

## BOARD ELECTIONS THIS MONTH!!!!



This image of the full Moon with Mars was shot by OCA member Wally Pacholka through the Arch Rock at the Valley of Fire, Nevada, on September 23, 2003. Wally, this month's featured speaker, has won the Picture of the Year Award for 2003 from both *Time* and *Life* magazines for his astrophotography.

### OCA CLUB MEETING

The free and open club meeting will be held Friday, January 9th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The featured speaker this month is Wally Pacholka, who will tell us 'How To Take Astrophotos That Get Published'

### STAR PARTIES

The Black Star Canyon site will be open this month on January 17th. The Anza site will be open January 24th. Members are encouraged to check the website calendar, for the latest updates on star parties and other events.

Please check the website calendar for the outreach events this month! Volunteers are always welcome!

*You are also reminded to check the web site frequently for updates to the calendar of events and other club news.*

### COMING UP

The next session of the Beginners Class will be held on Friday January 2nd (and next month on February 6th) at the Centennial Heritage Museum (formerly the Discovery Museum of Orange County) at 3101 West Harvard Street in Santa Ana.

OCA Board Meeting: Jan. 18th  
Astro-Imagers SIG: Jan. 20th, Feb. 17th  
EOA SIG: Jan. 21st, Feb. 18th  
Astrophysics SIG: Feb. 20th

# President's Message

By Barbara Toy

Welcome to 2004 – and I hope you and everyone dear to you had a really wonderful holiday season!

Before going to more weighty topics, I'd like to make a small disclaimer. When I wrote the introduction to the December PM, I had no idea just how cold it was going to be at the November Star Party – or, rather, how cold and windy! Dark, clear, STILL nights make great winter viewing. Add a bitterly cold hard wind – and that's another story altogether! I'm hoping conditions will be better for the December party which, as I write this, is about a week away...

## The OCA Election

If all goes well with the January Sirius Astronomer, you should be getting your ballot with your newsletter. If there are unexpected delays in spite of all of Steve Condrey's efforts to keep things on track (which include an early deadline, so he can get it to the printer earlier than usual), you may get it in a separate mailing. If, for some reason, you don't get it, you can download a copy from the website, and copies will be available at the January general meeting.

Directions for voting are on the ballot – please be sure to follow them, so you can be sure your votes will be counted. You can submit your ballot by mail before the January meeting (the address is on the ballot), or put it in the ballot box at the meeting itself. The deadline for voting is the day of the January meeting, and no ballot postmarked after 11:59 p.m. on January 9 will be counted – so get your ballot in early!

## The final list of candidates for the 2004 Board is:

**President: Barbara Toy**

**Vice President: Dave Radosevich**

**Secretary: Bruce Crowe**

**Treasurer: Charlie Oostdyk**

**Trustee: Bob Buchheim, Gary Schones, Tony Obra, Joel Harris,**

**Craig Bobchin, Tom Kucharski, Bob Swifka and Stephen Eubanks**

I'm sure that those of you who were at the December general meeting recall that Chris Butler generously volunteered to run for Vice President, as we did not have a candidate for that position. This was met with enthusiastic approval by everyone at the meeting, but, unfortunately, on further consideration of the many calls on his time and talents in the coming year (including his signature "What's Up" talks for us), he realized that he wouldn't be able to handle the duties of the position the way he felt they should be handled, and had to withdraw his name. I am delighted that Dave Radosevich, who has been a real asset to the Board as Trustee this last year, agreed to run for Vice President in his place, and I look forward to working with him next year – and to Chris's continued "What's Up"s!

## Russell Sipe and Tim Hogle Leaving the Board

Every year at this time we have to say a sad farewell to members who have decided that the time has come for them to leave the Board. This year, much to our regret, we are losing Russell Sipe and Tim Hogle.

Russ was president when I joined the club, and has been a wonderful resource during the three years that I've been on the Board. He has a very strong business background, as well as useful ties to such entities as Sky and Telescope magazine, and a lot of useful ideas – all of which have enriched the Board discussions of club issues. I have been particularly grateful for his advice and support while I've been president, which have helped tremendously as I've attempted to learn my job. He has taken on the job of website editor for the club, so he will definitely continue to be very involved in club affairs, even though it won't be as a Board member. He also continues to welcome visitors to his observatory at Anza, especially on star party nights – which is a tremendous boon on a cold winter night, as his "warming room" is genuinely warm!

Tim joined the Board the same year I did, 2001, so we were newcomers

together, but with very different backgrounds. He is a charter member of the club, and has often contributed a valuable historical perspective to our discussions in addition to a rare patience and attention to detail that has been carefully developed over the many years he has been on the Voyager team. While I have depended on Russ to help keep discussions focused and the meetings moving along, I have equally relied on Tim to be sure we didn't overlook important aspects of issues under discussion or forget about matters that had been postponed for further consideration. Even though I know that both of them will be available for consultation if we need them, and they will both remain active in the club (and Tim will remain our representative to the WAA), I will really miss working with them both as Board members.

On the bright side, they've both said that they hope to serve on the Board again in the future – so hopefully we'll see them back before too long!

## The Beginners Class

One of the major educational services our club provides to the general public is our free "Beginners Class," which has been developed and taught by Antonio Miro for the last several years. It's a cycle of six sessions (so there are two complete cycles each year), and is almost always held on the first Friday of each month in the classroom behind the Centennial Heritage Museum in Santa Ana. As one who has frequently attended the class to harass Antonio in the guise of giving him moral support, I can say from personal knowledge that he has done a wonderful job of developing the class and filling it with helpful information for the people who attend. It is very well attended, particularly considering its location and the fact that there isn't any aggressive attempt to publicize it.

Antonio needs some help with the class, both in developing the curriculum and class materials and in teaching it. Change happens and, unfortunately, recent changes in his personal life mean

Don't forget to place  
your vote by the  
January Meeting!

that he no longer has the time that he had in the past to devote to the class. If you can help him out, or want more information about it, please contact Antonio ([tycmiro@aol.com](mailto:tycmiro@aol.com) or 714/898-9677) or me ([btoy@cox.net](mailto:btoy@cox.net) or 714/606-1825).

### On the "Care and Feeding" of Volunteers...

You may have noticed that, while our records show that we have over 700 individual adult members of the club, there are only about 40 who regularly volunteer their time and energy to keep the club and its various facilities and functions going. Whenever we lose one of these people, it affects the functioning of the club and the morale of the remaining volunteers. We have seen many instances when changes in the personal lives of volunteers have forced them to spend less time on club activities or even give some activities up altogether – as I mentioned about the Beginners Class, change does happen. We expect it and do our best to deal with it when it happens.

A less obvious factor that costs us volunteers is burnout – which is less obvious because it's rare for someone suffering burnout to give that as the reason for leaving a particular activity. By the time it's clear to others that someone is having a burnout problem, it's usually too late to do much to reverse the condition, though we try.

We usually associate burnout with people who take on too much and become overextended. From my experience, though, it happens more from frustration or lack of appreciation, often coupled with being overextended. While there can be many different causes of frustration, the ones I hear OCA volunteers complain about most often are thoughtlessness and lack of consideration from other club members – even though most of our members most of the time are very appreciative of what people do for the club and are very helpful. Since it appears at this point that, unless someone launches a successful write-in campaign or people fail to vote for any candidate for president at all, I will

continue to be the person primarily responsible for dealing with the problems caused when volunteers have been pushed too far, I have to admit to a certain amount of self-interest in offering the following suggestions for reducing volunteer frustration – which I make to volunteers and non-volunteers alike:

1) We all have complaints at some point or other – it's part of the human condition. When you find yourself complaining about someone or something in the club, please stop a moment and consider why you're complaining. If you want to see something corrected, is the person you are complaining to a person who can make the correction or direct you to the person who can make the correction? If not, is the person you are complaining to someone who can check your

Join The  
Fight Against  
Volunteer  
Burnout!!!

perceptions about whether the condition needs correction and is that the reason you are complaining to that person? If not, are you making the complaint to that person because you need to vent and does the person you are complaining to know that the complaint is to go no further? If not – please don't voice that complaint. There are few things more infuriating to a volunteer who has devoted time and energy to a particular area of responsibility than to hear from third parties that someone has been complaining about some aspect of what he or she is doing when that person has never raised it directly to the volunteer in question. And, please – don't broadcast a complaint to a general forum, such as one of our email lists, even if you think that's an efficient way to get the gripe to the responsible volunteer and even if you think the complaint in question is trivial and will cause no offense – trust me, it *will* offend.

2) If someone complains to you about someone or something in the club, please consider the reasons behind the complaint. Unless there is a very strong reason not to, please encourage the complainer to take the complaint directly to the responsible person. And, unless there's a very strong reason why you should be the one to carry someone

else's complaint to the responsible person when the complainer won't complain directly, please don't, and please also refrain from sharing the fact that someone has this complaint with people other than those directly involved. In other words, don't let yourself be made a carrier of discord by someone who lacks the courage or the courtesy to complain directly to the person who could actually do something about the complaint.

3) When you contact a responsible volunteer about an area of concern, please make a special effort to be courteous and diplomatic in conveying your concern. Above all, please do all you can to avoid an accusatory tone, even if you feel outraged by something someone has done or not done. Even the most compassionate and fair-minded person gets defensive under attack, heels dig in, opinions become entrenched, and your chances of getting a good resolution to your problem drop through the floor.

4) If you complain about something to the person responsible, please don't assume that this automatically means that whatever problem you have identified will be resolved on the terms you suggest. If the issue is something like a correction of information on the website or something else that's relatively easy and unambiguous, most likely it will get done, but not until the responsible volunteer has time to do it. If you were told in response to your complaint that something specific would be done but you don't see the change after a reasonable period, a diplomatic follow-up is certainly in order – perhaps your issue got lost in a deluge of other matters, or (especially if you raised it where there would be a delay before anything could be done about it) it was simply forgotten. If you talk to a volunteer about something and that person asks you to send a reminder email or otherwise bring it to their attention later on, please do that (e.g. during the general meetings a lot of people ask me to email them information or to check on various things – I'm happy to do it, but I can guarantee you that I won't remember who I promised what to after the meeting, so a follow-up email is an absolute necessity for anyone who really wants

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# Virtual Astronomy

by Dave Kodama

Late November brought another total solar eclipse viewing opportunity – for “extreme” eclipse chasers only! The total eclipse of November 23<sup>rd</sup> was visible only on the Antarctic continent where summer is approaching, but the sun is still very low in the sky. Technical details for this eclipse are on the NASA page:

<http://sunearth.gsfc.nasa.gov/eclipse/TSE2003/TSE2003.html>

The earth-grazing nature of this eclipse is clear in these shots taken from near the Russian Novo Research Station, only about 20 degrees from the South Pole itself. In the photos, the sun’s image is clearly reddened by the thicker atmosphere near the horizon as well as flattened by the effects of atmospheric refraction.

<http://icstars.com/Antarctica/MidnightEclipseSeries/index.htm>

A view from the “top” (Earth Observing System [EOS]) Aqua satellite) shows the elongated shadow of the moon brushing the Earth:

[http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img\\_id=16373](http://earthobservatory.nasa.gov/Newsroom/NewImages/images.php3?img_id=16373)

More views of the eclipse are visible on these pages:

<http://www.moonglow.net/eclipse/2003nov23/index.html>  
<http://www.eclipseguy.com/pages/antarctica.htm>  
<http://www.phys.unsw.edu.au/~jl/DCeclipse.htm>

As one might expect, many of the observers were plagued by cloudy skies, but penguins and the exotic ice scenery make it worthwhile to check out these pages.

For 2004, there are unfortunately no total solar eclipses taking place. Two partial solar eclipses will occur, but neither will be visible at all from Southern California. There are also two lunar eclipses occurring in 2004, only one of which will be visible (partially) from our location (October 28<sup>th</sup>). But the big event for 2004 is clearly the transit of Venus (June 8<sup>th</sup>). As luck will have it, this one is not visible at all from Southern California! Detailed information on eclipses and transits may be found on the Fred Espenak / NASA pages:

<http://sunearth.gsfc.nasa.gov/eclipse/solar.html>  
Solar eclipses  
<http://sunearth.gsfc.nasa.gov/eclipse/lunar.html>  
Lunar eclipses  
<http://sunearth.gsfc.nasa.gov/eclipse/transit/transit.html>  
Transits  
<http://sunearth.gsfc.nasa.gov/eclipse/OH/transit04.html>  
Specifics for 2004 Venus transit

Given the rather poor prospects for special astronomical events visible from Southern California, if you’re not planning to travel for viewing in 2004, we had better keep our fingers crossed for a good show of comets!



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## President’s Message (continued from Page 3)

what was asked for).

5) When dealing with club matters, please keep in mind that everything done by or for the club is done by volunteers, through the donation of their time, energy, expertise, imagination, and (frequently) materials and tools. Please treat them with even more consideration than you would show an employee, co-worker or even your doctor or accountant (I won’t say “relative” – too often relatives get no consideration at all!).

To all of you who take the time to express your appreciation to the people who keep the club going for what they do – thank you. And, for all of you volunteers out there who have made and continue to make this club the wonderful organization it is – thank you from the bottom of my heart for all you do.

## In Closing...

Certain people have commented to me about the length of these messages. Well, I’m of a profession that has its own unique definition of the term “brief”... But, please, don’t let this message get between you and any of the genuine content in this newsletter! My standing instruction to the editor is, if there’s not enough room for the PM and all the genuine content that’s been submitted, the PM gets cut (that’s one reason for having separate sections). However – if we’re short on content, a longer PM helps fill the gaps.

So, there’s an easy way to save us all from overly long PMs – get those articles you’ve been thinking about down on paper! Send in your pictures! Flood Steve with content! (*Cry havoc! and let slip the Dogs of Copy! --Ed.*)

Do it for all of us!

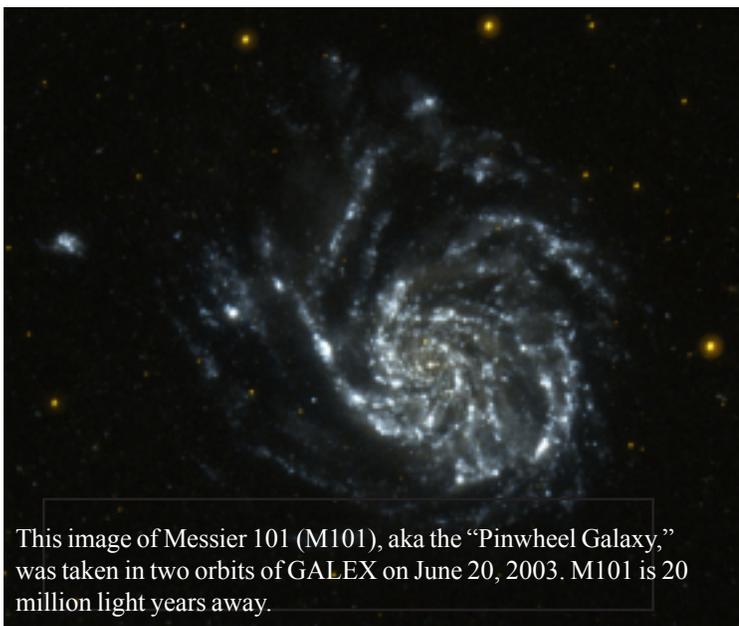


## So Little Time, So Many Galaxies

By Dr. Tony Phillips

Fourteen billion years ago, just after the Big Bang, the universe was an expanding fireball, white hot and nearly uniform. All of space was filled with elementary particles and radiation. "Soupy" is how some cosmologists describe it.

Today the universe is completely different. It's still expanding-even accelerating-but there the resemblance ends. The universe we live in now is "lumpy." Great cold voids are sprinkled with glowing galaxies. In galaxies, there are stars. Around stars, there are planets. On one planet, at least, there is life.



This image of Messier 101 (M101), aka the "Pinwheel Galaxy," was taken in two orbits of GALEX on June 20, 2003. M101 is 20 million light years away.

How we got from there to here is a mystery.

Finding out is the goal the Galaxy Evolution Explorer, "GALEX" for short, a small NASA spacecraft launched into Earth orbit April 28, 2003. GALEX carries an ultraviolet (UV) telescope for studying galaxies as far away as 10 billion light-years.

"GALEX is a time machine," says astronomer Peter Friedman of Caltech. Because light takes time to travel from place to place, pictures of distant galaxies reveal them as they were in the past. "GALEX is investigating the evolution of galaxies over 80% of the history of our universe."

The Hubble Space Telescope can see faraway galaxies, too, but GALEX has an advantage: While Hubble looks in great detail at very small regions of the sky, GALEX is surveying the entire sky, cataloging millions of galaxies during its 2-year mission.

GALEX is a UV mission for a reason. Friedman explains: "UV radiation is a telltale sign of star birth." Stars are born when knots of gas condense in interstellar clouds. The ones we see best are the big ones-massive stars that burn hot and emit lots of UV radiation. "These stars are short-lived, so they trace recent star formation."

Understanding star formation is crucial to studies of galaxy evolution. When galaxies collide, star formation surges. When galaxies run out of interstellar gas, star formation wanes. In galaxies like the Milky Way, spiral arms are outlined by star-forming clouds. The shapes of galaxies, their history and fate--they're all connected by star formation.

Even life hinges on star formation, because stars make heavy elements for planets and organic molecules.

"Our measurements of UV radiation will tell us both the rate at which stars are forming in galaxies and the distances of the galaxies," says Friedman.

How did we get here? GALEX will show the way.

Find out more about GALEX at [www.galex.caltech.edu](http://www.galex.caltech.edu). For children, visit The Space Place at [spaceplace.nasa.gov/galex\\_make1.htm](http://spaceplace.nasa.gov/galex_make1.htm) and make a beautiful galactic mobile while learning about some of the different shapes galaxies can take.

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

## OCA Member Gets Two Picture Of Year Accolades

By Russell Sipe

Samuel Goldwyn has nothing on Wally Pacholka. The world famous movie producer is almost as equally famous for his Yogi Berra-ish turns of phrase as he is for producing dozens of great movies such as *Pride of the Yankees*, and *Wuthering Heights*.

*"The harder I work,  
the luckier I get."*

-- Samuel Goldwyn

Two of my all time favorites quotes from Goldwyn are: "I read part of it all the way through", and "If people don't want to go to the picture, nobody can stop them."

It was Goldwyn that coined the oft quoted truism "the harder I work the luckier I get". While Mr. Goldwyn may be the person who first coined the term, OCA's own Wally Pacholka has been the living example of it during the past few years.

When I ran Halebopp.com back in the late nineties hundreds of amateur astronomers from around the world sent me their best images of the comet which I included in my Comet Hale-Bopp photo gallery (still online at [www.halebopp.info](http://www.halebopp.info) and still producing more than a thousand hits per week). There are some pretty special images in that gallery. But only a few were as unusual and dramatic as the image submitted by one our own local astrophotographers, Wally Pacholka. Wally's shot was an eerie wide field shot of the comet taken with stark but haunting rock formation in the foreground. (See "The Rocks Reach Out" in volume five of the Comet Hale-Bopp Gallery at the above site).

"The technique was discovered by accident", says Wally. "In 1996, while I was photographing Comet Hyakutake, a group of boy scouts build a huge fire in the campsite next to me. When that image was developed, I said to myself "Wow! Look at how dramatic that shot is with the desert scenery lit up". Ever since then, I light up the foreground scenery. Over the years, I even evolved from building huge bonfires to using a flashlight."

Those of us who have been in OCA for a few years have watched Wally take this simple yet dramatic technique and parlay it into a nice little business and world wide recognition

*"I wanted to  
shoot Mars from  
a place that looked  
like Mars."*

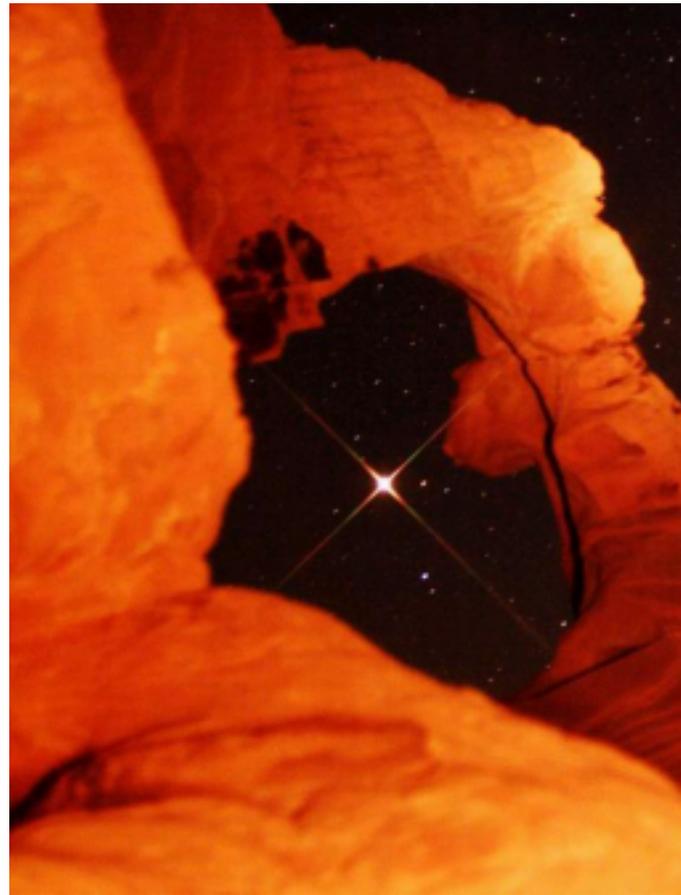
-- Wally Pacholka

for his work. A 1997 image of Comet Hale-Bopp garnered his first TIME magazine "Picture of the Year" award. Later the same image was included in TIME's

"Images of the Century".

Wally has continued to develop his technique and now he has received a double honor. Two of his Mars images have been selected as being among their "Pictures of the Year". One of the honors comes from TIME magazine. The other comes from LIFE magazine. As my college aged daughter would say, "how cool is that?". To which I would rely "way cool!"

Beyond the fact that the images are dramatic, to what quirk of fate should we attribute Wally's astronomical success? Well,



Goldwyn would put it this way, the harder Wally worked the luckier he got. Here's the story in Wally's own words:

"Since I was 'downsized' from my career accounting job and had some time on my hands, I had actually traveled to the scenic and colorful Valley of Fire State Park [Ed. Note: where both the new Pictures of the Year were shot] six times (700 mile round trip each time) over several months specifically to shoot Mars as I wanted to shoot Mars from a place that looked like Mars. I also went there specifically to attempt to get a 'Picture of Year' image. I knew that this 50,000 year Mars event was a 'Picture of Year' event and that the major magazines were all going to each have somebody's Mar's image. I wanted that image to be mine. Not only did I travel to Nevada's Valley of Fire, but I traveled the American Southwest extensively to Mammoth, June Lake, Hume Lake, Sequoia, Yosemite, Death Valley, Joshua Tree, Corona Del Mar, and a grand tour of Utah covering Arches & Canyon Lands national parks as well as

Monument Valley in Arizona. "Of all the places I visited, nothing compared to the 'Valley of Fire' with its martian-like landscape and incredible natural rock formations like Poodle Rock and Elephant Rock. My biggest fear was that the magazines would just go with the Hubble image. However, having the experience behind me that the public in general enjoy seeing something that they can relate to, I stuck to my simple equipment set up (35mm camera on tripod) and simple formula of capturing heavenly events (Mars in star-filled sky) with a scenic landscape that looked like Mars.



Wally Pacholka's image of Mars is one of TIME magazine's "Pictures of the Year." A second image will be receiving the same accolade from LIFE magazine

"Incidentally, I missed the LIFE 2001 'Pic of Year' (by an inch) when they called desiring use of one of my Leonid meteor shots of the 2001 storm. It went all the way to production day, but was rejected when the layout manager changed the spread from a one page to a 2 page spread, which caused my dead center meteor to fall into the gutter of the 2 page spread."

Liam Kennedy asked Wally how he was notified about the selections. Again, Wally tells it best:

"That is a long story. In the 1997 TIME Hale-Bopp Pic of Year as well as the 2001 LIFE Pic of Year ('Nomination' I call it) both TIME & LIFE found me through Astronomy Picture of the Day (<http://antwrp.gsfc.nasa.gov/apod/astropix.html>). I get most

of my publications by the way through the incredible exposure of APOD. Whenever I have a good image, I post it to the OCA site and then sent it on to APOD for possible inclusion in their vast database that is reviewed constantly by magazine photo researchers. This year APOD selected four images of mine, giving me wide exposure worldwide.

*"I certainly wasn't going to sit back and wait for the phone to ring."*

-- Wally Pacholka

"However, that being said, after all the driving I did this year, having taken 4000 plus images and absolutely knowing that the major magazine were going to have somebody's 'Picture of Year' image of Mars, I certainly was not going to sit at home and wait for the phone to ring. I aggressively (with tact) campaigned each of the major magazines, contacting every source I knew within each organization, asking who the contact person was for their 'pic of year' edition. I got nowhere with US News & World Report and nowhere with Newsweek. For both LIFE and TIME, it was a slow process; with repeated emails weaving through their vast organizations (they have dozens of photo editors/researchers).

"Once I got someone with interest, I emailed small jpg files for them to review and also gave them my web site. Then they requested 'a hi-res image' and then a wait and see game that was really tough on the nerves. It was yes/no for a couple of weeks. You never know anything until you see the thing in print. Overall, they really liked the 'man on the street' or 'man in the desert' view point or composition of my images. That if anything is the secret to my success.

"All my astrophotography technique goes back to my parents and friends constant question to me 'So you've been out to the desert again, what do you see out there anyway'. I force my images to answer that question. 'Mom/Dad, this is what I saw last night.' That's what magazines want. They want what their readers can relate to. They want to see the sky event yes, but with some touch of earth to give them a reference point."

*"All my astrophotography technique goes back to my parent's and friend's constant question: "What do you see out there anyway?" I force my images to answer that question."*

-- Wally Pacholka

We all want to thank Wally not only for his great images but for giving us, his fellow amateur astronomers, some great insight into what it takes to be the lucky one whose shots grace the pages of the great magazines of the day. I'm headed out to the garage to find my old tripod.

# ASTROSPACE UPDATE

## January 2004

Gathered by Don Lynn from NASA and other sources

To find out more on these topics, or those of past months' columns, through the World Wide Web, send your Web browser to our OCA Web site (<http://www.ocastronomers.org>), select Space Update Online, and the topics are there to click on.

**SOHO (SOlar and Heliospheric Observatory)** - has revealed details about how the Sun reverses its magnetic field every 11-year solar sunspot cycle. It showed that Coronal Mass Ejections, those blasts on the Sun that carry away vast amounts of electrified gas, are also carrying away the remaining magnetic field of the former polarity for perhaps a couple of years after the reversal occurs inside the Sun. In specific terms, after the internal field of a half of the Sun has reversed from a North magnetic pole to a South one, CMEs continue to blast North magnetic lines out of that half in a sort of cleanup operation. It takes more than 1000 CMEs to complete this process.

**Hubble Space Telescope (HST)** - has captured the relatively short phase at the end of a star's life when it throws out a planetary nebula through jets. V Hydrae is the star, and it is relatively nearby, so we can get a good look. This is the first time jets have been observed in action creating a planetary nebula. It is thought that this phase lasts only 100 to 1000 years out of the billions of years a star lives, so the chances of catching a star in this phase are tiny. Initial HST data show that an accretion disk and the jets surround V-Hydrae's companion star, so it appears the dying star is throwing material onto its companion, which in turn is jetting the material out into a planetary nebula.

**Chandra (X-ray observatory)** - has found the most distant jet shooting out of a quasar. It is so distant that the X-rays left there about 12 billion years ago, and the jet then extended over 100,000 light years out from the black hole that powers the quasar. Because the Cosmic Microwave Background (CMB) was far denser 12 billion years ago, it interacted with electrons in the jet. So measuring the X-rays allowed astronomers to calculate the density of the CMB back then, and it was found to agree with theory. Chandra has also found a trail of black holes and neutron stars emitting X-rays, stretching across more than 50,000 light years, apparently the remnants left when galaxy NGC 4261 tore apart a smaller galaxy by its gravity several billion years ago. Such remnants seen in visible light dissipate much faster than this, so looking in X-rays is now seen as a better way to look for past galaxy collisions.

**Mars Odyssey** - Analysis of the spacecraft's observations of the amount of frozen water near the surface in equatorial regions shows that there is too much to be in equilibrium with the air there. In other words, given enough time and the same conditions, much of that ice would sublime (evaporate) into water vapor. One theory about why this could exist is that Mars' climate could undergo ice ages, or oscillations in climate, and it may be just entering a somewhat warmer time, and it has not had enough time yet to sublime.

More Odyssey findings: 1) The entire south polar region has been imaged at fairly high resolution. This is now good enough to count impact craters on the various layers of ice cap, which will allow determination of the ages of the layers. 2) The temperatures have been measured of the dark spots on dry ice (carbon dioxide ice) fields, and they are very cold. This rules out the explanation that they were soil showing through holes. The new theory is that they are clear spots in the dry ice, where we are seeing through to lower, darker layers.

**Heliopause (boundary between the solar wind and interstellar space)** - The Voyager 1 plasma wave instrument has detected radio emission that appears to be caused by a solar outburst hitting the heliopause. Timing of that event says that the heliopause is between 153 and 158 AU (Earth's distance from the Sun). Theory says that if that's where the heliopause is, then the termination shock (where a shock wave is set up in the solar wind moving toward the heliopause) should lie at 101 to 118 AU. This would indicate that Voyager 1, at a distance from the Sun of 90 AU, has not yet reached the termination shock. As reported here last month, Voyager had detected 2 of the 4 symptoms of the termination shock, so astronomers were debating whether that goal had been achieved.

**Eta Carinae** - The interferometer on the Very Large Telescope in Chile has observed for the first time the inner parts of the stellar wind of the huge star Eta Carinae, the most luminous star known in our galaxy. It is 100 times the mass of our Sun, 5 million times as luminous, and is larger than the orbit of Jupiter. The wind was found to be elongated (50% longer one direction), rather than spherical, and the cause of the star's known instability was found to be its fast rotation. The shape of the star could be measured for the first time, using the interferometer, and from the flattening observed, the rotation speed was calculated. The rotation speed is 90% of that which would throw it apart by centrifugal force. Also the axis of rotation was found, and it aligns with the mushroom-shaped clouds about the star, which have long been imaged with ordinary telescopes. So much material is blowing off the star that it would be depleted to nothing in less than 100,000 years, but it is expected to explode as a supernova in a fraction of that time.

**Glowing disk** - A dust disk about a young star has been discovered using the UK infrared telescope in Hawaii. The unusual thing about this disk is that it is glowing from being hot, while all other such disks are reflecting light from their central star. There are even dark disks that we know about only by their silhouette against a background light. It appears that stellar winds are shocking the newly discovered disk, causing the heating. Dust disks around young stars are believed to be where planets are formed. But the new disk is too hot for accretion of material to occur, so planets would not form in this type of disk.

**Yarkovsky Effect** - Scientists using the Arecibo radiotelescope as a radar have for the first time detected the predicted Yarkovsky Effect. It slowly changes the orbit of an asteroid because heat photons radiated into space causes a slight force that is concentrated on the afternoon side of the asteroid. That is where the ground has become hottest from the most direct sunlight and so radiates the most. It was observed by carefully tracking asteroid 6489 Golevka. The asteroid is relatively small (1/3 mile across), so the Yarkovsky Effect causes a larger change on it, and it passes near the Earth, so accurate radar can be obtained. The force is only about 1 ounce in this case, but in the 12 years that radar has tracked it, the result moved Golevka about 9 miles. Although this is small in our time frames, over the billions of years the solar system has existed, the effect has changed the dynamics of the asteroid belt, contributed to the number of near-Earth asteroids, and affects our estimates of the ages of asteroid families.

**Kuiper Belt** - A new computer modeling of the formation of our outer solar system has shown that the Kuiper Belt, the region beyond Neptune full of icy asteroids, formed considerably closer to the Sun, but gravitational perturbations by Neptune shoved the belt out to its current location. This process also scattered most of the objects in the belt out of the solar system, so we are seeing now only a small remnant of the original. Neptune was already known to have formed closer to the Sun and migrated outward, and this migration is part of the process that moved and depleted the Kuiper Belt. The new model also showed why Neptune stopped migrating at its present location: it was caused to migrate by the dense presence of Kuiper Belt objects, and so when Neptune had finished scattering most of the original belt, it stopped migrating.

**Possible planets at Vega** - A computer modeling of the structure of the irregular dust disk observed around the star Vega matches best if a Neptune-like planet (both in mass and orbit size) is orbiting the star. Many astronomers believe that Neptune would not have formed the way it did without the influence of massive Jupiter orbiting somewhat closer to the Sun. So this may imply that Vega also has a Jupiter-like planet. This is much more like our solar system than nearly all the extrasolar planet systems known, which are Jupiter-size or larger planets orbiting far closer to their stars.

**Extrasolar planets** - Astronomers have developed a new method of looking for planets orbiting other stars. It works only for pulsating white dwarf stars, but there are lots of them. By precisely timing the pulses from the white dwarf, it reveals if the star is being tugged about gravitationally by planets orbiting. The process by which an ordinary star runs out of fuel and becomes a white dwarf probably destroys inner planets, but the outer ones should remain and be detectable by this new method. It should work on stars that were initially between 1 and 4 times the Sun's mass, and on planets from 2 to 20 AU (Earth's distance from the Sun) from their star. This covers much range where the current method of search (Doppler shift) for extrasolar planets is not sensitive. Observations using the new method have begun, but results may take a few years.

**Rings** - For a long time it has been known that rings around planets should dissipate far faster than the age of the planets. The explanation for Saturn's rings was that they must have been created recently in astronomical terms, by some rare event. But this was too much of a coincidence when rings were found around all 4 gas giant planets. When it was found many years ago that some of Jupiter's moons contribute a steady supply of dust into the rings, the mystery was partly answered, but we are still short on ring material to allow rings to remain for billions of years. A new computer simulation shows that moons near the rings can sweep up material escaping from the rings. Then every time a meteoroid hits one of these moons, the material can be knocked back into the rings. This recycling can greatly extend the life of a ring.

**Cracks in the Magnetosphere** - The Earth's magnetosphere acts as a shield that keeps out most particles from the solar wind. New observations by the IMAGE and Cluster satellites show that immense cracks sometimes develop in the magnetosphere and remain open for hours, allowing particles from the Sun to get to Earth. It appears that this happens when a burst from the Sun contains a magnetic field opposite in direction to the part of the Earth's magnetosphere that it hits.

**Neutron binaries and gravity waves** - Astronomers using the Parkes radio telescope in Australia have discovered a double neutron star, only the 6th ever found. The two stars are separated by only twice our Moon's distance from us, and orbit each other in just over 2 hours. In 85 million years they will have lost enough energy to fall together, giving off a huge burst of gravity waves. If this new neutron binary is typical, then such bursts should happen 6 times as often as previously predicted by analyzing one of the previous 5 such pairs. This is good news to those scientists building gravity wave detectors, since they should detect merging neutron stars 6 times as often as previously predicted.

**Update on Nozomi (Japanese Mars mission)** - As I write this, Nozomi, feared earlier to be on a collision course with Mars, is flying by that planet at about 600 miles, a near-miss in solar system terms. The goals of the mission, to study Mars' magnetic field, upper atmosphere and its moons, are essentially lost, since the engine to go into orbit is not working. But it will continue to take magnetic and other data about the Sun and solar system as it continues to orbit the Sun after the flyby.

*(continued on page 10)*

(continued from page 9)

### **Instant AstroSpace Updates:**

Observations by Chandra X-ray observatory and ground-based telescopes have shown that the galactic winds blow much farther than suspected, in some cases farther than the size of the galaxy. Galactic winds consist of particles thrown off of galaxies by central black hole activity and by supernovas, and they seed star forming regions with new elements. Theories of star and galaxy formation will have to be revised to account for much greater galactic winds.

January 2 the Stardust spacecraft is flying through the coma of comet Wild 2 (pronounced Vilt-2), about 190 miles from the solid nucleus, collecting comet material to be returned to Earth in 2006 for analysis. This is the first sample return performed beyond the Moon.

The Gravity-B satellite to test Einstein's Relativity was postponed from launch in December until sometime in 2004 due to faulty electronics in a gyro. Gravity-B will measure extremely precisely the effects on warping space (and therefore gravity, by Relativity) attributable to the Earth's mass and to its rotation.

Astronomers at Palomar Mountain have found one of the largest Kuiper Belt Objects, those icy asteroids beyond Neptune, at about 350 miles in diameter, designated 2003 VS2. It is in resonance with Neptune, making 2 revolutions around the Sun every time Neptune makes 3, the same as Pluto does.

GALEX (ultraviolet telescope) has released to the public its first collection of images, including Stephan's Quintet, the Whirlpool Galaxy and an impressive mosaic of the Andromeda Galaxy. Ultraviolet is given off chiefly by hot young stars, so the images show where stars have recently formed, giving familiar galaxies a different look. GALEX will survey the entire sky in the next couple of years, as well as make deep images and spectra of selected areas.

XMM-Newton (European X-ray telescope) has discovered that clusters of galaxies gave off more X-rays 7 billion years ago than clusters with similar conditions today. One theory is that the density of matter in the Universe is considerably higher (and consequently the density of dark energy lower) than other observations are calculating, but it could also be that there are differences in ancient galaxy clusters that we don't know about, or that the particular observations were somehow wrong. Further investigation is planned.

The International Space Station had its 5th anniversary since launch of the first part, and its 4th anniversary of the beginning of permanent habitation. It has completed 29,000 orbits about 210 miles up.

The HiPEP ion engine, being developed for future space flights such as the Jupiter Icy Moons Orbiter, was successfully tested in the lab. Compared to previous ion engines, it has 10 times the power, 2-3 times the fuel efficiency, 4-5 times the voltage, and 5-8 times the life.

The radiation-measuring instrument on Mars Odyssey has failed, apparently victim of an overdose of what it was designed to measure; it failed when a huge dose of charged particles hit it after a Coronal Mass Ejection (blast of particles from the Sun). In the 20 months that the instrument had been operating in orbit about Mars, it had already achieved its scientific objectives.

On January 3, Mars Exploration Rover 1, named Spirit, is scheduled to land in Gusev Crater, which appears to have held a lake in the distant past; Rover 2, named Opportunity, lands January 25 in Meridiani Planum, an area known to have mineral deposits that normally form only in water. Should be great!

Astronaut Michael Foale just broke the U.S. record for total time in space. The old record was 230 days, and Foale will have accrued 375 days by April when he returns from the International Space Station, his 6th mission. Foale's crewmate, Alexander Kaleri, will reach 610 days on this, his 4th mission, short of the Russian record of 748 days.

## **NOTES FROM THE EDITOR**

The December 15th cutoff seems to have worked in helping to produce the issue on time. Hopefully this issue will find its way to your mailbox well in advance of the meeting. The deadline for submissions to Sirius Astronomer will be the 15th of the month as opposed to the 20th from here on out. So be sure to get your great articles/book reviews/other goodies in by the 15th!

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