

Images completed in 2002 (left) and 2003 (right) depict the analemma. The analemma illustrates the motion of the sun across the sky when observed from precisely the same place and precisely the same time of the day over the course of a year. The ruins in the 2002 photo are those of Tholos, ancient Delphi, Greece; the ruins in the 2003 photo are those of the Temple of Zeus, ancient Nemea, Greece. For more information, see <http://www.perseus.gr/Astro-Solar-Analemma.htm> (courtesy Anthony Ayiomamitis).

## OCA CLUB MEETING

The free and open club meeting will be held Friday, March 12th 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 Luisa Rebull, who will tell us "What's New With SIRTf".

**NOTE: The April Meeting has been rescheduled to April 16.**

## STAR PARTIES

The Black Star Canyon site will be open this month on March 13th. The Anza site will be open March 20th. 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 March 5th (and next month on April 2nd) at the Centennial Heritage Museum (formerly the Discovery Museum of Orange County) at 3101 West Harvard Street in Santa Ana.

GOTO SIG: TBA (contact coordinator for details)

Astro-Imagers SIG: Mar. 16th, Apr. 20th

EOA SIG: Mar. 17th, Apr. 21st

Astrophysics SIG: Mar. 19th, Apr. 9th

## **President's Message**

### **By Barbara Toy**

Time flies by fast, especially when the deadline for material for the Sirius Astronomer is the 15<sup>th</sup> of the month before each issue – which means that I should be talking about things a month and a half or more out from when I'm writing. So, I guess I should have mentioned the Messier Marathon in the February PM – hopefully, we won't have any glitches with the printer or the Post Office in March, and you'll get this long before the Anza Star Party. With that hope in mind, kicking off our spring events...

### **The Messier Marathon**

When I was making the transition from armchair to observational astronomy a few years back, I noticed a number of books at OPT that referred to "Messier Objects." I could see from the pictures that these were fuzzies of various sorts, and remember thinking that this was a surprisingly accurate but not particularly scientific-sounding way of describing these things – you have your planets, your stars, and your "messier objects." I was a bit disappointed to learn that this is just a fortuitous conjunction of unrelated items, and the classification owes its name to Charles Messier, who collected the information for his "not a comet" list of things that looked like they could have been comets in the telescopes available at the time. There are two times of the year when you can see all 110 Messier Objects in one night, right around the two equinoxes. Theoretically at least, fall is as good a time for a Messier Marathon as spring – but almost everyone does it in spring, and so do we.

As usual, our Messier Marathons is set with the March Anza Star Party. This means that it's on March 20, which is early enough in the season that the nights are still long, giving us a better shot at getting all 110 objects on the list. As it happens, the 20<sup>th</sup> is right on the new moon – so, moonwise, conditions should be excellent. If the weather cooperates, a great time should be had by all.

What do you need to do to take part? Basically, come out to Anza with whatever you choose to observe with for the Marathon – some people have been known to try it with binoculars or even naked-eye, but most prefer more light-gathering capability (i.e. a telescope of some sort). The telescopes that Messier and his colleagues used weren't all that good by today's standards, so even a small telescope can find the Messier Objects; this isn't an event where you really need the big "light buckets," though, of course, there's no reason they can't be used! The Kuhn will be throwing its 22 inches into the fray, and people are welcome to "do" the Marathon up at the observatory (we also expect to have at least one of the LX200s running).

There will be forms available at the observatory and at Anza House, listing the objects in the suggested order for finding them, or you can bring your own. Remember that there is limited time to catch those in the west right after sunset before they set in their turn, and limited time to catch the ones in the east at the end of the night before they're lost in skyglow from the rising sun – those are the two major "crunch" points, but there are other challenges, such as wading through all of the Virgo galaxies (this is particularly tough for people who star hop to find them, as so many of them look alike in the eyepiece – those using automated systems tend to take it on faith that a particular galaxy is what the system says it is). As you find the different objects, you check them off on the form (the truly dedicated note the time for each one) and you turn it in at the end of the Marathon – and make sure that your name is on the form before you turn it in! Those who participate and turn in their forms will get an official certificate showing how many "M-Objects" they found and that they took part in this astronomical spring game. You don't have to find all of the objects to turn in the form – turn it in showing all that you did find, and you can challenge yourself to do even better next year!

If you've never tried a Messier Marathon, you may have trouble believing that it's a lot of fun and worth doing, but most people who've done one are determined to do it again and do it better – or to do it and increase the challenge level (e.g. by going from a "goto" system to star hopping). It's a great way to see objects that you might otherwise never visit – some of them are well worth the visit and may make you want to come back to them when you have more time. It's also a good way to test your planning and finding skills and your sense of the sky – the order shown on the form isn't by any means the only way you can run your Marathon, and it may not be the best order for your particular location. And this is very much a viewers', as opposed to photographers', event – there aren't many large-scale events like this in the world of amateur astronomy where the main emphasis is on what you can see through the eyepiece.

There are a number of excellent books out there to help you plan your Marathon and help you find the objects (Harvard Pennington's *The Year-Round Messier Marathon Field Guide* and Don Machholz's *Messier Marathon Observer's Guide* or his updated and expanded version, *The Observing Guide to the Messier Marathon*, are just the start of the excellent resources out there), and a lot of information is available on the Internet. An excellent site for information, lists and links is the Messier Marathon Homepage at <http://www.seds.org/messier/xtra/marathon/marathon.html>, and AAAA has information and Mr. Machholz's viewing lists available at <http://www.corvus.com/marathon.htm>. For more information about our local Marathon, you can contact me or our coordinator, Doug Millar, at [doughhelen@moonlink.net](mailto:doughhelen@moonlink.net); Doug's also the person who ultimately should get your completed Marathon form,

which you can turn in at the observatory or to the box that should be set up at Anza House at the March star party, or you can turn in at the April or May general meeting, or you can mail to Doug care of the club's P.O. Box.

This is always a fun event out at Anza, but you don't have to go out there to take part, and you don't have to do it on March 20. Anytime in late March or early April should be good, though it always seems to me to be more fun when you have a bunch of other people around who are trying it at the same time. However, whenever and wherever you do your Marathon – good luck, and have fun!

### **Date Change for the April General Meeting**

In case you missed the notice elsewhere in the Sirius Astronomer and on the website, we had to change the meeting date for the April general meeting. **The meeting will be on the 3<sup>rd</sup> Friday of the month, April 16**, not on its usual 2<sup>nd</sup> Friday of the month. This is because Chapman University is shutting down the power to most of the campus on our usual meeting night, including Hashinger Hall, where we meet. As people who have been to recent meetings have probably noticed, there's a lot of construction going on at Chapman right now, and we understand that the power shut-down is related to that.

### **In Appreciation of Chapman University**

For those of you who may not know much about our club history, Chapman University has been exceptionally generous over the last twenty years or more in allowing us regular use of the Irvine Auditorium in Hashinger Hall for our monthly meetings, as well as space in the auditorium to house our library and to store the equipment and supplies we need for the meetings. It has also allowed us full use of the audio-visual equipment in the auditorium, and been helpful with special projects, such as when Liam Kennedy worked with the university staff to set up an Internet link for the demonstration of the Telescopes In Education program at one of our meetings a year or so ago. Up to a couple years ago, the university also hosted our website.

Chapman's generosity to us over the years has been a major help in developing many of our programs and activities. Certainly, without the university's generosity in allowing us to use its facilities at no charge, it would have been much harder to bring you and the students and members of the general public who attend our meetings the range and depth of programs that we have been able to present. It would also be a lot harder to make all of our library materials available to members on a regular basis.

On behalf of all of us in Orange County Astronomers, I would like to thank Chapman University for all it has done for us in the past, and all it continues to do for us. Our relationship with the university is one we treasure, and we all hope it continues for many years into the future.

### **"How To Use Your Telescope" Class**

Our spring "How to Use Your Telescope" session of the Beginners Class is on Friday, April 2<sup>nd</sup> at the Centennial Heritage Museum in Santa Ana at 7:30 p.m. This is the session where people bring their telescopes to the class and get some hands-on help with setting them up, using them, and any particular problems they're having with them. This is a particularly fun class for both the people who bring their scopes and the club volunteers who come to work with them.

If you have a telescope of any kind and want some help learning how to use it, bring it along to this class – it's for club members as well as members of the general public. We need volunteers to help the folks who are bringing their scopes, so please plan to come out for this if you have any experience with any type of scope at all. For more information, contact Antonio Miro ([tycmiro@aol.com](mailto:tycmiro@aol.com)) or me ([btoy@cox.net](mailto:btoy@cox.net)).

### **A Tribute to Gordon Pattison**

One great thing about our club is that one member with a vision can bring it to fruition and, in the process, give fellow members a way to increase their enjoyment of both our hobby and of their membership in the club. Gordon Pattison is one of those members, and his particular vision led to the formation of the Astrophysics Special Interest Group in the mid 1990's.

When I first went to an Astrophysics meeting, it was mainly because I thought that, as an officer of the club, I should visit all of the SIGs at least once. As has been my experience more than once with club activities, I completely underestimated just how fun and rewarding it would be. The Astrophysics SIG is for the armchair astronomer in all of us, and for the part of us that wants to understand what we're seeing out there when we look through the eyepiece or at a particular image. Its aim is to help its members learn more about the laws and theories of physics that apply to astronomical phenomena, including how the theories developed and what's going on now in those areas. Besides watching videos from different lecture series (which are a lot more interesting

(continued on Page 4)

# Virtual Astronomy

by Dave Kodama

## Another Bright Comet

Following up on last month's discussion of comets for 2004, the second bright comet to watch for is C/2001 Q4 (NEAT), which is expected to reach magnitude +1.0. Unfortunately this comet is currently located very far south, so it will not become visible to us in Southern California until it is almost at peak brightness. This spectacular entry into our skies will occur in early May, when the comet will be heading rapidly north. After the first part of May, the comet will be in a good viewing position, but rapidly fading in brightness. Positional information for this comet can be found here:

<http://cfa-www.harvard.edu/iau/Ephemerides/Comets/2001Q4.html>

By the way, local viewing information specifically for observing both comets from the OCA's Anza site can be found on the Special Sky Events page on the Hutech web site:

<http://www.sciencecenter.net/hutech/events/index.htm>

## Columbia Accident Investigation Report

It has now been roughly a year since the shuttle Columbia was destroyed during reentry. The accident report was released in August of 2003 and available online, but recently, I was able to pick up a nicely printed (in color on glossy paper) copy of a printed version of Volume 1 from Apogee books.

<http://www.cgpublishing.com/columbia.htm>  
[http://www.nasa.gov/columbia/home/CAIB\\_Vol1.html](http://www.nasa.gov/columbia/home/CAIB_Vol1.html)  
(NASA online PDF version)

As you might expect, the report includes numerous technical details and summary timelines which pull together all of the available ground observations, communications, telemetry, and recorded data. In addition, it puts the Columbia accident into the context of the entire history of shuttle mishaps and "glitches". Some interesting highlights from the report:

- The foam impact ultimately determined to be the cause of the damaged left wing was estimated to be ~24x15" (unsure thickness) at a speed of about 545 mph, 81.9 seconds into the flight.
- The impact damaged the reinforced carbon-carbon (RCC) leading edge of the left wing.
- Military space radar noted (after the fact) that a piece of debris separated from Columbia

2 days into the flight. The object was found to be consistent with a 140-square inch piece of RCC panel.

- A Kirtland AFB (New Mexico) shot of the reentering Columbia shows a "bulge" in the glowing silhouette of the left wing.
- The debris track plotted against the ground clearly shows left wing pieces coming off first.
- Plots of damage to tiles and RCC edges on previous shuttle flights show a large number of foam impacts in the past, no doubt contributing to the lack of alarm at NASA about the impact. The impact was also initially judged to occur at a lower speed.

All-in-all, everything seems clear as to what happened when examined with 20-20 hindsight. Can it happen again? No doubt that despite the criticism of NASA's internal processes, it's impossible to bat a thousand, so given enough time, something will go wrong again. After all, things still go wrong in virtually anything man has ever engineered. I might add that I'm not exactly in agreement with the general critical assessment that NASA has "gone soft." There's no doubt room for improvement, but for those who think that everything was done right in the early days of the space program, I recommend another excellent book: **Disasters and Accidents in Manned Spaceflight** by David J. Shayler (Springer-Praxis Books)

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### President's Message *(continued from page 3)*

when watched with a group than alone), it's in part seminar discussion group and social group – a wonderful forum

for exploring the exciting and complex issues and theories that encompass how the universe developed, where it's going and how it may end, the nature of matter and energy, development of stars and planetary systems, development and interactions of galaxies, and all kinds of related topics.

Gordon has been the coordinator for the Astrophysics SIG from its beginning to the meeting in January, 2004, when he formally stepped down due to health problems. Without his efforts over the years, the group would not be what it is today – a true treasure among the many activities available to club members. Those of us in the group are very sorry he has not been able to come to meetings over the last few months – we miss him a lot, and have been worried about his condition. By report, he's doing much better, and we hope he'll be able to start coming to meetings again soon.

Thanks, Gordon, for all you've done to get the Astrophysics SIG going and to make it into the wonderful group it is today!

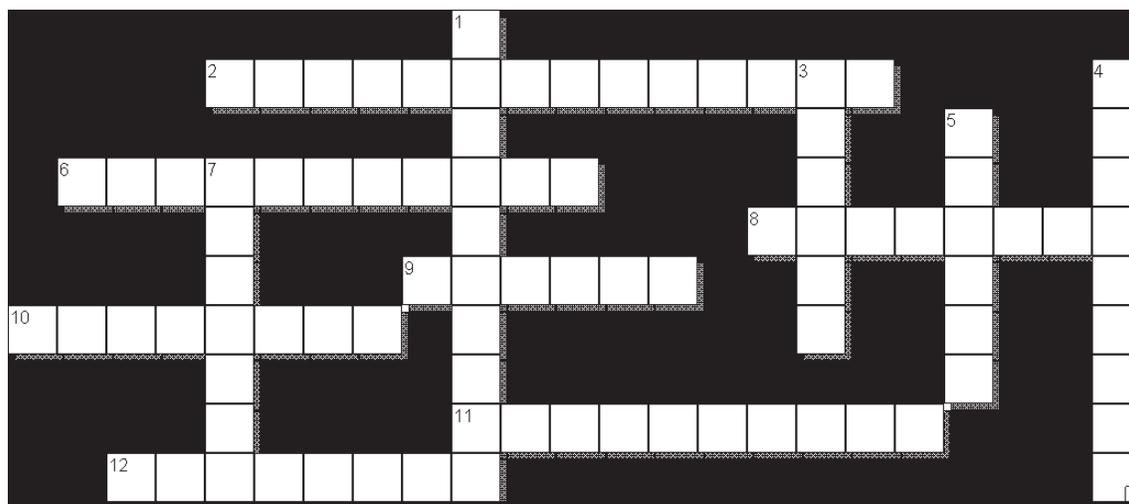
And welcome to Chris Buchen as the new coordinator for the Astrophysics SIG, and truly a worthy successor to Gordon in that position.

# OCA Crossword Puzzle

(Theme this month: Miscellaneous)

March 2004

by John Garza



## ACROSS:

2. 88 different overlapping areas.
6. Created Event Horizon formula.
8. Planets outside the Earth orbit around the Sun.
9. Imaginary point in the sky directly overhead.
10. Largest Jupiter moon
11. When a planet lies opposite the direction of the Sun.
12. When a planet is farthest from the Sun.

## DOWN:

1. When planet is closest the Sun.
  3. Cloud
  4. Closest galaxy
  5. The Sun crosses the celestial equator in northward direction.
  7. Coordinate system measured in degrees from north.
- (Solutions to last month's puzzle on page 6)

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## Go-To Telescope SIG Feb. '04 meeting Summary

by Craig Bobchin

The meeting took place in Placentia on 2/16/04 and there were 13 members present. Several of the attendees were new to the now expanded Go-to group. While most in attendance has ETX's ranging from the 70mm to the 105mm, there was representation of Celestron, LX200 and LX200 models. It was nice to get a slightly different perspective on other go-to telescopes.

After about 30 minutes of general telescope/observing discussion we settled down to the meeting's main topic, What books/charts do we find useful for planning and running our observing sessions. There was almost unanimous agreement that Planispheres, and the charts in Astronomy magazine and Sky and telescope magazine were good for getting in the general area, they were not really suitable for finding the faint fuzzies we all try and look for.

Mary Brown likes "Burnhams" and there was general agreement that this is a very good set of books. It will also help about astronomy. "The night sky" was also mentioned as good for planning observing sessions, but not really to read. "Uranometria 2000" was considered to have excellent maps. Other books mentioned as good were, "Nightwatch", "Turn left at Orion" and "365 Starry nights". Brent Watson's charts were discussed and two of his, "Overlooked Objects", and "Select Double Stars" were passed around for people to check out. (continued on page 6)

# WAA Board Meeting Notes

by Tim Hogle

The Western Amateur Astronomers (WAA), an umbrella organization of astronomy clubs of which OCA has been a longstanding member club, had its winter Board meeting on February 7 in beautiful Ridgecrest California.

One of WAA's most well known functions is annually awarding the prestigious G. Bruce Blair Medal to an individual who has made outstanding contributions to amateur astronomy. This year the Blair medal recipient is to be Jane Houston Jones. Although not a name familiar to most amateurs in Southern California, Jane has been very active in promotion of amateur astronomy in the northern part of the state. Some of her accomplishments include being amateur astronomy representative on the board of the Astronomical Society of the Pacific (ASP) and board member and president of the Amateur Astronomical Societies of Northern California (AANC), extensive speaking programs on astronomy at schools and astronomy clubs and publications in Sky and Telescope, Astronomy, and Amateur Astronomy magazines. The ASP position is important in allowing amateurs to have a forum to be heard among professional astronomers, and under her guidance the AANC has grown in its membership and sponsorship of many noteworthy astronomy programs. Jane and her husband Morris recently moved to southern California, where Jane now works as Cassini Project outreach coordinator at JPL. The award presentation venue is still being negotiated - either at RTMC or the Astrocon 4004 (see next paragraph).

At the meeting a major amateur astronomy conference, AstroCon 2004, was announced. It is to be held on July 20-24 in Berkeley, with an awards dinner on the USS Hornet aircraft carrier. It is being co-sponsored by the ASP, Astronomical League (AL), American Association of Variable Star Observers (AAVSO) and the Association of Lunar and Planetary Observers (ALPO). The conference web site at <http://www.astrocon2004.org/>, has details.

WAA will again have an information booth at RTMC this year. Stop by and say hello. For more info about WAA, log on to the Web site at <http://www.waa.av.org>.



## GoTo SIG Meeting (continued from page 5)

Two other works that we looked at were the "Peterson Field Guide Stars and Planets" and the National Audubon Society's "Field Guide to the Night Sky". Both are useful in different ways. Another book and web site that many of us find very useful: Mike Weasner's Using the Meade ETX and his Mighty ETX Site (which is also good for other small scope users as well) [www.weasner.com/etx](http://www.weasner.com/etx). While geared towards the ETX, both have a wealth of information good for almost all small telescopes.

Software was also briefly discussed and the three top programs that people seem to use were The Sky by software bisque - [www.Bisque.com](http://www.Bisque.com) Cartes Du Ciel - <http://www.stargazing.net/astropc/> AstroPlanner - <http://www.ilangainc.com/astroplanner/>

We then adjourned to the back yard we we did some observing and learning about some scopes. Craig had his ETX 105 w/UHTC set up Greg Freeman had a Celestron Nexstar 114 that Mary Brown was able to help him set it up and use. Glenn hand had his 10" LX D55 Schmidt Newtonian that was having problems with power issues. We looked at Saturn, Jupiter and M42. However observing was frequently interrupted by clouds.

## Last Month's Crossword Solutions

### ACROSS:

3. Lepus
5. Aldebaran
7. Sagittarius
9. Pollux
11. Cepheus
12. Lyra

### DOWN:

1. Canis Major
2. Regulus
4. Ursa Major
6. Antares
8. Perseus
10. Deneb

## For Sale (all in like new condition)

Meade LX 200 8" SC Telescope with Telrad and spotter scope.

Televue 16mm Nagler type II eyepiece

Televue 22mm Panoptic eyepiece

Meade Series 4000 26mm eyepiece

Meade Series 4000 9mm Illuminated Reticle eyepiece

Parks GS-5 15mm eyepiece

Meade 4000 #140 Achromatic Barlow 1.25"

Meade Off axis guider

Meade 4000 f6.3 Focal Reducer / Flattenner

Meade Variable Proj. Tele-Extender

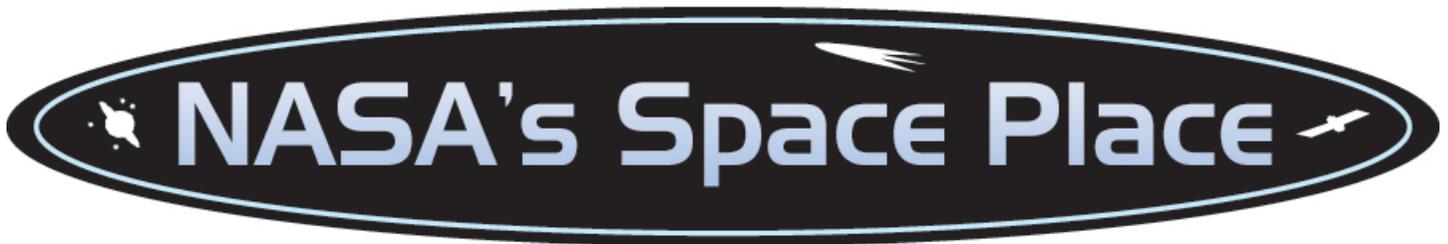
Parks ALP SC rear cell Broadband filter

Lumicon UHC 1.25" filter

Lumicon Oxigen III 1.25" filter

All for \$3000.00, Please serious inquiries only.

(909) 924-6652



## Deep Space Network 2-for-1 Sale!

By Patrick L. Barry

Call it a "buy one, get one free" sale for astronomers: Build a network of radio dishes for communicating with solar-system probes, get a world-class radio telescope with a resolution nearly as good as a telescope the size of Earth!

That's the incidental bonus that NASA's Deep Space Network (DSN) offers the astronomy community. Designed to maintain contact with distant spacecraft in spite of the Earth's rotation, the large, widely spaced dishes of the DSN are ideal for performing a form of radio astronomy called "very long baseline interferometry" (VLBI).

VLBI produces very high resolution images of the cosmos by combining the output from two or more telescopes. The result is like having a giant "virtual" telescope as large as the distance between the real dishes! Since bigger telescopes can produce higher resolution images than smaller ones, astronomers need to use dishes that are as far apart as possible.



That need dovetails nicely with the DSN's design. To maintain continuous contact with deep space missions, the DSN has tracking stations placed in California, Spain, and Australia. These locations are roughly equally spaced around the Earth, each about 120 degrees of longitude from the others-that way at least one dish can always communicate with a probe regardless of Earth's rotation. That also means, though, that the straight-line distance between any two of the stations is roughly 85 percent of Earth's diameter-or about 6,700 miles. That's almost as far apart as land-based telescopes can be.

"We often collaborate with other VLBI groups around the world, combining our dishes with theirs to produce even better images," says Michael J. Klein, manager of the DSN Science Office at NASA's Jet Propulsion Laboratory. "Since our 70-meter dish in Canberra, Australia, is the largest dish in the southern hemisphere, adding that dish in particular makes a huge difference in the quality of a VLBI observation."

Even though only about 1 percent of the DSN's schedule is typically spared from probe-tracking duty and scheduled for radio astronomy, it manages to make some important contributions to radio astronomy. For example, the DSN is currently helping image the expanding remnant of supernova 1987A, and Dr. Lincoln Greenhill of the Smithsonian Astrophysical Observatory is using the DSN dishes to explore a new way to measure the distances and velocities of galaxies.

And all this comes as a "bonus" from the dishes of the DSN.

To introduce kids to multi-wavelength astronomy, NASA's website for kids, The Space Place, has just added the interactive demo, "Cosmic Colors," at [spaceplace.nasa.gov/cosmic](http://spaceplace.nasa.gov/cosmic).

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

# ASTROSPACE UPDATE

March 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.

**Mars** - Both Mars rovers are roving (what else would they do?) and taking amazing pictures, including microscopic ones, and taking spectra of rocks and soil, using their X-ray and gamma-ray spectrometers. The first rock examined at Gusev Crater was ordinary basaltic lava. Olivine, a mineral that would weather away if there were any recent water, was found in considerable quantity in the soil there. The infrared instrument has been used to measure the air temperature at various heights, which detected considerable rising thermal activity. Hematite, a mineral that usually forms in the presence of water, was found in the soil of Meridiani Planum. Less expected were the tiny rock spheres found in the soil there, which may be the remnants of past volcanic activity throwing tiny bits of molten splatter into the air. Rover Opportunity landed in a small impact crater, and spent some time examining the ledge of bedrock exposed when the crater was formed. It is hoped in future weeks that both rovers can reach nearby much larger craters for deeper samples. Both rovers have recovered from problems: one was overloaded computer memory, the other a motor too cold to aim the antenna at Earth.

Meanwhile the European Mars mission, **Mars Express**, is in its mapping orbit and returning spectacular images. Its lander, Beagle 2, has been declared lost, since all efforts to raise a signal from it have failed.

**Hubble Space Telescope (HST)** - has found hot gas that escaped from the supergiant star Betelgeuse, far beyond the cooler gas of its huge atmosphere. This is the farthest that escaping hot gas has been observed from any star, a distance 5 times that of Neptune from our Sun. It appears that a shock wave is pushing this hot gas through the colder regions without heating them much. Other astronomers are working on oscillation explanations for the phenomenon. While this gas was escaping one side of the star, on the other side of the star gas was falling in. Astronomers compared this to a cosmic lava lamp. More observations are planned on other nearby supergiant stars.

HST has continued observing the star (HD209458) that has a gas giant planet that passes in front of it. As reported here last April, the planet is so close to its star that it is overheating and losing its mostly hydrogen atmosphere. The further studies have found carbon and oxygen in its atmosphere. These elements were also found to be escaping from the planet, like the hydrogen. Elemental oxygen (as opposed to being in compounds like water or carbon dioxide) is rare in planetary atmospheres, other than the Earth where life produces the oxygen. It is thought that the extreme heat at this exoplanet (a planet outside our Solar system) is breaking up compounds that contained oxygen to produce the element. It is predicted that eventually this, and similar planets, will lose its entire atmosphere, leaving a solid core. Astronomers have already come up with a name for a solid core remaining from an evaporated gas giant, a chthonian planet. I hope they don't find one, because I can't pronounce it.

**The presidential decision to send astronauts to the Moon and possibly Mars** is planned to be financed principally by removing major amounts of funding from the Shuttle and Space Station programs. A side effect of this is that the definitely planned Shuttle mission to repair and upgrade instruments on the HST has been cancelled, as well as any chance of the tentatively planned similar mission a few years later. The effect of this is that the HST will likely become unusable in 2007 or 2008. The HST replacement, the James Webb Space Telescope, is not scheduled to be launched until 2011, and is not completely a replacement anyway, lacking ultraviolet and other capabilities of HST. HST has been the most productive instrument of science ever built. I agree with the rising tide of scientists asking for a reconsideration of the cancellation of Shuttle missions to service HST.

**Brown dwarfs** - Two of the theories how brown dwarf stars form are 1) that they are just stars that ran out of material before they had collected enough to support nuclear fusion (the heat source of true stars), and 2) that they form as part of multiple star systems, and are gravitationally thrown out of the forming cloud by their companion stars before they finished forming. To distinguish between these theories, astronomers used the 8-meter VLT Telescope in Chile and the 10-meter Keck Telescope in Hawaii to look for accretion disks surrounding young brown dwarf stars (such disks are usually found about young true stars), because those disks should have been torn apart by events of the second theory. The majority of the brown dwarfs had perceptible disks, about the same as young true stars. So we can discard theory 2. In one case a jet was

found spewing material out from a brown dwarf, similar to those seen about some recently formed true stars. So the forming of brown dwarfs and stars seem to be quite similar. This implies brown dwarfs could have planets, asteroids, and comets, since they appear to form within those disks about young stars.

**Pleiades** - Astronomers have measured the distance to Atlas, one of the stars in the Pleiades star cluster, more accurately than ever before. The result is 440 light-years, give or take 6. This was important for 2 reasons: 1) the two claimed most accurate measures of the distance of the Pleiades disagreed, and 2) the distance to this cluster is one of the bases of the entire cosmic distance scale. The result was based on a decade of interferometer measurements made at Mt. Wilson and Palomar on Atlas and the companion star in orbit about it. The new result agrees with the distance calculations based on theoretical models of the lives of stars, and disagreed with the measurement by the Hipparcos satellite.

**XMM-Newton (X-ray satellite)** - has imaged a pair of concentric rings glowing in X-rays, expanding over a period of just hours, caused by gamma ray burst hitting 2 slabs of denser dust in between the source and us. It demonstrated the known superluminal illusion, which is where a distant object (the rings) appear to be moving faster than the speed of light, in this case 1000 times faster. It is an illusion caused by the geometry of the situation, when light from events at different times and places arrives at Earth all about the same time. This is the first time this has been seen in X-rays, though it has been seen occasionally in visible light. It is an important discovery because it allows us to find the location of previously unseen clouds of dust (they were both relatively nearby in the Milky Way — 2900 and 4500 light-years away — one a part of the Gum Nebula). Also, the peak brightness in X-rays of the burst was calculated from the rings, even though the burst had occurred hours earlier and gone unobserved in X-rays (it had been observed only in gamma rays).

**Supernova progenitor** - The most detailed observations ever, including spectra, of a star before it exploded as a supernova were found in archived data from the Gemini Telescope and HST. The supernova was found by amateur Robert Evans of Australia in nearby galaxy M74. Results are that it was a normal aging red supergiant star, with a mass about 10 times the Sun, and a diameter about 500 times greater. Such stars have long been predicted to be the kind that become Type II supernovas. Only 2 previous stars have ever been found to have been imaged before they became supernovas, and they were a blue supergiant and an interacting binary pair, not a red supergiant that theory said should be the common kind.

**Chandra (X-ray observatory)** - Theory says that when a star swells up into its red giant phase, it may get so large as to engulf a companion star in orbit about it. There was some controversy over whether such a companion star would survive after orbiting within the outer parts of the red giant. Chandra took a spectrum of V471 Tauri, known to be a white dwarf in close orbit with an ordinary sun-like star. White dwarfs have already been through their red giant phase. The sun-like star of the pair was found to have a spectrum contaminated by the carbon-poor gas that a red giant has, showing that it had survived being engulfed within the red giant. The spectrum showed that about 10% of the sun-like star is material that it had accumulated from the red giant's atmosphere.

**Young star** - Astronomers have discovered a young star in the Rosette Nebula, about 1500 light-years away, that is ejecting a complex jet of material riddled with knots and bow shocks. Normally stars this young are engulfed in the dense molecular clouds from which stars form, and are not seen in visible light (but sometimes are in infrared). This star has been stripped of its opaque surroundings by the intense ultraviolet radiation produced by nearby massive stars that formed earlier from the same cloud. This illustrates how stars form from a cloud nearly simultaneously, since the matter for formation is blown away soon after the most massive stars light up. Since such young stars are rarely seen in visible light, this example is a valuable discovery that will be studied in detail. It appears that this star had a second jet, but only bow shocks are seen where it should have been. It is theorized that the second jet starved when material to feed it was blown away by the more massive stars. The effect on the young star is that its formation is arrested early, resulting in a smaller star than would normally form from such a cloud.

**Hydrogen clouds** - The Byrd radio telescope at Green Bank, WV, has detected 20 clouds of neutral hydrogen swarming about the Andromeda Galaxy. Theorists had long predicted that clouds of hydrogen that had not yet been involved in any star forming ought to be slowly captured by the major galaxies, because most of those galaxies have a few recently-formed stars made of pristine gas; that is, those few show the same low metal content as stars and galaxies did in the early history of the universe, while being surrounded by high-metal-content stars typical of our time. The higher concentration of metals (really, all elements heavier than helium) is known to be a result of stars creating the heavier elements through nuclear fusion, then recycling them to the next generation of stars through stellar winds, planetary nebulas, and supernova explosions. The problem is, such clouds falling into galaxies give off really weak radio signals, so had remained undetected, except for a few clouds near our own Milky Way. The Byrd telescope is the largest and most sensitive

(continued from page 9)

steerable radio telescope, so was able to find these clouds where others had failed. This finding nicely supports the theory.

**Gravitational lenses** - Einstein's General Relativity says that light is bent as it travels near great masses, which causes a bright object (quasar or galaxy) behind a heavy object (such as a galaxy cluster) to be seen as if through a lens that makes multiple magnified images of the object behind. Theory predicts that we should see 3 or 5 images in the common geometric cases, with the center image being dimmer than the outer ones. But in practice, almost all of the scores of known gravitational lenses produce 2 or 4 images, as the center one is too dim or blocked by the massive object in front. For the first time the central image in a gravitational lens has been found, by observing one of the known lensed objects (a quasar in Ophiuchus) with a radio telescope. The key was to take a spectrum of the faint smudge suspected to be the central image to prove it matched the 2 known gravitationally lensed images. This observation is a breakthrough, not just because it verifies the lensing theory, but because analysis of the central image gives much more information about the mass and structure of the massive object causing the lensing. In this case it was found to be the central black hole of a galaxy, with nearly 200 million times the mass of the Sun. The detail of information obtained this way does not depend at all on the distance of the lensing (massive) object, but only on the brightness of the object behind it.

**Possible life in Martian meteorite** - Just when scientists had cast doubt on almost all the evidence that was promoted as fossils of microscopic life contained in one of the meteorites known to have come from Mars, some scientists have thrown new evidence into the arena. Microscopic life found in mud in Australia has been shown in electron microscope images to have nearly identical structure to the objects embedded in the Martian meteorite, including the chains of magnetic crystals. The debate will continue.

**Rosetta (comet mission)** - is set to launch from French Guiana by the time you read this, to begin its 10-year journey to Comet Churyumov-Gerasimenko. The spacecraft has a lander portion, which has just been named Philae. The significance is that inscriptions on the Philae obelisk were used to help understand the Rosetta stone, which allowed scholars in 1822 to decipher ancient Egyptian hieroglyphics. The Rosetta/Philae spacecraft is hoped to allow us to decipher the history of comets. A 15-year-old student in Italy suggested Philae. A harpoon will be used to anchor Philae to the comet nucleus, as gravity is expected to be insufficient to keep it on the surface.

### **Instant AstroSpace Updates:**

Astronomers using radiotelescopes to study **Circinus X-1**, a known neutron star with bright X-ray emission, have found that it is emitting a jet of matter at nearly the speed of light. Such energetic jets have been seen before only near black holes.

A computer study simulating **collisions of black holes** shows that the forces involved, particularly from gravitational waves, can kick the resulting merged black hole completely out of its galaxy. This favors the theory of growing massive black holes by accumulating gas and dust, not by merging black holes. If a black hole is found off-center in a recently collided galaxy, it will support the conclusion of this study.

**A crystallized carbon star** has been discovered in Centaurus, about 50 light-years away, with a mass a bit larger than the Sun, but its size just barely larger than the Moon, making it extremely dense. The proof that it was crystallized was in the way the surface pulsates, similarly to how seismology tells us about the interior of the Earth. It can in effect be considered a cosmic diamond.

One of the about 30 volunteers, mostly amateur astronomers, who use the internet to help the **Spacewatch** program examine their images for asteroids, found one that approached within 1.2 million miles of Earth on January 23, a fairly close approach.

Construction is complete on the first outlying telescope (of 4) for the **VLT Interferometer**, a smaller telescope (only 1.8 meters) to be used in association with the four 8-meter telescopes. The outlying telescopes move on tracks, along with their mounts, enclosures, cooling, electronics, hydraulics and the transporter that moves it (33 tons total).

**A group in Britain has begun designing telescopes** optimized to observe changing objects, such as X-ray binaries, black hole accretion disks, flare stars, gamma-ray bursts, near-Earth asteroids, gravitational lensing events and supernovas. The keys to the new designs are instruments sensitive to changes in milliseconds, computer control, networking of telescopes around the world, telescopes dedicated to surveying, and fields of view that cover substantial portions of the sky.



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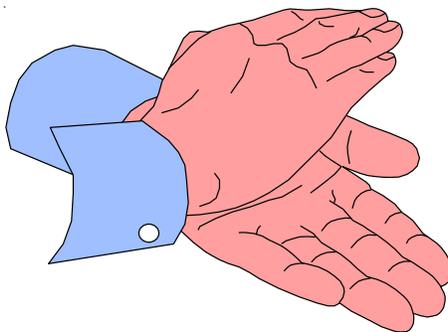
For details on the itinerary, westerners traveling in Iran, making reservations and more on the country and its people from first-hand accounts, visit the web site at [www.vtransit.com](http://www.vtransit.com) or email Mike Simmons at [mike@vtransit.com](mailto:mike@vtransit.com).

Join Mike Simmons for a slide show on Astronomy in Iran, based on his travels around the country, at the OCA meeting on April 16.

**MEMBERS ASSISTING THE LIBRARY**

The OCA library would like to thank our members for their generous contributions.

- Mike Lee donated three books at February's meeting
- Karl Kuhn gave the library a bag of books at the last meeting



Some books will be added into the library and some will be sold to bring in funds for new books. Thanks to everyone for their efforts!

**FOR SALE**

Dark sky site: 5 acres, 3,550' elev (never snowed in), darker than Anza; w. 1,100 sq ft home: 3b+2ba, only 3 yrs old, tile & wood-laminate flooring, freshly painted interior, extra pad for observatory, etc. All utilities, very safe community. Zoned for adding 2<sup>nd</sup> home, horses, etc. 1/2 hr. south of Lake Isabella, 2 1/2 hrs N. of LA. \$129,000. Pictures available. [Jay.Glowacki@aero.org](mailto:Jay.Glowacki@aero.org), eve 310-831-4199.

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