The Spectrogram

Newsletter for the Society of Telescopy, Astronomy, and Radio

December 2014

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S*T*A*R
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http://www.starastronomy.org

December Meeting

Our speaker will be STAR member Ken Legal, who will present "The H-R Diagram and Interesting Star Facts." The famous Hertzsprung-Russell (H-R) diagram contains a lot more information than first meets the eye. This talk will include a brief history about how the H-R diagram came to be, then continue on to explain why it is so valuable a tool to astronomers. Not only does it summarize some interesting facts about some well-known (and not so well-known) stars, it can also help us evaluate the possibility of intelligent life on planets orbiting particular stars.

The meeting will begin at 8:00pm at Monmouth Museum on the campus of Brookdale Community College in Lincroft, NJ.

Calendar

January 9, 2015 – S*T*A*R meeting

February 5, 2015 – S*T*A*R meeting

February 25, 2015 - Mill Lake Star Party

November Meeting Minutes

By Steve Fedor

The November 6th, 2014 meeting of S*T*A*R Astronomy club began at 8:08 p.m. The meeting was attended by 30 people. President Kevin Gallagher chaired the meeting and began by welcoming three new people. He also mentioned that the S*T*A*R tee shirts were available for pickup at break for those who ordered them.

The evening's talk was presented by past STAR president Steve Walters. Steve gave an absolutely fascinating talk titled "The Search for type 1A type Supernovae– Needle in a Haystack." Steve began with the history of hunting for these types of supernovae and why they are so important to understanding the nature of the cosmos. However the main topic was Steve's software that he developed to detect these wonders of nature from digital photographic images. Steve discussed at great length the techniques and algorithms his software uses to coax these supernovae out of images. The talk ended at 9:40 for coffee break.

The meeting resumed at 10:00 with Ken Legal presenting "Sky Happenings." Ken discussed Delta Cephi-a double variable, Mu Cephi- a bright red star, Algol- an eclipsing binary, Mercury and the Leonids.

Upcoming observing events were then discussed:
11/14 – Penn Brook, Manalapn
11/25- Summerfield School, Neptune
2/25/15 Mill Lake School, Monroe

George Z. started a discussion about matching the dates of star parties to the age group of the audience because there may not always be something of great interest to young children in the sky. Dave B. suggested a chart be created. Jay R. suggested we use the Sky & Telescope annual chart as a tool to create it. President Kevin agreed these were good ideas and asked for volunteers.

Fall meeting Speaker Schedule:
Nov.: Steve Walters – Search for 1A Supernovae
Dec.: ken Legal – The H-R Diagram
Jan. 9th – Winter Social to be held at Kevin's house

George Z. then indicated he will investigate the Collier's Mills observing site. He also said that an update to his Messier Object image cd were available to the club. The CD costs $8.00. An upgrade to existing CD is $1.00. All profits go to the club – Thanks George!

President Kevin G. asked all members to pay their dues and said that STAR club membership gift certificates are available. It's the perfect holiday present for the astronomically inclined person on your good list. Kevin also announced there is no news on the club's 25 inch obsession

Gavin W. mentioned that BBC TV showed a high res picture of planet formation.

Charlie Byrne discussed that Arizona State University is using highly detailed images of the moon from NASA's Lunar Reconnaissance Orbiter to search for certain types of boulders. This effort is open to the public. Charlie will be sending out more information soon. Note: since the meeting Charlie has emailed this web site to get started http://wms.lroc.asu.edu/lroc/

The meeting was adjourned at 10:34.

A home-brew observatory detects exoplanet

(Phys.org) David Schneider, a senior editor at *IEEE Spectrum*, was interested in exoplanets, planets that orbit stars other than the sun, but figured this kind of exercise as a home-based project was going to need expensive telescopes; he stumbled across a project at Ohio State University, where resourceful astronomers had figured out a way to spot exoplanets using a device with a lens designed for high-end cameras. Schneider's wheels turned, thinking he might also be able to pull this off if he got his hands on a charge-coupled-device detector not research-grade, and maybe he could forget about an expensive telescope as well? He also discovered an online posting by an amateur astronomer saying he had detected a known exoplanet using a digital single-lens reflex (DSLR) camera with a telephoto lens.

So go the events leading up to Schneider's recent DIY video, which shows him successfully star-tracking with a telephoto lens and barndoor tracker—otherwise known as two pieces of plywood hinged together. Without the aid of a high powered telescope, then, "You yourself can detect an extrasolar planet, and I'm gonna show you how," he tells viewers, showing a little telephoto lens. He holds up two pumpkins, one smaller than the other. "If you're very lucky, the planet, as it orbits its star, will come directly in front of the star, as viewed from earth—in which case, the amount of light coming from that star diminishes, very briefly as the planet passes in front of it. But that signal could be big enough for you to detect with a DSLR camera. The lens that comes with your camera probably isn't going to do it." Instead, he said, you can inexpensively purchase a 300-millimeter Nikon telephoto lens, along with a Nikon-to-Canon adapter.

For next steps, cost-conscious Schneider looked for DIY alternatives to an expensive tracker and went for two pieces of plywood, which he referred to as his barndoor tracker. To drive the tracker, he pulled gears out of a defunct inkjet printer, added an Arduino microprocessor, wooden platform and ball head to orient the camera in any direction. He said he used software that came with his camera, allowing adjustments to camera settings, taking shots, recording images directly to a computer and programming a sequence of timed exposures.

Schneider's goal? "A gas giant that belongs to a binary star system variously named HD 189733, HIP 98505, or V452 Vulpeculae, depending on the star catalog." (His article in IEEE Spectrum noted that, 63 light-years away, HD 189733 is too dim to be seen with the naked eye. Finding it required the use of such waypoints as the Dumbbell Nebula.) He used Iris software to perform corrections needed to calculate the brightness of HD 189733 as well as four reference stars. "So," he concluded "it seems my home-brew observatory did detect an exoplanet—using little more than run-of-the-mill DSLR and a $92 eBay camera lens."

Where the Heavenliest of Showers Come From

By Dr. Ethan Siegel

You might think that, so long as Earth can successfully dodge the paths of rogue asteroids and comets that hurtle our way, it's going to be smooth, unimpeded sailing in our annual orbit around the sun. But the meteor showers that illuminate the night sky periodically throughout the year not only put on spectacular shows for us, they're direct evidence that interplanetary space isn't so empty after all!

When comets (or even asteroids) enter the inner solar system, they heat up, develop tails, and experience much larger tidal forces than they usually experience. Small pieces of the original object—often multiple kilometers in diameter—break off with each pass near the sun, continuing in an almost identical orbit, either slightly ahead-or-behind the object's main nucleus. While both the dust and ion tails are blown well off of the main orbit, the small pieces that break off are stretched, over time, into a diffuse ellipse following the same orbit as the comet or asteroid it arose from. And each time the Earth crosses the path of that orbit, the potential for a meteor shower is there, even after the parent comet or asteroid is completely gone!

This relationship was first uncovered by the British astronomer John Couch Adams, who found that the Leonid dust trail must have an orbital period of 33.25 years, and that the contemporaneously discovered comet Tempel-Tuttle shared its orbit. The most famous meteor showers in the night sky all have parent bodies identified with them, including the Lyrids (comet Thatcher), the Perseids (comet Swift-Tuttle), and what promises to be the best meteor shower of 2014: the Geminids (asteroid 3200 Phaethon). With an orbit of only 1.4 years, the Geminids have increased in strength since they first appeared in the mid-1800s, from only 10-to-20 meteors per hour up to more than 100 per hour at their peak today! Your best bet to catch the most is the night of December 13th, when they ought to be at maximum, before the Moon rises at about midnight.

The cometary (or asteroidal) dust density is always greatest around the parent body itself, so whenever it enters the inner solar system and the Earth passes near to it, there's a chance for a meteor storm, where observers at dark sky sites might see thousands of meteors an hour! The Leonids are well known for this, having presented spectacular shows in 1833, 1866, 1966 and a longer-period storm in the years 1998-2002. No meteor storms are anticipated for the immediate future, but the heavenliest of showers will continue to delight skywatchers for all the foreseeable years to come!

'Smart dust' technology could reshape space telescopes

(Phys.org) Telescope lenses someday might come in aerosol cans. Scientists at Rochester Institute of Technology and the NASA Jet Propulsion Laboratory are exploring a new type of space telescope with an aperture made of swarms of particles released from a canister and controlled by a laser. These floating lenses would be larger, cheaper and lighter than apertures on conventional space-based imaging systems like NASA's Hubble and James Webb space telescopes, said Grover Swartzlander, associate professor at RIT's Chester F. Carlson Center for Imaging Science and Fellow of the Optical Society of America. Swartzlander is a co-investigator on the Jet Propulsion team led by Marco Quadrelli.

NASA's Innovative Advanced Concepts Program is funding the second phase of the "orbiting rainbows" project that attempts to combine space optics and "smart dust," or autonomous robotic system technology. The smart dust is made of a photo-polymer, or a light-sensitive plastic, covered with a metallic coating.

"Our motivation is to make a very large aperture telescope in space and that's typically very expensive and difficult to do," Swartzlander said. "You don't have to have one continuous mass telescope in order to do astronomy—it can be distributed over a wide distance. Our proposed concept could be a very cheap, easy way to achieve large coverage, something you couldn't do with the James Webb-type of approach."

An adaptive optical imaging sensor comprised of tiny floating mirrors could support large-scale NASA missions and lead to new technology in astrophysical imaging and remote sensing.

Swarms of smart dust forming single or multiple lenses could grow to reach tens of meters to thousands of kilometers in diameter. According to Swartzlander, the unprecedented resolution and detail might be great enough to spot clouds on exoplanets, or planets beyond our solar system.

"This is really next generation," Swartzlander said. "It's 20, 30 years out. We're at the very first step."
Previous scientists have envisioned orbiting apertures but not the control mechanism. This new concept relies upon Swartzlander's expertise in the use of light, or photons, to manipulate micro- or nano-particles like smart dust. He developed and patented the techniques known as "optical lift," in which light from a laser produces radiation pressure that controls the position and orientation of small objects.

In this application, radiation pressure positions the smart dust in a coherent pattern oriented toward an astronomical object. The reflective particles form a lens and channel light to a sensor, or a large array of detectors, on a satellite. Controlling the smart dust to reflect enough light to the sensor to make it work will be a technological hurdle, Swartzlander said.

Two RIT graduate students on Swartzlander's team are working on different aspects of the project. Alexandra Artusio-Glimpse, a doctoral student in imaging science, is designing experiments in low-gravity environments to explore techniques for controlling swarms of particle and to determine the merits of using a single or multiple beams of light.

Swartzlander expects the telescope will produce speckled and grainy images. Xiaopeng Peng, a doctoral student in imaging science, is developing software algorithms for extracting information from the blurred image the sensor captures. The laser that will shape the smart dust into a lens also will measure the optical distortion caused by the imaging system. Peng will use this information to develop advanced image processing techniques to reverse the distortion and recover detailed images.

"Our goal at this point is to marry advanced computational photography with radiation-pressure control techniques to achieve a rough image," Swartzlander said. "Then we can establish a roadmap for improving both the algorithms and the control system to achieve 'out of this world' images."

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

S*T*A*R meets the first Thursday of each month, except July and August, at 8:00 p.m. at Monmouth Museum on the campus of Brookdale Community College in Lincroft, NJ. Meetings usually include a presentation of about one hour by a guest speaker, a break for refreshments and socializing, a description of interesting objects to view, and a discussion of club business.

Memberships:
( )Individual...$35
( ) Family...$45
( ) Student…$15

Name_____

Address_____

City_____State___Zip_____

Phone_____

Email_____
Make checks payable to: STAR Astronomy Society, Inc. and mail to P.O. Box 863, Red Bank, NJ 07701

The club owns 8" f/8, and 13" f/4.5 Dobsonian telescopes which are available for use by members. To borrow a telescope, please contact the Vice President.

The officers of S*T*A*R are:
President Kevin Gallagher
Vice President Rob Nunn
Secretary Michelle Paci
Treasurer Arturo Cisneros
Member at Large Dave Britz

S*T*A*R members can join the Astronomical League (AL) for a small fee. Members receive the AL publication Reflector.

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