Southwest Florida Astronomical Society
SWFAS

The Eyepiece
September 2015

Contents:

A MESSAGE FROM THE PRESIDENT:

A lot is happening out at the Calusa Nature Center. There is a major renovation going on, including work on the ramp to the planetarium. The schedule for this work has not been finalized, so at this time we do not know for sure if we will have the IOMN night on the 19th. The facility is closed to the general public for the month of September except for a few special events.

I would like to thank Mike McCauley for stepping in and seeing about taking over the Program Coordinator position. He has already scheduled 2 of our fall meeting events. If you have ideas for programs, please send them to Mike. (He won't be here for this month's meeting but will be back later this year.)

We have the total lunar eclipse the evening of the 27th. This may be a good public event, as it starts at 9:00 pm and goes to midnight. I am going to see where we can setup for this. This is a good PR type of event.

Our November meeting is going to be a combination of Telescope Renaissance Night starting at 7:00 pm with Chap Percival doing a program about the 2017 Solar Eclipse and a book he has written. He will have the book and other items for sale as well. (http://goseetheeclipse.com/) We will not have a business meeting in November.

We are again playing it by ear as to the Star Party on the 12th as the CRP may be closed again. If it is, Seahawk Park is where we will have it.

Brian

In the Sky this Month

Autumnal Equinox arrives September 23.

Moon: September – Last Quarter, Sept 5th; New, 13th; 1st Qtr, 21st; Full, 27th.
Total Lunar Eclipse on September 27 visible from 9 – midnight EDT.

The Planets:
Venus, Mars, and Jupiter are now visible in the east before dawn.

Saturn, the only observable evening planet this month, will be visible in eastern Libra. It has dimmed to magnitude 0.5 – 0.6. At beginning of month it is visible for 3.5 hrs after sunset. This shrinks to 2.5 hrs by month's end.
It's still positioned for good telescopic views. Its ring tilt is near a maximum of 24°. It is located 5° west of the double star β Scorpii.

International Space Station: The ISS is visible several mornings throughout the month, but only visible in the evening September 29th and 30th, and then only at 20° above the horizon. Much better views are promised for October evenings.
See this link for specific times: http://www.heavens-above.com/

Future Events

Star Party and Event Schedule

Date	Event	Location	Time	Info/Contact
September 3rd	Monthly Meeting – Program: IAU 2015 General Assembly Highlights	Calusa Nature Center & Planetarium	7:30 pm	Brian Risley Program by Heather Preston
Sept. 12th	Star Party		Dusk	Bruce Dissette
Sept. 19th	International Observe the Moon Night/Astronomy Day	TBD		Brian Risley
October 1st	Monthly Meeting – Program: TBD	Calusa Nature Center & Planetarium	7:30 pm	Brian Risley
October 10th	Star Party		Dusk	Bruce Dissette
October 18th	Ding Darling Days	Sanibel	10am – 4 pm	Brian Risley
November 5th	Monthly Meeting – Program: 2017 Solar Eclipse/ Telescope Renaissance Night	Calusa Nature Center & Planetarium	7:00 pm Program at 7:30 (no bus meeting)	Brian Risley Program by Chap Percival
November 14th	Star Party		Dusk	Bruce Dissette
December 12th	Star Party		Dusk	Bruce Dissette

Minutes of the Southwest Florida Astronomical Society – August 6, 2015

At the IAU: New Dwarf Galaxy Neighbors & Dark-Sky Sanctuaries
Babak Tafreshi in Sky & Telescope Weekly

As the IAU General Assembly in Hawai'i draws to a close, the results were still coming in: a new bevy of dwarf galaxies discovered around the Milky Way, the celebration of the first Dark-Sky Sanctuary, and a new directly imaged exoplanet to boot.

At sunset on Mauna Kea, Hawai'i, Babak Tafreshi captured this telephoto view of the neighboring island of Maui. The summit of Haleakalā, home to several astronomical observatories, reaches above the clouds. *Babak Tafreshi*

The morning twilight is rapidly growing in this subequatorial latitude. I walk slowly and breathe deeply at an altitude of 4,200 meters (13,800 ft), where air has 40% less oxygen than at sea level, where I was a day before.

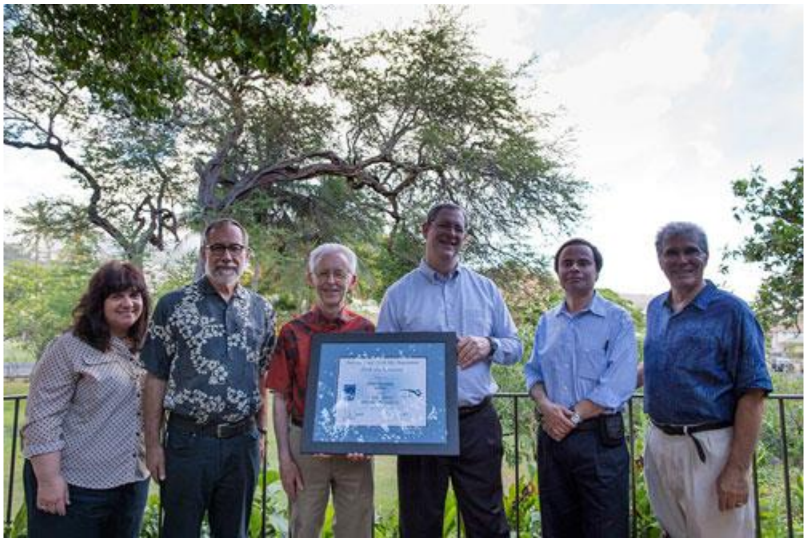
As dawn broke on Sunday, 9 August, the twin 10-meter telescopes of the W. M. Keck Observatory were wrapping up the night's observations, employing their laser-guide-star adaptive-optics systems. *Babak Tafreshi / NAOJ*

Our New Dwarf Galaxy Neighbors

After my 24-hour trip to Mauna Kea, I returned to the International Astronomical Union General Assembly in Honolulu. In the last few days of the two-week-long conference, the problem of missing satellite galaxies captured my attention. According to a leading scenario, dwarf galaxies are the building blocks of galaxy formation, so there should be hundreds or thousands of these faint satellites around the Milky Way and other grand galaxies. Yet by the 1980s, astronomers had identified less than 10 satellite galaxies around the Milky Way — the most prominent of these in our night sky are of course the Large and Small Magellanic Clouds.

With the digital revolution in astronomical imaging and increasing size of telescopes astronomers are now revealing many more of these cosmic islets once hidden among the foreground stars of the Milky Way. The current list contains about 35 confirmed satellites, ranging in size from less than 1% of the Milky Way's diameter to 10%. Some of these dwarfs are as close as 30,000 light-years from the outer spiral arms of our galaxy, while others lie more than a million light-years away. Now astronomers from the Carnegie Institution for Science report that they have found 16 new Milky Way satellite candidates in just the last 5 months. But even as the list grows, it still doesn't come close to covering the gap between galaxy formation theory and observation.

Dark Sky Sanctuaries



The award pictured here is the first International Dark Sky Sanctuary (IDSS) ever awarded and the first International Dark Sky Place of any kind in South America. The people from left to right are Connie Walker (vice-president of C.B7), Steve Pompea (NOAO), Malcolm Smith (CTIO), Chris Smith (Head of AURA-O), Pedro Sanhueza (OPCC) and Richard Green (President, C.B7). The middle four people authored the application for the IDSS designation. *IAU / B. Tafreshi*

My work as a nightscape photographer very much ties in with dark skies and light pollution. I was fortunate to attend one of the conference's public events honoring astronomical heritage and the importance of dark skies. Hosted by the Bishop Museum in Honolulu, the reception launched the book, "Hawaiian and Pacific Star Names." The International Dark-Sky Association (IDA) also celebrated Dark Sky Sanctuaries, sites that, along with dark sky parks and reserves, will preserve our night skies. Sanctuaries designates the rarest and most fragile dark places left on the planet, and the plan is to include prominent observatory sites. The event celebrated the first approved Dark Sky Sanctuary in the Elqui Valley of northern Chile, the location of the Association of Universities for Research in Astronomy (AURA) Observatory. The site will be known as the "Gabriela Mistral Dark Sky Sanctuary," named after the famed Chilean poet.

Exoplanet Direct Imaging

The newly discovered exoplanet Eridani b made breaking news here as the first directly imaged exoplanet from the Gemini Planet Imager (GPI) situated at the southern Gemini telescope in Chile. Read the full story on 51 Eridani b.

In other exoplanet news, IAU's NameExoWorlds contest is going strong. Since its launch last week, the contest has already received more than 150,000 votes.

Vienna in 2017

The 10-day astronomy marathon ended on August 14th. The next host of the 2018 IAU General Assembly will be in Vienna, a highly cultural city, home to an office of the United Nations, and a hub for a variety of international events.

A portion of the 2015 IAU General Assembly's 3,000+ astronomers gathered on the last day for a group photo. *Babak Tafreshi*

What We Found at Pluto

Alan Stern in Sky & Telescope Weekly

It sounds like science fiction, but it's not: NASA's New Horizons mission explored the Pluto system this summer!

Exactly 50 years to the day after Mariner 4 became the first mission to explore Mars, New Horizons completed the first era of planetary reconnaissance by flying past Pluto on July 14, 2015. In my final "insider blog" for SkyandTelescope.com, I want to give you a recap of the main findings that came from the initial data returned from the spacecraft.

NASA's New Horizons spacecraft took this image of Pluto with its Long Range Reconnaissance Imager (LORRI) on July 13, 2015. The color image has been combined with lower-resolution color information from the Ralph instrument acquired earlier. This view is dominated by the large, bright feature informally named Tombaugh Regio, roughly 1,000 miles (1,600 km) across. This is the last and most detailed image sent to Earth before the spacecraft's closest approach on July 14th. *NASA / JHU-APL / SwRI*

Regarding Pluto, we found a wonderland of diverse geological expression, with both old and young surfaces, mountain ranges, polygon-subdivided ice plains, flowing glaciers, and possibly even evidence for subsurface liquids. Pluto's mountains require strong materials to survive (and not slump) over time, indicating Pluto's crust is likely to be composed of water ice, rather than a deep layer of frozen nitrogen, which is soft and malleable to form long-lived mountains.

We also found that Pluto was bigger — 2,374 km in diameter — than most past estimates. This larger true size, combined with Pluto's already well-known mass, means its true density is lower than we thought. So the ice fraction is higher (35% or 40%) and its rock fraction lower (60% or perhaps 65%).

Meanwhile, its tenuous atmosphere has a base pressure of less than 10 microbars (about half what ground-based measurements had predicted), and it contains widespread hazes, several new molecular species (including acetylene and ethylene).

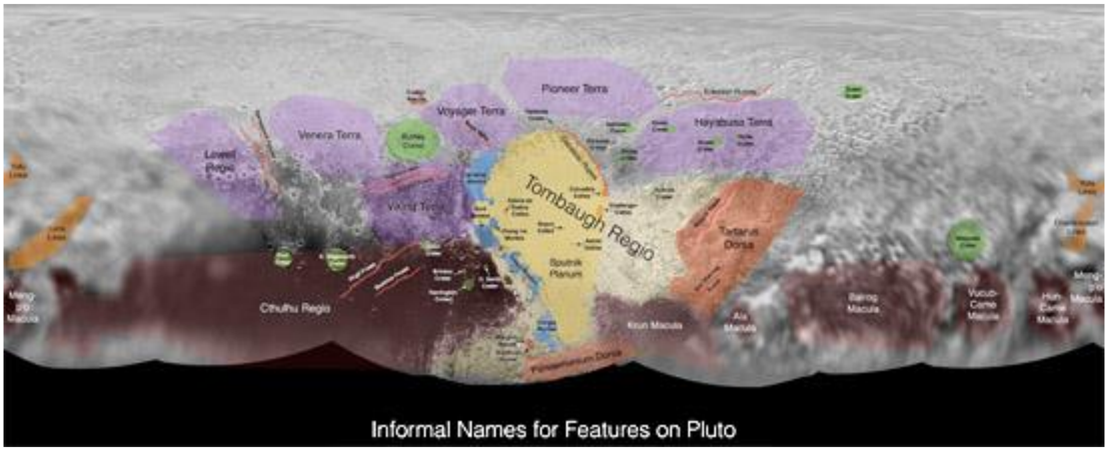
Pluto's moon Charon, as seen by New Horizons on July 13, 2015, shows an array of landforms that has stunned mission scientists. *NASA / JHU-APL / SWRI*

Regarding Charon, we found no evidence for an atmosphere — though the final verdict depends on data not yet back on Earth. We also found a more complex geological story than many had anticipated.

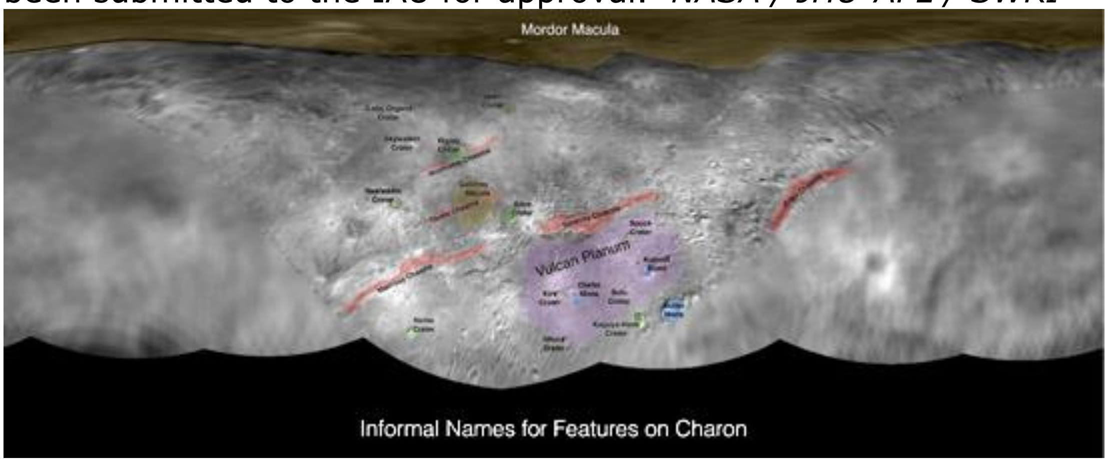
Most of us expected Charon to be little more than a battered ball of water ice and craters. Instead, we found tectonic ridges, chasms, and mountains, along with a strangely dark red stain covering its north polar region.

Next Steps

The New Horizons science team is now at work mapping both bodies and preparing to formally submit names for specific surface features to the International Astronomical Union. We've been naming features informally, drawing from the "OurPluto" name banks that New Horizons and NASA conducted with the public's help. Preliminary maps of both Pluto and Charon are below.

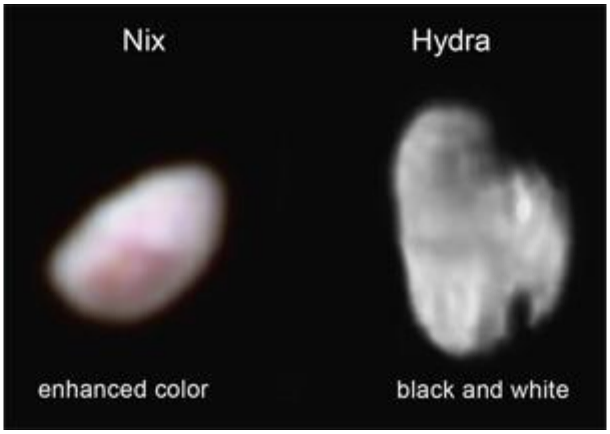


Although informal for now, these feature names follow an approved scheme and have been submitted to the IAU for approval. *NASA / JHU-APL / SWRI*



Similarly, the initial, informal names used by the New Horizons team for the features on Charon, Pluto's largest moon, were selected based on input received from the OurPluto naming campaign. *NASA / JHU-APL / SWRI*

Regarding Pluto's small satellites, we've learned the sizes of Nix (35 km in diameter) and Hydra (41 km), and our first looks reveal brightness and color variegation across their surfaces. We found their *albedos* (reflectivities) are higher than expected — so high in fact that both are likely ice covered. (Resolved images of Styx and Kerberos have not yet been returned as of this writing.)



New Horizons recorded these images of two of Pluto's four small moons. Nix has an irregular shape (seen here end-on in false color), about 42 km (26 miles) long and 36 km (22 miles wide. Hydra appears roughly spherical and is 55 km (34 miles) across. NASA / JHU-APL / SWRI

Most surprising to me about Pluto's satellites, however, is that, despite searching with about 15 times more sensitivity than even the Hubble Space Telescope, we didn't find any more —not even one. Few on our science team would have predicted this, including myself.

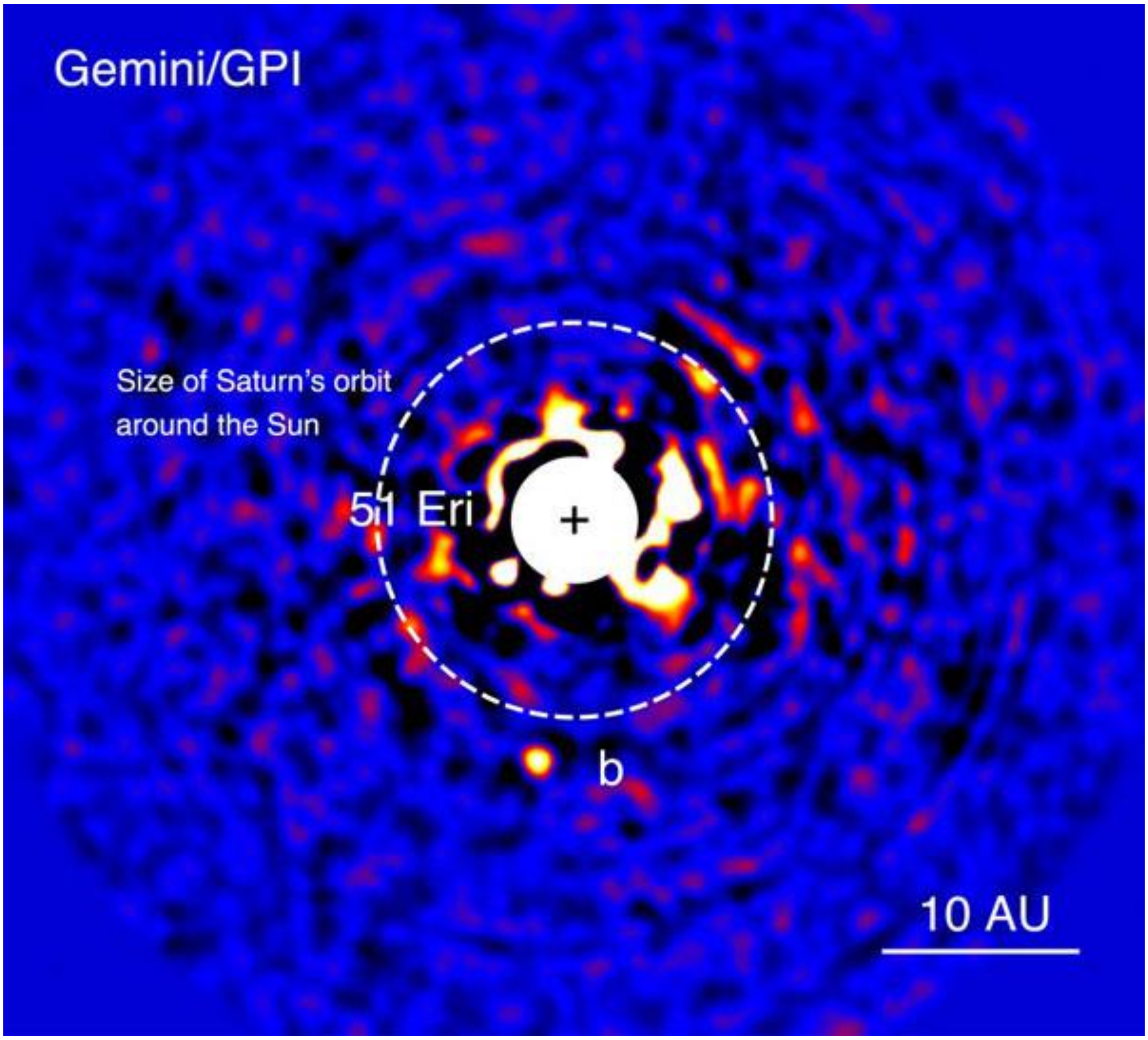
The flyby of Pluto and its system of moons by New Horizons is complete, but over 95% of the data from that reconnaissance is still aboard the spacecraft, awaiting downlink to Earth. Getting all those observations back will take some 16 months and won't complete until the fall of 2016. So expect many more images and spectra and, from those, many more discoveries in the months ahead. New Horizons is a gift that will keep on giving.

Direct-Image Discovery of a Young Jupiter

Monica Young in Sky & Telescope Weekly

The Gemini Planet Imager has discovered its first exoplanet, a young Jupiter still glowing with the heat of its formation.

Only 100 light-years away, a just-formed gas giant orbits a Sun-like star, the infant equivalent of Jupiter in the solar system — and the first exoplanet discovery for the direct-imaging instrument Gemini Planet Imager (GPI).



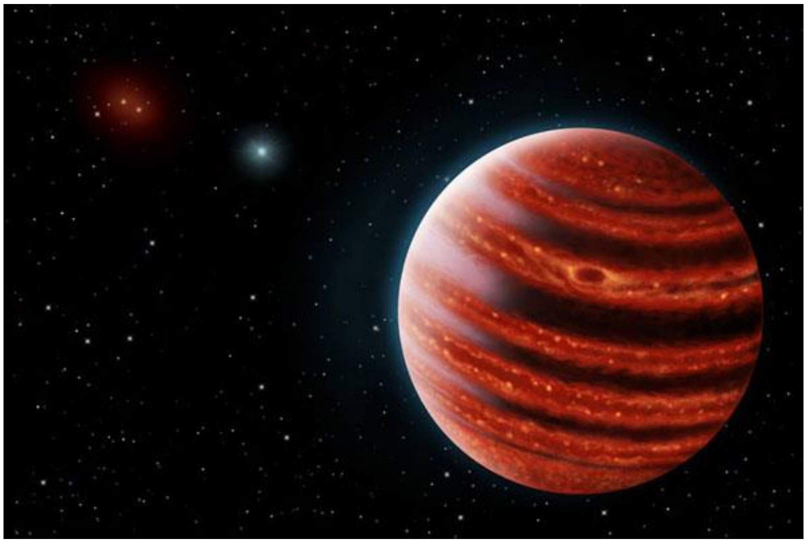
The discovery image from Gemini Planet Imager of 51 Eridani b, a gas giant orbiting a star 100 light-years away. *Gemini Observatory / J. Rameau / C. Marois*

GPI is part of the next-gen suite of direct-imaging instruments, which also includes SPHERE, ScEX-AO, and Project 1640. It captures infrared light from stars and their young (less than 1 billion years old) planets. The star-planet contrast is better at infrared wavelengths than in visible light, at least for young systems, since giant planets still glow appreciably with the leftover heat of their formation.

GPI operates with a coronagraphic mask, to block most of a star's light, and silicon microchip deformable mirrors, whose shape can bend to cancel out atmospheric turbulence. Some diffracted starlight still leaks through in a speckled pattern, but thanks to the adaptive optics, the instrument can make out planets as long as they are big, young, and hot enough, and far enough from their parent star to escape from its glare.

GPI is imaging 600 young, nearby stars in a sweeping search for exoplanets between 2014 and 2016. The discovery of 51 Eridani b came as the team was about 20% of the way through the survey.

A Young Jupiter?



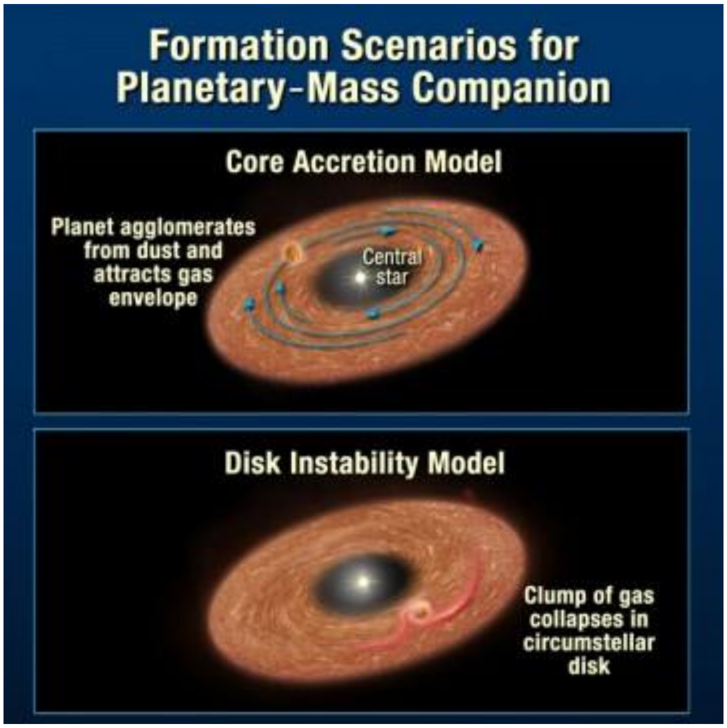
This artist's conception of 51 Eridani b shows the hot layers deep in its atmosphere glowing through the clouds. Because this system is only 20 million years old, the planet still radiates the heat of its formation. *DanielleFutselaar and Franck Marchis*

51 Eridani b is a gas giant 13 astronomical units from its 20 million-year-old star, which, if it were orbiting our Sun, would put it farther out than Jupiter — somewhere between the orbits of Saturn and Uranus. As directly imaged planets go, this one is relatively cool at 750 Kelvin (900°F).

Near-infrared spectra show that this planet’s atmosphere contains methane and water vapor. Even though methane is present on Jupiter as well, its detection in 51 Eridani b was a surprise, since previously direct-imaged planets haven’t shown clear methane signatures.

Though the team obtained two images of the planet, one in December 2014 and one in January 2015, not enough time had elapsed between the two observations to track the planet’s motion around its star. So its mass is still a bit of a mystery. Plugging its temperature into models, Bruce Macintosh (Stanford University and Lawrence Livermore National Laboratory) and colleagues estimate its mass could be anywhere between 2 and 12 Jupiter masses.

Forming Planets: Cold-Start vs. Hot-Start



This diagram depicts two leading scenarios for planet formation. Core accretion is another name for the cold-start scenario and disk instability is another name for the hot-start scenario. *NASA / ESA / A. Feild*

Because the researchers base their mass estimate on the exoplanet's temperature, the estimate depends on how the team assumes the planet formed. There are two main scenarios: cold start and hot start.

The cold-start model suggests that gas giants begin as dense, solid cores that then gather gas around them. The hot-start model instead proposes that planets don't use a rocky seed but begin as instabilities in the star's gaseous protoplanetary disk that collapse quickly and directly into planets.

"In the case of 51 Eridani, since there is just the one close-in companion, it's not clear what the formation scenario is," says Davy Kirkpatrick (Caltech). "The newly found 51 Eri b could have formed as the only planet from a protoplanetary disk, or it might have formed like stars do."

If the team assumes 51 Eri b formed via the hot-start model, the planet's mass is roughly twice that of Jupiter. The cold-start model gives a wider range, between 2 and 12 Jupiter masses.

The dozen or so exoplanets found so far have all been so hot, astronomers have had difficulty explaining their formation via either scenario. (We've been limited to very hot planets in large part because first-generation instruments haven't been sensitive enough to detect cooler, dimmer exoplanets.) In fact, 51 Eridani b is the first directly imaged planet that is roughly consistent with *both* scenarios.

But, Kirkpatrick cautions, "At the moment, planetary . . . modeling is not just in its infancy — it's downright fetal.

"The theory doesn't yet have any predictive power because the models are still too crude and too simplistic," he adds. "Exoplanet and brown dwarf science will continue to be led by observations, and whatever tests the models might deliver should be taken with a grain of salt."

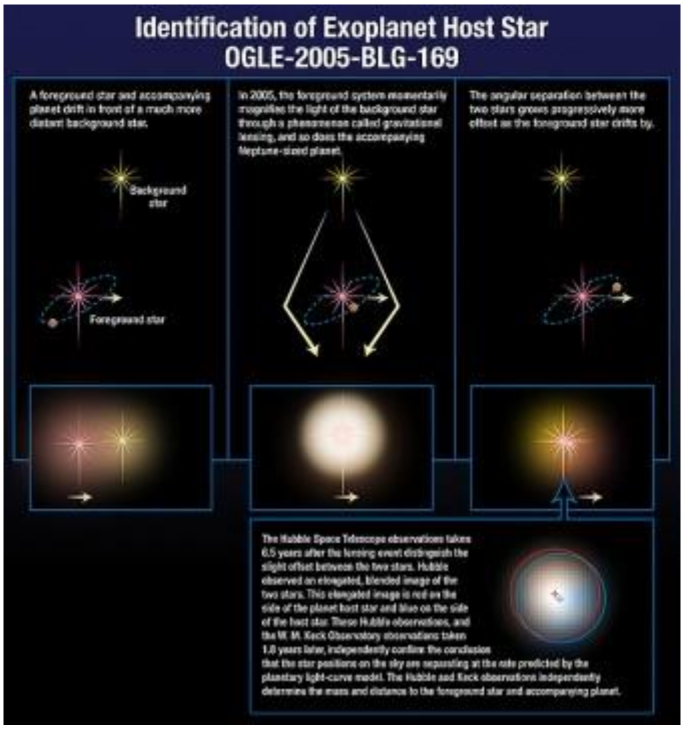
Nevertheless, better mass estimates in the near future will help narrow down formation scenarios for young 51 Eridani b and other Jupiter-like planets.

Microlensing Exoplanet Confirmed

Camille M. Carlisle in Sky & Telescope Weekly

Astronomers have confirmed the existence of an exoplanet found via microlensing — the first time they've been able to successfully follow up on this method.

One of various methods astronomers use to hunt for planets around alien stars is microlensing. In a microlensing event, one star passes in front of another from our perspective, and this alignment — within a fraction of a milliarcsecond (1/3,600,000°) — boosts the light of the background star. It's as though the closer star is a magnifying glass, amplifying the farther star.



In a microlensing event, a foreground star passes directly in front of a background star. The background star's light bends around the foreground star, which gravitationally lenses and magnifies the starlight. If a planet orbits the foreground star, it, too, will leave its own mark on the background star's light (the exact shape of the blip in the

light curve often looks rather complex, depending on the nature of the system). Click here to see the full-size version on the Keck Observatory's website.
NASA / ESA / A. Feild (STScI)

If the closer, magnifying star has a planet around it, this planet can add an extra blip to the light curve of the boosted signal, which astronomers can detect. Astronomers can use the blip's characteristics, such as its timing and magnitude, to calculate how far the planet is from its star and (indirectly) its mass.

Astronomers have found about three dozen exoplanet candidates via microlensing. But these candidates are difficult to confirm: observers need to either catch the closer star passing in front of another faraway star (statistically unlikely) or wait several years until the stars move far enough apart to see them as two separate signals instead of one. Only then can astronomers confirm each star's physical characteristics, which they need in order to confirm the blip's nature.

Using this latter method, Virginie Batista (Astrophysics Institute of Paris) and colleagues have now confirmed a microlensing exoplanet's existence. The team used images from the Hubble Space Telescope and the Keck II telescope on Mauna Kea to study the stars involved in the microlensing event OGLE-2005-BLG-169. A collaboration of amateur and professional astronomers discovered this system in 2005. Since then, the stars have moved farther apart in the sky; after several years, they were finally far enough apart for astronomers to tell the closer and farther star apart.

The analysis shows that the star is a *K*5 main-sequence star (still fusing hydrogen in its core, like the Sun), with a mass about two-thirds that of our star. It also confirms that the planet is 12 to 15 Earth masses (about Uranus's mass) and orbits its star roughly 4 Earth-Sun distances out — that would put it on the outer edge of the main asteroid belt in our system.

This success shows that, with patience and superb images, astronomers can indeed confirm some of the microlensing exoplanet candidates.

You can read more about the result in the press release from the W. M. Keck Observatory and the Space Telescope Science Institute, or in the team's two papers, which appear in the August 1st *Astrophysical Journal*. Below, you'll also find a short animation of the microlensing event (disclaimer: yeah, it's fuzzy, but the flash is neat).

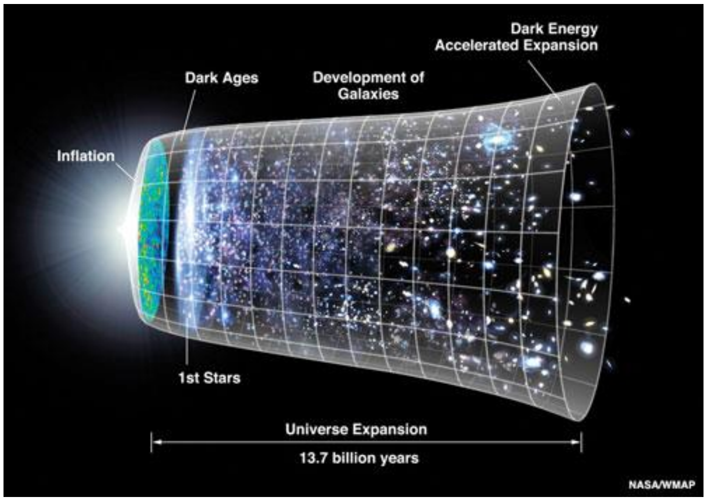
Credit: NASA / ESA / D. Bennett (University of Notre Dame) / Wiggle Puppy Productions / G. Bacon (STScI)

References:
P. Bennett et al. "*Confirmation of the Planetary Microlensing Signal and Star and Planet Mass Determinations for Event OGLE-2005-BLG-169*." *Astrophysical Journal*. August 1, 2015.
Batista et al. "*Confirmation of the OGLE-2005-BLG-169 Planet Signature and Its Characteristics with Lens-source Proper Motion Detection*." *Astrophysical Journal*. August 1, 2015.

Is Dark Energy a Chameleon?

Monica Young in Sky & Telescope Weekly

A lab experiment has all but nixed one of the theories of dark energy, a mysterious force pushing the universe apart.



This diagram shows changes in the rate of expansion since the Big Bang. About 7.5 billion years ago, astronomers observe the effects of a mysterious force that causes galaxies to fly apart at a faster rate. *NASA / WMAP*

One of the most bizarre discoveries of the 21st century was that the universe is expanding at an accelerating speed. The culprit behind this ramp-up, called dark energy for lack of a better term, is an unknown force that's pushing the universe's expansion so that as cosmic time goes on, galaxies fly faster and faster apart. Yet despite its implications for the fate of our universe, astronomers have no idea what dark energy is.

Now a new (and really awesome) experiment, reported in the August 21st *Science*, has narrowed down the field of possibilities.

Scientists have come up with a couple of ideas for the nature of dark energy. One camp supposes it's the energy pent up in empty space itself, known as the *cosmological constant*. True to its name, it should stay constant from the Big Bang onward. But the theory has some problems — most notably it overpredicts the energy density of the cosmic vacuum by 120 orders of magnitude (yikes!).

Another camp instead suggests *quintessence*, a fifth fundamental force that doesn't have to be constant — it could have arisen at some point in the early universe and might one day gradually fade away again. But so far scientists have failed to detect this fifth force in the lab. So in 2004 Justin Khoury and Amanda Weltman (both then at Columbia University) suggested a modified scenario: *chameleons*.

In the world of physics, particles and forces are two sides of the same coin, with particles acting as “force carriers.” Chameleon particles carry the chameleon force, and just like their namesakes, these particles adjust to their surroundings to hide from detection. But rather than change color, they change mass.

Amidst the high-density environs of Earth, the theory goes, chameleons take on high mass, and high-mass subatomic particles are difficult to detect. In consequence, the fifth force that they carry would become weak and all but impossible to measure. But in emptier space, chameleons shed mass. The fundamental force they represent would thus be felt over longer ranges, and could act over cosmic scales to affect the universe’s evolution.

To Catch a Chameleon

An artist's impression shows the aluminum sphere of the experiment, the Cesium atoms (violet dots), and the laser beam that travels from one of the sphere to the other every time it flashes. *Simca Bouma*

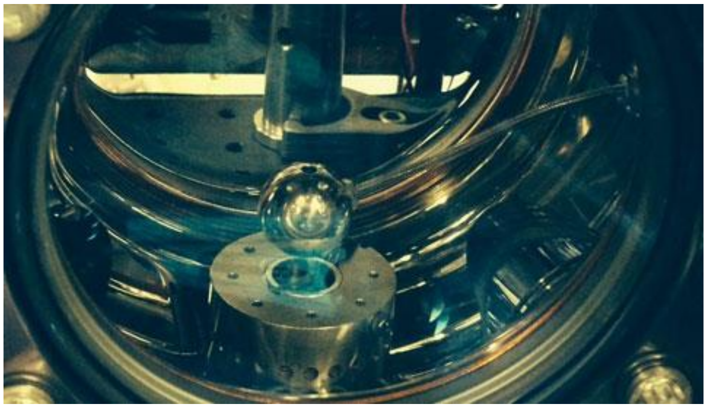
Khoury and Weltman’s ingenious theory remained out of practical reach for about a decade — it was simply too difficult to test. Then in early 2014, Clare Burrage (University of Nottingham, UK) and colleagues developed an idea for an experiment that could do the trick.

The key, they said, is to use a vacuum. In a vacuum, scientists could test the chameleon force without the obscuring effects of matter. (To read the details, take a look at the excellent article, “The Chameleon in the Vacuum Chamber.”)

When Paul Hamilton (University of California, Berkeley) read Burrage and colleagues’ article, he realized that he could do the test with an experiment he had already helped develop.

Hamilton and Holger Müller (also at Berkeley) had built a small spherical vacuum chamber just 10 centimeters across with a solid aluminum sphere at the center. Into this sphere, the physicists dropped in a few (read: 10 million) cesium atoms and flashed a laser beam at them, three flashes separated by 10 milliseconds.

The first laser beam splits the cesium atoms into two packets of information. (Remember, this is quantum mechanics world, where particles can behave like waves: "splitting an atom" in this case has a probabilistic meaning that has nothing to do with actual nuclear fission.)



This photo shows the experimental set-up, with the 25-mm-diameter sphere at the center of the vacuum chamber. The experiment measures the force between the sphere and cesium atoms (not visible). *Holger Mueller*

Since the first beam sent the two packets recoiling away from each other, a second flash reverses their direction and sends them back together. Then a third laser beam acts as a beam splitter, causing the two cesium waves to overlap and interfere with each other, like two sets of ripples in a pond. The whole laser light show takes just 1.7 seconds.

The cesium atoms' interference pattern will show the effect of gravity combined with the chameleon field — but the experiment found only gravity at work. With this null result, Hamilton and Müller's team was able to rule out the existence of chameleon particles over a wide range of masses.

And in fact, the results might end up being even better than what's reported in *Science*. Burrage's theoretical work came out in early 2014, but this past July Sandrine Schlögel (University of Lamur and Louvain University, Belgium) and colleagues released a new-and-improved version of those difficult calculations. This development, says Hartmut Abele (Technical University of Vienna, Austria), may already have increased the experiment's range, narrowing the possible masses for chameleon particles even further — by up to a factor of 10.

"The experiment by Paul Hamilton and colleagues is a huge step forward in chasing the chameleon field," Abele concludes. "Future experiments with atoms or neutrons will either find a chameleon signal or exclude chameleon fields completely."

Khoury agrees, stating in a press release, "[Müller] is now pushing his experiment into areas where chameleons interact on the same scale as gravity, where they are more likely to exist."

What the Future Holds for Dark Energy

What's significant to physicists involved in this research is that the experiment was small, done in a university lab, yet probed complex physics that had previously been out of reach. "I think it's very reassuring," adds Jörg Schmiedmayer (also at the Technical University of Vienna), "that the most fundamental science can sometimes be probed in clever, small-scale experiments and doesn't always need mega collaborations and mega facilities."

What's even more reassuring about this result is that it promises that a definitive, yes/no answer is on the horizon. There are no free parameters to tweak, no theoretical modifications that could evade a null result — future experiments will reveal for certain whether chameleon particles exist.

But what's less reassuring is that if they're ruled out, then we're back to square one: the cosmological constant or quintessence scenarios, along with all their attendant problems.

Club Officers & Positions:

President:
Brian Risley
swfasbrisley@embarqmail.com
(239-464-0366)

Vice President:
Bruce Dissette
bdissette@centurylink.net
(239-936-2212)

Secretary:
Don Palmer
swfas.sec@gmail.com
(239-334-3471)

Treasurer:
Tony Heiner
verahei@aol.com
(941-457-9700)

Program Coordinator:
Mike McCauley
mmccauley13@comcast.net

Librarian:
Maria Berni
(239-940-2935)

Viewing Coords./Fakahatchee:
Tony Heiner
verahei@aol.com
(941-629-8849)
Chuck Pavlick
cpav4565@gmail.com
(239-560-1516)

Viewing Coord/Caloosahatchee:
Bruce Dissette
bdissette@centurylink.net
(239-936-2212)

WebsiteCoordinator:
Bill Francis
Bill_Francis@hotmail.com
(239-233-0958)

Equipment Coordinator:
Brian Risley
swfasbrisley@embarqmail.com
(239-464-0366)

Club Historian:
Danny Secary
asecary@gmail.com
(239-470-4764)

Astronomical League Coordinator: (ALCOR):
Carol Stewart
cjstewart@mindspring.com
(239-772-1688)

Calusa Nature Center Planetarium Director:
Heather Preston
heather@calusanature.org
(239-275-3435)

Newsletter Editors:
Ron Madl
rmadlksu@gmail.com
(785-410-2911)
Doug Heatherly
dheatherly72@gmail.com

Southwest Florida Astronomical Society, Inc.
P.O. Box 100127
Cape Coral, FL 33910

www.theeyepiece.org