The High Desert Observer

November 2017

The Astronomical Society of Las Cruces (ASLC) is dedicated to expanding public awareness and understanding of the wonders of the universe. ASLC holds frequent observing sessions and star parties and provides opportunities to work on Society and public educational projects. Members receive the *High Desert Observer*, our monthly newsletter, plus membership to the Astronomical League, including their quarterly publication, *Reflector*, in digital or paper format.

Individual Dues are $30.00 per year

Family Dues are $36.00 per year

Student (full-time) Dues are $24.00

Annual dues are payable in January. Prorated dues are available for new members. Dues are payable to ASLC with an application form or note to: Treasurer ASLC, PO Box 921, Las Cruces, NM 88004. Contact our Treasurer, Patricia Conley (treasurer@aslc-nm.org) for further information.

ASLC members receive electronic delivery of the HDO and are entitled to a $5.00 (per year) Sky and Telescope *magazine discount.*

Table of Contents

ASLC Board of Directors, 2017

Board@aslc-nm.org

President: Howard Brewington; President@aslc-nm.org

Vice President: Rich Richins; VP@aslc-nm.org

Treasurer: Patricia Conley; Treasurer@aslc-nm.org

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Director-at-Large: Ed Montes Director2@aslc-nm.org

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Leasburg Dam: David Doctor; astrodoc71@gmail.com
Tombaugh: Steve Shaffer, sshaffer@zianet.com
Outreach: Chuck Sterling; csterlin@zianet.com
Web-Site: Steve Barkes; steve.barkes@gmail.com
HDO Editor: Charles Turner; turner@milkywayimages.com

Masthead Image: February 10, 2017 From Las Cruces, Moon rising over the Organ Mts in Penumbral Eclipse.

November Meeting --

Our next meeting will be on ***Friday, November 17***, at the Good Samaritan Society, Creative Arts Room at 7:00 p.m.

The speaker will be Steve Barkes and the topic will be Astronomical Applications for Arduinos..

Member Info Changes

All members need to keep the Society informed of changes to their basic information, such as name, address, phone number, or emai address. Please contact Treasurer@aslc-nm.org with any updates.

Events

ASLC hosts deep-sky viewing and imaging at our dark sky location in Upham. We also have public in-town observing sessions at both the International Delights Cafe (1245 El Paseo) and at Tombaugh Observatory (on the NMSU Campus). All sessions begin at dusk.

At our Leasburg Dam State Park Observatory, we hold monthly star parties. Located just 20 miles north of Las Cruces, our 16" Meade telescope is used to observe under rather dark skies. Please see *Calendar of Events* for specific dates and times.

What's Up ASLC?

November 2017

As stated in the October HDO, I love star parties, large or small. My first trip to a major star party was in the mid-eighties. I drove from my home state of South Carolina to the Stellafane gathering in Vermont. According to their website, "The name Stellafane, originally stellar-fane, is Latin for 'shrine to the stars' and was adopted by Russell Porter when the clubhouse was constructed in 1923. It officially refers to only the building but; over the years, has commonly been used to refer to the convention." Stellafane is one of our nation's oldest and most prestigious celebrations of amateur astronomy. The two-day event includes great speakers, a telescope-making contest, an incredible swap table, and nightly observing. Although Stellafane's night skies are not as dark as the star parties here in the southwest, I highly recommend this annual event based on its history alone. Likewise, Porter's turret telescope is certainly a must see. Unfortunately, 2,300 miles separate Las Cruces from Vermont. But, if you're in their neighborhood during July next year, check out Stellafane.

A star party that's a little closer to Cruces is Okie-Tex; you'll only need to drive ~535 miles for this one. I do my approach in two legs by spending the first night in the Walmart parking in Las Vegas, NM. Then, for the last two years, Steve Barkes and I have met up there to caravan to Kenton the following morning. I've gone every year since retiring from NMSU in 2015. The night skies at O-T are as good as any I've seen. And, since it's a fall event, the Milky Way and its many wonders are conveniently placed in the evening sky as twilight ends. The great observing conditions are attracting more amateurs of late; in fact, the crowd at Okie-Tex slightly surpassed the Texas Star Party in 2017. Don't worry about securing an O-T camping site though; there's plenty of space available.

Okie-Tex is held at Camp Bill Joe, a Christian youth camp. But, unlike Stellafane's location, creature comforts abound. For example, you'll enjoy the camp's bathhouses with hot showers and flush toilets. And, for your convenience, Porta-Potties and hand-washing stations are found at many locations on the observing fields. Food is not a problem either. In fact, three meals are served daily via the camp's kitchen. A large tent, located just outside the kitchen/vendor building, serves as their dining hall. This tent also serves as the location for the evening presentations. But, don't make plans for dinner on Monday evening because that's "Si Senor Chicken Night," and it's become a tradition as the Cruces guys team-up with amateurs from Texas to enjoy a huge pot-luck dinner.

Well, there you have it. Stellafane is a great star party if you're seeking a historic event and site. But, if you'd like a few creature comforts with your dark-sky observing as well as a shorter drive, then the Okie-Tex Star Party is the better choice. In 2018, the event will be held from October 6 to the 14th. You'll need to submit a registration, of course, and buy a meal plan if you'd like to eat in their dining hall. More details can be found on the Okie-Tex webpage at http://www.okie-tex.com/index.php I'll certainly be there in 2018 for their 35th annual gathering, and I hope to see you at Camp Billy Joe too.

Howard Brewington ASLC President November 2017

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Outreach
Outreach is a very important part of ASLC. We are always looking for more volunteers to help us educate the public. Even if you do not have a portable telescope to bring to the events, please consider attending our public outreach programs to help answer questions, share knowledge and point out objects in the sky.

Outreach Events

September Report

by Jerry McMahan

Leasburg, Saturday, October 14

We had another good night. Dave Doctor opened the observatory. Sid Webb operated the 12 inch Dobsonian. Bob Armstrong made an early appearance. Chuck Sterling had an 8 inch on the Orion mount. I had the ETX 125. I was aided, at the scope, by Trish Conley

Charles Turner had a 5 inch binocular scope. Mike Nuss and Colleen Carlson set up a 4 inch refractor that was controlled by wifi using SkySafari Pro to control the scope. Rich Richins brought his home made 16 inch Dobsonian.

Also in attendance, were 10, or 15 Physics students, and their teacher, from El Paso High School. We had a lot observers and many objects to observe on a successful night.

Tombaugh Observatory, Friday, October 27

Chuck Sterling came to the dome, before going to the club meeting. He brought a broom and a can of Raid to continue his war on spiders. Steve Shaffer was not feeling well, but still came to operate the 12.5 inch scope. I attended after dropping off my straight party vote, at the meeting.

It was a cold night, mainly because the South wind was blowing through the dome slit. Even with the cold weather, Steve counted 60 people that viewed the Moon with the scope.

Moongaze, Saturday, October 28

Howard Brewington set up the club's 4 inch Unitron refractor. Chuck Sterling had Saturn, marking the end of our Saturn season, on his 10 inch. Ed Montes brought his small refractor. Trish Conley said she wasn't really there, but did show up for a while. I had the ETX 125. Mike Ka....., a past and future member, also attended.

The weather was good, as was the seeing, so we had a good viewing session. . I, however had a lousy night teaching. I was not able to convince one guy that Astrology does not work, or another man that the Apollo Moon landings were not faked. Ed tried to console me by saying "Nice try." Either that, or he was being sarcastic.

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Calendar of Events (Mountain Time - 24 hr. clock)

Nov	01	18:17	Sun Sets
	03	23:22	Full Moon
	03	09:00	Renaissance Faire Setup
	04	10:00	Renaissance Faire Begins
	05	16:00	Renaissance Faire Ends
	05	02:00	Daylight Saving ends - Get out the longjohns, winter is coming
	08	18:30	OUTREACH; Star Party for the Red Hawk Country Club
	10	13:37	Last Quarter Moon
	10	18:00	OUTREACH; Star Party for Desert Springs Christian Academy, 6 - 8:30 pm
	11	18:15	OUTREACH; Dark Sky Observing at Leesburg Dam State Park
	17	19:00	OUTREACH; Tombaugh Observatory open at NMSU
	17	19:00	ASLC Monthly Meeting; Good Samaritan Society, Activities Meeting Room
	18	04:42	New Moon
	23	00:00	Thanksgiving Day
	25	17:00	OUTREACH; MoonGaze, International Delights Café
	26	10:03	First Quarter Moon
Dec	01	17:02	Sun Sets
	02	17:30	ASLC Holiday Party, At Howard Brewington's house.
	03	08:46	Full Moon
	08	19:00	OUTREACH; Tombaugh Observatory open at NMSU
	09	17:00	OUTREACH; Dark Sky Observing at Leesburg Dam State Park
	10	00:52	Last Quarter Moon
	17	23:31	New Moon
	21	00:00	The Winter Solstice; sunset at 5:06 pm
	23	17:00	OUTREACH; MoonGaze, International Delights Café
	25	00:00	Christmas!!@#$%^&*: New telescopes, new eyepieces, new cameras, etc.,
	26	02:20	First Quarter Moon
Jan	01	17:13	Sun Sets
	01	19:25	Full Moon
	06	17:00	OUTREACH; Dark Sky Observing at Leesburg Dam State Park
	08	15:26	Last Quarter Moon
	16	19:18	New Moon
	18	17:00	OUTREACH; Star Party for Tombaugh Elementary School
	24	15:20	First Quarter Moon
	26	19:00	OUTREACH; Tombaugh Observatory open at NMSU
	26	19:00	ASLC Monthly Meeting; Good Samaritan Society, Activities Meeting Room
	27	17:00	OUTREACH; MoonGaze, International Delights Café
	31	06:28	Full Moon, the second one this month!

Be sure to visit our web site for ASLC information: *www.aslc-nm.org*

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Announcements

1. The program for the November meeting will be a presentation by Steve Barkes on the Astronomical Applications for Arduinos. It is a small rodent, related to the mouse but with a much shorter tail and no buttons. Also, an Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

2. This years holiday party will be held on December 02 at 5:30 pm, at Howard Brewington's house at 3814 Stoney Brooke Circle in Las Cruces. The theme of the dinner will be Mexican/Southwest Holiday potluck dinner. Howard will provide a Brisket, tamales, beans, and beer. If you are in doubt about your entree, contact Howard about what is needed; comet_brewington@msn.com.

3 The agreement to use the facilities at Good Sam for our meeting prohibits members from bringing in ANY food or beverages, except water in a container with a screw lid. Take note: no more Starbucks or Saturn Cookies!

4. We will not publish an HDO in December. The next HDO will be the January 2018 issue.

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Meeting Minutes

ASLC Monthly Meeting
October 2017 Minutes

Show & Tell:

Chris Brownewell presented a series of astro-images he has collected recently, some from his back yard, and some from a site in Indiana. He is a big fan of globular clusters. He will present more images in a future presentation.

Call to Order:

Howard Brewington, President, Astronomical Society of Las Cruces (ASLC, the Society), called the October 2017 business meeting to order at 7:16 pm, 27 October 2017, Creative Arts Room, Good Samaritan Society Las Cruces Village, 3011 Buena Vida Circle, Las Cruces, New Mexico.

President's Comments:

Howard Brewington, President, welcomed the group to tonight's meeting. There were several guests present. Howard welcomed them all and asked all members and visitors to sign in on the rosters at the rear of the room. Howard thanked Charles Turner for the October edition of the High Desert Observer (the Society's newsletter, the HDO) which included an excellent article by Bert Stevens and more imaging by John Kutney. The minutes of the September 2017 meeting were also published in the HDO. If there are no corrections or discussion, Howard asked that the minutes be accepted as submitted. Ed Montes and Janet Stevens presented a motion to do so; they were accepted by acclamation.

Outreach:

Chuck Sterling, Outreach Coordinator, was not present. It was reported there will be Moon Gazes at International Delights Café (IDC) on 28 October and 25 November. 28 October is also International Observe the Moon Night. Tombaugh Observatory on the NMSU campus is hosting an open house tonight. The Society will be supporting a public star party on the driving range at Red Hawk Country Club from 6:30 pm to 9:00pm on 08 November. Ed Montes gave additional details for this event. He is working closely with the management of the Country Club on details for this event including sending an email blast to the Country Club's email list, so a large crowd is anticipated.

2018 Officer Election Committee:

Rich Richins, committee chairman, announced the results of the 2018 officer election as follows:

President:	Howard Brewington
Vice-President:	Rich Richins
Treasurer:	Patricia Conley
Secretary:	John McCullough
Director-at-Large, Position #1:	Steve Barkes
Director-at-Large, position #2:	Ed Montes

Check Sterling will continue to serve as most immediate Past-President to fill out the Board of Directors.

Treasurer's Report:

Trish Conley, Treasurer, presented a status of the Society's accounts. She noted a net income of $61.44 for the Society in September.

RASC Observers Handbook:

Bert Stevens will post an email so those members interested in an issue of the 2018 Royal Astronomical Society of Canada (RASC) Observers Handbook (US version) may make their request(s). In addition Trish Conley will place an order for 2018 Planetary Society calendars for those who wish them.

Renaissance Arts Faire 2017:

This year's RenFaire is 04 05 November at Young Park with setup on 03 November. Contact Trish Conley if you can help.

Equipment Donation:

Howard Brewington announced the recent sale of astronomical equipment donated by Vince Dovydaitis was successful. Some items are still available at tonight's meeting. A 12" Meade LX200 is also for sale for $800.

Bob Kimball and Glenn Brookshear described meeting four members of the Montreal (Canada) Astronomy Club during a recent trip to Rusty's Campground. They were a great bunch and Bob and Glenn invited them to get together with the ASLC the next time they visit the Southwest.

Presentation:

This month's presentation was by ASLC member Glenn Brookshear on "The Copernican Universe". Popular belief is that the heliocentric model proposed by Copernicus was much simpler and more accurate than the Ptolemaic model, and thus it was mainly stubbornness in the scientific community and religious opposition that kept it from gaining immediate traction and acceptance. Glenn takes a look at the reality behind this myth.

The October meeting of the Astronomical Society of Las Cruces concluded at 8:25 pm. A social time followed at Pecan Grill

-Respectfully submitted by John McCullough, ASLC Secretary

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Back at the Telescope

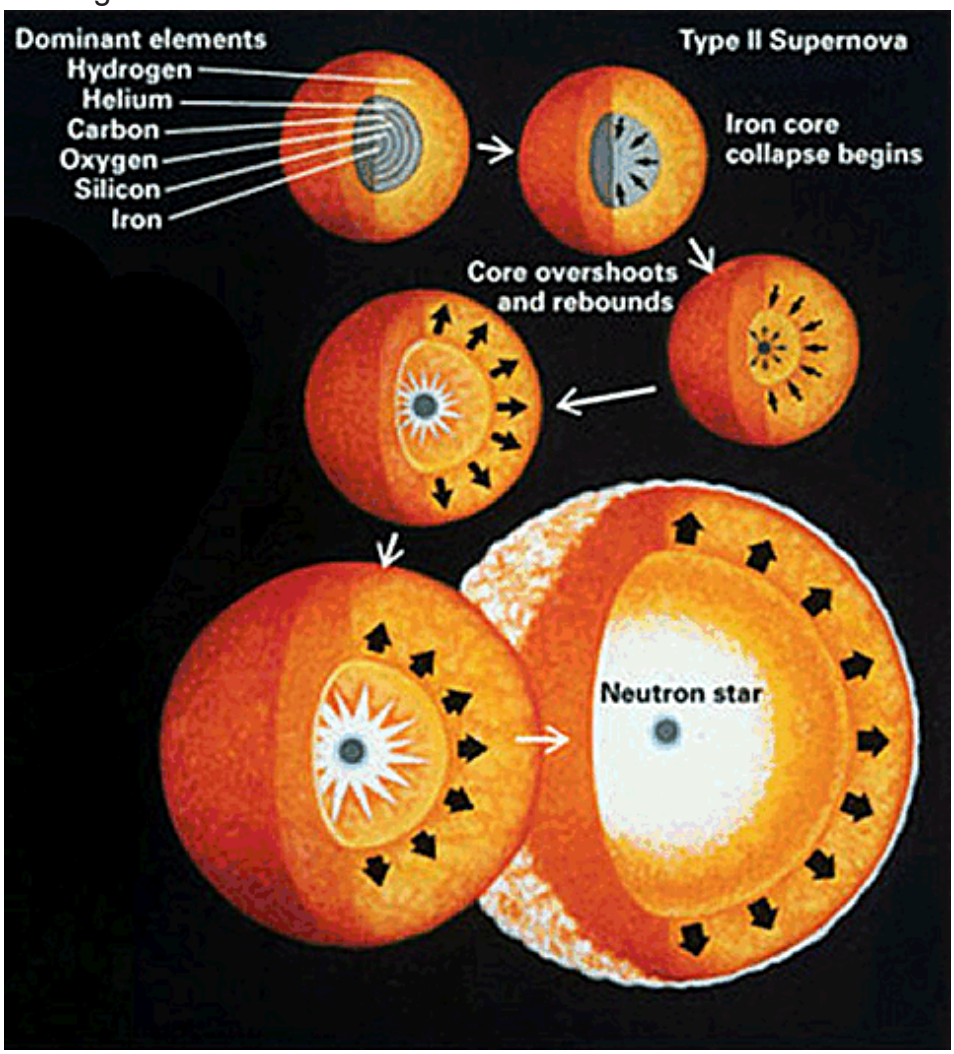
by Bert Stevens

Stellar evolution has long fascinated astronomers. How a star forms, lives through late middle age, and how it dies have all been studied, analyzed, modeled and described. Each star has been measured and placed on its timeline. We understand the life of a star, or so we thought.

The most massive stars form and live their life on the main sequence in pretty much the same way as solar-sized stars. A star is composed mostly of hydrogen. In the core of a star, the temperature and pressure are so high that the nuclei of hydrogen atoms slam together with enough energy to fuse together to form a helium nucleus. In the process, a tremendous amount of energy is released to keep the core hot and sustain the fusion process.

At first, the core of the massive star (twenty-five solar masses) is almost all hydrogen with just a little helium mixed in. As the fusion progress and the star ages, the core contains an increasing amount of helium. Being heavier than hydrogen, the helium slowly sinks to the center of the core. This eventually leaves a central core of helium, with a shell of hydrogen fusing around it.

Helium ash deep in the star's interior continues to fall from the hydrogen-burning layer onto the core, increasing its density and temperature. It soon becomes hot enough for the helium to fuse into heavier elements like carbon. Now the heavier carbon starts to accumulate in the core, just as the helium did. Eventually, most of the core is carbon, with a shell of helium burning around it and a shell of hydrogen burning around that.



This process moves the star off the main sequence as the extra energy causes the star's outer layers to expand away from the core. As the star expands, the temperature of the surface starts to drop as the energy being radiated by the star occurs over a larger area. The cooling surface moves from a hot blue color to a cooler red color, a red supergiant.

Figure 1: *A massive star forms a black hole in a supernova explosion. The iron core becomes so massive that it reaches 1.4 solar masses and electron degeneracy can no longer support it. The core collapses into a black hole. The outer core and all the layers above it fall inward but bounce off the compressed inner core, causing a shock wave that blows the star apart.*

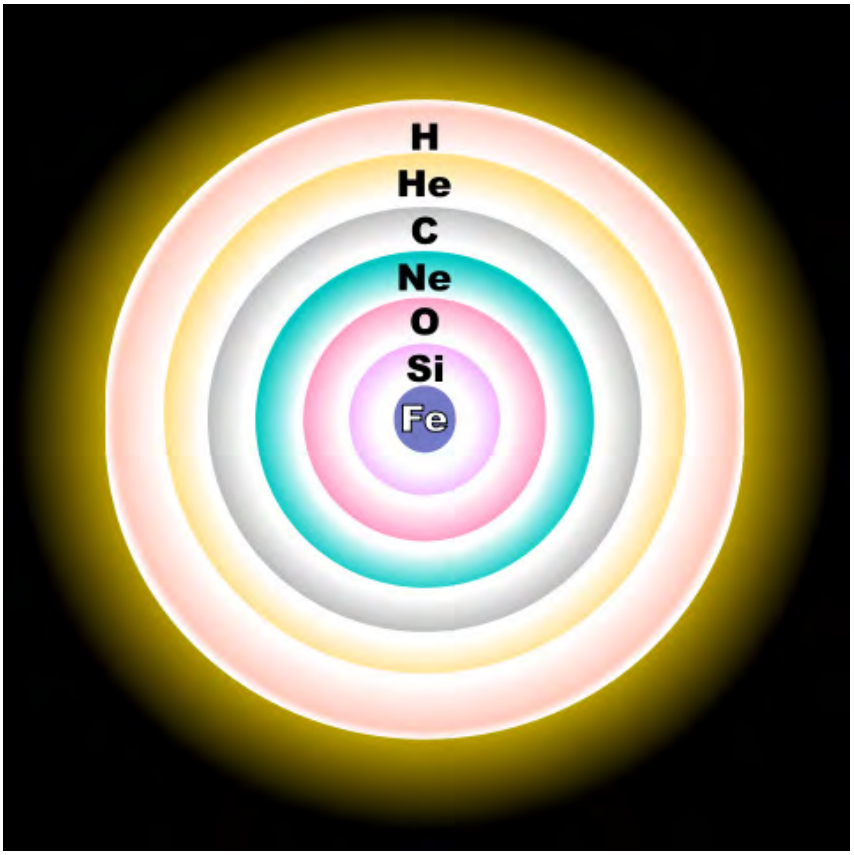
With even higher densities and temperatures from the fusing shells above it, this process continues as carbon starts to fuse to form neon. Each time, as the star is about to collapse, a new element starts fusing in its core to create enough energy to prevent the collapse.

With extremely high temperatures and densities in the core, nuclei cannot continue to exist unscathed. A neon nucleus quickly breaks down into oxygen and an alpha particle (helium nucleus). The alpha particle immediately fuses with another neon nucleus to form magnesium. The increasing temperature makes all the elements in the core subject to being broken down. An alpha particle is usually released in the process, immediately fusing with another nucleus to form a heavier atom. This process takes more numerous lighter nuclei and creates a lesser number of heavier nuclei.

This process continues with the star's interior looking more like an onion. The top fusion layer is still hydrogen fusing into helium, then helium into carbon, carbon to neon, neon to oxygen, oxygen to silicon, and silicon into iron. Each layer contributes to the energy output of the star and helps to keep the star from collapsing.

Unfortunately, at this point the core is now mostly composed of iron-56. Iron-56 is the heaviest nucleus that can be formed by fusion that releases energy in the process. To make heavier elements, energy is absorbed in the fusion process. Since the iron cannot form heavier elements, it simply continues to accumulate in the core.

Finally, the mass of the iron core exceeds the Chandrasekhar limit of 1.4 solar masses and electron degeneracy can no longer support the core. It then undergoes a catastrophic collapse into a neutron star. The higher layers of the star, no longer supported by the core start to fall inward toward the tiny neutron-star core. They attain a significant fraction of the speed of light before they hit the remains of the core.



Since the collapsing layers of the inner star can go no further when they strike the core, they bounce back upward, striking the material that is still falling inward. This creates a massive shell of nuclear fusion, forming not just lighter elements, but elements heavier than iron as well. The tremendous energy of this burst of fusion generates a shockwave that propagates outward, blowing the star apart in a massive type II supernova explosion.

Figure 2: *An evolved massive star just before a supernova explosion consists of shells of fusion burning. The highest and coolest shell has hydrogen fusing to helium. Deeper fusion shells have lighter nuclei forming heavier nuclei as the temperature and pressure increase. Each shell rains down "ash" that acts as fuel for the next lower fusion shell. The central core is composed of iron-56, which will not fuse to release energy.*

The giant star that shown so brightly is reduced to a cloud of gas and dust expanding outward as a supernova remnant and the former core is either a neutron star or a black hole, depending on its mass. This is the prototypical life story of a massive (25 solar masses) star,

As astronomers studied supernova, they discovered differences in the way they formed and the results of the star's evolution. They discovered that among the supermassive stars, between ten and thirty percent of the expected supernovas did not materialize. This caused them to question if these massive stars always end their lives in a supernova explosion or if there are alternate evolutionary tracks. It was time for more research.

Figure 3: *This image of the Fireworks Galaxy, NGC 6946, was taken with the Joan Oró Telescope of the Montsec Astronomical Observatory, using several broadband filters and over an hour of exposure time. Supernova SN 2017eaw is marked by the two lines in this late May image. Courtesy of the Institute of Space Studies of Catalonia*

Supernovae announce themselves in no uncertain terms. Massive stars that do not go through the full supernova phase (failed supernovae) do not call attention to their end, going directly from supergiant star to black hole. The only way to find any of these stars suffering quiet deaths is to look for a star to disappear from the sky.

A team of astronomers began a program of observing neighboring galaxies and looking for disappearing stars. Using the twin 8.4-meter Large Binocular Telescope (LBT) on Mt. Graham in the Pinaleno Mountains of southeastern Arizona, they observed a series of galaxies repeatedly, looking for a star to disappear.

One of the galaxies they observed was the Fireworks Galaxy, NGC 6946. This face-on spiral galaxy has had an unusually high number of supernova explosions, at least ten in the last one hundred years. This made it a good choice for finding one of these failed supernovae. SN 2017eaw, discovered on May 14th, graced this galaxy earlier this year. Most of the resident stars that are visible from here on Earth, twenty-two million light-years away, must be rather luminous, good targets for this study that started in 2009.

Among the stars in the Fireworks Galaxy, they found a star that brightened a little, now dubbed N6946-BH1. However, it did not brighten as much as a supernova. Its brightness then dropped off. By 2015, it was no longer visible in LBT images, indicating that it had formed a black hole without going through the supernova phase.

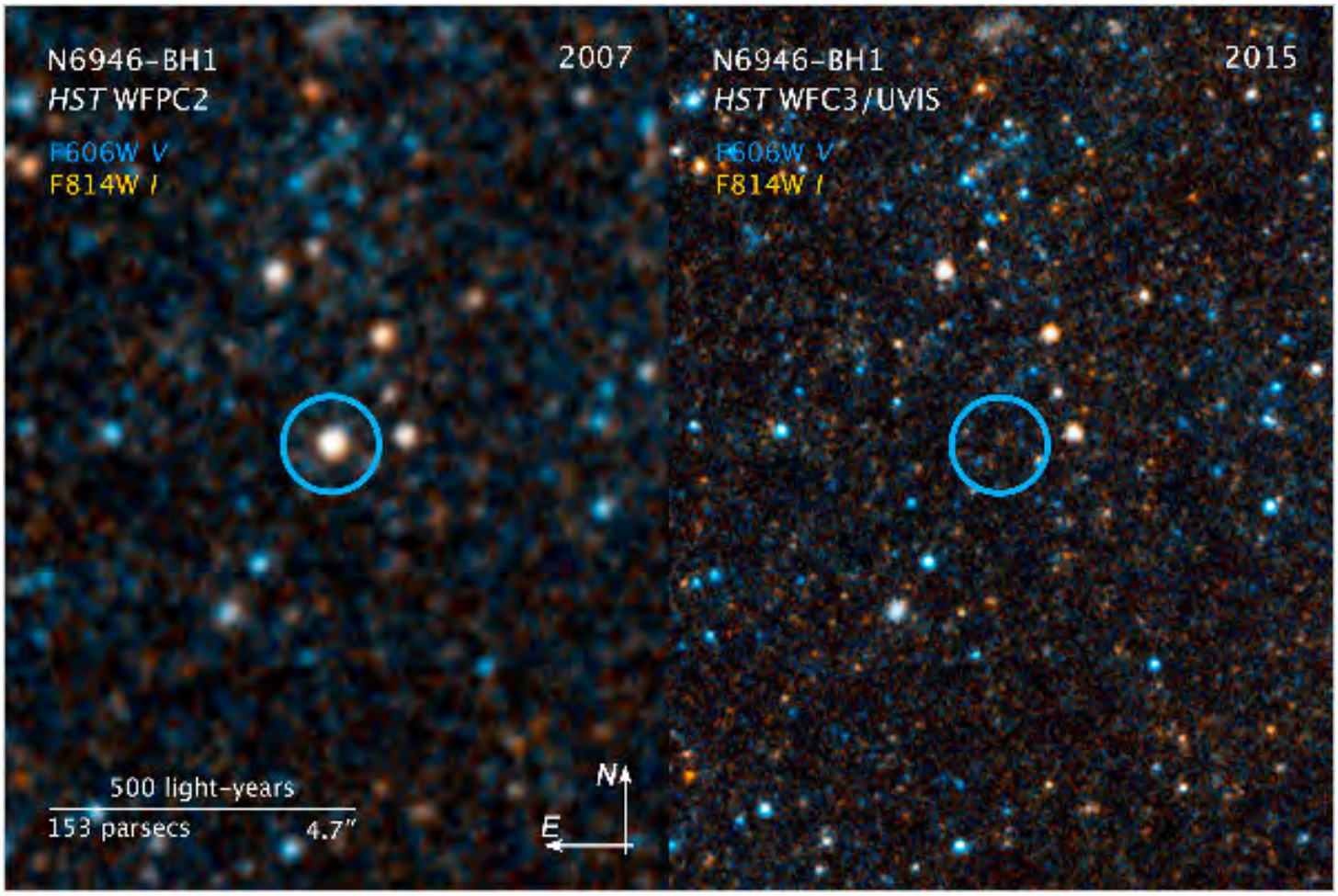


Figure 4: *Images of N6946-BH1 taken eight years apart show the disappearance of this star from NGC 6946. It is believed the star collapsed into a black hole without expolding as a supernova.*

To verify that N6946-BH1 was not just hiding behind a dust cloud, the team observed it in the infrared with the Spitzer Space Telescope. They found some residual infrared, but not nearly as much as when the star was a red supergiant. The residual infrared is probably from the star's outer atmosphere ejected during the formation of the black hole.

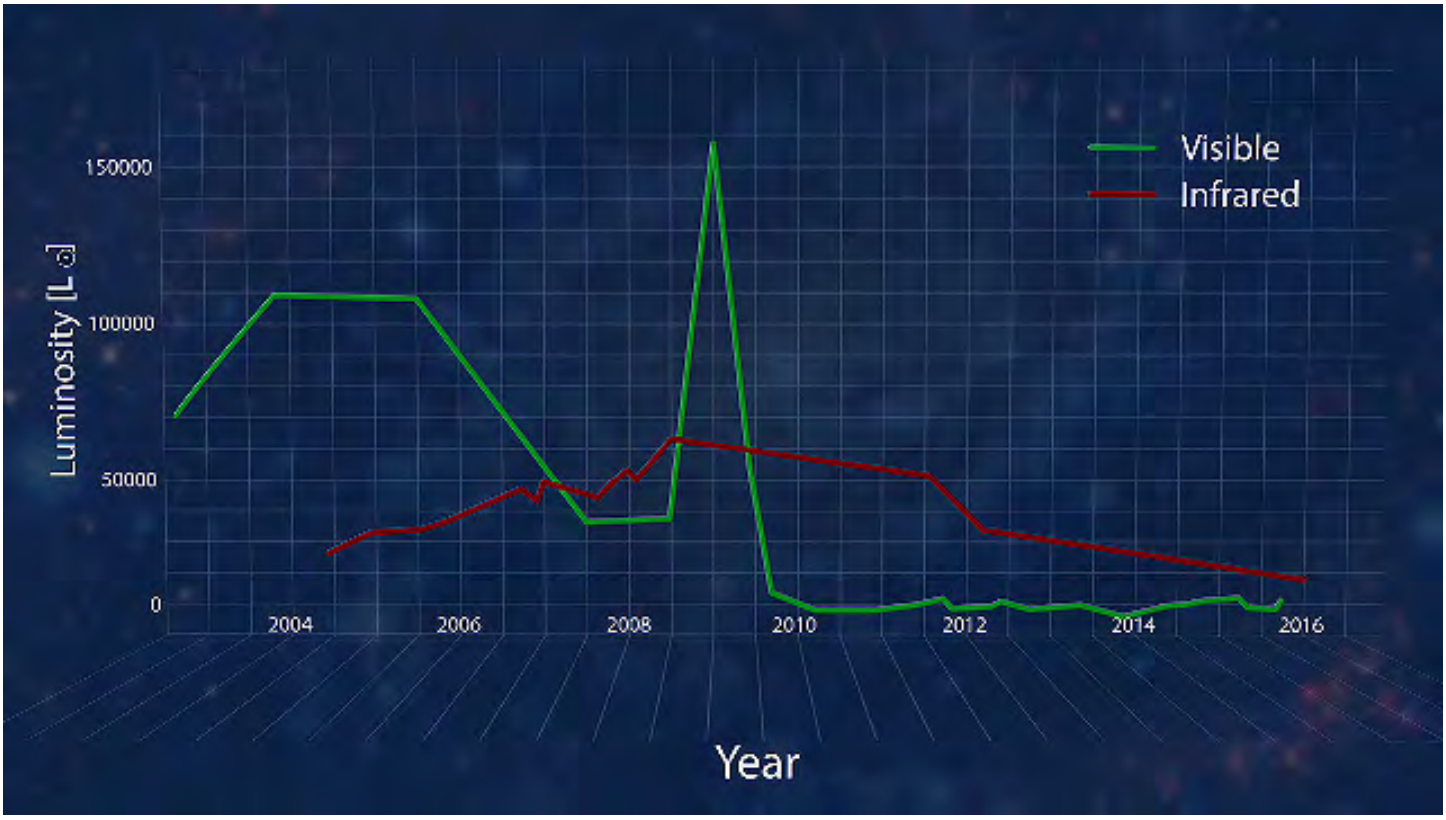


Figure 5: *This is a plot of the brightness of N6946-BH1 in visible (green) and infrared (red). This star brightened in 2009, but it did not come near the brightness of a supernova. It then faded into invisibility. The infrared brightness also increased somewhat, but then started to fade as the outer atmosphere of the star cools after having been blown off the star in the final stage of its life.*

Some of this ejected material should have been pulled back into an accretion disc surrounding the new black hole. The team is planning to look at this star with the Chandra X-Ray Telescope to see if it is emitting x-rays from the hot spot on the accretion disc. They will also continue to monitor it with the Hubble Space Telescope to see if it suddenly reappears.

Most likely, this is the formation of a massive black hole. A supernova expels most of the mass of the supergiant star, resulting in a much smaller black hole. N6946-BH1's disappearance shows that a black hole can form without the supernova explosion. This allows most of the mass of the star to become part of a much more massive black hole. This helps to explain the existence of these monster black holes.

The exact process that would allow the star to collapse without a supernova will need to be explained by astrophysicists. Perhaps the star is so massive that core collapse and resulting shockwave are insufficient to reverse the infall of the upper layers of the star. They would then pass through the event horizon to become part of the black hole. This is an exciting discovery that may fundamentally change our understanding of stellar evolution among the more massive stars.

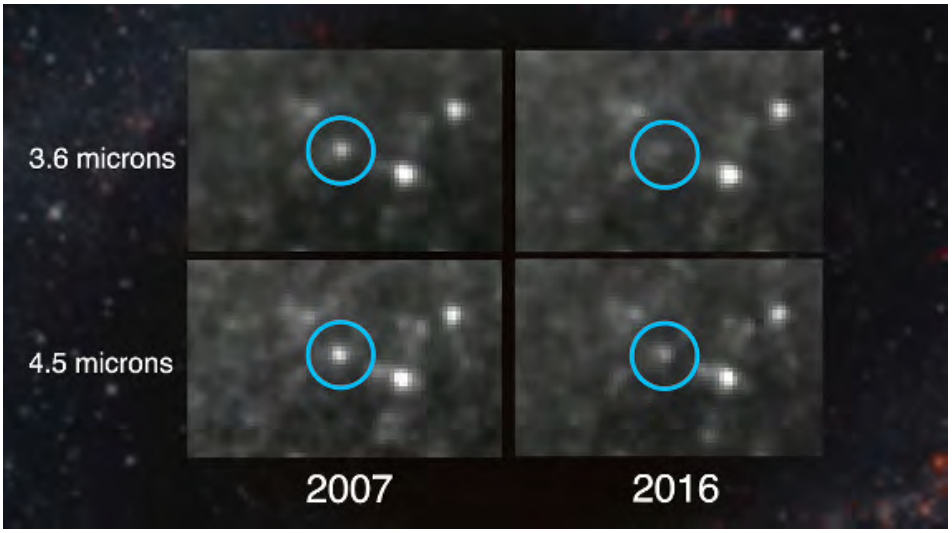


Figure 6: *Pairs of infrared multi-wavelength images of N6946-BH1 taken in 2007 and 2016 by the Spitzer Space Telescope demonstrate that this star has dimmed substantially during that interval. The two wavebands shown here are at 3.6 microns and 4.5 microns. This drop in brightness strongly suggests that a black hole was formed, rather than the star just being hidden by a dust cloud.*

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Photo of the Month

NGC 6940: NGC 6940 is a rich, uniformly concentrated open cluster containing about 70 stars in the constellation of Vulpecula. Most of the stars are 11th and 12th magnitude with several brighter 9th magnitude members.

This was acquired on 2017/10/22 from Las Cruces, NM, using an Astro Tech f/4 Imaging Newtonian with a Canon 60Da camera set at ISO1600 and 60 seconds, taking 27 images, mounted on a Celestron CGE.

Chuck Sterling, Las Cruces, NM

Photo of the Month

OBJECT Messier 76 the Little Dumbbell Nebula, NGC 650/651, the Barbell Nebula, or the Cork Nebula, is a planetary nebula in the constellation Perseus.

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Telescope RC 10
Camera QSI 6120
Settings 8 x 5min LRGB Ha 7 x 5min
Processing CCDstack /PS6/
Date/Location 18 & 21 October 2017 - from Rodeo and Las Cruces, NM
. by John Kutney

Photo of the Month

OBJECT **IC 5146 - Cocoon Nebula - Distance: 3300 light years**
Telescope Takahashi TOA-130F @ f/7.7 **Mount** Takahashi EM200 Temma II
Camera QSI 540wsg @ -10C
Filters Astrodon Ha (3nm), Astrodon Tru-Balance I-Series LRGB Gen 2
Guider SX Lodestar
Settings 11x10min Ha, 4x5min L (bin1x1); 5x5min ea RGB (bin2x2); AstroArt5, CS4 (uncropped, 10xdarks/flats/fdarks/bias)
Date/Location 27 August - Las Cruces, NM
Notes This image is LHaRGB, where Ha was used in combination with Luminance and Ha:R (80:20) was used for the Red channel.