Mount Diablo Astronomical Society

Diablo MoonWatch

September 2013

General Meeting

Tuesday September 24, 2013

Living Maya Time

The Sun, Corn, and the Maya Calendar

By Dr. Isabel Hawkins (Astronomer and Project Director)

Doors open at 6:45 p.m.
Lindsay Wildlife Museum
1931 First Avenue,
Walnut Creek, CA 94597

Please park East of the museum, follow the instructions on the last page

Thousands of years ago, the Maya of Mesoamerica built one of the most advanced communities in the history of human kind, and the ancient cities of Uxmal, Chichén Itzá, Palenque, Tikal, Copán, and others offer a sense of awe and wonder.

These ancient cities also provide a tangible link to the richness and enduring power of Maya culture as expressed by the Maya people today. More than 7 million Maya, direct descendants of the ancestors who built the great pyramids, live in Mesoamerica and in other parts of the world. The Maya continue to thrive through a strong tradition of ceremony and ritual that permeates their daily life.

The Calendar is a tangible expression of the scientific and cultural legacy of the Maya, emerging from a deep knowledge of astronomy, mathematics, timekeeping and the cycles of celestial objects, hieroglyphic writing, architecture, ceremony, and agriculture.

Isabel Hawkins, Ph.D., is a bilingual and bicultural native of

Córdoba, Argentina. Dr. Hawkins received her Ph.D. in astrophysics at the University of California, Los Angeles, in 1986. She worked for 20 years at the University of California at Berkeley as a Senior Fellow on several NASA satellite projects, and as the Director of Science Education at the Space Sciences Laboratory. Currently, she is Astronomer & Project Director at the San Francisco Exploratorium, and Faculty of the Indigenous Education Institute, Friday Harbor, WA.

In 2011, Dr. Hawkins produced the bilingual (English and Hawaiian) Webby-award winning website Never Lost: Polynesian Navigation at the Exploratorium, which features the astronomical foundations of Native Hawaiian navigation. She worked with Maya curators to develop the website "Living Maya Time – Viviendo el tiempo maya" website for the Smithsonian National Museum of the American Indian. Her work focuses on broadening access to science and enhancing participation by all communities through the appreciation of the cultural roots of science. Dr. Hawkins received eight NASA awards between 2004 and 2008 for her work on NASA education and public outreach. In 2009, the Astronomical Society of the Pacific awarded Dr. Hawkins the prestigious Klumpke-Roberts Award in recognition of her outstanding contributions to the public understanding and appreciation of astronomy

What's Up

"America's (Other) First Manned Space Program"

Presented by Dick Flasck

Years before Project Mercury was conceived the US Air Force (in conjunction with NACA) began a manned space program that result-

(Continued on page 8)

President's Corner

On Top of The World (Part 1)

by Chris Ford

Early in September, I was invited to Hawaii to deliver a talk on the future of rendering at the Full Dome Festival at Imiloa in Hilo, an annual gathering of directors and producers of contemporary planetarium shows.

During my visit I was fortunate enough to be invited on a behind the scenes tour of some of the major observatories on the summit of Mauna Kea. As probably the pre-eminent location for ground based telescopic astronomy today, this was hardly an opportunity to miss and I have included a selection of the many photographs I took in this months Moonwatch and next.

This was in fact my first visit to the summit which is just under 14,000' high, (more precisely 13,803') and above 40% of the atmosphere and where the air pressure is only 60% that of sea-level. In fact the observing floor level of the Gemini (North) telescope, several stories above the summit ground level, is the highest single point in the entire Pacific basin. Before setting out, I was advised that for anyone unaccustomed to very high altitude, that only 2-3 hours maximum exposure was recommended first time up. As it turned out I was up at the summit for over 4-hours, and with the drive up and down, and extra time to acclimatize at the 9,200' level, it was certainly a full day outing with some physical after effects.

Our party included two Full Dome Festival colleagues both professional astronomers from Brazil and Atlanta and myself. We were picked up by our host in a 4-wheel drive vehicle as the summit is not accessible to normal rental cars. The drive from Hilo up Saddle Road was fairly routine until we reached the visitor center at the 9,200' level. At this point we stayed for over an hour to acclimatize to the altitude, and had lunch (astronomers eat fairly well at this level on Mauna Kea) in the Onizuka Center for International Astronomy (also known as Hale Pohaku) for visiting research astronomers just above the public visitor center, and began the process of hydrating with regular drinks of water in preparation for the exceptionally dry climate at the summit which makes it so valuable for astronomical observation. After signing the inevitable liability waivers, we also received a short lecture from a staff astronomer on the physical aspects of functioning at 14,000' and what to be aware of in terms of possible symptoms of altitude sickness. There are no real advance predictors of who might suffer from this malady, and I was able to tolerate the altitude reasonably well with the assistance of techniques such as pressure breathing, but I was definitely aware of feeling a bit light headed and floaty and was rather "thick headed" on the way down. In fact the entire trip to the summit was as much of personal physiological interest as it was astronomical!

The road from the visitor center to the summit is rough and unpaved for half the distance, and is only paved in the final stretch to the top. As we climbed higher, the sparse grass vegetation that was still very evident at the visitor center totally faded out, and the terrain became barren, rocky, and desertlike, resembling Mars to a great extent. Most astonishing however was the odd sensation of driving up a road with the clouds "below" eye-level, leading to some strange visual perspectives.

The Onizuka Center for International Astronomy above the visitors center from the 10,000' level.

The dirt road above 9,200' on the way to the summit and bumpy! Remember all the telescope components come this way.

On Top of The World (Part 1) (Continued from the previous page)

Closer to the summit the roadway is paved again.

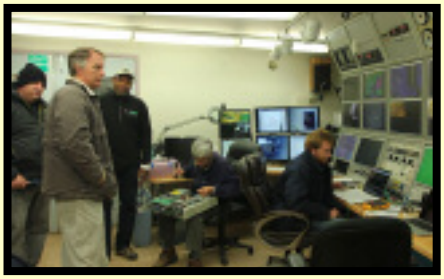
Arriving at the summit, our first port of call was the Canada-France-Hawaii Telescope (universally known as the CFHT) one of the oldest observatories on the summit dating back to 1979.

This is an old school equatorially yoke mounted 3.58 meter reflector that resembles a slightly smaller yellow version of the Palomar 5 meter (200") in its construction and "built like a battleship" integrity.

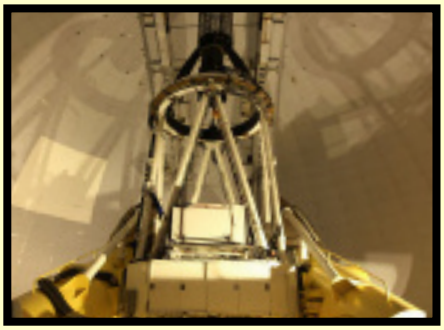
Our host, the CFHT Observatory Director Doug Simons, made a point that when the telescope was constructed funding was a lot more lavish and few corners were skipped in this facility and it kind of shows. In fact this is probably the last telescope of this size built as its larger successors use simpler Alt/Azimuth mountings.

However Doug Simons also told us there are preliminary plans in place to demolish the entire facility and replace it with a 10 meter or larger instrument if funding becomes available. Taking an elevator to the control room it was fascinating to look at the electronics which are a blend of 1970's and contemporary equipment, and one of the technicians was literally making repairs to an electronics module on the floor with sticky tape while we were there. This was an observatory with character!

The road to the CFHT. (It looks like Mars!)



The CFHT control room with some impromptu repairs going on under the watchful eye of observatory Director Doug Simons. (Second from left)



The CFHT telescope in its equatorial yoke mount with secondary cage visible. Even with a 16mm wide-field lens there is not enough room to fit the entire telescope into the field of view.

Walking the observatory floor after a slow staircase ascent from the control room, revealed a telescope that if smaller than more modern instruments is still enormous with a focal length of 13.5 meters and a primary mirror with a focal ratio of F/3.7.

Under the business end of the CFHT. (A cryogenically cooled CCD camera is above our heads)

Another view under the business end of the CFHT. The bearings under the horse-shoe collar rotate almost silently.

This is one of those older instruments in which it was once possible to physically ride in the secondary cage involving a fairly vertiginous climb up the inside of the dome to get there. Of course like all modern observatory instruments this telescope is used with large cryogenically cooled CCD cameras, but I did ask in the control room if anyone had actually looked through it visually.

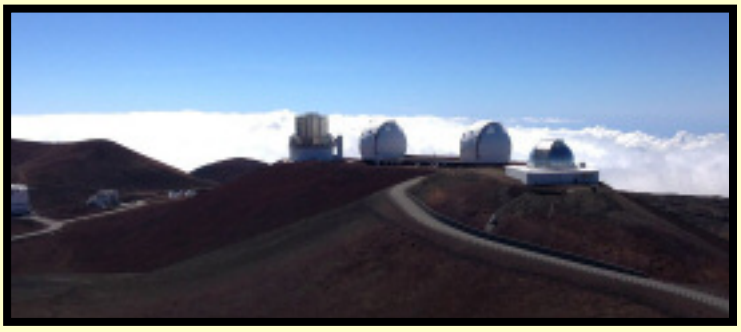
One of the operators said he had been in the secondary cage to visually check its alignment, and had taken a 31mm plossl eyepiece up there for fun, but he also said that with such an enormous primary mirror you really do not need an eyepiece as the sensation of looking down from the secondary focus position into the mirror is like floating in a sea of stars.

On Top of The World (Part 1) (Continued from the previous page)

Needless to say, a 31mm plossl yields a magnification of 4354X for the focal length of this instrument!

All the observatories on Mauna Kea are chilled throughout the day to freezing point which combined with the harsh high altitude climate makes layered cold weather clothing essential. It is one of the odd contrasts of visiting these observatories that the day starts at 85 degrees F in high humidity at sea level, and transitions to below freezing and almost no humidity at altitude and then back again.

Though one of the older telescopes on Mauna Kea, the CFHT is still a highly productive instrument scientifically. The telescope operators moved it around inside the closed dome while we stood underneath it, and for all its size it is exceptionally quiet as it glides on its oil bearings. In fact it is so silent and vibration free it is barely audible, which was a surprise given the sheer mass of metal being moved. The enclosing dome itself has heavy lift crane equipment built into its structure, so the monolithic mirror assembly weighing many tons can be periodically removed and lowered down to a lower level re-coating chamber. Some of the mirrors in smaller telescopes on Mauna Kea are recoated in this facility also.



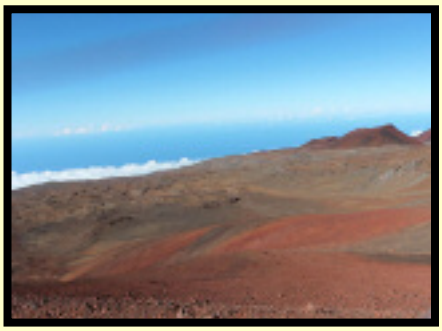
The stupendous view above the clouds from the high catwalk surrounding the dome of the CFHT. (From left to right, the Japanese Subaru telescope, the two Keck reflectors, and the NASA Infrared Telescope Facility or IRTF. The site of the future Thirty Meter Telescope of TMT lies further down the hill in the distance on the right)

After snacking on jelly beans and noodles in the observatory lounge, (odd for an observatory part financed by the French!) we went out onto the catwalk surrounding the observatory 5 stories above the summit ground level for some stunning views of the other Mauna Kea observatories. I was feeling a little light headed at that time due to altitude and my reflexes may have been impaired, as I accidentally dropped my 15mm- 35mm zoom lens onto the catwalk while circling the observatory dome, and smashed its filter on the metalwork. Luckily the lens itself was undamaged and thankfully it did not roll off and drop all the way down to the summit surface.

*What astronomers *really* eat on Mauna Kea! I asked if being partly French, the observatory had a chef, but alas not.*

One observation I was not expecting in examining the topography of the summit in real life compared to photographs of the Mauna Kea observatories, is that the CFHT (and the adjacent United Kingdom Infrared Telescope or UKIRT) are somewhat higher up than the famous 10 meter Keck and 8.2 meter Subaru reflectors which are slightly lower down the mountain. Even lower down past the Keck reflectors, we could also see the future location of the gigantic Thirty Meter Telescope (TMT) when it starts construction in 2014.

A casualty of my trip onto the CFHT catwalk.



The site of the future Thirty Meter Telescope (TMT) to the left of the picture. Note the totally barren landscape resembling Mars.

Next month in Part 2, a tour of the inside of the Gemini North observatory, a look at the twin 10 meter Keck telescopes, and an unexpectedly fascinating tour of the Sub-Millimeter Array (SMA) before heading down to sea level and 86 degrees Fahrenheit.

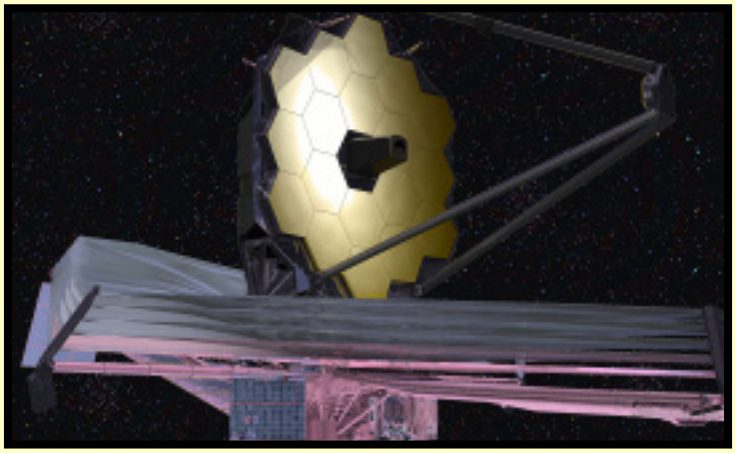
Clear skies! *Chris Ford*

N° 30–2013: ESA COMPLETES SECOND INSTRUMENT FOR JAMES WEBB SPACE TELESCOPE

by the European Space agency

September 6, 2013

ESA has completed the Near-Infrared Spectrograph, one of two instruments it is contributing to the international James Webb Space Telescope, a space observatory set for launch on an Ariane 5 rocket in 2018.



The James Webb Space Telescope, or JWST, is being built in a partnership between NASA, ESA and the Canadian Space Agency as the successor to the hugely successful Hubble space telescope.

It will boast a segmented primary mirror spanning a total of 6.5 m in diameter, making it the largest astronomical telescope in space. This mirror will feed light to four state-of-the art science instruments, including the Near-Infrared Spectrograph, or NIRSpec, which has been built for ESA by Astrium GmbH in Germany.

NIRSpec is designed to detect the light from the first stars and galaxies that formed in the young Universe, roughly 400 million years after the Big Bang, a time when conditions were very different to today, some 13.8 billion years later.

It will split the infrared light from these objects into its colour components – a spectrum – providing scientists with vital information on their chemical composition, dynamical properties, age and distance. NIRSpec will be able to observe up to 100 such objects simultaneously.

A very versatile instrument, NIRSpec will also be used to study the early phases of stellar birth across our Milky Way galaxy, and to analyse the atmospheric properties of planets in orbit around other stars, assessing the potential for life on worlds elsewhere in the Universe.

"The formal handover of NIRSpec from Astrium to ESA marks an important and exciting milestone in Europe's contribution to the JWST mission," said Alvaro Giménez, ESA's Director of Science and Robotic Exploration, speaking at a ceremony held today at Astrium GmbH in Ottobrunn, Germany.

"Along with the delivery of the Mid-Infrared camera and spectrograph (MIRI) to NASA last year, we are thrilled that European engineers and scientists are playing a key role in this important international mission."

Having undergone rigorous testing in Europe, NIRSpec will be shipped to NASA later this month for integration into JWST's instrument module, followed by further testing and calibration as the whole observatory is built up.

"We are delighted to acknowledge the completion of ESA's NIRSpec and excited to have it join the other Webb science instruments at NASA's Goddard Space Flight Center," said Eric Smith, NASA's Acting Program Director forJWST.

Once completed, JWST is scheduled for launch in 2018 on Ariane 5 from Europe's Spaceport in Kourou, French Guiana. It will then be positioned 1.5 million kilometres beyond Earth's orbit around the Sun, around the gravitationally stable point known as L2. There, the observatory and instruments will cool behind a giant sunshield to temperatures below –233°C and carry out scientific observations for up to 10 years.

"NIRSpec's completion takes us one step closer to fulfilling JWST's science goals and answering outstanding questions in astrophysics, such as how the first galaxies and stars formed and evolved," says Peter Jensen, ESA's JWST Project Manager.

More information

JWST is a joint project of NASA, ESA, and the Canadian

N° 30–2013: ESA COMPLETES SECOND INSTRUMENT FOR JAMES WEBB SPACE TELESCOPE *(Continued from the previous page)*

Space Agency. It is scheduled for launch in 2018 and will carry four scientific instruments: a near-infrared camera (NIRCam), a near-infrared spectrograph (NIRSpec), a mid-infrared camera and spectrograph (MIRI), and a combined fine guidance sensor and near-infrared imager and slitless spectrograph (FGS-NIRISS).

JWST and its instrument suite are optimised for observing infrared light to study the light coming from distant galaxies or to pierce through the veil of dust surrounding some objects like infant stars.

Free of the influence of Earth's atmosphere, kept in the dark and cold behind a sunshield the size of a tennis court and orbiting 1.5 million kilometres beyond Earth's orbit around the Sun, JWST and its instrument suite will achieve unprecedented sensitivity levels.

NIRSpec will operate over a wavelength range of 0.6–5 microns, spanning the red end of the visible to the near-infrared. It has been built by European industry under the management of the ESA JWST Project at ESTEC in the Netherlands. The prime contractor is Astrium GmbH in Ottobrunn, Germany and the NIRSpec detector and micro-shutter subsystems are provided by NASA's Goddard Space Flight Center.

Visit to Mount Wilson

by Vianney

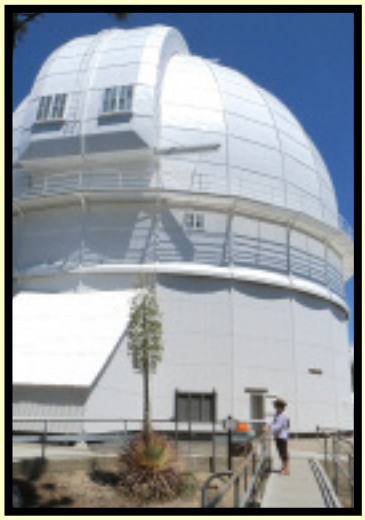
If you ever go South to Los Angeles and Pasadena, making a detour up to Mount Wilson will be very rewarding.

A 15 miles drive up the mountain will offer beautiful views on a clear day, but watch out for cyclists as it is a great ride on two wheels. It is not very steep because horses were used to built the historical 100 inch telescope.

There is a guided visit that will take you to the floor of the telescope, although a self guided tour will offer an excellent understanding of Mount Wilson's place in the history of astronomy.

A small museum using flat back lighted panels explaining its history: In 1919, American astronomer Edwin Hubble was at Mt. Wilson and, throughout the 1920s, made many astronomical discoveries using the Hooker Telescope.

One can even rent for half a night the 60 inch telescope at the cost of $750.00. So a group of 10 friends can enjoy the night sky, cookies and beverage will be included. At $1,500 one can enjoy the telescope for an entire night!

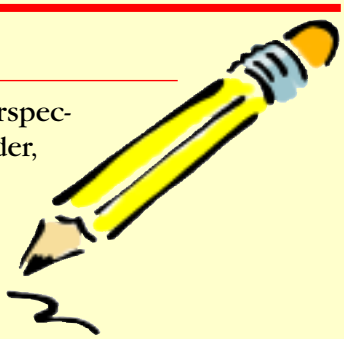


Einstein came to visit Mount Wison and "discussed" those great dicoveries by Hubble--Hubble kept calling galaxies nebulae even though he discovered them!
You can even mountain bike up to visit Mt. Wison!

Mount Diablo Astronomical Society Event Calendar–September 2013

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	Labor Day 2	3	4	5	6	Society Observing (Private) 7 Sunset: 7:29 PM
8	Board Meeting (Private) 9	10	11	12	13	6:30 PM Public Astronomy (CANCELLED) 14 Sunset: 7:17 PM
15	16	17	18	19	20	21 Sunset: 7:06 PM
22	23	6:00 PM NSN Telecon : PANOPTES 24 7:15 PM GenMtg: Mayan Astronomy	25	26	27	Observatory Maintenance (Private) 28 Sunset: 6:56 PM
29	30	1	2	3	4	5

As Always Writers Are Wanted



We are always looking for new articles and content. If you have astronomical perspectives or experiences to share with your fellow members that you would us to consider, please feel free to contact me Chris (cford81@comcast.net) or our newsletter editor Vianney. (veloroute@hotmail.com)

Clear skies!

Chris and Vianney

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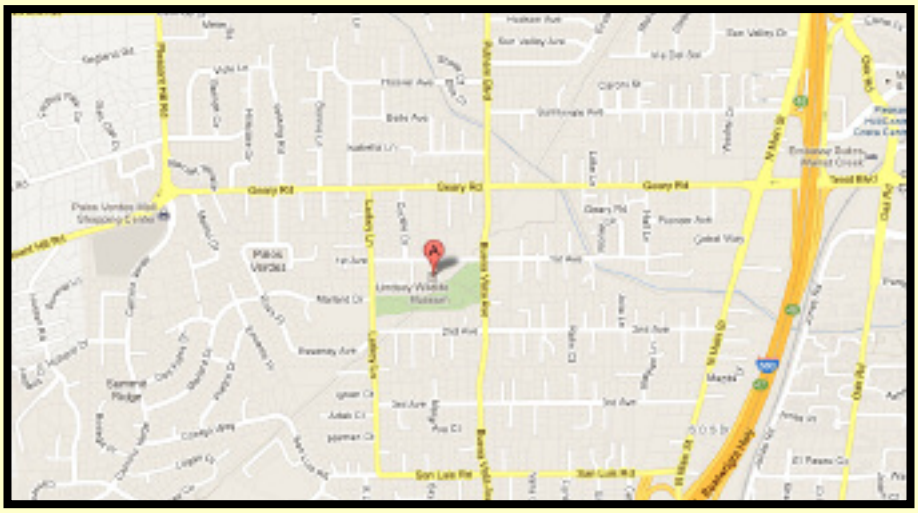
General Meetings:
Fourth Tuesday every month, except on the third Tuesday in November and December. Refreshments and conversations at 6:45 pm; Meeting begins at 7:15

Where:
Lindsay Wildlife Museum
1931 1st Avenue
Walnut Creek, CA 94597
(925) 935-1978
wildlife-museum.org.

Directions to facility:
From the North: Take 680 South to Treat Blvd. exit. Turn left at light onto North Main St. Turn right on Geary Road. Turn left on Buena Vista. Turn right on First Avenue. The museum is halfway up the block on the left.

From the South: Take 680 North. Take the Treat Blvd./Geary Road exit and turn left over freeway. Go three more lights and turn left on Buena Vista. Turn right on First Avenue. The museum is halfway up the block on the left.

Parking:
The museum is located in a residential area. There are no parking fees nor meters. Please park only in the museum parking lots on the east side of the museum, the Friends Church lot across the street (except Sunday mornings) or on Buena Vista Avenue. Please do not park on First Avenue in front of our neighbors' homes — you will get a parking ticket.



WHAT'S UP

(Continued from page 1)

ed in eight space pilots earning their astronaut wings. This was the X-15 program. Although the X-15, a winged spacecraft, became "space capable" before Alan Shepard's Mercury 7 flight, a combination of cold war politics and inter-agency rivalry made sure that Project Mercury carried the first American astronaut into space - and that the X-15 program was largely ignored. But what is "space" and what is an "astronaut?" We'll take a look at the X-15 program and the astronauts that flew the X-15 into space.