Santa Monica Amateur Astronomy Club

Oct, 2017

The Observer

Upcoming club meeting:
Friday, Oct 13, 7:00 pm

Talk: "Chemical Evolution of the Milky Way Galaxy"

Speaker: Dr. Terese Hansen, Carnegie Observatories

The chemistry of the Milky Way galaxy is the chemistry of us! Our sun and its planets formed from a cloud, enriched by elements forged in myriads of stars that populate our galaxy.

Terese Hansen, an astronomer at Carnegie Observatories, specializes in the study of how nucleosynthesis in the earliest stars in our galaxy shaped the Milky Way's composition.

Dr. Hansen received her B.S. and M.S degrees in astronomy from Copenhagen University, and her Ph.D. from Heidelberg University. She has been a postdoctoral researcher at Carnegie since 2015.

INSIDE THIS ISSUE

OUR MEETING SITE

Wildwood School
11811 Olympic Blvd.
Los Angeles, CA 90064

Free parking:
Garage, SE corner of Mississippi & Westgate.

IMAGE AT LEFT:

"Portrait of the Milky Way," by Jon Lomberg. The artist used actual coordinates of nebulae and clusters to produce this rendering. One exception—he placed a very faint image of Hawaii, his home state, among the stars. Can you see it?

UPCOMING EVENTS:

Note—all events subject to change! Always check first!

Oct 13 (Friday): SMAAC Astronomy Club meeting, Wildwood School, 7pm
Dr. Terese Hansen: Chemical Evolution of our Galaxy

Oct 15 (Sunday): Carnegie Observatories, Open House
813 Santa Barbara Street, Pasadena *2pm to 5pm*
Free; no RSVP required
This was where Hubble, and all the other luminaries associated with Mt. Wilson had
Their offices—but don't think it's just astronomer cubicles! Lots to do and see.
You can talk to some of the current astronomers, too!
obs.carnegiescience.edu
Note: Exit 210 Fwy at Lake in Pasadena; head north over freeway; several blocks
Left onto Santa Barbara Street (church at the corner)
Park in lot or on the street. There's only one non-residential building…
That's Carnegie Observatories HQ. G.E. Hale had it built in 1912.

Oct 16 (Monday): "Alexander von Humboldt"
Caltech; Baxter Auditorium *7:30 pm*
See Caltech Events

Oct 19 (Thursday): "Using Radar to Protect California's Water Supply"
JPL; Von Karman Auditorium *7 pm*

Oct 20 (Friday): Cosmic Fireworks
Caltech; Cahill Astronomy Center *8pm*
Free; open to all
Note: Cahill is on the south side of California Av, just west of Hill

Nov 1 (Wednesday): Cassini Mission
Watson Lecture
Beckman Auditorium, Caltech; 8 pm
Free; open to all
Speaker: Linda Spilker

Nov 1/2 (Wednesday/Thursday): 100th anniversary of the 100" telescope
First light on the 100" was Nov. 1/2, 1017—wow!!!!
Stay tuned for updates on events.
There's a conference Fri/Sat Nov 17/18…see
obs.carnegiescience.edu for details

Nov 5 (Sunday): Moon occults Aldebaran
Visible over much of North America

Again…be sure to check for yourself. Events can change.
Please report any changes to me. —ed.

Arecibo Dish Survives Maria—But Faces Uncertain Future

The great 1000-foot wide Arecibo Radio Dish has survived Hurricane Maria, though not without some damage.

Workers did their part before the hurricane—they stowed removable antennas and waveguides, locked movable instrument packages in place and installed storm shutters on the control rooms. A number of people hunkered down in the facility itself—and emerged to find 'relatively minor' damage. "It's a thing to be thankful for," said Deputy Director Joan Schmelz.

Still, Arecibo was hit. Part of a 29-meter linear antenna, used for probing the upper atmosphere, broke off and crashed through the mesh of the dish. Some observatory roofs were blown off, and there was flooding in the karst 'crater' that houses the dish. The cost of repair could be in the millions.

And that may pose a problem...

The National Science Foundation, its limited budget stretched by a number of big projects (such as the DKIST Solar Telescope on Maui and the Large Scale Synoptic Telescope in Chile), is looking to cut back on facilities such as Arecibo. Some scientists worry that adding millions of repair dollars to a stretched operating budget might tilt the decision toward closing down the great dish.

Arecibo is where millisecond pulsars were discovered, and it continues to do cutting edge research, bouncing signals off asteroids and monitoring the mysterious mesosphere above Earth's ozone layer. This is still the world's largest radio dish, along with China's FAST.

Meanwhile, the town of Arecibo fared very badly, and we all hope relief comes soon to the people who live there, including many workers at Arecibo. Losing the dish would be yet another hit for the beleaguered people of the area. On a personal note, I fondly remember how kind those people were to me when I visited, years ago, just as radar beacons from Arecibo were detecting abundant water ice on the surfaces of Europa and Ganymede—a shocker, at the time.

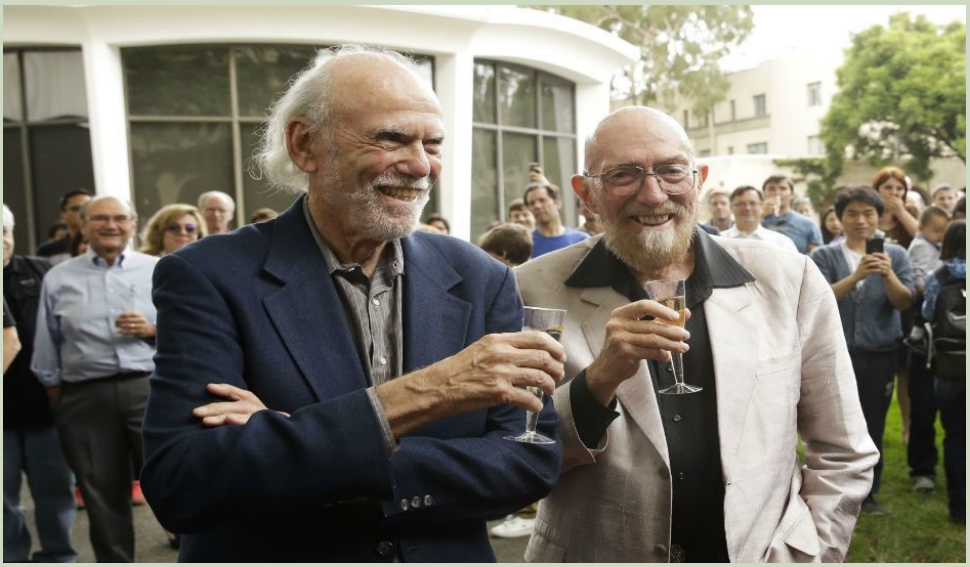
The NSF is looking for willing partners to help support future operations. If they come through, Arecibo will once again listen in on the universe, sending us more great discoveries.

The 2017 Nobel Prize in Physics Makes Waves—
And vice versa!

The Nobel Prize awards always make waves. This time, the reverse also held. Kip Thorne, Barry Barish and Rainer Weiss shared the $1.1 million prize for their role in the detection of gravitational waves with LIGO.

Many suspected that the 2017 prize would honor this blockbuster discovery. The effort was decades in the making, but relatively quick to be recognized, once the announcement was made.

Above: Rainer Weiss and Kip Thorne at the press conference held to announce the first direct detection of gravitational waves. Weiss got half the prize money for his design of an interferometric system for LIGO; Thorne and Barish shared the other half. Many club members have met and spoken with Kip Thorne, who has always been eager to chat in his casual, unassuming manner.



Caltech, no stranger to Nobel Prizes, can now add two more: Barry Barish (left) and Kip Thorne, seen celebrating outside the Millikan Library.

Thorne said he had to stumble down the stairs to answer the 2:45 am call—but he knew something was up. Thorne noted that he doesn't get a lot of phone calls at that hour of the morning!

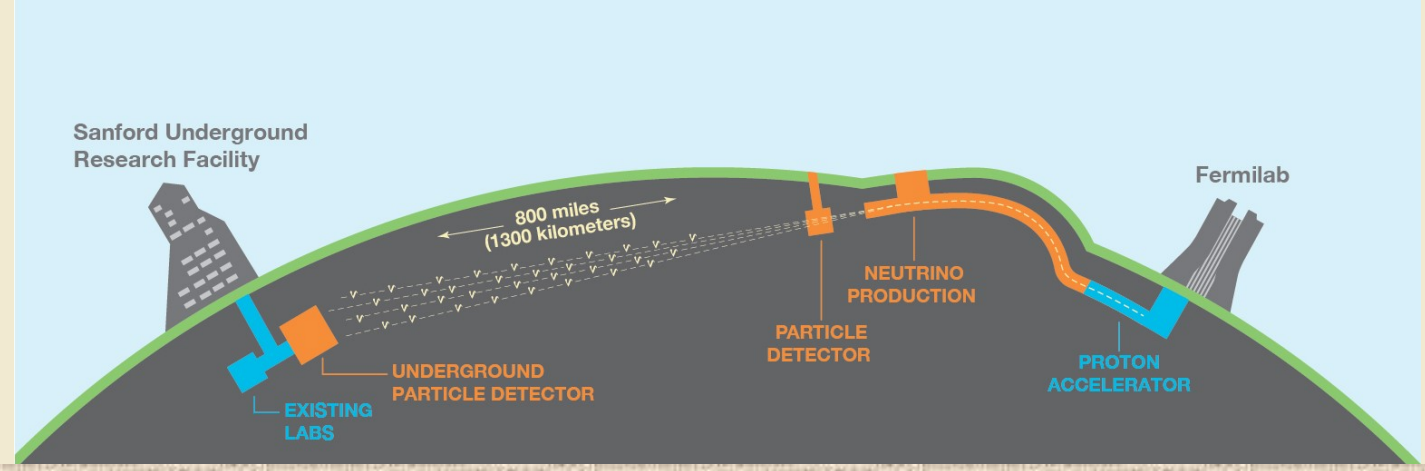
Rainer Weiss, the third prizewinner, is Professor Emeritus at MIT, another Nobel-heavy institution.

What to do with an Old Atom Smasher? DUNE!

--U.K. Set to Partner on the Deep Underground Neutrino Experiment—

Europe has the Large Hadron Collider, so what to do with Chicago's Fermilab, once the world's most powerful collider? Answer: The Deep Underground Neutrino Experiment—DUNE!

Neutrino beams produced at Fermilab (now without its venerable Tevatron, but still housing a 120 GeV accelerator) will be sent at depth to the Homestake Mine in South Dakota. This famous gold mine helped make the Hearst fortune—and was much later the site of Ray Davis' Nobel Prize-winning solar neutrino experiment. Now, the British are 'Brexiting' some of their money to join in the effort.



Homestake was once the world's most productive gold mine. Now, it is dedicated completely to science. Its giant liquid argon neutrino detectors will have unprecedented sensitivity. What might we learn?

1) ***The origin of matter:*** Radiation from the Big Bang should decay into equal numbers of particles and antiparticles—yet, we wouldn't be here if matter equaled antimatter. What broke the symmetry? Neutrinos oscillating between 'flavors' over their 1,300 km traverse might provide a clue.

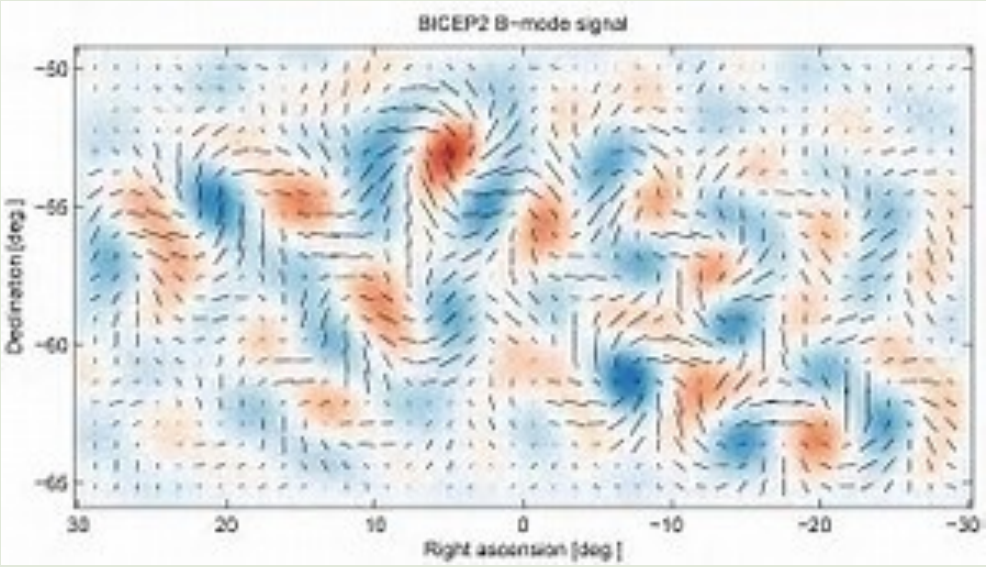
2) ***The formation of black holes:*** We detected neutrinos from Supernova 1987A, in the Large Magellanic Cloud, but DUNE's detectors should give us detailed information on neutrinos from any nearby supernova. If we're lucky, we might catch the birth of a black hole.

3) ***The Unification of Forces:*** The Grand Unified Theories that link the strong nuclear force to the weak and electromagnetic forces predict that protons decay. None has ever been seen it happen, but DUNE can catch these rare events, if they do exist.

Go to *fnal.gov* for more information!

A Bundle of BICEPS?

Flexing Our Scientific Muscles to Detect Cosmic Inflation



A while back, Phil Korngut of Caltech told us about BICEP (Background Imaging of Cosmic Extragalactic Polarization)—a 26 cm telescope at the South Pole to measure the imprint of gravitational waves in the Cosmic Microwave Background. This would be a direct confirmation of the Inflationary Big Bang Model, which assumes exponential expansion in the first trillionth of a trillionth of a trillionth of a second after the Big Bang—an instant in time that may have shaped our entire universe.

The tell-tale sign: Swirls of polarization, called Primordial B-Modes, made by these gravitational waves. A small telescope was needed to give a wide field of view—these patterns are most visible at scales of greater than 1 degree on the sky.

The problem was that dust can cause these patterns, too. As of now, the detection remains unconfirmed.

To eliminate the dust signal, astronomers need multi-wavelength observations, currently underway.

There's another complication, though—Dark Matter. The pull of this elusive mass can produce similar modes. The Dark Matter could be teased out by looking at smaller scales, with larger telescopes.

The answer? Many astronomers think it will take a large collaboration, and there's an effort underway to get this started.

Looks as if astronomers are eager to flex their muscles to tackle this fundamental problem in cosmology!