Celestial Observer

NEWSLETTER OF THE CENTRAL COAST ASTRONOMICAL SOCIETY
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The Crab Nebula, the result of a supernova seen in 1054 AD, is filled with mysterious filaments. The filaments are not only tremendously complex, but appear to have less mass than expelled in the original supernova and a higher speed than expected from a free explosion. The above image, taken by the Hubble Space Telescope, is presented in three colors chosen for scientific interest. The Crab Nebula spans about 10 light-years. In the nebula's very center lies a pulsar: a neutron star as massive as the Sun but with only the size of a small town. The Crab Pulsar rotates about 30 times each second. *(Image courtesy of NASA, ESA, J. Hester, A. Loll (ASU) and NASA/APOD; Acknowledgement: Davide De Martin (Skyfactory) and NASA/APOD)*

CLUB MEETING

See you **Thursday, January 26th, from 7pm** at **1515 Fredericks Ave, San Luis Obispo.** We will have a guest speaker for the first meeting of the year!

1.5 Meter Telescope wins Top Student Prize in Appleply Contest!

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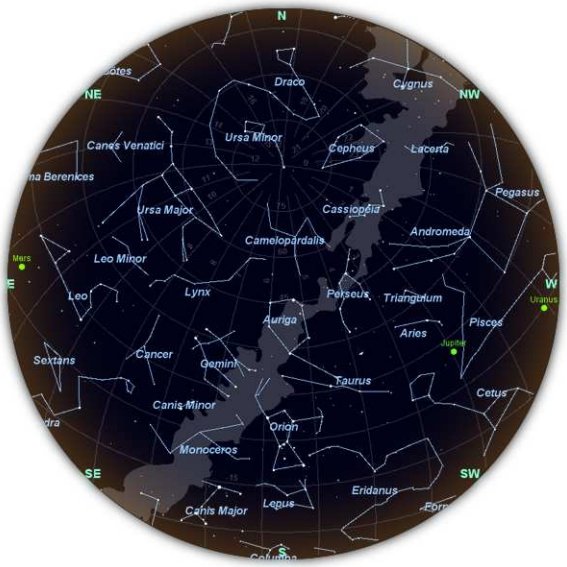
Star Party

The first star party of the year will be held at **sunset on Saturday, January 21st**, at Santa Margarita Lake KOA Camp ground. See you there!

This Month's Sky



(Image: http://www.popastro.com)

At dusk on New Year's Day, Jupiter will be high in the heavens, on the border of Aries and Pisces, and will set by 2:15 a.m. the following morning.

On Jan. 2, the waxing gibbous moon and Jupiter will share the field in a pair of seven times 50 mm binoculars. The Pleiades, or Seven Sisters, will join the moon in that same field on Jan. 4. Then, at about 8 p.m. Jan. 26, the three-day-old crescent moon and Venus, too, will be found in that 7-degree circle. Venus will set about 7:45 p.m. on Jan. 1, and move from Capricornus into Aquarius as the month progresses.

At 7:45 p.m. Jan. 13, if you place Venus in the center of that binocular view, Neptune will be the dimmer greenish spot only 1.2 degrees to the right, at about the 3 o'clock position. About the same distance away and below, at 6 o'clock, will be the brighter Iota Aquarii, the ninth brightest star in Aquarius.

You will be able to spot Mercury in the east-southeast in Sagittarius about 7 a.m. during the first half of January. Mars will rise at 10:40 p.m. early in the month in Leo, brighter than Regulus, the Lion's heart.

Over the month, Mars will move into Virgo, and by the 25th will be in retrograde motion, headed back into Leo. Saturn can be found in Virgo, rising early in the month about 2 a.m.

The Quadrantid meteor, usually brief but intense, is best between moonset (around 3 a.m.) and the onset of twilight (around 6a.m.).

(Image: sustainabilityninja.com)

The Quadrantid meteor shower will peak in the early morning hours of Jan. 4. The Quadrantids appear to have originated from the debris of minor planet 2003 EH1, which astronomers have concluded is an intermittently active comet. There are 500-year-old Korean, Chinese and Japanese astronomical records of this shower. The name comes from Quadrans Muralis, an obsolete constellation that is now part of Bootes, the Bear Herdsman. As many as 40 bright, blue meteors will radiate from this constellation. The shower may last only about an hour, starting at about 2 a.m.

1/5/2012: Today, Earth is at its nearest distance from the Sun, called perihelion. Feel the Sun's power!

Moon, Mars, and Saturn 1/14/2012: Late evening, early morning The waning Gibbous Moon rises with Mars around 10:30 PM, later on to be joined by Saturn, lower on the eastern horizon.

Moon, Saturn, and Spica 1/16/2012: After 1:00 AM The Third Quarter Moon, planet Saturn, and bright star Spica all cluster close together tonight, making a beautiful celestial triangle.

Moon and Venus, Jupiter 1/26/2012: After sunset Look to the evening western sky after sunset to see a thin Crescent Moon, the bright planet Venus, and, higher in the sky, Jupiter.

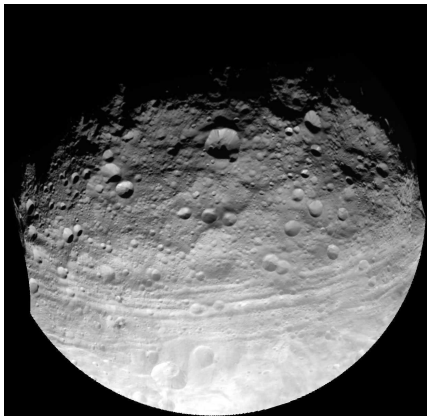
(chabotspace.org, ohio.com, astroasheville.org)

Dawn Takes a Closer Look

By Dr. Marc Rayman

Dawn is the first space mission with an itinerary that includes orbiting two separate solar system destinations. It is also the only spacecraft ever to orbit an object in the main asteroid belt between Mars and Jupiter. The spacecraft accomplishes this feat using ion propulsion, a technology first proven in space on the highly successful Deep Space 1 mission, part of NASA's New Millennium program.

Launched in September 2007, Dawn arrived at protoplanet Vesta in July 2011. It will orbit and study Vesta until July 2012, when it will leave orbit for dwarf planet Ceres, also in the asteroid belt.



This full view of the giant asteroid Vesta was taken by NASA's Dawn spacecraft, as part of a rotation characterization sequence on July 24, 2011, at a distance of 5,200 kilometers (3,200 miles). Credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Dawn can maneuver to the orbit best suited for conducting each of its scientific observations. After months mapping this alien world from higher altitudes, Dawn spiraled closer to Vesta to attain a low altitude orbit, the better to study Vesta's composition and map its complicated gravity field.

Changing and refining Dawn's orbit of this massive, irregular, heterogeneous body is one of the most complicated parts of the mission. In addition, to meet all the scientific objectives, the orientation of this orbit needs to change.

These differing orientations are a crucial element of the strategy for gathering the most scientifically valuable data on Vesta. It generally requires a great deal of maneuvering to change the plane of a spacecraft's orbit. The ion propulsion system allows the probe to fly from one orbit to another without the penalty of carrying a massive supply of propellant. Indeed, one of the reasons that traveling from Earth to Vesta (and later Ceres) requires ion propulsion is the challenge of tilting the orbit around the sun.

Although the ion propulsion system accomplishes the majority of the orbit change, Dawn's navigators are enlisting Vesta itself. Some of the ion thrusting was designed in part to put the spacecraft in certain locations from which Vesta would twist its orbit toward the target angle for the low-altitude orbit. As Dawn rotates and the world underneath it revolves, the spacecraft feels a changing pull. There is always a tug downward, but because of Vesta's heterogeneous interior structure, sometimes there is also a slight force to one side or another. With their knowledge of the gravity field, the mission team plotted a course that took advantage of these variations to get a free ride.

The flight plan is a complex affair of carefully timed thrusting and coasting. Very far from home, the spacecraft is making excellent progress in its expedition at a fascinating world that, until a few months ago, had never seen a probe from Earth.

Keep up with Dawn's progress by following the Chief Engineer's (yours truly's) journal at http://dawn.jpl.nasa.gov/mission/journal.asp. And check out the illustrated story in verse of "Professor Starr's Dream Trip: Or, how a little technology goes a long way," at http://spaceplace.nasa.gov/story-prof-starr.

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

Recent Astronomy Events

1.5 meter telescope wins top student prize in Appleply contest

Letter from Russ Genet to winners Mounir, Laura, and Mike

It is my distinct pleasure to inform you that your entry of the 1.5 meter telescope in the Appleply annual contest has won the first place prize for student entries, so you three will share the $3000 prize. My sincere congratulations for a job well done on the design and construction of the telescope's structure.

It has been a real pleasure working with you on this project. I thought it was really neat that the same equations and software used to analyze skyscrapers was also is totally applicable to telescope structures. The deflections are smaller and it is a stiffness as opposed to strength problem, but mathematically structures are structures whether they are skyscrapers or telescopes! I look forward to continuing to work with you on the evaluation of the structure and your final report.

Congratulations and cheers,

Russ

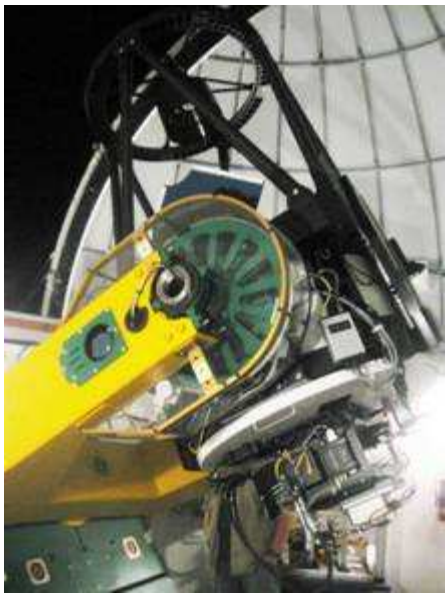
Byrne Observatory Sedwick

Double Star Speckle Interferometry Test Run

Russ Genet

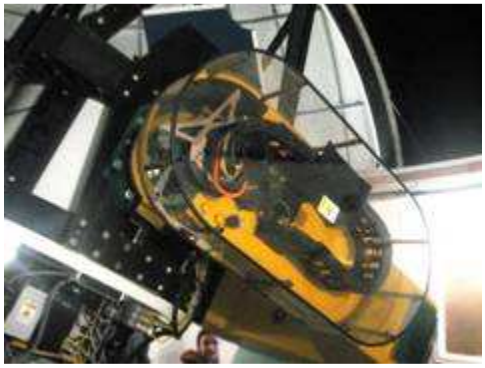
Chris and Reed Estrada, B. J. Fulton, Russ Genet, and John Matrinez used the 0.8 meter telescope at Byrne Observatory Sedwick (BOS) on the night of October 16, 2011 (local time) for a test/familiarization run in preparation for making observations of close visual double stars via speckle interferometry. Technical details on the run are given toward the end of this informal report.

The Byrne Observatory Sedwick (BOS) is part of the growing Las Cumbres Observatory Global Telescope (LCOGT). The BOS 0.8 meter f/8 telescope is located on a ridge at the Sedwick Reserve, a 5000 acre dark site east of the small town of Santa Ynez, California (just over the mountains to the north of Santa Barbara).



The mount for the telescope was designed by a team of mechanical engineering students
at California Polytechnic State University, San Luis Obispo, while working as interns at LCOGT. The telescope was built at the LCOGT shop in Santa Barbara. The mirror and OTA assembly were made by RC Optical in Tucson.

The telescope is equipped with extensive instrumentation, including an Andor Luca-R emCCD camera which we used for our high speed observations, as well as an SBIG 6303 CCD camera that we used for wide field object identification/astrometry.



The mount has many advanced features, such as the declination cable wrap shown above. This eliminates almost all cable drag on the telescope, not to mention dangling cables snagging astronomers in the dark! There is a much larger cable wrap is in right ascension.

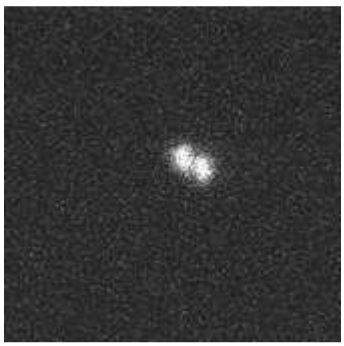
John reseats the Andor Luca-R emCCD camera after checking the filter. This camera normally sits behind an x2 TeleVue Barlow. The first half of our run was made with this x2 Barlow. The second half of the run was made at x4 using a second x2 TeleVue Barlow that Russ brought with him. (We placed the second Barlow in series with the first Barlow.) A long focal length can be advantageous for speckle observations of close visual double stars.

B.J. Fulton controlled the telescope and cameras. Russ used his laptop to look up stars and he took notes in his notebook. The telescope control software was written several years ago by Wayne Rosing, LCOGT's Director. The telescope and instruments can be controlled remotely.

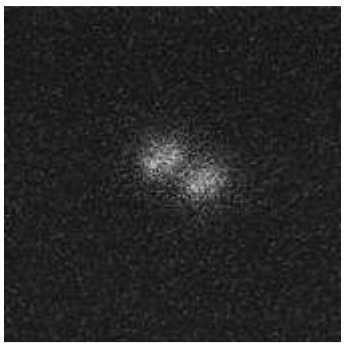
B.J., Russ, and John pose for a photo in front of the BOS telescope. The yellow and green telescope colors are Cal Poly's school colors.

Chris and Reed Estrada stand below the sizeable instrument package. Chris is a geology

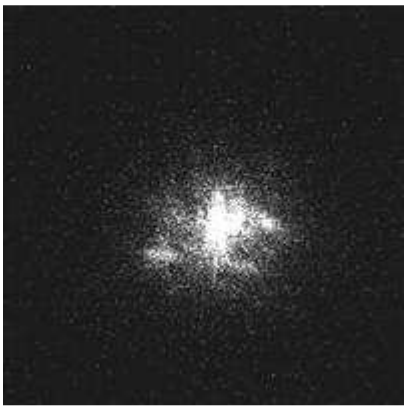
student at California State University, Los Angeles, while Reed is a test pilot at Edwards Air Force Base. Reed, Chris, and Russ have worked together for several years observing double stars with students
at Cuesta College and at summer student workshops. The three of them built a 1-meter portable telescope.



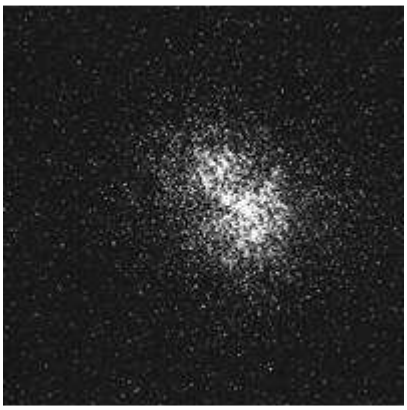
The first of 10,000 images taken with the Andor Luca-R camera at 10 frames/second (0.1 second integrations in the streaming mode), a Region of Interest (RoI) of 512x512 pixels, and no filter. The electron multiplying gain was set at 50 (very faint image without any em gain). A single x2 Barlow was in the optical path. Seeing throughout the run was about 3 arc seconds. This visual double star was taken from a list that Brian Mason at the USNO provided Russ of neglected stars that could benefit from further observation. This star, HDS3161 / 22190+4107 (our file A), has primary and secondary magnitudes listed in the Washington Double Star (WDS) as 9.5 and 9.6 magnitudes respectively, and a separation of 4.2 arc seconds (1998). Only six astrometric observations have been reported in the WDS catalog over the last 200 years.



Next we added Russ' x2 Barlow to the optical path, giving us a total of x4. Above is the first of 10,000 images of the same star (our file A_2x). The RoI remained at 512x512, with 0.1 second integrations and no filter.



We thought it would be appropriate to obtain some observations with a filter at higher speed, so we added in an R filter, chose a brighter double from the Sixth Orbit Catalog, and increased our streaming frame rate to 45 frames/second. We obtained 5,000 images (our star B 2X). As before the RoI was 1/4th frame at 256x256 pixels. The star was WDS 22388+4419 BAG Aa with a 160 year orbit. The two magnitudes are listed in the WDS as 6.82 and 8.09, with a recent separation of 0.0 arc seconds (not the actual separation as there is an orbital solution) and position angle of 162 degrees. The Sixth Orbit Catalog gives the V magnitudes as 7.48 and 7.96.



A third and final star was chosen from the Sixth Orbit Catalog, WDS 23524+7533BU AB (our file star C 2X). It has a 320 year orbit, 15 reported observations, with a last reported

separation of 3.0 arc seconds (1983) and position angle of 116 degrees. The first frame of 5,000 is shown above, taken at 45 fames/second with a ¼ full frame RoI and a red filter. Magnitudes in the WDS are given as 6.49 and 11.4, and the Sixth Orbit Catalog as 6.6 and 11.5.

To obtain camera orientation, longer integrations were taken in several declination positions before the camera was removed to check for filter wheel movement to the R position, and also toward the end of the run after the camera was reinstalled.

We plan on making additional speckle interferometry observations of close visual double stars on the BOS 0.8-meter telescope, operating it remotely from LCOGT headquarters in Santa Barbara.

Upcoming Space Missions for 2012

As 2011 draws to a close, the year ahead, 2012, promises to be a year when some greatly anticipated space missions are scheduled to take place. They can be divided into unmanned, commercial, and international.

Unmanned Missions for 2012

The twin NASA GRAIL probes will arrive in lunar orbit on New Year's Day for a three month mission to examine the moon's gravity, as well as its interior and formation. The two satellites will create a map of the moon's variable gravity field by measuring the changes in distance between them due to gravitational variations.

The Dawn spacecraft, currently in orbit around the asteroid Vesta, will complete that phase of its mission in July. It will blast out of orbit and head toward the largest known asteroid, Ceres, where it is due to arrive in Feb 2015.

Mars Science Laboratory Curiosity is scheduled to land on the Martian surface on August 6. The SUV sized Mars rover will touch down with that will use a crane to gentler lower it to the ground after having its descent slowed by retro rockets and a parachute. If it successfully touches down, it will provide the most sophisticated and extensive unmanned examination of Mars yet.

Commercial Missions for 2012

If all goes well, the first cargo version of SpaceX's Dragon will launch on Feb 7 on board a Falcon 9 rocket. A few days later the cargo Dragon will rendezvous with the International Space Station. The crew of the ISS will take hold of the Dragon with a remote manipulator arm and berth it to an airlock. If all is successful, a new era of commercial cargo space missions will have been born, presaging crewed flights scheduled to take place in 2017.

Virgin Galactic's SpaceShipTwo has so far been engaged in glide tests, after having been dropped by its carrier plane, WhiteKnightTwo. It is hoped that powered flights of the SpaceShipTwo will commence sometime in 2012, bringing closer that era of paid passenger space flights to low Earth orbit.

International Space Missions for 2012

While NASA astronauts are compelled to pay for rides on the Russian Soyuz, due to the end of the space shuttle program, the Chinese space program will quicken its pace with two missions to its space station module prototype, the Tiangong-1. These missions will be the Shenzhou 9 and the Shenzhou 10. It is anticipated, pending an analysis of the unmanned mission of the Shenzhou 8, that one or both of these flights will carry a crew. That being the case, the crew of each mission will spend about two weeks docked to the Tiangong-1, according to Space Daily. One of the members of the Shenzhou 10 may well be China's first female astronaut.

Mark R. Whittington is the author of Children of Apollo and The Last Moonwalker. He has written on space subjects for a variety of periodicals, including The Houston Chronicle, The Washington Post, USA Today, the LA Times, and The Weekly Standard

Read This!

Children of Apollo

(amazon.com)

Mark R. Whittington

Read Children of Apollo, the alternate history novel of high adventure and low intrigue against the backdrop of a space program that never was, but should have been. July 20, 1969. Apollo 11 has landed men on the Moon, fulfilling the great dream of generations. It was to be the start of a new, glorious age of space exploration that would take humanity to the planets and ultimately to the stars. But just three years later the great dream was over and the last men to explore the Moon returned to Earth. Thirty years later no one has been back. The hope of space settlements and expeditions to the planets was deferred, perhaps for a generation, perhaps forever. But what if history had taken a different path? Children of Apollo tells the story of a space age that never was, but could have been.

Thank You!

A big thank you to all those who helped make this newsletter possible. Thank you to Dr. Marc Rayman and the Jet Propulsion Laboratory, California Institute of Technology, for their contributions, as well as Amazon.com, chabotspace.org, ohio.com, astroasheville.org, popastro.com, sustainabilityninja.com, NASA, ESA, J. Hester, A. Loll (ASU), NASA/APOD, Davide De Martin (Skyfactory), NASA/JPL-Caltech/UCLA/MPS/DLR/IDA, Mark R. Whittington, the Yahoo! Contributor Network, Russ Genet, Laura K. Lincoln, and Lee Coombs.

For additional information on the Central Coast Astronomical Society, please visit our website: www.centralcoasastronomy.org, contact President Aurora Lipper at (805) 544-4636, or Email at: aurora@CentralCoastAstronomy.org