The Spectrogram

Newsletter for the Society of Telescopy, Astronomy, and Radio

October 2014

Inside this Issue

S*T*A*R
P.O. Box 863
Red Bank, NJ 07701
On the web at:
http://www.starastronomy.org

October Meeting

The next meeting of S*T*A*R will be held Thursday October 2. The speaker will be S*T*A*R member Gordon Waite of Waite Engineering, who will talk about the new generation of super-fast amateur telescopes (down to f/3), including his new "Renegade" Line. Gordon will also be updating the club on the reconfiguration of the 25" telescope.

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

Calendar

October 2, 2014 – S*T*A*R meeting

October 16, 2014 – Talk by astronaut Story Musgrave at OCC

September Meeting Minutes

By Rob Nunn

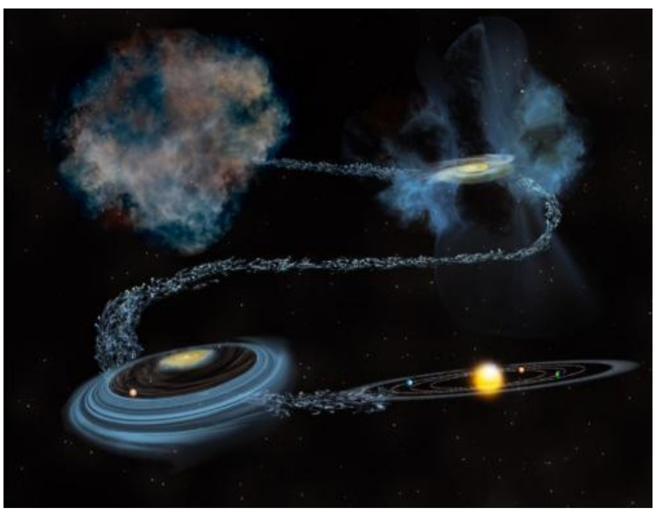
The S*T*A*R meeting of September 4 was held at Monmouth Museum in Lincroft. The meeting began at 8 p.m. with 25 people in attendance and was chaired by president Kevin Gallagher.

The speaker was Kevin Conod of the Newark Museum and the Star-Ledger newspaper, whose talk was titled “Glass Giants: the Biggest Telescopes in the World.”

Ken Legal presented sky events for the month. The 50/50 drawing was won by Mike Kozic.

Water in the solar system predates the Sun

Sep 25, 2014



An illustration of water in our Solar System through time from before the Sun's birth through the creation of the planets. Credit: Bill Saxton, NSF/AUI/NRAO

(Phys.org) Water was crucial to the rise of life on Earth and is also important to evaluating the possibility of life on other planets. Identifying the original source of Earth's water is key to understanding how life-fostering environments come into being and how likely they are to be found elsewhere. New work from a team including Carnegie's Conel Alexander found that much of our Solar System's water likely originated as ices that formed in interstellar space. Their work is published in *Science*.

Water is found throughout our Solar System. Not just on Earth, but on icy comets and moons, and in the shadowed basins of Mercury. Water has been found included in mineral samples from meteorites, the Moon, and Mars.

Comets and asteroids in particular, being primitive objects, provide a natural "time capsule" of the conditions during the early days of our Solar System. Their ices can tell scientists about the ice that encircled the Sun after its birth, the origin of which was an unanswered question until now.

In its youth, the Sun was surrounded by a protoplanetary disk, the so-called solar nebula, from which the planets were born. But it was unclear to researchers whether the ice in this disk originated from the Sun's own parental interstellar molecular cloud, from which it was created, or whether this interstellar water had been destroyed and was re-formed by the chemical reactions taking place in the solar nebula.

"Why this is important? If water in the early Solar System was primarily inherited as ice from interstellar space, then it is likely that similar ices, along with the prebiotic organic matter that they contain, are abundant in most or all protoplanetary disks around forming stars," Alexander explained. "But if the early Solar System's water was largely the result of local chemical processing during the Sun's birth, then it is possible that the abundance of water varies considerably in forming planetary systems, which would obviously have implications for the potential for the emergence of life elsewhere."

In studying the history of our Solar System's ices, the team—led by L. Ilsedore Cleeves from the University of Michigan—focused on hydrogen and its heavier isotope deuterium. Isotopes are atoms of the same element that have the same number of protons but a different number of neutrons. The difference in masses between isotopes results in subtle differences in their behavior during chemical reactions. As a result, the ratio of hydrogen to deuterium in water molecules can tell scientists about the conditions under which the molecules formed.

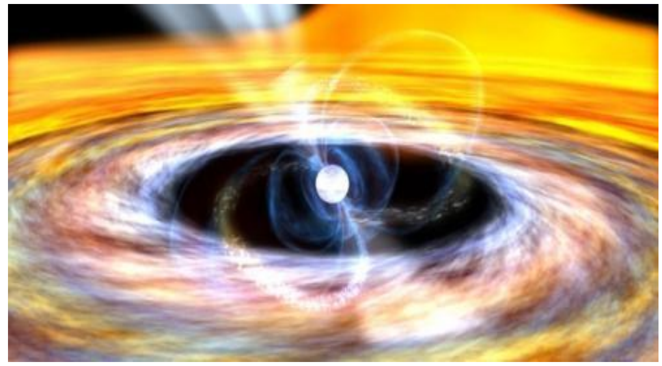
For example, interstellar water-ice has a high ratio of deuterium to hydrogen because of the very low temperatures at which it forms. Until now, it was unknown how much of this deuterium enrichment was removed by chemical processing during the Sun's birth, or how much deuterium-rich water-ice the newborn Solar System was capable of producing on its own.

So the team created models that simulated a protoplanetary disk in which all the deuterium from space ice has already been eliminated by chemical processing, and the system has to start over "from scratch" at producing ice with deuterium in it during a million-year period. They did this in order to see if the system can reach the ratios of deuterium to hydrogen that are found in meteorite samples, Earth's ocean water, and "time capsule" comets. They found that it could not do so, which told them that at least some of the water in our own Solar System has an origin in interstellar space and pre-dates the birth of the Sun.

"Our findings show that a significant fraction of our Solar System's water, the most-fundamental ingredient to fostering life, is older than the Sun, which indicates that abundant, organic-rich interstellar ices should probably be found in all young planetary systems," Alexander said.

The connection between x-ray binaries and millisecond pulsars

by Brian Koberlein



Artist rendering of a pulsar. Credit: NASA / Goddard Space Flight Center / Dana Berry

(Phys.org) A millisecond pulsar is a neutron star that is rotating about 600 to 700 times a second. Because of their strong magnetic fields, they produce strong beams of radio energy from the regions of their magnetic poles, and as they rotate these beams can point in our direction. As a result, we observe these neutron stars as radio bursts that pulse every 1 – 10 milliseconds. Hence their name.

Millisecond pulsars are rotating about as fast as neutron star can rotate, which makes them a bit of a mystery. Left by themselves, a pulsar gradually slows down over time. That means millisecond pulsars are either very young neutron stars that formed at near maximal rotation, or there must be some mechanism that causes them to spin more rapidly.

It's generally thought that the latter process is the more common. A neutron star that is part of a binary system with a red giant companion can capture material from the companion star. As the material is captured, the angular momentum (rotation) of the material is transferred to the neutron star, thus increasing its rotation. This would explain why millisecond pulsars are often old pulsars with a companion. While this mechanism was initially proposed decades ago, over the years we've gathered a lot of evidence to support it.

When neutron stars are actively capturing material from their companion, the energy released as it falls to the neutron star produces intense x-rays. Such x-ray producing systems are known as x-ray binaries. These x-ray binaries can be quite active, but the radiation emitted by them tends to push the accreting material away. Thus over time an active x-ray binary will become less active, eventually entering a quiet period after which it may become active again. In the late 1980s it was observed that some x-ray binaries in the late stage of their active period contain radio millisecond pulsars. In 1998 a millisecond pulsar was observed within an active x-ray binary. Then in 2009 an accretion disk was discovered around a millisecond pulsar, indicating that the pulsar had been accreting material in the past.

Then last year in *Nature* new evidence was presented that further verifies the mechanism. The paper presents observations of an x-ray transient known as IGR J18245–2452. An x-ray transient is an object that emits x-rays for a time, then goes quiet for a time. There are several types of x-ray transients, but this particular one is a neutron star with a companion. In the past it had been observed as a radio pulsar. It then entered an active period and begin emitting x-rays with millisecond pulsations. After an active period of about a month, the x-rays went quiet, and the neutron star began to emit radio pulses again.

This not only demonstrates a clear connection between x-ray binaries and millisecond pulsars, but that these objects can shift between the two states on a fairly rapid pace. It seems that some neutron stars really do eat and run.

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
Andromeda Galaxy	Galaxy	Andromeda	00h42m44.3s	+41°16'09"	4.3
The Sculptor Galaxy -- NGC 253	Galaxy	Sculptor	00h47m33.1s	-25°17'18"	8.2
NGC 7789	Open Cluster	Cassiopeia	23h57m01.9s	+56°43'42"	7.5
NGC 278	Galaxy	Cassiopeia	00h52m04.4s	+47°33'01"	11.5
NGC 288	Globular Cluster	Sculptor	00h52m38.2s	-26°35'43"	8.9
NGC 247	Galaxy	Cetus	00h47m08.7s	-20°45'38"	9.7
IC 10	Galaxy	Cassiopeia	00h20m23.1s	+59°17'35"	11.8
The Bubble Nebula	Diffuse Nebula	Cassiopeia	23h20m42.0s	+61°12'00"	--
NGC 40	Planetary Nebula	Cepheus	00h13m01.0s	+72°31'19"	10.7
The Blue Snowball	Planetary Nebula	Andromeda	23h25m53.9s	+42°32'06"	9.2
NGC 246	Planetary Nebula	Cetus	00h47m03.3s	-11°52'19"	8.0
NGC 7640	Galaxy	Andromeda	23h22m06.5s	+40°50'45"	11.8
NGC 7606	Galaxy	Aquarius	23h19m04.8s	-08°29'08"	11.7
NGC 128	Galaxy	Pisces	00h29m15.1s	+02°51'51"	12.7
Jn 1	Planetary Nebula	Pegasus	23h35m53.4s	+30°27'36"	15.1
NGC 281	Open Cluster	Cassiopeia	00h52m50.1s	+56°37'17"	7.4
NGC 381	Open Cluster	Cassiopeia	01h08m21.0s	+61°35'00"	9.3
I C 289	Galaxy	Sculptor	00h52m42.4s	-31°12'22"	11.8
Gamma Cassiopeia Nebula	Diffuse Nebula	Cassiopeia	00h57m30.0s	+61°09'00"	--
Hu 1-1	Planetary Nebula	Cassiopeia	00h28m15.0s	+55°57'54"	13.3
M 2-55	Planetary Nebula	Cepheus	23h31m51.3s	+70°22'11"	--
NGC 7492	Globular Cluster	Aquarius	23h08m28.7s	-15°36'28"	11.2
Hickson 94	Galaxy Group	Pegasus	23h17m18.2s	+18°43'31"	13.1
Gyulbudaghian's Nebula	Variable Reflection Nebula	Cepheus	20h45m54.2s	+67°57'51"	14