SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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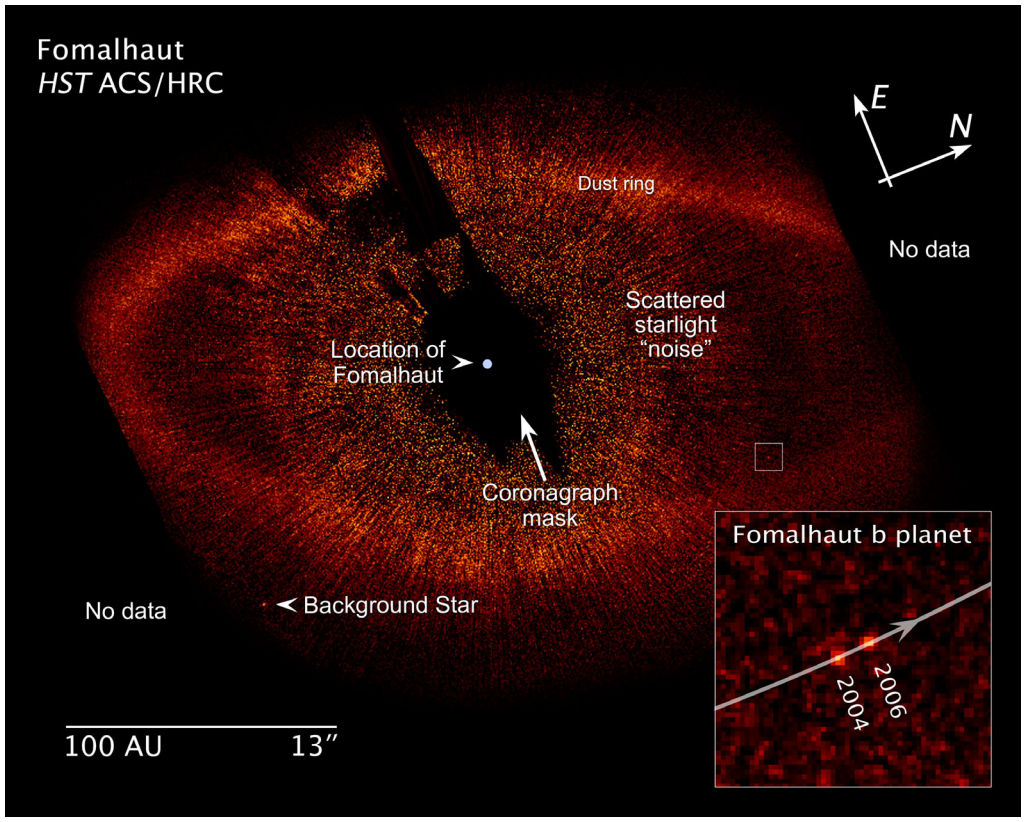
DON'T FORGET TO VOTE! BOARD ELECTION IN JANUARY!



On November 13, NASA released this first-ever direct image of a planet orbiting another star. The image of Fomalhaut's planetary system was captured in 2004 by the Hubble Space Telescope and confirmed in a subsequent image in 2006. Planetary observing just got a bit more interesting... (credit: NASA, ESA, P. Kalas, J. Graham, E. Chiang, and E. Kite (University of California, Berkeley), M. Clampin (NASA Goddard Space Flight Center, Greenbelt, Md.), M. Fitzgerald (Lawrence Livermore National Laboratory, Livermore, Calif.), and K. Stapelfeldt and J. Krist (NASA Jet Propulsion Laboratory, Pasadena, Calif.))

OCA CLUB MEETING

The free and open club meeting will be held Friday, December 12th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month is our annual Members' Night, so be sure to hear what your fellow OCA members have been up to!

NEXT MEETING: January 9th

STAR PARTIES

The Black Star Canyon site will be open on December 20th. The Anza site will be open on December 27th. 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, December 5th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.

GOTO SIG: TBA (contact coordinator for details)

Astro-Imagers SIG: Dec. 16th, Jan. 20th

EOA SIG: Dec. 24th, Jan. 28th

Astrophysics SIG: Dec. 19th, Jan. 16th

Dark Sky Group: TBA (contact coordinator for details)

President's Message
By Barbara Toy

It's hard to believe another year is winding to a close. This time last year, we were all concerned about gas prices, and there were some segments of the economy that were not doing too well, but I recall the overall mood as reasonably optimistic. I don't think even those who wondered how long the overheated housing market could continue or who had concerns about the extent of subprime lending foresaw the collapse we've witnessed in the last few months, or had any idea how far-reaching the effects might be. Right now, it's looking like 2009 will be a difficult year for many of us. In addition to our economic woes, I'm sure many of you have been touched directly by the wars in Afghanistan and Iraq. Please let anyone you know who is serving in the military, has served in the military in the past, or has family serving in the military that we truly appreciate their many sacrifices – and that this is *not* just rhetoric by politicians.

Fortunately, even when things are crazy on a human scale here on earth, the stars continue in their regular courses, assuring us of continued pleasure in the various celestial treasures they mark and giving us a sense of dependability that may be lacking in other parts of our lives right now. I hope that catching some of the beauty that's out there, whether through your eyes, camera or imagination, can give some relief to your spirit when times are rough. To that end, though we certainly need rain, I profoundly hope that we will have a lot of excellent nights for viewing this coming year!

OCA Elections – It's Time to Vote!

You should receive a copy of the ballot for the OCA Board election with this issue of the Sirius Astronomer, or you can download it from the website. Please vote for your candidates and send your ballot to Bob Evans right away, so you don't forget – you have until the January general meeting, but why wait that long?

You might notice that, while we do have a candidate for every position, we don't have any extra candidates this year. I like to think that is in recognition of the high caliber of the people we have on the current board – I reserve comment when it comes to the presidency on the grounds that it might tend to incriminate me, but as to the other officers and the past board members who are running again this year, I can state emphatically and without reservation that they are a wonderful group of people to work with, talented, with diverse interests and skills, and all of them have a very strong interest in working for the best interests of the club as a whole. I really look forward to working with them again next year. We expect that Reza AmirArjomand will be joining the Board as a new member – he's our new website editor, and has done a great job working with Hassi Norlen, our past editor, to make the transition a smooth one, and it's really great that he is willing to run for the Board as well.

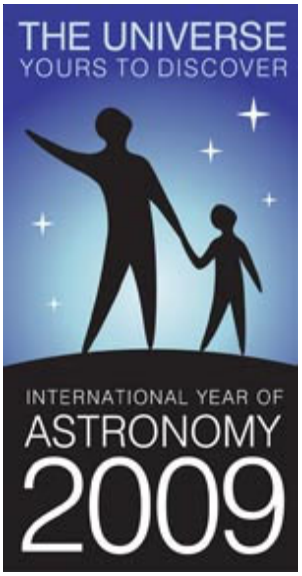
Unfortunately, we have one member of the 2008 Board who will not be returning in 2009. Steve Condrey, is the current editor of the Sirius Astronomer and he and his wife, Sandy, have also has taken on the job of Anza House Coordinator. Besides working full time and becoming the father of a charming and highly energetic young son, Steve has decided to go back to school to work on his Masters degree – it's not at all surprising that he felt that he just wouldn't have the time to continue with his board position in addition to all of his other responsibilities! We'll certainly miss him on the Board next year, but look forward to seeing him at Anza and at any meetings he's able to attend, as well as admiring his work in putting the Sirius Astronomer together each month!

As a last note, though you may not think it's important to vote this year because there's only one candidate for each spot on the Board, please vote anyway – if nobody votes, nobody will win the election. There may also be issues if someone is written in as a candidate – if you really want certain candidates to win, but don't vote, there's a possibility they could lose to a write-in candidate. And knowing that ballots were cast by the membership helps us feel that you do care who is running the club and ensures that those who get your votes know that they have your support.

2009 — The International Year of Astronomy

As you may have heard, 2009 has been designated as the International Year of Astronomy (IYA2009 – ours is the age of abbreviations), celebrating astronomy at all levels, including both professional and amateur astronomy. As stated on the IYA2009 website, this "is a global effort initiated by the International Astronomical Union and UNESCO to help the citizens of the world rediscover their place in the Universe through the day- and night-time sky, and thereby engage a personal sense of wonder and discovery." Activities are planned on the international, national and local levels, and (at least, per the website) center around eleven "Cornerstone Projects."

You can find out all the details on these projects and other information on IYA2009 by checking its website, http://www.astronomy2009.org/. They expect to update the website regularly with more information about activities planned all over



the world as part of IYA2009, so it's a good idea to check back regularly for activities and information that particularly interest you.The Cornerstone Projects are listed on the website as: 100 Hours of Astronomy (see below), The Galileoscope (plans to distribute thousands of easily-assembled telescopes similar in size to Galileo's original scope to help introduce people to the pleasures of the night sky), Cosmic Diary (a blog of professional astronomers around the world discussing their lives and work as astronomers, which is expected to provide a basis for future documentaries, among other uses), The Portal to the Universe (envisioned as a "one stop" portal that would include a semi-automatically updating index and aggregator of all types of information related to or useful in astronomy as well as a social networking site for the astronomically-inclined), She is an Astronomer (to help reduce gender biases in astronomy and other sciences, and to encourage more women to go into astronomy and other sciences as a career), Dark Skies Awareness (an area of particular interest to us), Astro & World Heritage ("the main objective [of this program] is to establish a link between science and culture…"; apparently with particular interest in identifying and preserving properties related to astronomy around the world), Galileo Teacher Training Programme (to help teachers, among other things, find and use resources available through the Internet and elsewhere so they can teach astronomy more effectively), Universe Awareness ("using the sky and children's natural fascination with it as common ground, UNAWE creates an international awareness of our place in the Universe and our place on Earth," with an emphasis on teaching tolerance and exposing "very young children in under-privileged environments to the scale and beauty of the Universe"), From Earth to the Universe (which "endeavours to bring wonderful astronomical images [and the science behind them] to a wider audience in non-traditional venues," such as public parks, metro stations, art centres, etc., hoping to "engage individuals who might normally ignore or even dislike astronomy, or science in general"), and Developing Astronomy Globally (to help develop an astronomical infrastructure in areas of the world where this is missing, including the professional and amateur levels as well as public education). If you happen to be reading this on-line, you should be able to get to the pages for each of these projects by clicking or control-left-clicking on the title of each project.

The formal project descriptions for many of these Cornerstone Projects are in grandiose or obscure terms that make it hard to come to grips with what that specific project is really about. It's worth delving deeper, though – all of these projects have a real-world side that should produce some very interesting results if they are implemented. If any of these concepts resonates with you, the Year of Astronomy is a great time to get directly involved with it! These activities all have long-term components, so that whatever gains are made during this celebration will be a foundation for further endeavors and won't be lost when the year ends; your involvement now could lead to other interesting activities in the future.

The "100 Hours of Astronomy" project has attracted the interest of some of our members already, particularly our vice president, Craig Bobchin. The goal is to have "sidewalk astronomy" and other outreach events going on continually somewhere in the world for 100 hours, along with such things as webcasts from ongoing public events and research observatories around the world, and other related activities. As night falls in a sweeping circuit of the globe from April 2 through 5, 2009, these activities aimed at introducing thousands of people to the pleasures of the night sky will be taken up around the globe, demonstrating the interest we share in the sky above us, regardless of where in the world we live.

Mike Simmons, who you may remember from his talks at our general meetings and in connection with his organization, Astronomers Without Borders, is one of the co-chairs of this project, which certainly is in keeping with the philosophy of his organization. Scott Roberts, who many of you know from his years of work for Meade Instruments, is also a member of the task force organizing the 100 Hours of Astronomy project, so there are a lot of local connections with this project already. It has its own website at http://www.100hoursofastronomy.org/, and is scheduled to take place "when the Moon goes from first quarter to gibbous, good phases for early evening observing" (to quote the website. As an FYI for people who haven't done public outreaches, we generally consider the moon a friend, not an obstacle, particularly around first quarter when it's up in the evening sky and the terminator helps give definition to the surface, as people love to look at it ["Oooooh – it's so bright! Look, there are mountains…"], and it's bright enough to cut through a lot of clouds or haze that block other objects).

I agree with Craig that this an IYA2009 project that our club should be actively involved in – in addition to having the experience of being part of this worldwide effort, it should be a lot of fun! If you're interested in helping to organize specific outreach activities for our club for that event, please contact Craig at ETX_Astro_Boy@sbcglobal.net.

Doug Millar, who is coordinating events for another club he is involved in for IYA2009, has generously volunteered to help coordinate activities for our club, as well, which, among other things, may involve letting us know about events his other club is working on that people in our club might be interested in as well. If you would like to check out possibilities for working with him on any of these projects, please let me know and I'll be happy to put you in contact with him.

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AstroSpace Update

December 2008
Gathered by Don Lynn from NASA and other sources

Phoenix (Mars lander) mission was officially declared over when spacecraft had not responded for a week, apparently succumbing to the lack of sunlight for its solar panels and to extreme cold. It had gone into safe mode due to low power a few days earlier, but had been revived. End of operation was expected as Mars drifts into fall, since the spacecraft was designed to work only during the 24-hour sunlight (actually 24.6-hour on Mars) that occurs above the arctic circle in summer. However the end came more suddenly than expected, since a dust storm and clouds formed at the end of October, reducing the sunlight available and dropping the temperature at night to below minus 140°F. November 2 was the last radio contact, ending the mission after 161 days. It was designed to last 3 months, so far exceeded design. Spacecraft controllers had planned sequentially shutting down instruments and heaters to prolong the life of a few instruments that don't need much power, but only half the plan had been executed by the end. The mission was a fabulous success, having dug to the water ice lying inches below the surface, analyzed 6 soil samples in its analyzer ovens and several additional samples in the wet chemistry analyzers, examined soil in optical and electronic microscopes, detected snow falling, monitored the weather, and returned more than 25,000 pictures. The orbiting Mars spacecraft (MRO and Odyssey) will continue to listen for any further radio messages from Phoenix, including when next summer arrives, though predictions are that the craft has suffered permanent damage from the cold.

Mars methane – In 2003 methane was discovered in small amounts in the atmosphere of Mars. It was calculated that methane would break down in a few hundred years, so something recently (probably continuously) emitted methane. The source has remained a mystery. Further observations over the last 4 years showed the gas is concentrated in certain areas, and the concentrated areas sometimes disappear in a year or so. Since the gas can dissipate much faster than the original calculations, it means it is being emitted much faster than thought. And it is being emitted only in certain areas, those where concentrations are found. One of the concentration areas is Nili Fossae, an eroded fissure, which happens to be a candidate for the landing spot for the Mars Science Laboratory, to be launched next year. Some scientists believe that the source of the methane is underground bacteria. A recent paper has proposed another source: If methane was rich in the atmosphere in the distant past, then methane could have been trapped chemically in rocks that formed then, and current conditions are causing those rocks to give up the gas. Clathrate rocks can trap gas, such as methane, and give it off later due to pressure or other changes. The existence of hematite deposits on the surface (found by the rovers and other spacecraft) is also an indication that methane was once rich in the atmosphere, since that would have promoted formation of hematite.

Spirit (Mars rover) experienced the lowest power levels seen by either rover when a vast dust storm cut off most of the daylight that powers the rover through its solar panels. Spacecraft controllers commanded the rover to go into hibernation for 4 days, shutting off everything possible. The rover reported in after the hibernation that it had survived, though the batteries were at very low charge levels.

Mars Reconnaissance Orbiter (MRO) has observed a new category of minerals over large regions of Mars that suggests that liquid water remained on the planet's surface a billion years later than previous evidence indicated. The mineral is opal and it occurs in areas that are as young as 2 billion years old. Sulfates that formed in liquid water were previously found in regions about 3 billion years old. The opal probably formed from liquid water altering materials created by volcanic activity or meteorite impact. The longer liquid water remained on the surface of Mars, the more time was available for life to have possibly formed there.

MRO includes an instrument called the Mars Climate Sounder, which measures conditions in the entire atmosphere. MRO scientists have just started giving global Mars weather reports from the Climate Sounder data. One of the surprises is that the upper atmosphere over the pole during winter is 15-30° warmer than expected. It is thought that circulation of air from the equator is causing the warmth.

Messenger (Mercury mission) scientists released more data from the October flyby of Mercury. This was the first flyby through this hemisphere of the planet's magnetic field, and it was found to be highly symmetric with the previously measured side. Magnesium was discovered in Mercury's extremely thin atmosphere, sometimes called an exosphere. The concentrations in that exosphere of sodium, calcium and magnesium were found to vary about the planet and may differ from each other. Mercury has a larger fraction of ancient heavily cratered terrain than either the Moon or Mars. About 95% of Mercury has now been imaged.

Cassini (Saturn mission) preliminary results were released from the 2 October flybys of Enceladus. Images of the Tiger Stripes showed where geyser activity is taking place within the 1000-foot deep canyons that form the Stripes. Cassini also discovered a new kind of aurora at Saturn's north pole. Previously seen aurora, both at Saturn and other planets, occur in a ring around the magnetic pole, but this new aurora covers the entire area north of 82 degrees latitude, and changes or even disappears faster than ordinary aurora.

Cassini made images and movies of Saturn's north pole, showing clouds circling in a **huge cyclone** rotating at 325 mph. The cyclone is surrounded by the hexagon, a shape in clouds that doesn't move even though it surrounds the fast winds. The Saturn cyclone strongly resembles ones on Earth, even though they are powered completely differently (no oceans on Saturn) and it doesn't budge from the pole, while Earthly ones move across the oceans whose heat powers the storms. Thunderstorms were found within the Saturn cyclone, but the thunderclouds on Saturn are probably made of ammonium hydrosulfide instead of water. These are miles below the ammonia clouds, which are the ones seen on Saturn in visible light.

Eris, the dwarf planet and plutoid that is larger than Pluto, has changed its spectrum some time in the last 2 years, showing increased frozen nitrogen and diluted methane. Since Eris is spending decades at essentially the same distance from the Sun, near the farthest point in its 557-year orbit, it shouldn't be changing temperature enough to freeze any additional nitrogen. Further observations will be made to rule out that there might be nitrogen-rich spots, and the latest observation just happened to hit that point in the dwarf planet's rotation. Another theory proposed is that Eris is cryovolcanic, that is, spewing out heated (but still very cold) liquid, such as nitrogen in volcano-like activity. Though Neptune's moon Triton is known to do this, Eris should be much colder, perhaps too cold for nitrogen cryovolcanic activity.

Another Solar System – It has been known for a few years that the nearby (10.5 light-years away) star Epsilon Eridani has a Kuiper Belt of icy asteroids, similar to that surrounding our Solar System, but containing 100 times the material, and has at least one planet. Now the star has been found to have 2 asteroid belts, the inner one about the same place as our asteroid belt. The outer one is about where the planet Uranus is in our system and holds about 20 times the material in our asteroid belt. The star is slightly smaller and cooler than our Sun, and is much younger, only about 850 million years old. This may be what our Solar System looked like when it was that young. Each of the 3 belts probably has a planet that helped the belt to form. The known planet probably tends the inner asteroid belt. Initial reports were that this planet had a highly elliptical orbit, but that would be very unlikely, since that would have dissipated the inner asteroid belt. Science fiction fans may recognize Epsilon Eridani as being home to Star Trek's Spock.

Spitzer (infrared space telescope) – has made observations indicating young stars may be creating the raw material for planets. What was seen was crystals of cristobalite and tridymite, minerals similar to quartz, but which are formed by flash heating, that is, reaching high temperatures quickly. These minerals have been found in a comet, volcanic lava flows on Earth, and some meteorites. But these were found in the planet-forming disks of 5 young stars about 400 light-years away, the first time these have been found in such disks. That environment is too cold to have formed the minerals unless a shock wave passes through the disk. Such shock waves could form when clouds of gas swirling in the disk collide. An alternative theory is that formation of giant planets forms shock waves. It is known that crystallized dust grains stick together upon colliding to form larger particles, a necessary step in forming planets, while uncrystallized dust does not stick well.

Galex (ultraviolet space telescope) has imaged the lenticular galaxy NGC 404, sometimes known as the ghost of Mirach, since that star lies almost in front of the faint galaxy. Lenticular galaxies are disk-shaped with no spiral arms and little ongoing star formation. But in ultraviolet light, a clumpy ring of bright newly formed stars appeared. The galaxy was first seen by Galex in its all-sky survey, and there appeared to be a hint of the ring structure. Longer exposures were taken by Galex, which clearly showed new star formation. The ring is located exactly where previous radiotelescope observations showed a ring of hydrogen gas. The radio astronomers believe that the gas ring was formed by a collision with a small neighboring galaxy 900 million years ago. It appears that when the ring of gas settled into the plane of the galaxy (by gravity), stars began forming out of the gas. So it appears that old galaxies thought to be finished forming stars can be rejuvenated by a collision.

Fermi (gamma-ray space telescope) has discovered a pulsar that pulses only in gamma rays, no other types of light. It is the first ever found with this property. Of the 1800 known pulsars, most have been discovered in radio light. Many also show up in visible light, X-rays or gamma rays. The newly discovered pulsar pulses about 3 times per second (that would be the rotation speed, since rotation causes the pulses), formed about 10,000 years ago in a supernova explosion, and lies about 4600 light-years away in Cepheus.

Gamma-ray bursts – The directions of weaker gamma-ray bursts appear to correlate with the direction of nearby clusters of galaxies. Some astronomers believe that means a type of gamma-ray burst exists that is intrinsically less powerful than normal bursts, and thus we see them only when they are much closer than normal bursts. There is much speculation as to what could cause such bursts. The normal bursts of longer duration (over 2 seconds) are almost certainly caused by supernovas of extremely large stars. Short bursts are probably caused by collisions of neutron stars with other objects. Weaker bursts might be caused by white dwarf star collisions.

Quasar – By sheer chance a quasar was imaged and its spectrum taken in 2002 and 2006 for separate studies, and a student happened to notice that the spectrum had changed. The newer observation showed a huge flow of gas expelled from the quasar at the tremendous speed of 58 million mph. This quasar is so distant that the light we are now seeing left there 10.3 billion years ago. The black hole at the center of a galaxy is invisible, but the matter falling into it glows brightly, making the phenomenon that we have named quasar. Some of the material falling in is thrown out, apparently along magnetic field lines. This is the first time that the expulsion process has been seen to start. It was surprising that it could occur in as little as the 4 years between the observations.

Black holes – The flickering of material falling into a black hole has been observed in visible light and X-rays simultaneously. Theory had it that the material was heated until it produced X-rays, that in turn caused nearby material to glow in visible light. But the visible light dimmed then brightened before the X-rays responded. It appears that the flickering in both visible light and X-rays have a single cause, probably something involving a magnetic field.

Hubble Space Telescope (HST) – After the failure of the data controller on board HST that was reported here last month, a lengthy (about a month) process of failure analysis, planning and recovery resulted in the telescope resuming observations October 30. The process was not without some setbacks while turning on backup modules that had never been used. As reported before, the Shuttle mission to repair previously worn out and failing parts was postponed (from its planned October launch) in order to add

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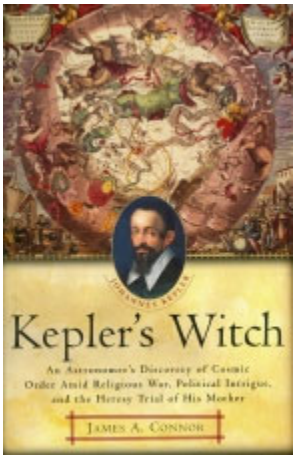
Book Review: *Kepler's Witch* by James A. Connor

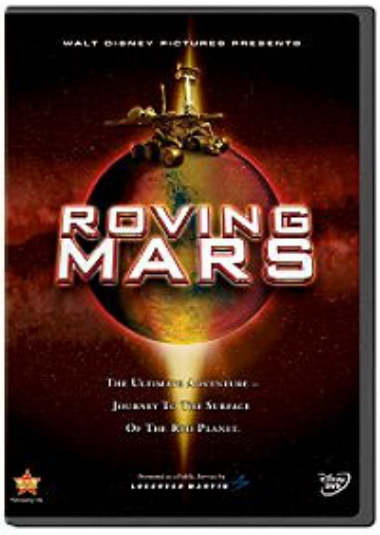


This is a really wonderful book! Most of you are probably familiar with the outline of Kepler's astronomical genius – he worked with Tycho Brahe and used Tycho's observations to make sense of the motions of planets. (Kepler was the first fellow to recognize that their orbits were ellipses – not circular orbits modulated by circular epicycles), he corresponded with Galileo and with him endorsed the Copernican concept of a heliocentric solar system. This book is designed to put flesh on those dry bones. It provides the "life and times" story of a remarkable man who lived, strived, and struggled in troubled times. Kepler's astronomy is only a backdrop to the tale: there is very little detail about his scientific work. Instead, the author transports you into an alien culture: that of 17th century Europe. The worldview and social organization of Kepler's time is so different from ours, that it is indeed a journey to another world to share his life. He practiced both astronomy and astrology, but had an enlightened concept of the latter – the stars may influence a person's personality and predilections, but they don't enable the astrologer to foretell specific events. He had emperors and generals as patrons, but often struggled to support his family. It was one thing to be granted a salary by the ruler, but quite another thing to actually collect the money from the bureaucracy! He was a multi-dimensional man. Kepler the astronomer was a deep and innovative thinker, an almost-modern scientist. Kepler the Christian was steadfast in his commitment to his Savior, and to his Lutheran church, yet he maintained strong friendships with Catholics (especially the Jesuits). The scandals and dangers that he faced by holding such friendships, in his time, were roughly analogous to what one of us would face if we had friends in both the US Army and Al-Qeada. At various times, both sides suspected him of treachery.

He was no ivory-tower recluse. He became an independent businessman when he determined that it was more cost-effective to own a printing press than to pay a printer to set up and sell his manuscripts. He was a clever marketeer: there wasn't a large popular market for astronomical books, but there were quite a few wealthy people who would pay premium prices for special books dedicated to them by the author – and he ran off plenty of dedicated volumes to subsidize the publication and distribution of his scientific works. His family life touched on all the joy and sorrow that his times could offer – complex relationships with his parents, happy courtships (quite a few of those!), marriages that were at various times exhilarating, frustrating, insensitive, and tragic – culminating in the drawn-out trial of his mother on charges of witchcraft. The detailed explanation of the procedures, rules of evidence, and background of this trial is one of the book's most remarkable features.

You can find this book in the OCA Library. It might not teach you very much astronomy, but it will take you on a remarkable journey into the turbulent world that gave birth to modern science. — Bob Buchheim

Video Review: *Roving Mars* by Walt Disney Pictures



Some of you are old enough to have watched the old "Disneyland" TV show in the 1950's. I remember a warm summer night in 1957, with the TV (black and white) turned to the screen door so that we could watch while sitting outside on the patio (no air conditioning in those days), and learning about canals on Mars, the mysterious "W-shaped cloud" that was once observed on the planet, and hearing Wernher von Braun himself describe how we were going to travel to Mars, using a fleet of spacecraft based on ion propulsion. If you remember that old show, get this DVD: that show is one of the special features on this disk.

If you aren't old enough to remember the '50's (or even if you do), you will be educated, excited, and motivated by the main feature – the story of the development, launch, landing, and mission of the Mars rovers Spirit and Opportunity. The animated sequence describing the launch, cruise, and entry phases of the spaceflight is absolutely stunning. The human drama at JPL during the landing phase is wonderfully portrayed.

You'll enjoy the video, and your kids will learn some important lessons about science, and about life. — Bob Buchheim

NASA's Space Place

What Happened to Comet Holmes?

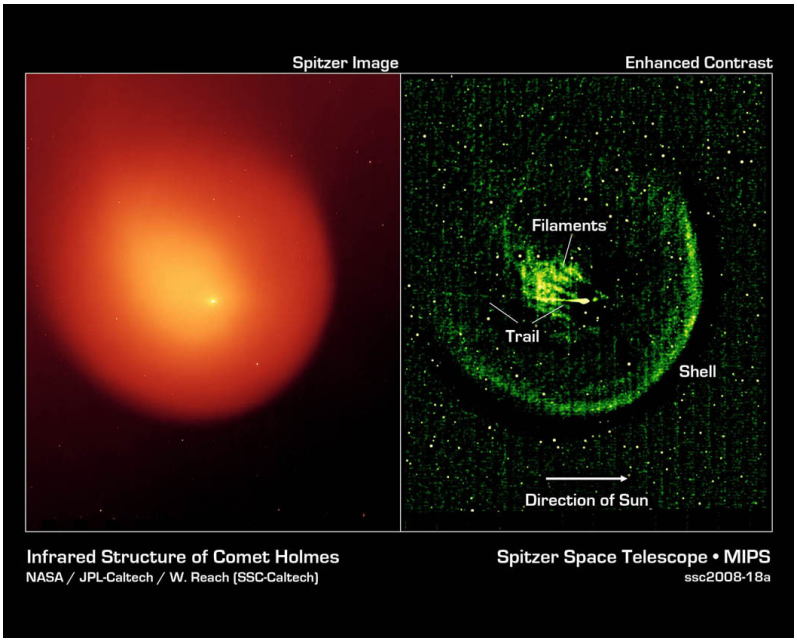
by Dr. Tony Phillips

One year after Comet 17P/Holmes shocked onlookers by exploding in the night sky, researchers are beginning to understand what happened.

"We believe that a cavern full of ice, located as much as 100 meters beneath the crust of the comet's nucleus, underwent a change of phase," says Bill Reach of NASA's Spitzer Science Center at the California Institute of Technology. "Amorphous ice turned into crystalline ice" and, in the transition, released enough heat to cause Holmes to blow its top.

Anyone watching the sky in October 2007 will remember how the comet brightened a million-fold to naked-eye visibility. It looked more like a planet than a comet—strangely spherical and utterly lacking a tail. By November 2007, the expanding dust cloud was larger than Jupiter itself, and people were noticing it from brightly-lit cities.

Knowing that infrared telescopes are particularly sensitive to the warm glow of comet dust, Reach and colleague Jeremie Vaubaillon, also of Caltech, applied for observing time on the Spitzer Space Telescope—and they got it. "We used Spitzer to observe Comet Holmes in November and again in February and March 2008," says Reach.



Comet Holmes as imaged by the multiband imaging photometer (MIPS) on the Spitzer Space Telescope. The enhanced contrast image at the right shows the comet's outer shell and mysterious filaments of dust.

The infrared glow of the expanding dust cloud told the investigators how much mass was involved and how fast the material was moving. "The energy of the blast was about 10^{14} joules and the total mass was of order 10^{10} kg." In other words, Holmes exploded like 24 kilotons of TNT and ejected 10 million metric tons of dust and gas into space.

These astonishing numbers are best explained by a subterranean cavern of phase-changing ice, Reach believes. "The mass and energy are in the right ballpark," he says, and it also explains why Comet Holmes is a "repeat exploder."

Another explosion was observed in 1892. It was a lesser blast than the 2007 event, but enough to attract the attention of American astronomer Edwin Holmes, who discovered the comet when it suddenly brightened. Two explosions (1892, 2007) would require two caverns. That's no problem because comets are notoriously porous and lumpy. In fact, there are probably more than two caverns, which would mean Comet Holmes is poised to explode again.

When?

"The astronomer who can answer that question will be famous!" laughs Vaubaillon.

"No one knows what triggered the phase change," says Reach. He speculates that maybe a comet-quake sent seismic waves echoing through the comet's caverns, compressing the ice and changing its form. Or a meteoroid might have penetrated the comet's crust and set events in motion that way. "It's still a mystery."

But not as much as it used to be.

See more Spitzer images of comets and other heavenly objects at www.spitzer.caltech.edu. Kids and grownups can challenge their spatial reasoning powers by solving Spitzer infrared "Slyder" puzzles at http://spaceplace.nasa.gov/en/kids/spitzer/slyder.

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

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replacement of the data controller to the mission agenda. After examining the spare data controller on Earth, which had sat in storage since 1991, a refurbishment and test plan was made that delivers the controller to Florida for the Shuttle mission no sooner than early April. So the Hubble repair mission will be even later than thought at first after the data controller failure.

Exoplanet imaged – HST has taken the first ever image in visible light of a planet orbiting another star (other than the Sun). The first such picture in infrared was reported here just 2 months ago, taken with the Gemini telescope in Hawaii. The new image is of a planet orbiting Fomalhaut, one of the brightest stars in our sky, which is only 25 light-years away. The star was known to have a planet-forming disk with a sharp inner edge, usually an indication of a planet orbiting just inside that edge. HST used its coronagraph, which blocks the light from a star, allowing dim objects next to the star to be seen. Images were taken 21 months apart, showing that one dot in the image had moved in exactly the way an orbiting planet would. The planet is about 3 times the mass of Jupiter, is more than 3 times as far from its star as Neptune is from our Sun, and takes 872 years to orbit Fomalhaut. Infrared observations of the planet will be made to try to detect its atmospheric constituents and to get a more accurate mass measurement.

Yet another – A few days after the HST planet imaging announcement, other astronomers announced that the Keck and Gemini Telescopes in Hawaii have imaged 3 planets orbiting another star (HR8799). The innermost planet is orbiting just outside what appears to be an asteroid belt. They are 24, 37 and 67 AU distant from their star, where 1 AU is Earth's distance from the Sun.

Antimatter – The Bullet Cluster, a collision of 2 clusters of galaxies, has been examined for signs of primordial antimatter, that is, anti-protons and anti-electrons left over from the Big Bang. Antimatter would collide with ordinary matter and give off gamma rays in such conditions, but no gamma rays were detectable in archived Compton Gamma Ray Observatory data. So primordial antimatter could not exist in or around the Bullet Cluster in any concentrations exceeding 3 parts per million. Previous observations of non-colliding galaxy clusters showed that primordial antimatter likely does not exist on scales smaller than a galaxy cluster. Further observations are planned of other collisions of clusters of galaxies to look for antimatter on large scales.

Moon dust was found to be a large problem for the Apollo landings, clogging equipment and the astronauts' lungs, clinging to everything, and preventing air-tight seals. The only data ever gathered on dust on the Moon was from the dust detectors placed on the later Apollo missions. Attempts to locate this data, needed for the program to return to the Moon, found that NASA's data tapes of it were lost, but the original tapes were stored in Australia. The only tape readers for this type of tape found in Australia were located on a computer in the Australian computer museum. They expect to have the museum computer restored to operation by January, and will proceed to read the Apollo dust data, and presumably store it on a more modern data storage medium.

Chandrayaan I (Moon mission from India) has entered lunar orbit, and has lowered down to the working orbit, which is about 60 miles above the surface. The 2-year mission intends to map the entire Moon to determine altitude and chemical composition with better resolution than ever before, and measure solar wind. It dropped a 64-pound impactor into the surface at Shackleton Crater near the south pole. NASA and the European Space Agency cooperated by providing state-of-the-art sensors and instruments. It is hoped that the mission will settle the controversy over whether ice exists in large quantities near the poles.

Kaguya (Japanese Moon mission) failed to find ice in the craters near the Moon's poles. However, it looked for ice visually, not with any penetrating technology, and it may be that lunar ice is beneath soil. Many of the previous claims of finding lunar ice have been with radar.

Planet formation – A new study of magnetism in meteorites concluded that the building blocks of which planets were formed, even as small as 100 miles across, must have completely melted, with iron sinking to the core, setting up magnetic dynamos, whose magnetic field became frozen into material that later broke up into meteoroids. It had been generally believed that only the largest planetary bodies underwent complete melting. Having more pre-planet bodies molten would change our understanding of how planets form. Some of the angrite meteorites used in the study formed just 3 million years after the birth of the Solar System, and showed that their parent body had a magnetic field that was 20 – 40% as strong as the Earth's field today.

More planet formation – A new simulation of planet formation shows that the molten period of newly formed rocky planets lasts longer (a few million years) than previously thought. The longer time is caused by heat released by the sinking of iron to the core of the molten planet. Even after the molten period, for tens of millions of years the new planet should be hot enough to glow in infrared light. This may make it easier than thought to find newly formed planets by imaging in infrared. The biggest problem in trying to image planets is that they are far dimmer than the stars they orbit, and are overwhelmed by starlight. But during and after the molten period, in infrared the brightness of a planet is far closer to that of its star. And that period is now understood to last much longer, so odds are better to catch a newly formed rocky planet in that period.

Possible new particle – The Tevatron in Illinois will remain the most powerful particle collider until the LHC in Switzerland is powered up again in spring. In its last fling before its planned shut down in 2010, the Tevatron has detected excessive muons and muons outside the experiment (by a centimeter [0.4 inch] or more), both of which could indicate that a previously unknown particle is being created. However the scientists involved caution that there are other explanations for those muons, which will have to be ruled out by further work before it is concluded that a new particle has been discovered.

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This year of appreciation for all aspects of astronomy is an excellent time to think about what this means to you, both astronomy itself and what you do with it as a hobby, what it means to you, how it has made a difference in your life, your memories of being an amateur astronomer, and where you would like to see our hobby go in the future. Please write your thoughts and recollections down and share them with the rest of us, whether formally in an article in the Sirius Astronomer or the webpage, or as a less formal statement or set of statements to the e-mail groups. Perhaps one of our contributions to IYA2009 can be a collection of thoughts, memories and comments from different people who've been active in the hobby about these topics – I'll be happy to put a collection together if you forward your comments to me at btoy@cox.net.

"How To Use Your Telescope" Class

For the last few years, we have had our "How To Use Your Telescope" class (for convenience, "Telescope Class") as the fifth session of our regular Beginners Astronomy Class. Usually, that session falls in January and July, with the January session conveniently placed shortly after Christmas, to help those who may have acquired a telescope as a gift but are unsure what to do with it. This year, the Telescope Class will be the first Friday in February instead of the first Friday in January, mainly because we had to reschedule the sessions for this cycle of the Beginners Class due to facilities issues in September, when the first session was originally scheduled. Because we were unable to have a session in September, we moved the regular sessions ahead by a month, so this cycle will have only five sessions instead of the usual six, and, if you want to attend the Beginners Astroimaging session, you'll have to do that next August, at the end of the next cycle.

If you or anyone you know has a telescope or acquires one over the holidays and would like some help in learning how to use it or learning to use it better, please plan to bring it to the Telescope class in February. If you need help urgently, you can bring it to the Beginners Class in January, and we will do our best to help you, but we'll have a lot more volunteers available and can get more hands-on assistance at the February session. Before you attend one of these sessions, you should try setting up your equipment yourself in the daylight, when you can see better what you are doing, and you should get it to work as well as you can, so you have a better idea of where your problems lie and can get specific help where you need it most. Also, this will help you find out before the class whether there are parts missing while you can take steps to get them before the class, so you'll be ready to go when the class meets.

As always, we need volunteers to help out with the class – if you haven't tried it before, do come, as this is one of our best outreach activities and is a lot of fun as well as informative for all concerned.

Have a great end-of-the-year, see 2008 off in style, and Happy Holidays and Happy New Year to all of you! ■

Leon Aslan created this image of the California Nebula on November 19, 2008

FOR SALE: brand-new items - 8'F/6 Discovery Optics 1.5" Pyrex Mirror cell; 8"University Optics Alum Mirror Cell; Vega-HP1-1.25"Focuser (Japan Made); Vega-3 Low Profile Helical 2" Focuser; 48 Rini2 Eyepiece in Bolt Case (this item not new but seems to be in good condition. Will sell these items separately for lowest price or as a package for $200 o/b/o. Contact Doug 562-598-6103

(continued from page 8)
International Space Station (ISS) – Space Shuttle mission STS-126 launched November 14 for a 15-day stay, to expand the ISS living quarters from the current capacity of 3 up to 6. Essentially, a 3-bedroom 1-bath house is being expanded to a 5-bedroom 2-bath one with a gym. Also being added are a refrigerator and a state-of-the-art water recycling system to turn waste water (don't think about that long if you are easily disgusted) into drinking water. The mission is also replacing bearings and lubricating the troublesome joint that turns some of the solar panels toward the Sun, and lubricating the other such joint even though it hasn't had problems yet. It has been 10 years since the first module of ISS was launched, and it will be completed in 2010. The Columbia disaster was the chief delay in building ISS, though not the only one.

New Horizons (Pluto mission) – To celebrate the 1000th day in space, the New Horizons team announced a list of objects that were added to the spacecraft before launch: part of the ashes of the late Clyde Tombaugh (discoverer of Pluto), a CD containing the names of everyone who entered the "Send your name to Pluto" promotion, commemorative quarters from the states where New Horizons was built and launched (Maryland & Florida), 2 flags, a CD of the spacecraft team, a small piece of SpaceShip One (the 1st privately funded manned spacecraft), and the 1991 stamp commemorating Pluto (reads "Not Yet Explored").

Instant AstroSpace Updates

The best images of Jupiter ever made from the surface of Earth were made with the Very Large Telescope in Chile, using a new **adaptive optics** system (named MAD) that for the first time uses 2 or more guide stars to correct for the Earth's atmosphere over larger areas than possible with only 1 guide star. The 2 stars used were actually the Galilean satellites.

The European **Venus Express** spacecraft is occasionally turning its visible light and infrared instruments toward Earth, even though it appears as a single-pixel dot, to see what a planet with life looks like when viewed from afar.

Preliminary notes made by **Christa McAuliffe** for the lessons she planned to teach from space before her tragic death aboard the shuttle Challenger have been assembled and completed by NASA and are being released as educational materials for teachers teaching about space.

After 3 failures, SpaceX finally succeeded in launching one of their **Falcon 1** rockets to orbit. It is the first privately developed liquid-fuel rocket to orbit.

Congress passed a waiver allowing NASA to continue to purchase Russian **Progress** supply flights and Soyuz manned flights to ISS after the Shuttles are retired in 2 years, but NASA has stated they will use Soyuz but not Progress. The plan for cargo is to use European supply flights and yet-to-be-developed vehicles designed by U.S. companies, such as SpaceX.

Richard Garriott, a paying space tourist on the Soyuz vehicle launched to ISS in October is the first son of an astronaut to go into space. One of his fellow passengers on his return trip was Sergei Volkov, the first son a cosmonaut to go into space.

After more than 2 years of few **sunspots** and solar flares, 5 new sunspot groups appeared during October, and will probably lead to the rise of the next sunspot cycle, finally. This has been the longest minimum in more than half a century.

Astronomers have discovered a binary pair of **Kuiper Belt Objects**, icy asteroids beyond Neptune, which are orbiting each other, but with a wider separation (about 80,000 miles) than any other known pair, including objects in the asteroid belt too.

Images of the wind telltale appear to indicate that a **dust devil** passed over or very near the Mars Phoenix lander on October 12.

The deepest image in **ultraviolet** ever taken from the Earth's surface has been made by the Very Large Telescope in Chile, of an area that is also being studied in X-rays, radio, and other wavelengths. It is almost completely covered by galaxies, some so distant that we are seeing them as they were only 2 billion years after the Big Bang.

The Submillimeter Array radiotelescope in Hawaii has observed 2 galaxies (which are colliding) so distant that the light left only 1.7 billion years after the Big Bang, and they both have **supermassive black holes** in their centers. It was surprising to find huge black holes at such an early time.

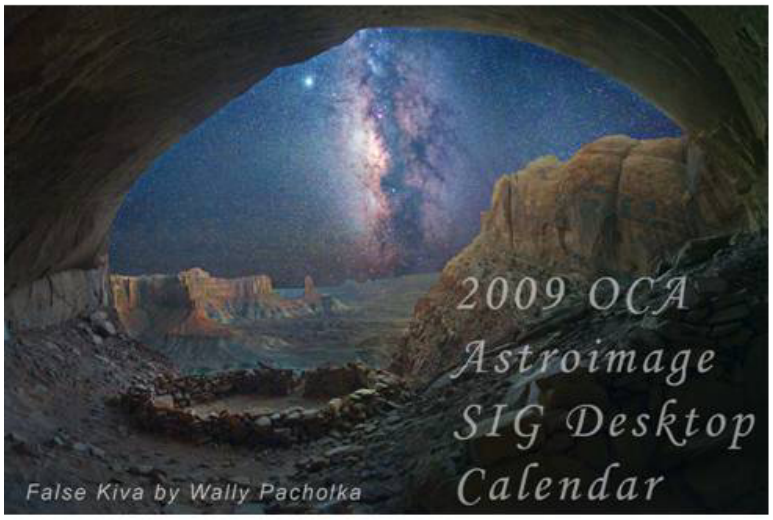
WASP, 2 groups of small robotic telescopes that search for planets transiting in front of stars, has discovered yet another planet, this one extremely close to its star, causing it to be the **hottest planet** known (nearly 4100°F). It is about 1.5 times the mass of Jupiter, 1.8 times Jupiter's diameter, orbits 40 times closer to its star than Earth does, and its year is 1.1 Earth days.

3 free-flying spheres (acronymed **SPHERES**) are being tested by flying around inside ISS to develop techniques for rendezvous, docking and formation flying that could be used in the future for refueling and repair of satellites, positioning of telescopes, and assembling spacecraft in orbit.

Stephen Hawking announced that he will retire next year, due to reaching the mandatory retirement age (67) of Cambridge University, but will continue his cosmological research as Emeritus Professor.

The launch of the European gravity measurement satellite (**GOCE**) has been postponed until February due to problems with the launcher. It will make the most precise (to a part in 10 trillion) measurements ever of the strength of gravity over every place on Earth, which will be of use in oceanography, Earth physics, climate change, surveying and mapping. ■

2009 OCA Astroimage SIG Desktop Calendar - Now Available!



With Images by John Sanford, Ray Stann, Larry Gershon, John Castillo, Craig Bobchin, Bruce Waddington, Pat Stoker, Don Lynn, Gary Schones, Dave Snope, Jim Windlinger, Dave Kodama, Bill Patterson, Alan Smallbone and Wally Pacholka!

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M101 as imaged by Don Lynn via a remotely-operated telescope in New Mexico, April 29 ,2008

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