December 2011

THE SPECTROGRAM

Newsletter for the Society of Telescopy, Astronomy, and Radio

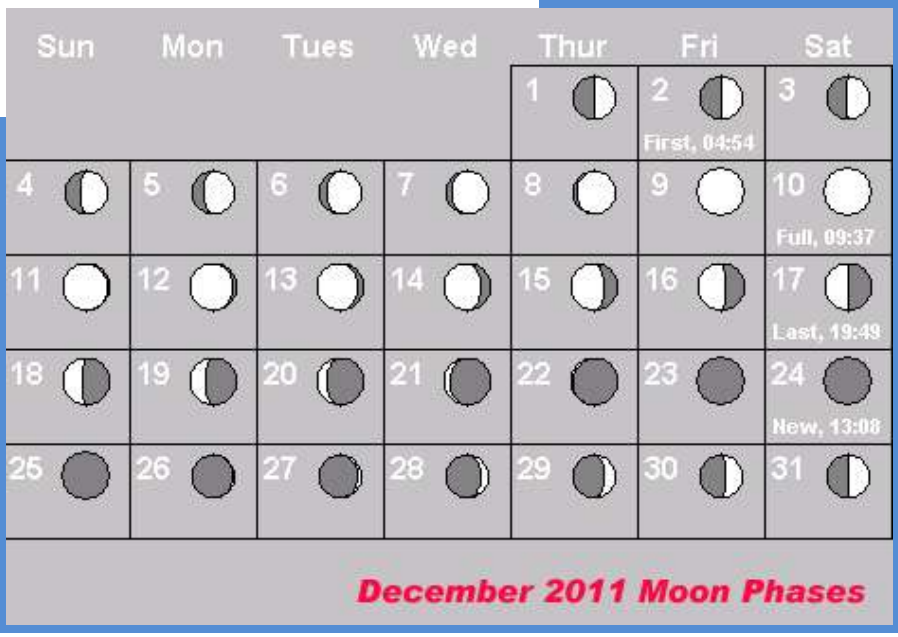
Inside this Issue:

December Meeting

The next meeting of S*T*A*R will be at 8pm on Thursday, December 1, 2011. Our speaker will be Dale Gary, a professor at NJIT, whose topic will be "Solar Radio Research and the ESOVA project: Your stimulus tax dollars at work." Professor Gary was awarded a $5.1 M grant through the National Science Foundation for an expansion of NJIT's solar radio observatory in Owens Valley in California. The ESOVA project is to be completed by the time of the current solar cycle maximum in 2013. The talk will describe some of today's most compelling solar research problems, the kind of instrument needed to address them, and how ESOVA is designed to play a major role in a new era of radio solar physics.

Calendar

- December 1st , 2011 – Monthly meeting. Speaker : Professor Dale Gary



January Issue

Please submit articles and contributions for the next *Spectrogram* by December 27th. Please email to fowler@verizon.net.

Star Parties:

Astronomy Night
Rescheduled from November 22nd…

Mill Lake Elementary School in Monroe Township is holding their annual Astronomy Night on Tuesday, February 28th 2012. They have asked if we could set up several telescopes for the students and parents. The school is located at 115 Monmouth Road, Monroe Township, NJ 08831.

We can arrive and set up in the rear of the school at 5:30. In the past there was pizza, subs and soda for the astronomers. The students will start to arrive at 6:00 and it should end about 9:00.

This event goes on rain or cloud. There are indoor stations where the students are engaged in hands-on activities supervised by the teachers. There will be a Starlab Planetarium and an exhibit of Moon rocks. There are about 180 students plus parents and siblings but they will come out to observe in class sized groups.

The last two years we were able to observe but the two previous years the skies were overcast and the astronomers did the observations through breaks in the clouds or came inside the gym and showed the students how their telescopes worked and viewed pictures of galaxies across the room.

Please post if you can help.
Please monitor "Events and Observation Plans" link on our web site for updates.

Russ Drum and Dennis O'Leary are contacts for the Club.

Name_____

Address_____

City_____State___Zip_____

Phone_____

Email_____
Make checks payable to: S*T*A*R Astronomy Society, Inc. and mail to P.O. Box 863, Red Bank, NJ 07701

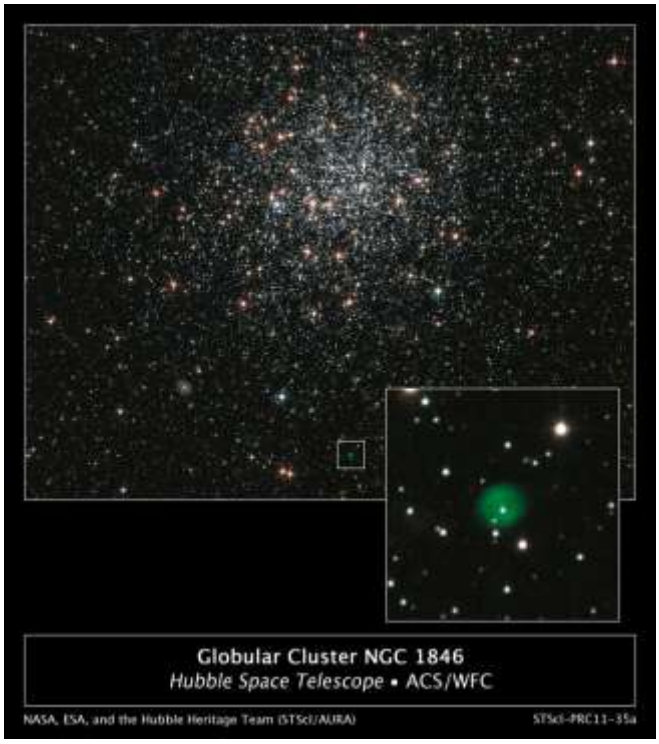
Are you a S*T*A*R Member?

Meetings are the first Thursday of each month, except July and August, at 8:00 PM at the Monmouth Museum on the Brookdale Community College campus. Meetings generally consist of lectures and discussions by members or guest speakers on a variety of interesting astronomical topics. S*T*A*R is a member of United Astronomy Clubs of New Jersey (UACNJ), the Astronomical League (AL), and the International Dark Sky Association (IDA).

Memberships: ( )Individual....$25 ( ) Family...$35

NASA's Hubble Finds Stellar Life and Death in a Globular Cluster

A new NASA Hubble Space Telescope image shows globular cluster NGC 1846, a spherical collection of hundreds of thousands of stars in the outer halo of the Large Magellanic Cloud, a neighboring dwarf galaxy of the Milky Way that can be seen from the southern hemisphere.



A new NASA Hubble Space Telescope image shows globular cluster NGC 1846, a spherical collection of hundreds of thousands of stars in the outer halo of the Large Magellanic Cloud, a neighboring dwarf galaxy of the Milky Way that can be seen from the southern hemisphere. (Credit: NASA and the Hubble Heritage Team, STScI/AURA; Acknowledgment: P. Goudfrooij, STScI)

Aging bright stars in the cluster glow in intense shades of red and blue. The majority of middle-aged stars, several billions of years old, are whitish in color. A myriad of far distant background galaxies of varying shapes and structure are scattered around the image.

The most intriguing object, however, doesn't seem to belong in the cluster. It is a faint green bubble near the bottom center of the image. This so-called 'planetary nebula' is the aftermath of the death of a star. The burned-out central star can be seen inside the bubble. It is uncertain whether the planetary nebula is a member of NGC 1846, or simply lies along the line of sight to the cluster. Measurements of the motion of the cluster stars and the planetary nebula's central star suggest it might be a cluster member.

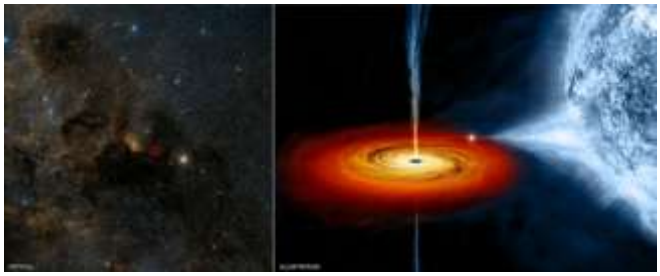
This Hubble image was taken with the Advanced Camera for Surveys in January of 2006. The cluster was observed in filters that isolate blue, green, and infrared starlight. As a member of the Large Magellanic Cloud, NGC 1846 is located roughly 160,000 light-years away in the direction of the constellation Doradus.

The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency. NASA's Goddard Space Flight Center manages the telescope. The Space Telescope Science Institute (STScI) conducts Hubble science operations. STScI is operated for NASA by the Association of Universities for Research in Astronomy, Inc., in Washington, D.C.

NASA's Chandra Contributes to Black Hole Birth Announcement

New details about the birth of a famous black hole that took place millions of years ago have been uncovered, thanks to a team of scientists who used data from NASA's Chandra X-ray Observatory as well as from radio, optical and other X-ray telescopes.

Over three decades ago, Stephen Hawking placed -- and eventually lost -- a bet against the existence of a black hole in Cygnus X-1. Today, astronomers are confident the Cygnus X-1 system contains a black hole, and with these latest studies they have remarkably precise values of its mass, spin, and distance from Earth. With these key pieces of information, the history of the black hole has been reconstructed.



On the left, an optical image from the Digitized Sky Survey shows Cygnus X-1, outlined in a red box. Cygnus X-1 is located near large active regions of star formation in the Milky Way, as seen in this image that spans some 700 light years across. An artist's illustration on the right depicts what astronomers think is happening within the Cygnus X-1 system.

"This new information gives us strong clues about how the black hole was born, what it weighed and how fast it was spinning," said author Mark Reid of the Harvard-Smithsonian Center for Astrophysics (CfA) in Cambridge, Mass. "This is exciting because not much is known about the birth of black holes."

Reid led one of three papers -- all appearing in the November 10th issue of The Astrophysical Journal -- describing these new results on Cygnus X-1. The other papers were led by Jerome Orosz from San Diego State University and Lijun Gou, also from CfA.

Cygnus X-1 is a so-called stellar-mass black hole, a class of black holes that comes from the collapse of a massive star. The black hole is in close orbit with a massive, blue companion star.

Using X-ray data from Chandra, the Rossi X-ray Timing Explorer, and the Advanced Satellite for Cosmology and Astrophysics, a team of scientists was able to determine the spin of Cygnus X-1 with unprecedented accuracy, showing that the black hole is spinning at very close to its maximum rate. Its event horizon -- the point of no return for material falling towards a black hole -- is spinning around more than 800 times a second.

An independent study that compared the evolutionary history of the companion star with theoretical models indicates that the black hole was born some 6 million years ago. In this relatively short time (in astronomical terms), the black hole could not have pulled in enough gas to ramp up its spin very much. The implication is that Cygnus X-1 was likely born spinning very quickly.

Using optical observations of the companion star and its motion around its unseen companion, the team made the most precise determination ever for the mass of Cygnus X-1, of 14.8 times the mass of the Sun. It was likely to have been almost this massive at birth, because of lack of time for it to grow appreciably.

"We now know that Cygnus X-1 is one of the most massive stellar black holes in the Galaxy," said Orosz. "And, it's spinning as fast as any black hole we've ever seen."

Knowledge of the mass, spin and charge gives a complete description of a black hole, according to the so-called "No Hair" theorem. This theory postulates that all other information aside from these parameters is lost for eternity behind the event horizon. The charge for an astronomical black hole is expected to be almost zero, so only the mass and spin are needed.

"It is amazing to me that we have a complete description of this asteroid-sized object that is thousands of light years away," said Gou. "This means astronomers have a more complete understanding of this black hole than any other in our Galaxy."

The team also announced that they have made the most accurate distance estimate yet of Cygnus X-1 using the National Radio Observatory's Very Long Baseline Array (VLBA). The new distance is about 6,070 light years from Earth. This accurate distance was a crucial ingredient for making the precise mass and spin determinations.

The radio observations also measured the motion of Cygnus X-1 through space, and this was combined with its measured velocity to give the three-dimensional velocity and position of the black hole.

This work showed that Cygnus X-1 is moving very slowly with respect to the Milky Way, implying it did not receive a large "kick" at birth. This supports an earlier conjecture that Cygnus X-1 was not born in a supernova, but instead may have resulted from the dark collapse of a progenitor star without an explosion. The progenitor of Cygnus X-1 was likely an extremely massive star, which initially had a mass greater than about 100 times the sun before losing it in a vigorous stellar wind.

In 1974, soon after Cygnus X-1 became a good candidate for a black hole, Stephen Hawking placed a bet with fellow astrophysicist Kip Thorne, a professor of theoretical physics at the California Institute of Technology, that Cygnus X-1 did not contain a black hole. This was treated as an insurance policy by Hawking, who had done a lot of work on black holes and general relativity.

By 1990, however, much more work on Cygnus X-1 had strengthened the evidence for it being a black hole. With the help of family, nurses, and friends, Hawking broke into Thorne's office, found the framed bet, and conceded.

"For forty years, Cygnus X-1 has been the iconic example of a black hole. However, despite Hawking's concession, I have never been completely convinced that it really does contain a black hole -- until now," said Thorne. "The data and modeling described in these three papers at last provide a completely definitive description of this binary system."

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for NASA's Science Mission Directorate in Washington. The Smithsonian Astrophysical Observatory controls Chandra's science and flight operations from Cambridge, Mass.

More information is available at:

http://www.nasa.gov/chandra

For an additional interactive image, podcast, and video on the finding, visit:

http://chandra.harvard.edu

Janet Anderson
Marshall Space Flight Center, Huntsville, Ala.
Megan Watzke
Chandra X-ray Center, Cambridge, Mass.

Mars Science Laboratory in Good Health

Latest Updates:

- Engineers have received data from NASA's Mars Science Laboratory showing that all systems are operating normally. The approximately eight-month journey to Mars is underway.

- NASA's Mars Science Laboratory has separated from the rocket that boosted it toward Mars and has sent a signal to Earth.

- NASA's Mars Science Laboratory and its rocket are coasting in orbit around Earth before heading to Mars.

- NASA's Mars Science Laboratory and its Curiosity rover have blasted off on an Atlas V rocket from Cape Canaveral Air Force Station in Florida.

NASA's Mars Science Laboratory lifts off from Cape Canaveral Air Force Station, Fla. Image credit: NASA/JPL-Caltech

The spacecraft, which will arrive at Mars in August 2012, is equipped with the most advanced rover ever to land on another planet. Named Curiosity, the rover will investigate whether the landing region has had environmental conditions favorable for supporting microbial life, and favorable for preserving clues about whether life existed.

Whitney Clavin
Jet Propulsion Laboratory, Pasadena, Calif.

Curiosity at Work on Mars (Artist's Concept)
This artist's concept depicts the rover Curiosity, of NASA's Mars Science Laboratory mission, as it uses its Chemistry and Camera (ChemCam) instrument to investigate the composition of a rock surface. ChemCam fires laser pulses at a target and views the resulting spark with a telescope and spectrometers to identify chemical elements. The laser is actually in an invisible infrared wavelength, but is shown here as visible red light for purposes of illustration.

Liftoff! Curiosity Bound for Mars with NASA's Mars Science Laboratory (MSL) spacecraft. The Atlas V rocket rides a plume of flames as it climbs into the blue sky over Space Launch Complex-41at Cape Canaveral in Florida at 10:02 a.m. EST Nov. 26. Image credit: NASA/George Roberts
Nov. 26, 2011

Year of the Solar System
Evolving Worlds

This lovely, otherworldly evening was captured by the rover Spirit in 2005 as it peered toward the western sky from its perch in Gusev Crater on Mars. Image Credit: NASA/JPL/Texas A&M/Cornell

Like people, planets grow old. They start out full of energy, but over billions of years, they change. Instead of losing their hair, planets can lose their atmospheres and oceans. Instead of wrinkles, they may gather craters. And rather than becoming frail, planets cool and shrink, becoming more dense as they move into their senior years.

Mars is an example of a planet past its youth. Planetary scientists envision a warmer, wetter early Mars, with flowing rivers and ocean and a thicker atmosphere, all surrounded by a protective global magnetic field. As Mars cooled, its core could no longer generate a magnetic field. Its interior became too cool to produce the volcanic eruptions that built and maintained the atmosphere. Without the protective shield of the magnetic field, the solar wind gradually eroded away Mars' diminished atmosphere. Water, once flowing across the surface, evaporated or became trapped in the subsurface or polar ice caps. Exploring how worlds evolve will help us understand more about Earth's own future -- and help us in our search for habitable planets!

Join us for December and January as we investigate how planets evolve! Check out the calendar for events these months and the upcoming observing event opportunities. Jupiter AND Venus are bright in the evening sky and if you're lucky, you may catch a glimpse of some meteors from the Geminid or Quadrantid meteor showers!

December 2011 Celestial Events: supplied by J. Randolph Walton (Randy)

Day	Date	Time (EDT)	Event
Fri	2	04:52	**First Quarter Moon**
		12:12	Moon rise
Sat	3	03:15	Saturn Rises
		03:45	Jupiter Sets
		07:04	Sunrise
		16:35	Sunset
		16:40	Mercury Sets
		18:00	**Lunar Straight Wall visible**
		18:25	Venus Sets
		23:25	Mars Rises
Sat	10	02:50	Saturn Rises
		03:15	Jupiter Sets
		06:00	Mercury Rises
		07:09	Moon Set
		07:11	Sunrise
		09:06	**Total Lunar Eclipse, not visible in NJ**
		09:36	**Full Moon**
		16:47	Moon rise
		18:37	Venus Sets
		23:10	Mars Rises
Wed	14	13:00	**Geminid meteors (ZHR=120)**
Sat	17	02:27	Saturn Rises
		02:50	Jupiter Sets
		05:30	Mercury Rises
		07:16	Sunrise
		11:30	Moon rise
		16:36	Sunset
		18:50	Venus Sets
		19:48	**Last Quarter Moon**
		22:57	Mars Rises
Thu	22	00:30	**Winter Solstice**
Sat	24	02:05	Saturn Rises
		02:20	Jupiter Sets
		05:35	Mercury Rises
		07:20	Sunrise
		13:06	**New Moon**
		16:50	Moon Set
		19:10	Venus Sets
		22:40	Mars Rises
Tue	27	20:52	**Two shadows transit on Jupiter**
Sat	31	01:35	Saturn Rises
		01:55	Jupiter Sets
		05:55	Mercury Rises
		07:22	Sunrise
		11:06	Moon rise
		16:44	Sunset
		19:25	Venus Sets
		22:20	Mars Rises

In the Eyepiece

Here is a list of objects for this month. This is reproduced from www.skyhound.com with the kind permission of its creator and author of SkyTools Greg Crinklaw.

Object(s)	Class	Con	RA	Dec	Mag
NGC 1501	Planetary Nebula	Camelopardus	04h06m59.4s	+60°55'14"	13.3
Cleopatra's Eye	Planetary Nebula	Eridanus	04h14m15.8s	-12°44'21"	9.6
The California Nebula	Diffuse Nebula	Perseus	04h03m12.0s	+36°22'00"	5.0
NGC 1664	Open Cluster	Auriga	04h51m04.4s	+43°42'04"	7.2
MSH 04-12	Quasar	Eridanus	04h07m48.4s	-12°11'36"	14.8
NGC 1360	Planetary Nebula	Fornax	03h33m14.6s	-25°52'18"	9.6
Crystal Ball	Planetary Nebula	Taurus	04h09m17.0s	+30°46'33"	10.0
Palomar 2	Globular Cluster	Auriga	04h46m06.0s	+31°22'54"	13.0
K 2-1	Planetary Nebula	Auriga	05h07m07.1s	+30°49'18"	13.8
NGC 1624	Open Cluster	Perseus	04h40m25.4s	+50°26'49"	11.8

Coordinates are epoch 2000.0