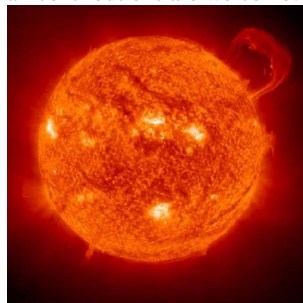
NASA currently plans to launch Discovery  
on Thursday, December 7<sup>th</sup> (our meeting  
day) at 9:35 PM. Weather constraints are  
likely to delay the launch, but it will likely  
be within 1-3 days of the meeting at the  
latest.

## Editor's Corner

Thanks to Randy and Steve for sending in  
articles this month. Please send in more  
articles- the Spectrogram needs you!  
Anything that strikes your fancy involving  
astronomy is welcome in the newsletter's  
pages.

## January Issue

Please try to send contributions for the  
next *Spectrogram* by Wednesday,  
December 20<sup>th</sup> (due to vacation  
scheduling). Email any contributions to  
[Daniel\\_handlin@hths.mcvsd.org](mailto:Daniel_handlin@hths.mcvsd.org). Any and  
all contributions are welcome!



*Solar Prominence, EUV*  
Image Courtesy NASA

## Calendar

Sep 7, 2006 -- Clif Aschraft --  
"Restoring the Tuthill  
Telescope"

5 Oct, 2006 -- Dr. Kenneth  
Kremer -- "Exploring Mars and  
the Search for Life"

2 Nov, 2006 -- Dr. Sebastien  
Lepine -- "The Search for  
Nearby Stars"

7 Dec, 2006 -- Kevin Kilkenny --  
"New Horizons' Journey to  
Pluto"

4 Jan, 2007 -- Daniel Kirby --  
"Pirates of the Solar System  
Caribbean"

1 Feb, 2007 -- Gavin Warnes --  
"Collimating your Telescope"

1 Mar, 2007 -- David Britz --  
"Motions of the Earth and  
Moon"

5 Apr, 2007 -- TBD

3 May, 2007 -- TBD

7 Jun, 2007 -- AGM Business  
Meeting

Image Courtesy NASA



# President's Corner

By Steve Walters

Wow, December already? It's starting to get pretty cold out there, the thermometer here has been in the low 30's so if you're going out observing, better bundle up! And if you do, you'll be rewarded with some of the clearest nights of the year. During the winter months, the sky holds far less moisture so transparency can be phenomenal. And occasionally, the jet stream will calm down and seeing will be at its best. This is the time of year to watch for calm cold nights and then get out there with your telescope!

During November, I attended the Advanced Imaging Conference (AIC) in San Jose, CA. This was the third event and I've made it to all of them. This year the conference was as good as always. Jay GaBany showed some of the most fantastic images ever taken by an amateur. He has captured the trails of a companion galaxy orbiting another galaxy. Over time, the companion merged with the larger one so only the trails remain. Jay is working with professionals at CalTech who are excited as can be since something like this has never been captured before. That was the high point of the conference for me but it was all very well done and the talks were excellent. My session planning software for imagers, "CCDNavigator", was introduced at the conference by CCDWare and that went very well. Everyone was quite interested in it.

I hope to see you at the upcoming meeting! But if I don't I wish you and your family a most happy holiday season!  
Clear Skies!

Steve...  
Clear Skies!

Steve...



Image courtesy NASA



Skylab in orbit  
Image courtesy NASA

## Martian Devils

by Dr. Tony Phillips

Admit it. Whenever you see a new picture of Mars beamed back by Spirit or Opportunity, you scan the rocks to check for things peeking out of the shadows. A pair of quivering green antennas, perhaps, or a little furry creature crouched on five legs...? Looking for Martians is such a guilty pleasure.

Well, you can imagine the thrill in 2004 when scientists were checking some of those pictures and they *did* see something leap out. It skittered across the rocky floor of Gusev Crater and quickly disappeared. But it wasn't a Martian; Spirit had photographed a dust devil!

Dust devils are tornadoes of dust. On a planet like Mars which is literally covered with dust, and where it never rains, dust devils are an important form of weather. Some Martian dust devils grow almost as tall as Mt. Everest, and researchers suspect they're crackling with static electricity—a form of "Martian lightning."

NASA is keen to learn more. How strong are the winds? Do dust devils carry a charge? When does "devil season" begin—and end? Astronauts are going to want to know the answers before they set foot on the red planet.

The problem is, these dusty twisters can be devilishly difficult to catch. Most images of Martian dust devils have been taken by accident, while the rovers were looking for

other things. This catch-as-catch-can approach limits what researchers can learn.

No more! The two rovers have just gotten a boost of artificial intelligence to help them recognize and photograph dust devils. It comes in the form of new software, uploaded in July and activated in September 2006.

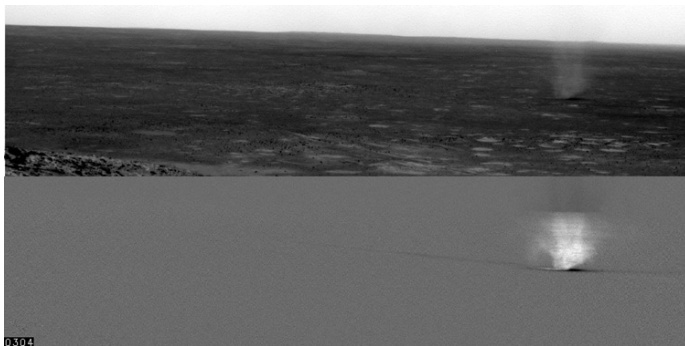
“This software is based on techniques developed and tested as part of the NASA New Millennium Program’s Space Technology 6 project. Testing was done in Earth orbit onboard the EO-1 (Earth Observing-1) satellite,” says Steve Chien, supervisor of JPL’s Artificial Intelligence Group. Scientists using EO-1 data were especially interested in dynamic events such as volcanoes erupting or sea ice breaking apart. So Chien and colleagues programmed the satellite to notice change. It worked beautifully: “We measured a 100-fold increase in science results for transient events.”

Now that the techniques have been tested in Earth orbit, they are ready to help Spirit and Opportunity catch dust devils—or anything else that moves—on Mars.

“If we saw Martians, that would be great,” laughs Chien. Even scientists have their guilty pleasures.

Find out more about the Space Technology 6 “Autonomous Sciencecraft” technology experiment at [nmp.nasa.gov/st6/TECHNOLOGY/sciencecraft\\_tech.html](http://nmp.nasa.gov/st6/TECHNOLOGY/sciencecraft_tech.html), and the use of the technology on the Mars Rovers at [nmp.nasa.gov/TECHNOLOGY/infusion.html](http://nmp.nasa.gov/TECHNOLOGY/infusion.html). Kids can visit [spaceplace.nasa.gov/en/kids/nmp\\_action.shtml](http://spaceplace.nasa.gov/en/kids/nmp_action.shtml) and do a New Millennium Program-like test at home to see if a familiar material would work well in space

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



Caption:  
*The top half of this image is part of a series of images of a passing dust devil on Mars caught by Spirit. In the bottom half, the image has been filtered to remove everything that did not change from one image to the other. Notice the faint*

*track left by the dust devil. Credit NASA/JPL/Mark T. Lemmon, Univ. of Arizona Lunar and Planetary Laboratory.*

## Happenings on Mars: Mars Global Surveyor Goes Out With A Bang

*By Daniel Handlin*

This month has been a bittersweet one for Mars scientists. On one hand, Mars Global Surveyor, NASA’s workhorse orbiter for a decade at Mars, has been lost. NASA lost contact with the spacecraft on November 2, 2006 when MGS told controllers on Earth it had a problem with its solar panels. A weak signal was detected on November 5, but MGS has not been heard from since and efforts to image the spacecraft with NASA’s Mars Reconnaissance Orbiter and contact it with the Opportunity rover have been unsuccessful. For all intents and purposes, MGS has finished its mission.

Yet it has been a wildly successful mission. Originally arriving at Mars with Mars Pathfinder in 1997, the spacecraft has lived for over 5 ½ years after its primary mission ended, and relayed thousands of photographs both on its own and as a communications relay for Spirit and Opportunity. MGS has provided extremely accurate topographic maps of the entire planet, discovered the possibility of recent water on Mars creating gullies in Martian craters (more on that in a moment), discovered possible evidence of glaciers across the planet, found minerals such as the hematite at Meridiani Planum suggesting ancient water activity on Mars, mapped the Martian north pole in 3-D for the first time, discovered Martian magnetism is confined to a few remanent regions on the surface, found ancient river deltas and recent climate changes, and returned almost a quarter of a million images to Earth. MGS also provided the first images of other spacecraft at Mars, both in orbit (Mars Express and Mars Odyssey) and on the surface (both rovers). MGS returned more data to Earth than all previous Mars mission combined. While its mission is now over, its remarkable career is one to be celebrated, and the even more capable Mars Reconnaissance Orbiter, now fully functional in its primary science orbit at Mars, can take its place.

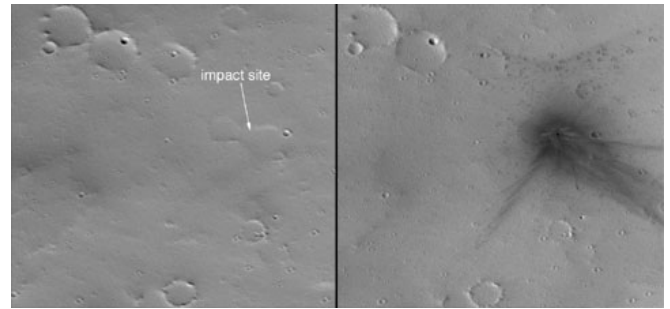
Indeed, MGS went out with a bang as scientists made the amazing announcement as this issue went to press that MGS had discovered current water flow on Mars, within the last few years. The spacecraft reimaged two crater sites in the Martian southern hemisphere where gully formation-indicate of possible recent water flow- had been discovered previously by MGS, and at these two sites found recent bright flow deposits that were not present when the site had first been imaged. The bright deposits have a flow

morphology, with “fingers” or digitate formations at the end of each deposit, and are not likely to be dust, which is dark.

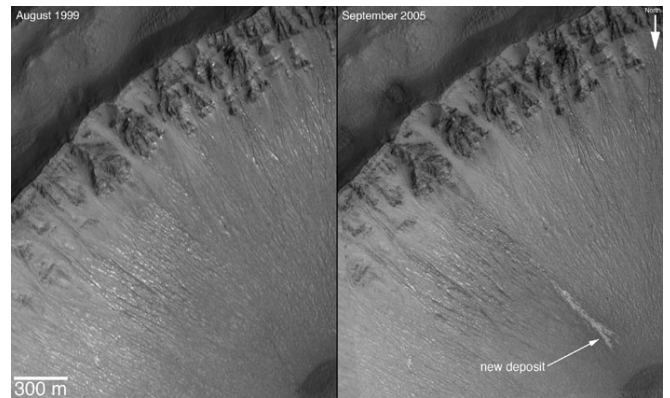
Additionally, the flows were diverted around obstacles as would occur in a water flow.

Thus, scientists believe this constitutes strong evidence for liquid water flow on Mars within the last seven years. The bright deposits may be frost, salt evaporated from the water, or fine silt transported by water. Each event probably involved “5-10 swimming pools” worth of water, scientists said. Water provides the simplest and best explanation for the formation of the recent gully deposits, and raises the exciting possibility that heated underground aquifer or large snow or ice deposits exist in the shallow Martian subsurface, creating a habitat for not just ancient, but present-day life on Mars.

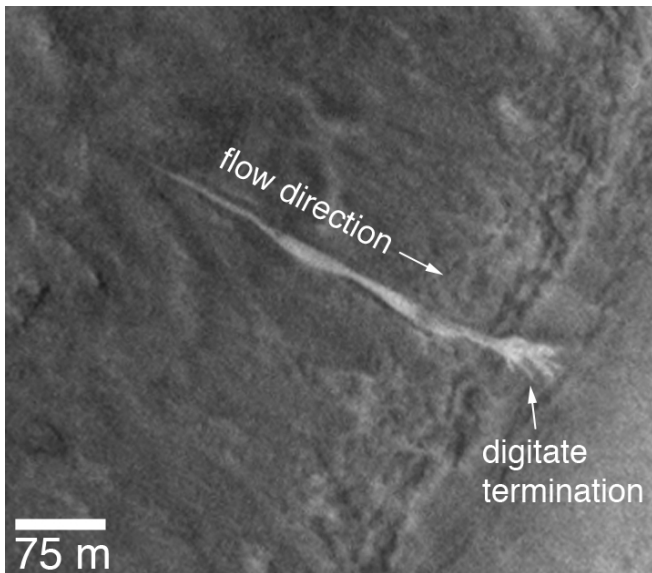
So while MGS has finally been lost this month, the mission has gone out with a bang; it is hard to imagine a discovery more exciting than current liquid water flow on the surface of Mars. Additionally, MGS discovered evidence of a number of recent cratering impacts on the Martian surface, indicating that craterless Martian surface really are as young as previously thought.



*Formation of a new Martian crater; the same area imaged earlier (left) did not display the large crater seen on the right several years later.*



*Appearance of one of the new liquid water flow deposits*



*Close-up of one of the new flow deposits seen on Mars. The shape and digitate termination indicate a flow, and water flow better explains the brightness than a dust avalanche.*



*The Mars Global Surveyor spacecraft was lost this month, but not before providing scientists with solid evidence of current liquid water flow on the red planet.*

*All images courtesy NASA/JPL/Malin Space Science Systems unless otherwise noted*

## Science Corner: Brown Dwarf Formation

*By Daniel Handlin*

*All images courtesy NASA unless otherwise noted*

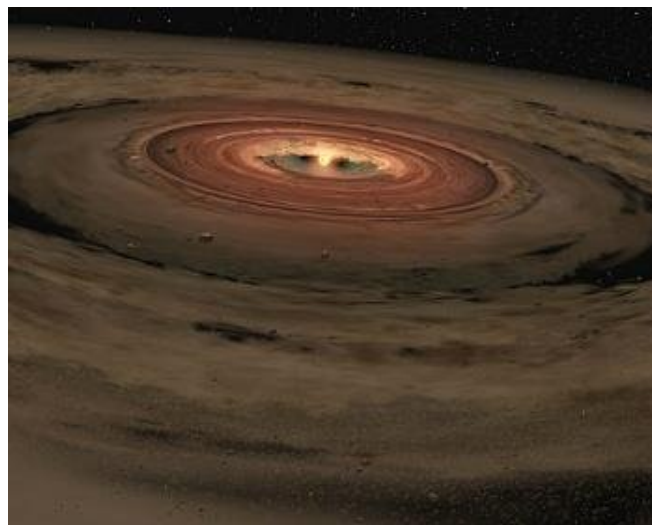
Brown dwarfs are bodies that span the gap between large planets and small stars. Their masses are generally considered to range from about 13 Jupiter masses (where deuterium fusion can take place in the object's core) to 80 Jupiter masses (when ordinary hydrogen fusion starts and the object becomes a dim red dwarf star). Astronomers have discovered hundreds of brown dwarfs in last 15 years or so as telescope technology has improved, and have made a number of interesting discoveries about them recently.

One burning question about brown dwarfs was how they formed. Two competing theories existed to answer this question; the first was the "ejected stellar embryo" theory, which held that brown dwarfs were ejected from collapsing cloud cores that would eventually form stars, so that they couldn't accumulate enough mass to become a star before ejection. The other theory was that they formed just like regular stars, collapsing directly of a molecular cloud disk. Recent evidence strongly suggests the latter theory is correct; astronomers have discovered a brown dwarf binary system consisting of two brown dwarf orbiting each other at more than six times the Sun-Pluto separation. Such loosely bound systems could not have formed through embryo ejection, favoring the theory that they collapse directly from star-forming disks.

Indeed, astronomers have found young brown dwarfs with their own protoplanetary disks, including objects as small as 8 Jupiter masses (planemos, or planetary-mass objects). This suggests that brown dwarfs can form just as stars do and have their own planetary systems circling them. This again is extremely strong evidence that brown dwarfs form directly from molecular clouds. This mystery of brown dwarf formation is now starting to look like a mystery solved.

Astronomers have recently discovered an amazing binary system of a white dwarf and a brown dwarf orbiting each at a few-thousandths of an AU of separation, with an orbital period of about 2 hours. This extremely small separation indicates that the brown dwarf was engulfed by the former star in its red giant phases, which means that the brown dwarf orbited *inside a star* and survived for several years within the star. Astronomers think that the brown dwarf probably shortened the red giant phase from millions of years to perhaps only a few decades, as the dwarf

gravitationally amassed matter from the red giant and ejected it into space. The engulfment of the brown dwarf caused a drag that resulted in today's short orbital period. The brown dwarf's extremely high density allowed it to survive; astronomers think that if the 55-Jupiter mass dwarf had weighed less than 20 Jupiter masses, it would not have survived the ordeal. In about 1.4 billion years the brown dwarf will collide with the white dwarf, causing a huge X-ray flare, as orbital energy is lost as gravitational waves.



A brown dwarf with its own protoplanetary disk in an artist's conception.

Image courtesy NASA/JPL/Caltech

## NASA Reveals Lunar Base Plans

*By Daniel Handlin*

In accordance with its current mandate to return humans to the Moon by 2020, NASA has revealed plans to construct a lunar base at the south pole to support a permanent crew of four astronauts by 2024.

Current plans are for American astronauts to return to the Moon in late 2019. NASA plans to replace the Shuttle, to be retired in 2010, with the Orion Crew Exploration Vehicle capsule, the LSAM (Lunar Surface Access Module) lunar lander, Ares I Crew Launch Vehicle (a Shuttle SRB with an new upper stage to launch the Orion) and the Ares V Cargo Launch Vehicle (a Shuttle-derived Saturn V-class heavy launch vehicle). NASA aims to fly Orion by 2014 and to land on the Moon with the system by 2019.

NASA laid out detailed plans at an exploration conference this month for constructing a lunar base at Shackleton crater at the south pole during 10 cargo delivery missions from 2019 to 2024. Some of these missions may also carry crews

for week-long “sortie” stays on the Moon to help prepare the base. By 2024 initial base construction will be complete, and a crew of four will man the outpost and be rotated at six-month intervals. Shackleton crater is ideal for a base because of the almost perpetual solar energy available, the possibility of ice in shadowed craters and a relatively moderate thermal environment. Initially solar power will be used, with the “possible augmentation of nuclear power” later on. NASA will deliver a pressurized rover to surface by 2027. The finished outpost will include In-Situ Resource Utilization (ISRU) equipment for processing any lunar ice deposits into water, oxygen, and rocket propellant, at least four ISS-class habitation modules, at least one heavy logistics truck, and at least four unpressurized rovers. NASA will use derivatives of the LSAM to deliver cargo to the lunar surface, an ideal choice because the LSAM can deliver large payloads autonomously to the lunar surface. A Lunar Comm Terminal (LCT) communications satellite will likely be launched to support base communications with Earth.

While the plan is likely to change over the next few years, this “Global Exploration Strategy” for the Moon is the most detailed agenda yet set out by NASA for lunar exploration. NASA also identifies specific desirable scientific and technological activities for a lunar expedition; specifically, astronauts can study lunar geology, set up astronomical observatories, and prepare for longer Mars missions sometime in the future. The modular base-building plan will save time and money by using a single, highly capable vehicle to transport both crew and cargo to the surface, and will allow significant capability to be added to the base in the future.

## Moon Phases



## December Celestial Events

By J. Randolph Walton (Randy)

Day	Date	Time (LMT)	Event
Sat	2	04:17	Moon Set
		07:04	Sunrise
Sun	3	22:00	Moon 0.6 Deg. N of Pleiades
Mon	4	15:59	Moon Rise
		19:25	Full Moon
Sat	9	05:55	Mercury Rises

		06:00	Mars Rises
		06:05	Jupiter Rises
		07:10	Sunrise
		16:35	Sunset
		17:15	Venus Sets
		21:45	Saturn Rises
Tue	12	09:32	Last Quarter Moon
		12:15	Moon Set
Thu	14	06:00	Geminid meteors peak (ZHR 120)
		07:13	Sunrise
Sat	16	03:24	Moon Rise
		05:45	Jupiter Rises
		05:55	Mars Rises
		06:20	Mercury Rises
		07:15	Sunrise
		13:39	Moon Set
		16:36	Sunset
		17:25	Venus Sets
		21:15	Saturn Rises
Wed	20	07:43	Moon Rise
		09:01	New Moon
Thu	21	19:22	Winter Solstice
Sat	23	05:25	Jupiter Rises
		05:54	Mars Rises
		06:45	Mercury Rises
		07:19	Sunrise
		16:39	Sunset
		17:37	Venus Sets
		19:59	Moon Set
		20:50	Saturn Rises
Wed	27	09:48	First Quarter Moon
		11:46	Moon Rise
Sat	30	05:00	Jupiter Rises
		05:52	Mars Rises
		07:22	Sunrise
		13:11	Moon Rise
		16:44	Sunset
		17:55	Venus Sets
		20:20	Saturn Rises

# Are you a S\*T\*A\*R Member?

S\*T\*A\*R is the proud owner of a **monstrous 25" Dobsonian Obsession reflector** – which YOU can gain access to as a S\*T\*A\*R member! Meetings are the first Thursday of each month, except July and August, at 8:00 PM at the King of Kings Lutheran Church, 250 Harmony Rd. in Middletown. Meeting generally consist of lectures and discussion by members or guest speakers on a variety of interesting astronomical topics. S\*T\*A\*R is a member of United Astronomy Clubs of New Jersey (UACNJ), the Astronomical League (AL), and the International Dark Sky Association (IDA).

Memberships: ( ) Individual....\$25  
( ) Family...\$35

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Make checks payable to: STAR  
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# In the Eyepiece

Here is a list of objects for this month. This is reproduced from [www.skyhound.com](http://www.skyhound.com) with the kind permission of its creator and author of SkyTools Greg Crinklaw.

Object(s)	Class	Con	RA	Dec	Mag
<a href="#">NGC 1501</a>	Planetary Nebula	Camelopardus	04h06m59.4s	+60°55'14"	13.3
<a href="#">Cleopatra's Eye</a>	Planetary Nebula	Eridanus	04h14m15.8s	-12°44'21"	9.6
<a href="#">The California Nebula</a>	Diffuse Nebula	Perseus	04h03m12.0s	+36°22'00"	5.0
<a href="#">NGC 1664</a>	Open Cluster	Auriga	04h51m04.4s	+43°42'04"	7.2
<a href="#">MSH 04-12</a>	Quasar	Eridanus	04h07m48.4s	-12°11'36"	14.8
<a href="#">NGC 1360</a>	Planetary Nebula	Fornax	03h33m14.6s	-25°52'18"	9.6
<a href="#">Crystal Ball</a>	Planetary Nebula	Taurus	04h09m17.0s	+30°46'33"	10.0
<a href="#">Palomar 2</a>	Globular Cluster	Auriga	04h46m06.0s	+31°22'54"	13.0
<a href="#">K 2-1</a>	Planetary Nebula	Auriga	05h07m07.1s	+30°49'18"	13.8
<a href="#">NGC 1624</a>	Open Cluster	Perseus	04h40m25.4s	+50°26'49"	11.8