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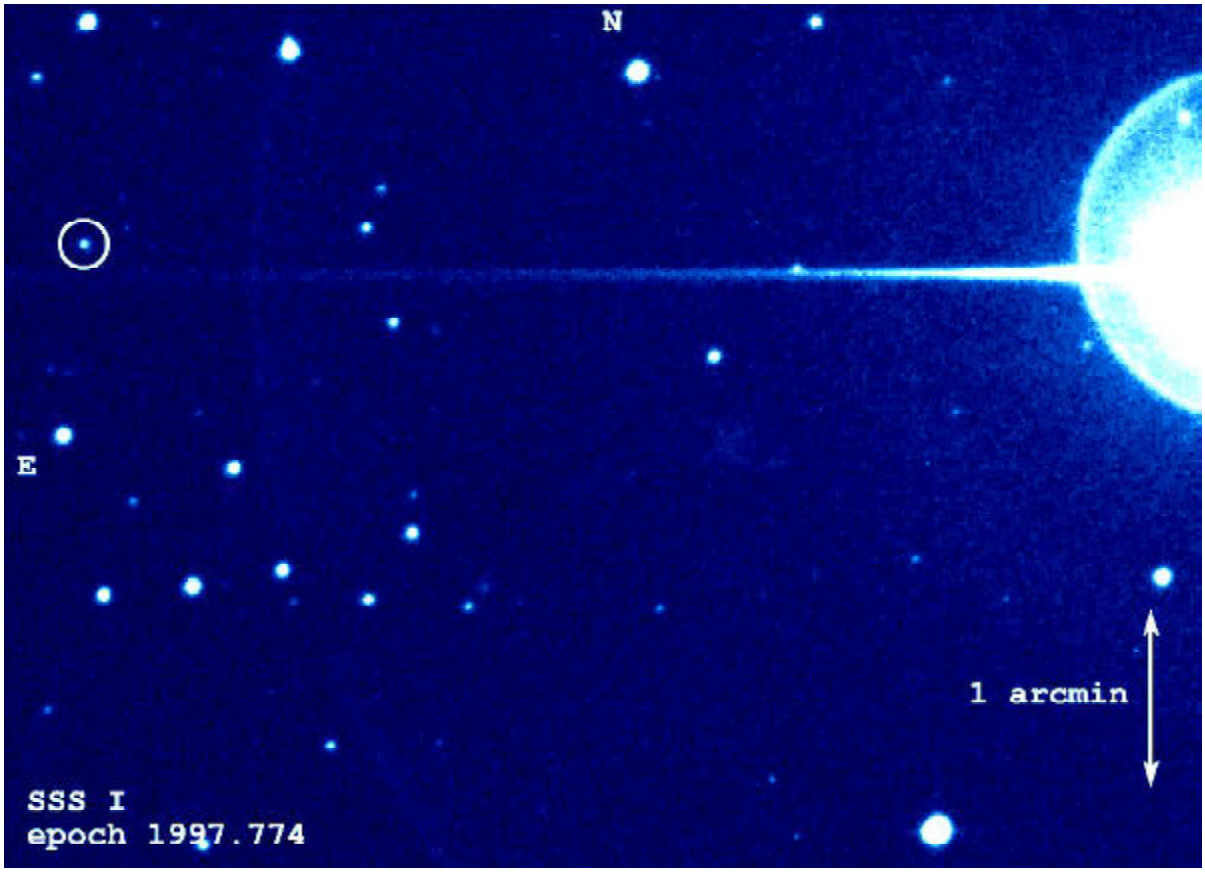

A team of European astronomers [2] has discovered a Brown Dwarf object (a 'failed' star) less than 12 light-years from the Sun. It is the nearest yet known.
Now designated Epsilon Indi B, it is a companion to a well-known bright star in the southern sky, Epsilon Indi (now "Epsilon Indi A"), previously thought to be single. The binary system is one of the twenty nearest stellar systems to the Sun.
The brown dwarf was discovered from the comparatively rapid motion across the sky which it shares with its brighter companion : the pair move a full lunar diameter in less than 400 years. It was first identified using digitised archival photographic plates from the SuperCOSMOS Sky Surveys (SSS)

OCA CLUB MEETING

The free and open club meeting will be held Friday, February 14th at 7:30 PM in the Science Hall of Chapman University in Orange. the featured speaker will be Dr. Gary Peterson of San Diego State University. Dr. Peterson's talk is entitled "Venus; exploring the inferno" and is not to miss!

STAR PARTIES

The Star Party this month, is on February 1st! Good news! The Kuhn should be up and running for the February Star Party. Naturally, the members will also have access to the club's 10" and 12" LX200's. The Black Star Canyon site will be open this month on February 22nd. Members are encouraged to check the website calendar, for the latest updates on star parties and other events. Also, please use the Anza Webcam before driving out to Anza to potentially save you some driving time.

COMING UP

Beginners class will be held on February 7th, at the Discovery Science Museum located at 3101 West Harvard Street in Santa Ana. The Astrophysics SIG will be meeting on February 21st. The Astro-Imagers' SIG will meet February 18th. The EOA SIG will meet February 19th. Please check the website calendar for the many outreach events this month! Volunteers are always welcome!

President's Message

by Barbera Toy

The New Board of Directors:

The big news around this time in the OCA year is the election of the new Board of Trustees. As you may have noticed, there have been a few changes from last year. One of the biggest changes, of course, is that Liam Kennedy is stepping down from the presidency, and will be a Trustee-At-Large for the coming year. He is still our webmaster, and still in charge of such important items as the weather station, the WeatherCam and the Anza broadband project. He's still very active in the Outreach program, the AstroImagers SIG, and in planning for AstroImage 2003, among many other club-related activities. You will undoubtedly continue to see a lot of him even if he's no longer our very own President Kennedy.

I feel very lucky to have two past presidents among the Trustees this year. Russell Sipe, who preceded Liam as president, returns as a Trustee. Russell continues to give us the benefit of his considerable experience and a ring-side seat for the continuing saga of Star Cruiser. I particularly appreciate his ability to nudge Board meetings along when we get bogged down, a skill that helps keep the meetings moving toward (we hope) a reasonable adjourning time.

Bob Buchheim, Tony Obra, Tim Hogle and Gary Schones were all Trustees last year and continue to serve in 2003. Dave Radosevich, who has done all of the great work on the Kuhn over the past few months, also joins the board this year. Charlie Oostdyk returns as Treasurer, and Bruce Crowe as Secretary. We are very pleased to welcome Joel Harris, once again, as Vice President.

Another big change on the Board this year is that we will be losing Carol Copp as a Trustee. We truly appreciate the many years she served on the Board. I've had the pleasure of serving with her for the last two years, and appreciate the historical perspective and intelligence she's brought to our discussions. I'll miss the wryly humorous side-comments she would often share with me when I was sitting next to her during our meetings. I hope this break from Board responsibilities will give her more time for observing and other activities. If it should happen that she still wants to spend time with us at the meetings, we'll be delighted to see her!

Stephen Eubanks is also leaving the board as Trustee, but I am happy to report that he will continue in his position as Anza House Coordinator, so we will continue to work closely with him and to benefit from his energy and insight.

Kuhn update:

It's such a pleasure to share good news. At the January Board meeting, Dave Radosevich reported that all of the major work on the Kuhn is now done. After fine-tuning the system and collimating the optics, there is a good chance that it will be operating at the next star party. I hope, if you are at Anza for the star party, you come up to the observatory and get a chance to see for yourself how much brighter the image is in the eyepiece with the new mirror coatings, how much quieter the Kuhn is, and how much more smoothly it runs.

As you may know, you have to be a Star Member and be trained on the operation of the observatory as well as the operation of the Kuhn in order to be qualified to run it. Yet, in the past, we had only one trainer. We're planning to train a group of existing Star Members on the new system. These volunteers will be able to train additional Star Members. Upon completion, we expect to retrain existing Star Members on the new system. Subsequent training of new Star Members can be done quickly, so that, once the Kuhn is ready for general use, it really can be used.

This is a great club, and it is my honor to serve as its president. Thank you for entrusting me with this position. You can be sure I will do my best to live up to the high standards set by my predecessors. Fortunately, a lot of them are still around to help me do that!

May the coming year be happy, productive and interesting for all of us!

The Astrophysics Special Interest Group

by Barbara Toy, OCA President

It's amazing how many really interesting activities go on in the club, often without much fanfare. The Astrophysics SIG is one of those low-profile groups that, when you discover it, make you feel that you've really found treasure. So, in hopes that it will help other members discover this particular treasure faster than I did – please let me introduce you to the Astrophysics SIG.

And, as always, if you have a question about the club, its facilities, its activities, etc., please email me at btoy@cox.net, or send by snail mail to P.O. Box 1762, Costa Mesa, CA. If I don't know the answer, I can probably find someone who does. Comments about or additions to anything I've written are also welcome.

What is the Astrophysics SIG?

Basically, this is a group of people interested in learning more about how the universe is put together and how it works. There is no formal membership, but there is a core of people who come to most of the meetings. The meetings themselves are true seminar sessions, in the best sense of the concept. There's no "teacher," though a number of people who come to the meetings do have a lot of helpful knowledge, and their knowledge gives depth to the discussions (think "Don Lynn," as just one example). But don't think the meetings are only for people with a lot of knowledge already – if you have an interest in the universe around you, no matter what level of knowledge you have, this group can help you learn more and have fun doing it.

The meetings are friendly and informal, with, naturally, time for socializing in addition to talking about cosmic matters. The main topics of the meetings are structured around viewing segments of videotape courses, often from the OCA library, with discussions about the material viewed and related material. This helps the participants get a better understanding of what was presented in the video, and, of course, is a lot more interesting than just looking at a video presentation on your own. And, because nobody has to worry about whether any of this will be on an exam, the discussions can flow in any direction the interests of the participants take it – it's a wonderful way to get new perspectives on these fascinating topics, and to get your questions answered. And there's no better way to help get your mind around some of these concepts and explore their implications than through discussions with other people who are also trying to understand them.

As is stated on the OCA website, "Topics for discussion cover a wide range of subjects from the latest discoveries to the history of astronomy. A sample would include the atom and its components, the spectrum, LIGO and gravity waves, isotopes, quantum mechanics, supernova, Hipparchus, and the Hubble Telescope. We purposely avoid introducing mathematics into the discussions except on rare occasions. **Our purpose is to make astrophysics accessible to the layman.**" [Emphasis in the original]

With such a wide range of topics to choose from, you can be sure it'll be a long time before this group runs out of material to explore!

Where and when are the meetings?

The regular meeting times are the third Friday of the month, at 7:30 p.m. The current meeting location is the classroom of the old Discovery Museum, at 3101 W. Harvard Street. This is about a block west of Fairview and a few blocks south of Edinger (between Warner and Edinger). If the gate is still locked when you get there, please wait a bit to give the person with the key time to get there.

Where can I get more information about this group?

The main contact person for the the Astrophysics SIG is Gordon Pattison, who can be reached at glpbmp@cox.net. There is also information posted on the OCA website about this and the other OCA Special Interest Groups, which is periodically updated. Meeting dates and times for all OCA SIG's are shown on the OCA calendar.

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Why should I come to these meetings?

Whenever we have "Ask and Astronomer" at the general meetings, most of the questions are on the theoretical aspects of astronomy – that is, on astrophysical issues. People want to know about black holes and their effects, the Big Bang, why and how the universe is expanding and what the effects are on what we can see out there, whether the universe will expand forever or maybe collapse on itself in the far distant future, what happens to matter in such extreme conditions as neutron stars or black holes, the nature of "dark matter" – just to name a few topics that have been raised repeatedly. A lot of you obviously have a lot of interest in these areas, and the Astrophysics SIG is where you can explore them to your heart's content with a friendly group of folks who share the same interest.

Do come and see for yourself – I'll hope to see you there!

Chasing the December eclipse, below the equator

A large number of OCA members have approached me recently for some information on the December eclipse from this past year from members who traveled the globe to observe this event in totality. Both Joel Harris, our own club Vice President and Sylvia Sligar, a long term OCA member have provided us with their own experiences in traveling abroad to observe the event. ----Darren Thibodeau

The December eclipse from Australia - Joel Harris OCA Vice President

On November 30th, 2002, a group of 30 eclipse-chasing enthusiasts departed from LAX International Airport, commencing a 14 day journey to Australia, to observe the total solar eclipse of 4 December 2002.

This collection of "umbraddicts", as I prefer to call any serious eclipse chasers, comprised the 12th expedition group that I have had the fortune to lead as head of Twilight Tours Inc. As prior groups go, this was a somewhat smaller sized aggregation of people, as our expeditions have ranged in the past from 3 to 536 participants.

Despite the tantalizingly short duration of totality in the Australian Outback, we were determined as a group to maximize as many of those fleeting 27 seconds of totality afforded us, as possible.

The group boasted both experienced eclipse chasers such as Jeff Schoeder, Tinka Ross, Derryl Barr, Jon and Francie Hudson, and Gregory and Vicki Buchwald, as well as four "eclipse virgins", --- as we commonly refer to first-time eclipse observers. Too, we had three OCA members on our trip, in the persons of Dana Matula, and George and Kathleen Dehart.

We entered Australia in Melbourne, in the southeastern part of the country, and immediately transferred to a domestic flight bound for Adelaide. When we finally "came to rest" for our first night in the Land Down Under, we had been traveling for some 18 hours straight, since leaving LA. After a night's rest in Adelaide, we transferred by ground transpiration to the town of Port Augusta, at the head of the Spencer Gulf, to break the 350-mile journey to our eclipse site.

The day of the eclipse, December 4th, we continued to the north-northwest, into the vast, dry, and decidedly sparsely populated Outback. As we left Port Augusta in our rear view mirrors, the few scattered cumuliform clouds we saw dropped below the horizon. From that point on, weather ceased to be a concern for our group on eclipse day.

We stopped in the small town of Quorn, just at the southern "shore" of Lake Torrens, one of the vast dry salt lakes in this part of the state of South Australia. Following our rest stop, we pressed on to the town of Leigh Creek, where we had lunch and a dreamtime story and local history lesson from an Aboriginal tribal elder. The experience was topped off by some audience participation in the form of a sing along to a tribal version of "Simon Says", replete with some hilarious "hand semaphore" routines.

Enroute to our observing site, we made a final stop at a huge open pit coalmine, situated just a few kilometers north of Leigh Creek.

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We arrived at our site at about 3:15 PM, local time. Aside from a modest-sized shade tent, our viewing area was starkly barren, with no significant vegetation or animal life. We did chance to see several Stub-Tailed Lizards, but that was all. The weather conditions at the site were ideal: dry, with temperatures in the mid 80s, and a constant, stiff wind --- blowing from the southwest at about 15 miles per hour, with gusts as high as 24 MPH. While the wind kept the air temperature down, it also blew a prodigious amount of sand and powdery dust into our eyes, hair, and yes, our equipment, as well.

The partial phases of the eclipse took place right on schedule, although due to our vantage point close to the eastern terminus of the eclipse track, the partials were about 30 percent shorter in duration than usual.

Totality occurred at 7:41:12 PM local time. I can honestly attest that in the thirty years I have observed total eclipses, this had to be THE most surreal, eerie, non-terrestrial looking one I have even seen. The dark-red sand and dust, the absence of any buildings or habitats, and the steadily blowing wind, forced me to imagine I was watching an eclipse from the surface of Mars, and not the Earth.

All too speedily, the 27.23 seconds of totality were over. Everyone in the group agreed that the eclipse was truly memorable, but 'way too short.

The remainder of our journey took us to Ayers Rock/Uluru in the center of the country, the Great Barrier Reef/Cairns, and Sydney, with visits to the Sydney Opera House (to attend a performance of Swan Lake), Sydney Harbor and its famous bridge, and the Koala Park Animal Habitat.

With the next total solar eclipse this coming November in Antarctica boasting a physically difficult, highly expensive, low probability of success, even dangerous venue, the next "eclipse" on the radar screen won't technically be an eclipse at all. The Venusian Transit of June 8, 2004 is our next target ---- one even rarer than a total eclipse, since the last such transit occurred some 121 years ago, in the year 1882!!

From the Indian Ocean - Sylvia Sligar

Dec 3rd was a sea day, beautiful sunny morning, we had our eclipse practise at 7:24 till 8:40 am. Later that day the sea became rougher and it was cloudy.

The sort of seen eclipse

Dec 4th I woke up to a completely overcast day. It didn't look promising for an eclipse. Previously, being in a rain storm for one eclipse and a snow storm for another, and yet having seen both of those eclipses. I was not without hope.

As the morning progressed, the ship would maneuver to a small open patch of sky seen ahead, each time we arrived only to have the hole close. At 1st contact, when the moon starts it's transit across the sun we caught glimpses of the sun diminishing. By the time the sun was 2/3s covered the thin layer of clouds negated the need for using the eclipse glasses provided to us. Then the sun was swallowed by the clouds. Beyond the ship's stern the sky was dark, at the bow the sky was as light as it could be with complete cloud cover. As Ed Krupp counted down the time, we were enveloped with the darkest dark I have ever witnesses during an eclipse. For 1 minute 40 seconds, we marvelled in the dark, the area beyond the stern lightened and we saw the darkness race ahead of the bow. At the time of totality, 8:34:11 am, the Olympia Countess was at 27 degrees 30.015 arcminutes south latitude, 37 degrees 38.037 arcminutes east longitude in the Indian Ocean under a band of clouds that extended across Africa and the Indian Ocean almost to the coast of Australia. The cloud cover was uncannily similar to the path of totality. Later reports were of spotty sightings in South Africa, great viewing in Australia.

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A bird had been sighted flying in bewilderment about the ship. We wondered if it would roost, but then it flew to the other side of the ship and was out of view. Many of the eclipse novices were completely awestruck by the darkness. It was darkest dark I've ever viewed during an eclipse. Mongolia, in 1997, even thought it was very cloudy the snow covered ground reflect the small amount of light viewed thru the one hole in the clouds. At the South China Sea, in 1995, there were enough holes in the clouds that the darkness wasn't as deep as this completely cloudy sky. I hear no complains about missing the corona and any possible prominences that might have been visible. Eclipse chasers have to be a philosophical lot. By noon the sky was clear with clouds at the horizon, by 3:00pm it was again completely overcast.

NASA's Space Place

Invisible Tornadoes

by Dr. Tony Phillips

The biggest problem with tornados—next to the swirling 300-mph winds—is that it's hard to see them coming.

But soon scientists will be able to foresee, not merely tornados, but the severe storms that spawn them, hours before there's even a cloud in the sky! Mind you, this isn't a vague "30 percent chance of rain today" type forecast. Thanks to a new satellite technology being co-developed by NASA, NOAA and the U.S. Navy, emergency personnel will actually watch the invisible beginnings of a storm unfold.

"They're going to know where the storm centers are forming before the storms are there," says James Miller, project manager for Earth Observing 3 (EO3), a satellite that will test out this new technology in 2005 or 2006.

Unlike the tiny water droplets that make up clouds, the water vapor that feeds storms is invisible to the human eye. Water vapor is easy to detect, however, at infrared (IR) wavelengths. EO3 will use an IR-sensitive device called GIFTS—short for Geosynchronous Imaging Fourier Transform Spectrometer—to make 3D movies of temperature, pressure, and water vapor in Earth's atmosphere.

Three or four hours before the storm clouds are visible, meteorologists will notice water vapor converging toward an area. This water vapor, which provides the "fuel" for the coming storm, is too close to the ground for today's weather satellites to see. Then meteorologists will check precisely how the air temperature over that area varies vertically (something else ordinary satellites can't do).

This temperature variation determines whether the humid air will rise to form storm clouds. And when these conditions look ominous, the meteorologists can alert the public.

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The goal of EO3 is to “test drive” this new technology and prove that it works. If successful, NOAA plans to incorporate GIFTS-style sensors into its next generation of weather satellites.

These future satellites will give meteorologists exactly what they need in order to give the people exactly what *they* need: an earlier warning that tornados may be on the way.

GIFTS and EO3 are managed by NASA’s New Millennium Program. NASA and NOAA will operate EO3 during its first year in geosynchronous orbit above the United States. If the technology works as planned, the U.S. Navy will assume control of EO3, move the satellite to a point above the Indian Ocean, and use it to monitor weather in shipping lanes there.

For adults, the EO3 web site at http://nmp.jpl.nasa.gov/eo3 has more about the mission and the GIFTS instrument. For children, The Space Place web site at spaceplace.nasa.gov/eo3_compression.htm has a jazzy, interactive “squishy ball” demo of the data compression methods that will be used on EO3.

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

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.

Dark Energy - Another completely independent way has been found to measure the amount of dark energy in the universe (or cosmological constant), and it agrees with other recent determinations. The new method was to observe with radiotelescopes, over the last 10 years, about 15000 very distant quasars and to see which of them showed gravitational lensing. This is caused by the gravity of an intervening galaxy bending the light according to general relativity. The probability of gravitational lensing occurring depends on the amount of dark energy and on the density of galaxies. The latter has been recently determined from optical light surveys of much of the sky. Given this density, the observed odds of 1 in 700 quasars being lensed occurs with 70% dark energy (the remaining 30% of the universe being matter). Arrays of radio telescopes were used in this survey because they can get far finer resolution than optical telescopes, allowing conclusive determinations of which images are gravitationally lensed. Dark energy is the force, of unknown origin, that appears to be making the expansion of the universe speed up, rather than slowing down due to gravity, as would be expected. Measurements of the brightnesses of very distant supernovae and measurements of the tiny variations in the cosmic microwave background are the other independent methods that indicate dark energy exists.

Dark Matter - Of the matter in the universe measured by various means, only a small fraction, probably less than 10%, is in the form of stars, planets, dust and gas that we can detect with any form of light. Most of the matter is in an unknown form, detected only by its gravitational effects, and has been termed Dark Matter. A new observation of the galaxy NGC 720 by the Chandra X-ray orbiting observatory indicates that the galaxy must be embedded in a flattened halo of dark matter. Further this dark matter cannot be explained away by the MOND gravity theory, which attempts to explain the apparent gravitational effects of dark matter not by dark matter itself, but by changing the equations of gravity, at very large distances, from those established by Newton and Einstein. It is believed that this is the first observation that cannot fit the MOND theory. The X-ray observations showed how much ordinary matter is found between the stars of the galaxy, and at what temperature it must be, in order to produce the X-rays. This amount is unstable and should have long ago dissipated, unless there is an accompanying cloud of matter, somewhat flattened and somewhat tilted from the galaxy orientation, holding the X-ray emitting gas gravitationally, but not interacting with it in any other observable way. This, along with not fitting the MOND equations, is the basis for the claim of dark matter surrounding the galaxy. The observations fit theory only if the "cold dark matter" theory is correct. It appears to rule out the hot dark matter, the cold molecular dark matter, and the self-interacting dark matter theories. But further evidence will be required before adherents of the other dark matter theories concede.

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Age of the Universe - A new study of the ages of the oldest stars known concludes that the Universe is at least 11.2 billion years old. The new study used new observations, calculations, and theories regarding distances to globular clusters, true brightnesses of stars, white dwarf theory, main sequence theory, RR Lyrae distances, stellar evolution, convection within stars, primordial helium abundance, stellar opacity and more. The age estimate itself comes from the limiting temperature and luminosity of main sequence stars found in various globular clusters. The study authors claim 95% confidence in their lower limit to the age. Some of the higher recent results in measuring the expansion rate of the Universe (the Hubble Constant) imply a smaller age of the Universe than this, unless it is also accepted that there is a Dark Energy, or Cosmological Constant, which makes the expansion since the Big Bang take longer.

Dinosaur demise - The controversy has continued many years over the cause of the mass extinction that included the demise of the dinosaurs 65 million years ago: an asteroid or comet impact, or massive volcanic activity are the only theories now remaining with substantial evidence. A new study concludes they may both be right. There are 38 large impact craters on Earth that formed during the last 250 million years. The new study dated all of these and found a correlation to the times of known massive volcanic activity, such as the formation time of the Deccan Traps area of India, and the Siberian Traps area. This correlation implies they may have a common cause, and the study group proposed that large enough impacts would penetrate the Earth's crust and allow magma to flow to the surface, resulting in massive volcanic activity. They further proposed that impacts big enough to do so would cause the impact craters to be inundated with lava, so the craters would not be visible today. From statistics of impacts, we know that over 90% of the craters that should be visible on Earth from impacts of the last 250 million years have not been found. The new study blames this not only on the traditional causes of being hidden under oceans or eroding, but also on being covered by lava. They suggested that the Chicxulub crater, presented by many scientists as the cause of the dinosaur extinction, could be just a secondary crater formed by debris from a larger impact in the area of the Deccan Traps. This theory will take more proof before being generally accepted, since some previous studies concluded impacts could not cause significant volcanic activity.

Neutrino oscillations - The KamLAND experiment, using a new very sensitive neutrino detector in Japan, has measured the disappearance of neutrinos between the power reactors that created them and a detector over 100 miles away. This supports the best theory of why neutrino detectors have for decades seen far fewer neutrinos from the Sun than its nuclear reactions should produce. This best theory is that the Sun actually produces the predicted neutrinos, but that many of them oscillate, that is, occasionally turn into other types of neutrinos, before they reach the detectors on Earth. Most neutrino detectors respond to only one type of neutrino. The amount of loss in the new experiment agrees well with the neutrino oscillation theory, and rules out the other theories that have been proposed to explain the missing Solar neutrinos. Theory of sub-atomic particles says that only those that have mass can change type. So this supports the other recent evidence that neutrinos have mass, although it is clearly far smaller than other light particles like electrons. This experiment accurately measures the differences between the masses of the various types of neutrinos, but does not pin down the actual masses.

Martian rain - A new study of the effects of major comet or asteroid impacts on Mars has concluded that the water-sculpted features there can be explained by a few wet warm years following each impact. By this theory, there is no need for, nor cause in evidence for, long periods of wet warm weather in Mars's past. Impacts of objects 60 to 150 miles in diameter would have caused great releases of water by 4 means: vaporized from the impacter, melted polar caps, vaporized from the soil at the impact spot, and baked out of near-surface water. Ejecta all over the planet would remain warm for years. When the atmosphere cooled sufficiently, all this water should rain up to 6 feet per year for periods of months to decades. After that, the water should retreat into the soil and polar caps, and the temperature should drop, to resemble the dry cold conditions we see on Mars today. Rough dating of the craters from the last period of heavy bombardment (more than 3.5 billion years ago) and of the water-sculpted features show they happened about the same time. The scientists making this study concluded that lack of limestone on the planet indicates that there was no long period of global warm and wet conditions caused by carbon dioxide warming, and that there is no other viable cause for a long period. The new theory would make it difficult for life to have formed, since the wet warm periods would have been only dozens of periods of several years each rather than the eons that favor development of life.

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Martian water - A new study of the dark streaks found on some Martian slopes concluded that they are caused by currently active hydrothermal activity, essentially hot springs. The dark streaks generally occur in areas of long-lived hydrothermal activity, magma-ground-ice interactions, and volcanic activity. They do not occur uniformly in regions with the same materials, topography, or slopes. In particular, not occurring on many similar slopes rules out the theories that landslides or avalanches cause these streaks. Other characteristics of the streaks that are difficult to explain by non-flowing-water theories include: originating at or near where 2 different rock units meet, occur on valley walls and occasionally continue on to valley floors, have braided delta-like ends, each feature has a constant darkness of color, though adjacent features differ, signs of erosion above the sources. New such streaks have appeared since Mars Global Surveyor began mapping the planet in 1999, and other streaks have faded greatly since such streaks were first discovered by the Viking spacecraft in the early 1980s. So these are not ancient features left from a wetter time. The new study concluded that extremely briny water, that is, with large amounts of salts dissolved, could remain liquid long enough to flow down, stain and erode slopes before evaporating or freezing, as pure water would do under Martian conditions.

Sunspot penumbra - Researchers have discovered that the lines of magnetic force that surge out of sunspots appear to peel apart like husk off an ear of corn as some of the lines are dragged back beneath the surface by a sort of solar quicksand. This "quicksand" and the magnetic fields it bends create the penumbrae around some sunspots, the strange rings of mid-darkness that have eluded explanation since Galileo discovered them. It has long been known that sunspots are created when giant bundles of magnetic lines, wider than the Earth, rise up from within the Sun and expand out into space. The force exerted by these bundles tends to inhibit the motion of the normally roiling gas just below the surface, slowing down the transfer of heat from deep in the Sun to the surface. This is why sunspots are relatively dark, because they are relatively cool -- a chilly 6000 degrees Fahrenheit instead of the regular 10,000. But the new understanding of the magnetic field behavior solves the mystery of the penumbrae, by showing how they reach intermediate temperatures, and therefore mid-dark color.

Dark Gamma-Ray Burst (GRB) - By imaging in visible light within a few days after a GRB has occurred, astronomers have been able to prove in just the last few years that the GRBs occur in galaxies that are billions of light years away, and are therefore may be the brightest objects in the universe, in order to be seen so far away. But roughly half the images of GRBs in visible light came up blank, and so those have been called "dark bursts". We may need a new name for them. The ground-based RAPTOR telescope managed to take a photo of a GRB 65 seconds after it occurred, and continued to image it for the next few hours. The object had nearly faded out of view within 9 minutes, and was completely undetectable by 2 hours. The new assumption is that there are no "dark bursts", only ones that fade really quickly. RAPTOR is an automatic telescope built just to image GRBs, and is networked into the GRB reporting system from the HETE gamma-ray satellite. It took Palomar Observatory about 20 minutes to manually photograph the same GRB, and they almost were too late. The fast fade may support the theory that faster bursts of gamma rays (which this burst marginally was) should be the result of a merge of two black holes or neutron stars, rather than the result of a supernova as the slow GRBs (where gamma rays last for minutes) appear to be. It has been theorized that the visible-light effects of a merge would fade very quickly.

Co-orbital asteroid - has been found, named 2002 AA29, approximately sharing the Earth's orbit. It was just outside the Earth's orbit and a bit ahead of the Earth, but slowly losing ground to the Earth in its race around the Sun. Computer simulations show that when the Earth overtakes it, a few weeks before you read this, the Earth's gravity will perturb it slightly closer to the Sun, and then it will slowly pull ahead of the Earth, gaining a full orbit over the next 95 years. When it overtakes the Earth, the reverse perturbation occurs, so it begins losing the race with the Earth for the succeeding 95 years. It repeats the gain-lose cycle forever, although the Earth may capture it as a moon temporarily in about 600 years. It does not appear there is any chance it will collide with Earth in the foreseeable future.

Seyfert's Sextet downgraded - HST has taken the best image ever of Seyfert's Sextet, a grouping that appeared to be 6 galaxies in a tight grouping, discovered in the constellation Serpens in the 1940s by Carl Seyfert. The image shows clearly that one "galaxy" is only a tidal tail of stars pulled out of a genuine galaxy. The face-on spiral apparently in the sextet was found to be a background galaxy 5 times as far away. The remaining quartet show in the new image much evidence of gravitational interaction between them due to their close approaches, such as distorted shapes, halos, and the tidal tail. All four galaxies lie in a smaller space than the Milky Way. It appears that they may merge into a single galaxy in the next few billion years. A mystery to be solved is that the new image shows no evidence of new star formation that is typical of gravitationally interacting galaxies.

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Instant AstroSpace Updates:

Ordinary salt has been detected (by a millimeter-wave radiotelescope) belching in large quantities from volcanoes on Jupiter's moon Io, confirming what has been theorized for decades: that the sodium clouds around Io's orbit are breakdown products of volcanic salt.

The Keck II and Gemini telescopes in Hawaii, using adaptive optics to cancel twinkling, imaged clouds of methane near the south pole of Saturn's moon Titan, confirming theory that the methane known to be in that atmosphere ought to form clouds, even though even Voyager was unable to find those clouds.

Hubble Space Telescope found a stellar-mass black hole hurtling away from what was probably a supernova explosion; considered the missing link between black holes and the supernovae thought to create them.

A new study of the dark bands on Jupiter's moon Europa concluded they resemble the Earth's mid-ocean ridges, where material is pushing up from below and spreading the surface.

A brown dwarf, a "failed" star without enough mass (only 4-5% that of our Sun) to start nuclear fusion that powers ordinary stars, has been found as a companion to the nearby (12 light years) star Epsilon Indi, and so is the closest brown dwarf known, and therefore the easiest to study.

A new computer simulation of planet formation shows that a gas giant can form in a few hundred years, rather than the millions of years previously believed; mechanism is pre-planet disk breaks into hunks that collapse quickly.

The new interferometer on the Very Large Telescopes in Chile has measured the diameters of a few very small stars (a first), including Proxima Centauri (123,000 miles), the nearest star beyond the Solar system.

Mars Odyssey has found large amounts of water ice at Mars's south polar cap, in addition to the previously known large amounts of dry ice there.

Long known wild fluctuations in radio signals from quasars have finally been proven to be caused by ionized gas particles in our Milky Way that the signals pass through, not by the quasar itself.

Galileo (Jupiter mission) has measured the density of Jupiter's moon Amalthea, and it must be composed of rock rubble loosely packed together.

A new computer simulation of satellite formation, which matches reality better than previous ones, shows that Jupiter's satellites formed slowly as the disk of material formed about Jupiter in the late stages of the planet's formation, not later out of a fully formed disk as previously believed.

A new theory of Kuiper Belt formation has explained how so many objects there are equal-sized doubles; it takes into account that low-energy collisions and near misses would occur in the midst of a sea of other particles during Belt formation.

Virtual Astronomy
by David Kodama

Season for the Planets

In case you hadn't noticed, the season for great planet views is in progress. Saturn and Jupiter are up at a reasonable hour and are now the targets for a new round of improved electronic cameras and image processing software. An excellent example of the amazing images appearing is this web cam image (by Eric Ng) of the Jovian moon Io transiting Jupiter:

http://www.ort.cuhk.edu.hk/ericng/200301121709UT-io.jpg

Recall that just a few years ago imagers using web cams were breaking new ground. Now we are regularly treated to images with such high resolution that surface markings are visible on a moon of Jupiter!

Eric Ng is a member of a club of imagers located in Hong Kong:

http://www.ort.cuhk.edu.hk/ericng/digital.htm

One of the new powerful tools that makes producing these amazing images possible is the program called Registax. This is specifically designed for combining (stacking) a large number of frames taken with a digital camera, web cam, or video camera (let's call them consumer cams). It takes the drudgery out of aligning frames, rating frames for sharpness, combining them, and filtering the resulting image to pull amazing sharpness out of what looks like hopelessly fuzzy individual frames. Note that Eric Ng's photo referenced above is a stack of 600 frames! And perhaps the most amazing thing is that Registax is available for free from:

http://aberrator.astronomy.net/registax/index.html

Yahoo Groups

One other factor accelerating advances in consumer cam imaging as well as other aspects of amateur astronomy is the collaboration going on via the Internet. No matter what you think of Yahoo's group discussion system, few can deny that it has made a difference. If you take a look at the current count

http://dir.groups.yahoo.com/dir/Science/Astronomy/

you'll find listings for hundreds of groups related to astronomy (64 for astrophotography alone!). Not all can be truly counted since some are not actually astronomy related, some have fallen by the wayside and are now abandoned, and some have never reached critical mass (many marked as having less than 5 members). However, that still leaves many, many groups with dozens or hundreds of members with dozens of daily postings, and also doesn't count the "unlisted" groups such as the three current OCA groups covering general OCA discussions, astroimaging, and scientific imaging.

http://groups.yahoo.com/group/ocastronomers/	OCA general discussions
http://groups.yahoo.com/group/astroimagers/	Astroimaging
http://groups.yahoo.com/group/digital_astro/	Digital camera imaging

If you haven't participated in the Yahoo groups and would like to try it, you can get involved at several levels. If the group is open to the public, you can just click on the link of the form:

http://groups.yahoo.com/group/GroupName/

where "GroupName" is replaced by the name of the group, and you will be able to browse through the archived messages with no further actions necessary. An example of such a group is this one:

http://groups.yahoo.com/group/ccd-newastro/

which has discussions revolving around the CCD imaging book **The New Astronomy**, by Ron Wodaski.

Other groups may require that you become a "member" first. To do this, you must first go to http://www.yahoogroups.com and click on "New Users: click to register" where you'll be instructed to pick a Yahoo ID and password and helped through the registration process. Once you have this ID established, you can then go to the group's link and "join" the group. Most requests to join will take some time to be approved as a standard procedure to weed out spammers attempting to join the group to post advertising. Once you have joined the group, you have the option of receiving new postings as individual email, in a daily digest of posts via email, or just viewing the postings on the web.

Please note that in registering with Yahoo, as is the case with other online groups, you are possibly opening yourself to junk (spam) mail being sent to the email address you provide. This is the "cost" we have to trade off against the benefits of these "free" services.

*You can also get **weekly email notices** of what's going on in the OCA by sending a request to me at: kodama@alumni.caltech.edu.*

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