The High Desert Observer

August 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.*

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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

Secretary: John McCullough; Secretary@aslc-nm.org

Director-at-Large: Sidney Webb; Director1@aslc-nm.org

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Tombaugh: Steve Shaffer, sshaffer@zianet.com
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Web-Site: Steve Barkes; steve.barkes@gmail.com
HDO Editor: Charles Turner; turnerc@stellanova.com

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

August Meeting --

Our next meeting will be on ***Friday, August 25***, at the Good Samaritan Society, Creative Arts Room starting at 7:00 p.m.

The speaker will be Dr. Nancy Chanover from NMSU Astronomy Her presenttion will be, "Jupiter's Atmosphere: Learning from Juno and APO"

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 and jkile3916@gmail.com 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?

August 2017

Our July observing session at Leasburg Dam State Park was unfortunately cancelled because of bad weather. But, we had two Moon Gaze events in July. The first was a bit windy, and the second was partly cloudy. Yet, we still shared views of the moon, Jupiter, and Saturn with lots of people in front of the International Delights Café on El Paseo. The number of people and scopes at our outreach events is growing, and I'm very appreciative of the club's enthusiasm.

In our free time during the Moon Gaze, we talked about the upcoming solar eclipse on 21 August. The centerline for this area will be southern Wyoming. Several ASLC members plan to stand in the shadow near Casper, so lodging reservations have been secured. Maya and I are spending the night at Fort Collins, Co. and plan to observe at the Glendo airport the following day. I hope there's space left when we arrive.

My first total solar eclipse was in 1991. I boarded a train in Nogales, Mexico and journeyed that evening, night, and the next morning to Mazatlan, Mexico. Mazatlan was a great destination, solar eclipse notwithstanding. This was my first trip across our southern border, and I was very surprised to find such beautiful beaches. The ocean water was brilliant blue and crystal clear. I also enjoyed the culture and great food. Although I did not speak Spanish, most natives spoke English, so I had no problem getting around the town and finding great restaurants. By 1991, I'd already moved from South Carolina to southern New Mexico, but I met up with several old friends from my home state in Mazatlan. We had a great time exploring the town and preparing for the eclipse the following day.

On eclipse day, we were allowed to observe from the roof of our hotel. My SC friends and I brought small telescopes, which we made available to the hotel staff since they'd never viewed the sun. After the moon made first contact with the sun, the local weather immediately started to look iffy. And, minutes before totality, clouds completely obscured the sun, which was very unfortunate. As luck would have it, the sky cleared a few minutes after totality. Sooo, during my first total solar eclipse, I stood in the shadow but totally missed the big show.

Feeling a bit let down, I could not face another 24 hours on that train. So, I called Delta Airlines and made a reservation to fly back to the US the following day. Except for missing totality, it was a great trip with many adventures. Yet, I hope I'll have better luck in Wyoming on 21 August, although there are never any promises when dealing with the weather. I wish all ASLC members safe and successful viewing during the eclipse. I think everyone knows that one's telescope needs to be properly filtered to observe the sun, but it's certainly worth mentioning again since permanent eye damage could result. If there are any questions about solar observing, please feel free to contact me or other ASLC members.

Howard Brewington
ASLC President

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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

July Cloud Report

by Jerry McMahan

Leasburg, Saturday, July 15

Sid Webb announced, by e-mail and phone, that the event was canceled. The reason being clouds and rain. I had not loaded the car anyway, since it was raining at my place as well.

Moongaze, Saturday, July 29

Moongaze was not canceled, but there may have been a total of 20 minutes with the Moon, or Jupiter not hidden by clouds. I brought the ETX 125 and Steve Shaffer set up his small Newtonian. We had more club member participation, than people to view through the scopes.

John McCullough, Howard Brewington and Ed Montes came by. Chuck Sterling, just out of the hospital, also made an appearance. Steve and I timed it just right. We took down the scopes just in time to miss the rain.

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

Aug	01	20:05	Sun Sets
	03	04:00	Uranus Stationary: Mag +5.8, Size 3.6 arcsec
	07	12:11	Full Moon
	07	12:22	Partial Lunar Edipse - Not visible from NM
	12	13:00	Pereid Meteor Shower Peak
	12	20:00	OUTREACH; Dark Sky Observing at Leesburg Dam State Park
	14	19:15	Last Quarter Moon
	21	10:21	Solar Eclipse begins
	21	11:46	Total Solar Eclipse - Partial from NM
	21	12:30	New Moon
	25	19:00	ASLC Monthly Meeting; Good Samaritan Society, Activities Meeting Room
	26	19:30	OUTREACH; MoonGaze, International Delights Café
	29	02:13	First Quarter Moon
Sept	01	19:31	Sun Sets
	04	00:00	Labor Day
	04	23:11	Neptune Opposition: Mag +7.8, Size 2.3 arcsec
	06	01:04	Full Moon
	13	00:25	Last Quarter Moon
	15	19:00	ASLC Monthly Meeting; Good Samaritan Society, Activities Meeting Room
	16	19:30	OUTREACH; Dark Sky Observing at Leesburg Dam State Park
	16	20:00	Okie-Tex Starparty Sept 16 to 24
	19	23:30	New Moon
	22	14:02	Autumnal Equinox - Summer is over!
	27	20:54	First Quarter Moon
	30	19:00	OUTREACH; MoonGaze, International Delights Café

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

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Announcements

1. The program for the August meeting will be a presentation by Dr. Nancy Chanover, NMSU Astronomy Dept. Dr. Chanover's presentation will be, "Jupiter's Atmosphere: Learning from Juno and APO". Dr. Chanover's reserch involves the study of planetary atmospheres using visible and infrared imaging and spectroscopic techniques. Dr. Chanover is also involved in the development of new instrumentation for planetary science, primarily acousto-optic tunable filter cameras for high spectral resolution imaging polarimetry and/or spatially resolved spectroscopy.

2. The September meeting of ASLC has been moved up to the third Friday, the 15th, to avoid conflict with the Okie-Tex Star Party.

3. Road-Trip to Mount Graham, Saturday, July 15 was cancelled due to forest fires around the observatories. Mike Nuss is attempting to arrange a new time next year in May or June. If you need more info, contact Mike Nuss (nuss1419@msn.com)

4 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!

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Meeting Minutes

ASLC Monthly Meeting
July 2017 Minutes

Show & Tell:

Steve Shaffer said he has had problems focusing his 3" reflector, particularly since cleaning the primary mirror. Several members had suggestions on how he could resolve his issues. This led to questions Steve has about how his telescope works, particularly the path light takes within the telescope.

Sid Webb spoke about the telescopes in the Loaner Telescope program. One telescope on loan to a member has been returned and a new donation of a table top Orion are now in the program (both telescopes were at tonight's meeting). He is considering using the Orion in a library loaner program but doesn't have all the details he requires. The Astronomical League can provide more detail on the system it supports. Sid plans to investigate further.

Phil and Patty Simpson brought the research material Phil collected when writing his Guidebook to the Constellations. Members are welcome to avail themselves of the material. Otherwise it will be donated. Howard Brewington presented John Kutney with the Rising Star Award for placing first in last month's imaging competition.

Call to Order:

Howard Brewington, President, Astronomical Society of Las Cruces (ASLC, the Society), called the July 2017 business meeting to order at 7:10 pm, 28 June 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. He particularly welcomed first-time visitor and potential member Dr. Joey Benoit. There were no other visitors or guests present at this month's meeting and Howard asked all members to sign in on the rosters at the rear of the room. Howard thanked Charles Turner for the July edition of the High Desert Observer (HDO). The minutes of the June 2017 meeting were published in the HDO. If there are no corrections or discussion, Howard asked that the minutes be accepted as submitted by acclamation; they were.

Outreach:

Chuck Sterling, Outreach Coordinator, is recovering from his recent health issues and reported on upcoming events. There will be Moon Gazes at International Delights Café (IDC) on 29 July and 26 August. There will be an observing open house at Leasburg Dam State Park (LDSP) on 12 August. A solar eclipse will occur on 21 August that will be partially observable from Las Cruces. There will be no organized open houses at the Tombaugh Observatory until at least August

Treasurer's Report:

Trish Conley, Treasurer, presented a status of the Society's accounts. She also noted an annual audit of the accounts by a non Board member is called for in the Society By Laws. Sid Webb offered to perform the audit, despite currently being a Director..

Budget Committee:

Trish Conley reported that she, Steve Barkes, and Howard Brewington met and developed a proposed budget for next year. She had some copies available and it will also be published in the newsletter.

Solar/Eclipse Glasses:

Trish Conley had eclipse viewing glasses available for $1 each.

Presentation:

This month's presentation was by Jerry Armstrong, a comet-observing friend of Howard Brewington's from the Atlanta, Georgia-area. Jerry's topic was observing in the Namib (Africa) desert where he had been the astronomer-in-residence at the Beyond Sossusvlei Desert Lodge three times for a total of 5 months over three years. Jerry presented images of the exotic fauna that populates the area around the lodge as well as a number of images of astronomical objects that can best be observed from south of the equator. He noted that the astronomer-in-residence position is open to anyone that is qualified and is a once in a lifetime opportunity.

The July meeting of the Astronomical Society of Las Cruces concluded at 8:08 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

On August evenings, the sky is populated by a bevy of stars, bright, dim and the “river” of the Milky Way travelling from south to northeast. All these stars have different colors and ages. However, when they are analyzed as a group, trends jump out of the data that tell us a great deal about the life and death of stars.

The first thing about a star that we can gather from Earth is the brightness of the star. As astronomical instrumentation came into existence, the photometer was one of the early instruments that allowed a precise measurement of a star’s brightness. With this information, astronomers were able to refine the magnitude system that we are familiar with today.

The definition of magnitude states that a difference of one hundred times in brightness is equal to five magnitudes on a logarithmic scale. This makes a one-magnitude change equal to a brightness ratio of 2.51 between the two objects. Using this formula, astronomers can take a photometric measurement and convert it to a magnitude on a standard scale that is based on the brightness of stars in the sky.

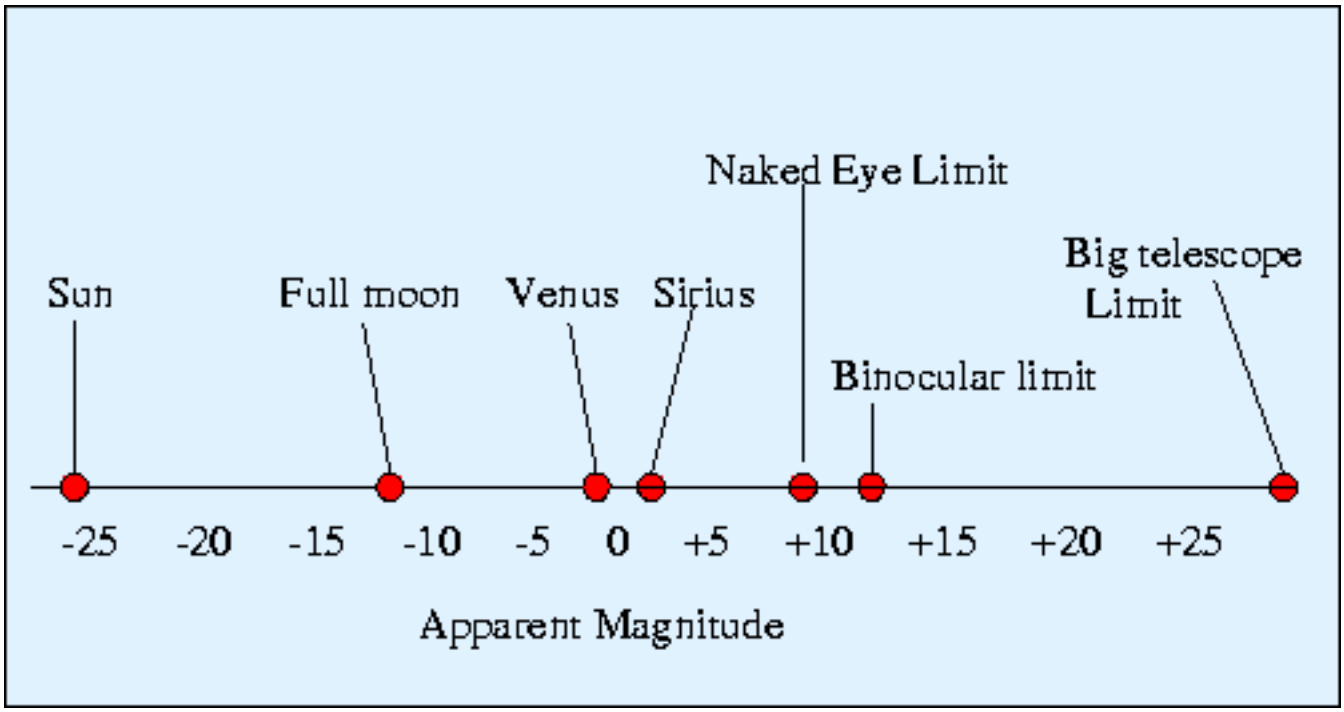


Figure 1: *This is the magnitude scale showing some of the objects in our sky. The brightest is our Sun, and then the full moon. The faintest stars that astronomers can record are fainter than 27th magnitude.*

A more difficult measurement of a star is its spectrum. The spectrum provides astronomers with much information about the star. The brightness of the star in each of the colors in the spectrum can be plotted against color and this will generally form a vertical curve with a peak that defines the temperature of the star. This is the result of Planck’s Law, which states that the curve is defined by the temperature of the star’s surface alone, not its size, shape or composition. A hot star has a higher peak at a shorter wavelength (bluer) than a cool star that has a shallower peak at a longer wavelength (redder).

In addition to the surface temperature, various chemical elements can emit or absorb light at specific wavelengths. This appears as bright and dark lines at specific colors in the star’s spectrum. The exact wavelength marking the fingerprint of an element depends on the outer electrons in the element’s

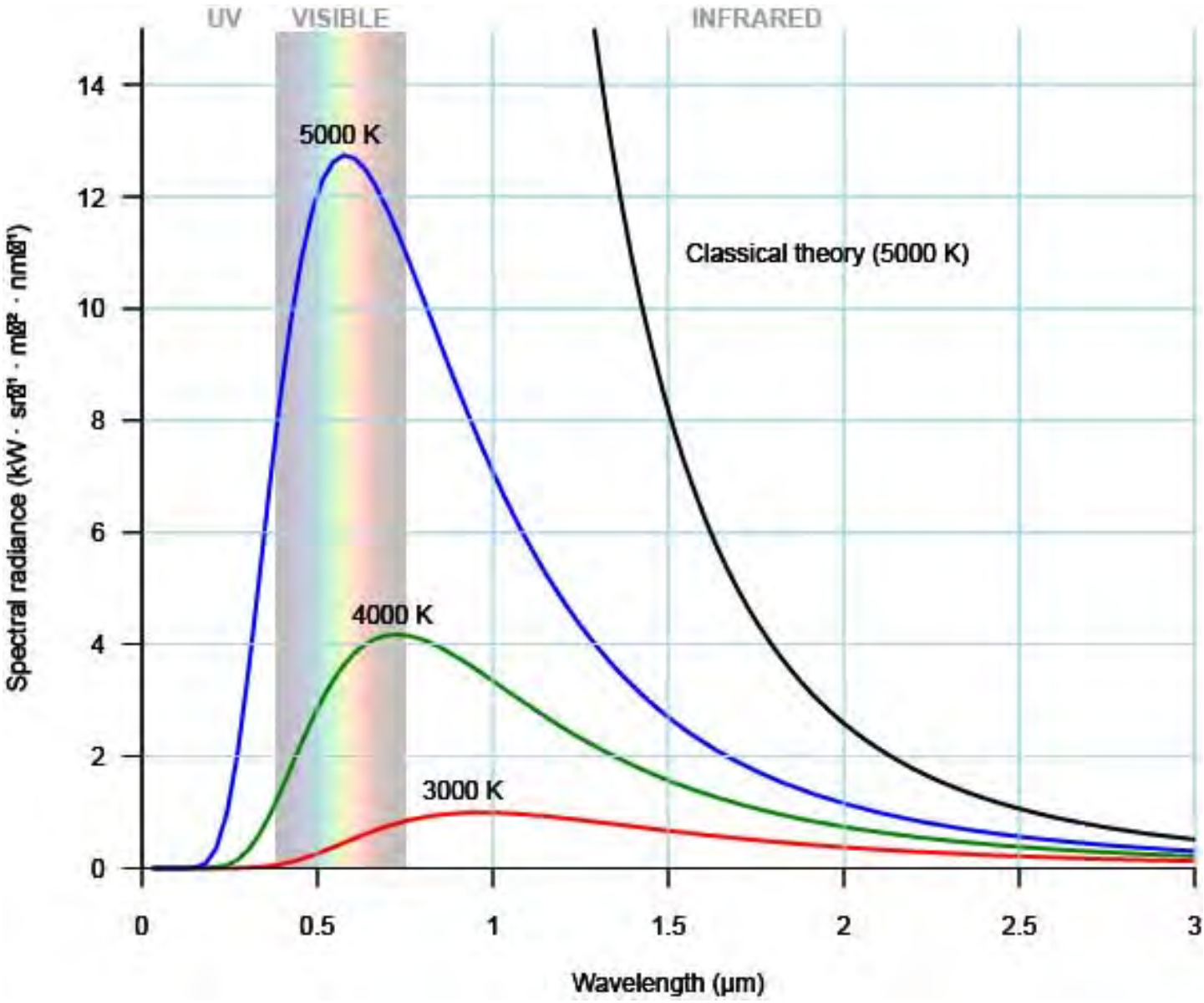


Figure 2: *A black body is a theoretical emitter of radiation. Its composition has no effect on the light it emits. The only property that affects the energy distribution in various colors that a black body emits is its temperature. One way to think about black body radiation is to think of a piece of metal slowly being heated. It first emits energy in the infrared, then the red and finally white hot.*

atomic structure. An electron can only occupy certain specific states in the atom defined by quantum mechanics, so it always takes the same amount of energy to move the electron from the lowest state to the next higher state.

In a hot gas, free electrons are zipping around and strike the electron bound to the atom bumping it up to the higher state. To move the electron back to the lower state, the electron must lose energy, typically in the form of is electromagnetic radiation. The color of a photon defines the amount of energy it carries, when an electron drops to the lower state, it emits a photon of the specific color that we see as a bright line in the spectrum.

Conversely, in a cold gas, most of the electrons are at the lowest state, often called the ground state. If an electron in the atom of the same element absorbs a photon of that specific color, the electron will jump to a higher state. This will appear as a dark line in the spectrum, since the electrons in the atom of that element have absorbed the photons of that color while other colors are undimmed.

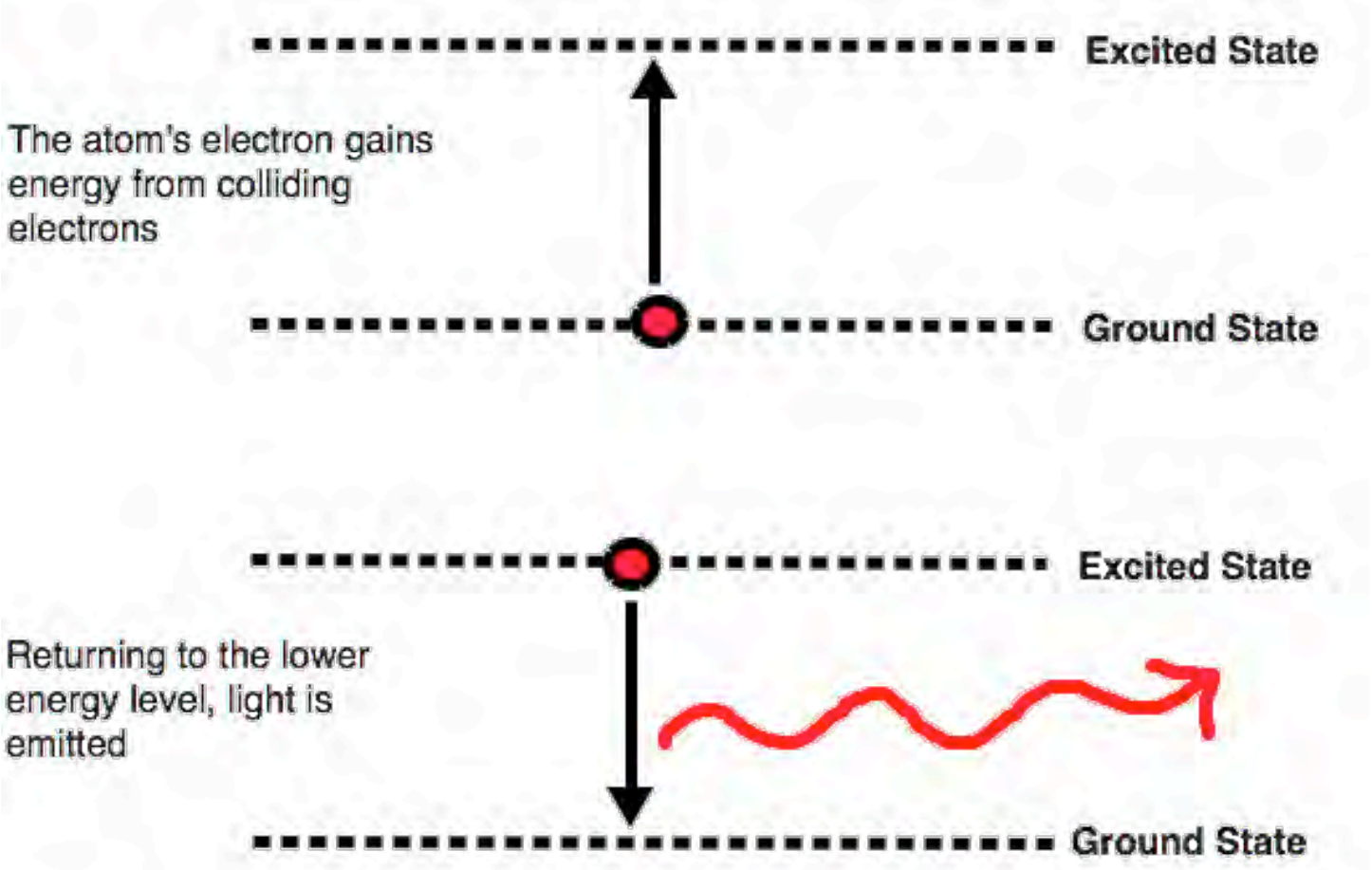


Figure 3: *The outer electrons in an atom are the most likely subject to being excited. In a hot gas, fast moving electrons hit those in an atom, jumping them up to a higher energy level. When they drop back to the lower level, they emit a photon of the specific energy and therefore color dictated by quantum mechanics.*

From these two measures, we know quite a bit about the star. We know its brightness in our sky and its surface composition, but we do not know the actual brightness of the star, called the intrinsic brightness, called its absolute magnitude. The brightness of a star dims the farther it is from us. Therefore, to know the intrinsic brightness, we need to know the distance to the star.

The most direct was to measure the distance to a star is by triangulation. Triangulation is a technique where the position of a star is measured from two different locations. The distance between the two measuring locations forms the base of a triangle and the positions of the star form the angles between the base and the sides. From this information, we can calculate the distance to where the two sides of the triangle intersect, giving us the distance to the star.

Initially, this was done by measuring the star's position against the background stars when it was rising to when it was setting, thereby using the diameter of the Earth as a baseline. Since the star was very low at each observation, this was difficult for most stars. An alternate method was to observe from the Northern Hemisphere and the Southern Hemisphere. This allowed the star to be observed when it was higher in the sky, but still using the diameter of the Earth as baseline.

Most stars did not appear to move against the background stars with this technique because the baseline is too short to show a significant shift compared to the positional measurement errors. To get

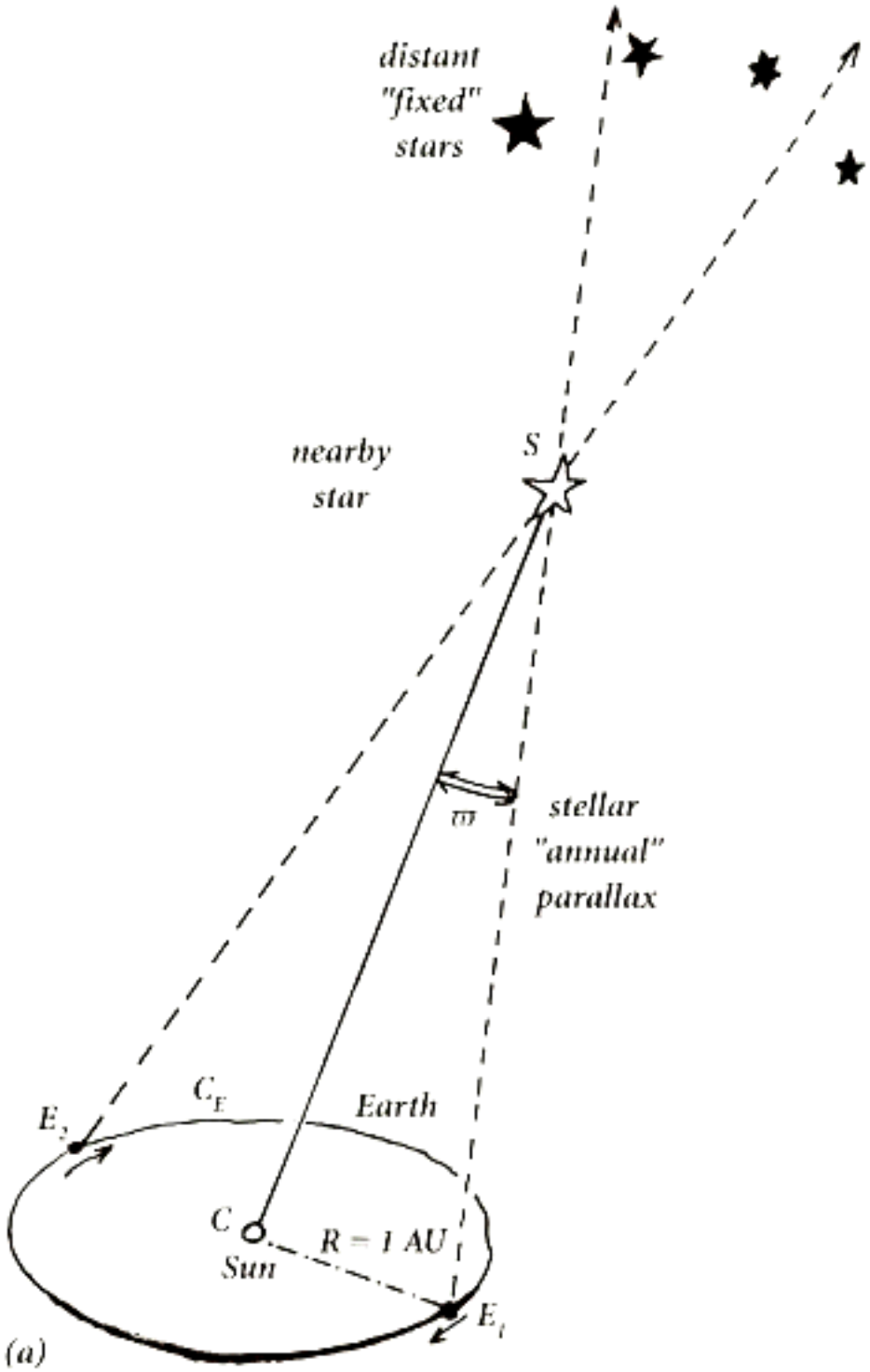


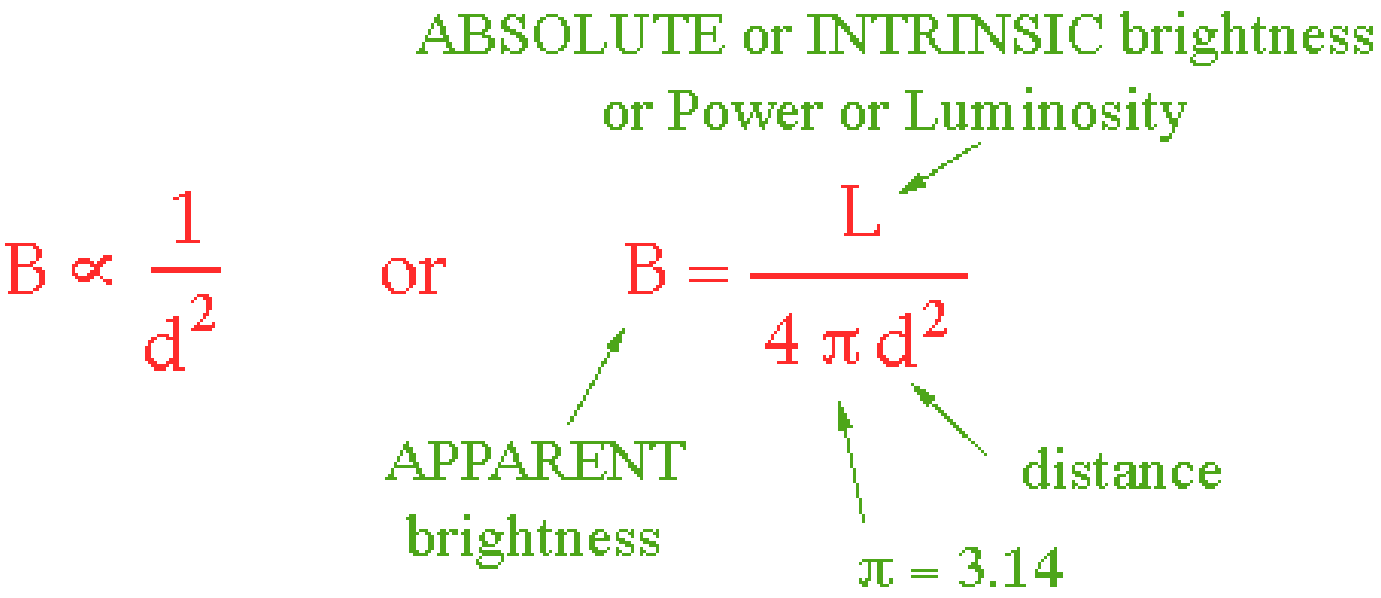
Figure 4: *Traingulation (called parallax measurement in astronomy) uses the diameter of the Earth's orbit around the Sun as a baseline for computing the distance to the nearer stars. This technique allows direct measurement of the nearer stars. Stars that are more distant have their distance measured by other techniques based on our knowledge about the nearer stars*

a longer baseline, astronomers began observing the star at opposite sides of the Earth's orbit, about six months apart. This gives a much longer baseline, allowing most of the nearby stars to have their distance measured.

The absolute magnitude of the star can now be computed. A star's brightness dims by a factor of four every time the distance to the star doubles. The calculation is straightforward and when the absolute magnitude of many stars is plotted against their surface temperature, an amazing diagram appears called the Hertzsprung-Russell (or H-R) diagram. You might think that the stars would be spread almost randomly across the diagram, but they are actually constrained to just a few bands.

The longest band that has by far the most stars on it is called the main sequence. These stars are all middle-age stars. They have made it past their early years when they tend to have a fast stellar wind. They also are not elderly stars that have stopped fusing hydrogen in their core to power the star. They are, you might, say "just right".

The main factor that determines where on the main sequence a star will fall is its mass. Lighter stars burn their hydrogen fuel much more slowly than the massive stars. As a result, the lightest stars have not run out of hydrogen yet, even if they formed right after the big bang. They will be still emitting their dim red light long after our Sun has begun to cool down. Stars at the other end of the main sequence are hugely massive blue stars that burn very hot and very bright. They use their fuel so quickly that they leave the main sequence in less then ten million years.



Our Sun is near the middle of the main sequence band. Its peak brightness is in the yellow region of the spectrum. It is a middleweight star with a mid-level brightness. Stars spend most of their lifetime on the main sequence.

After an aged star stops burning hydrogen in its core, it moves into the giant or supergiant bands of the H-R Diagram. These are above the main sequence. The supergiant band is for heavier stars that are burning heavier elements like helium, lithium, and nitrogen in their core, producing even more energy. The star's atmosphere expands outward, but it is producing so much energy that it still has a hot surface. Stars that are not as massive move into the giant branch of the H-R diagram. These giant stars have also stopped burning hydrogen in their core, but they are still burning helium. They also expand, but with less energy, their surfaces are redder and their total energy output is lower than the supergiants.

All good things must come to an end and when a star can no longer produce energy through fusion, it starts to shrink and fades. The star eventually lands in the final band on the H-R diagram, the white dwarf band. This band is below the main sequence and has stars that appear blue and white as the remaining core of the star slowly cools by radiating energy into space.

The stars along the main sequence with the same temperature also have very similar surface composition so they have similar patterns of bright and dark lines. This means that not only does the surface color and temperature map to the absolute magnitude (intrinsic luminosity), but the spectral classes do as well.

The spectral classification is based on the lines in the spectrum. This is where we get the standard spectral class sequence O-B-A-F-G-K-M. There are also two additional classes of peculiar stars, R and N. The mnemonic for remembering this sequence is the now politically incorrect "Oh, Be A Fine Girl, Kiss Me Right Now". This relationship was discovered by women spectral classifiers at the Harvard College Observatory, but that will have to be a story for another issue.

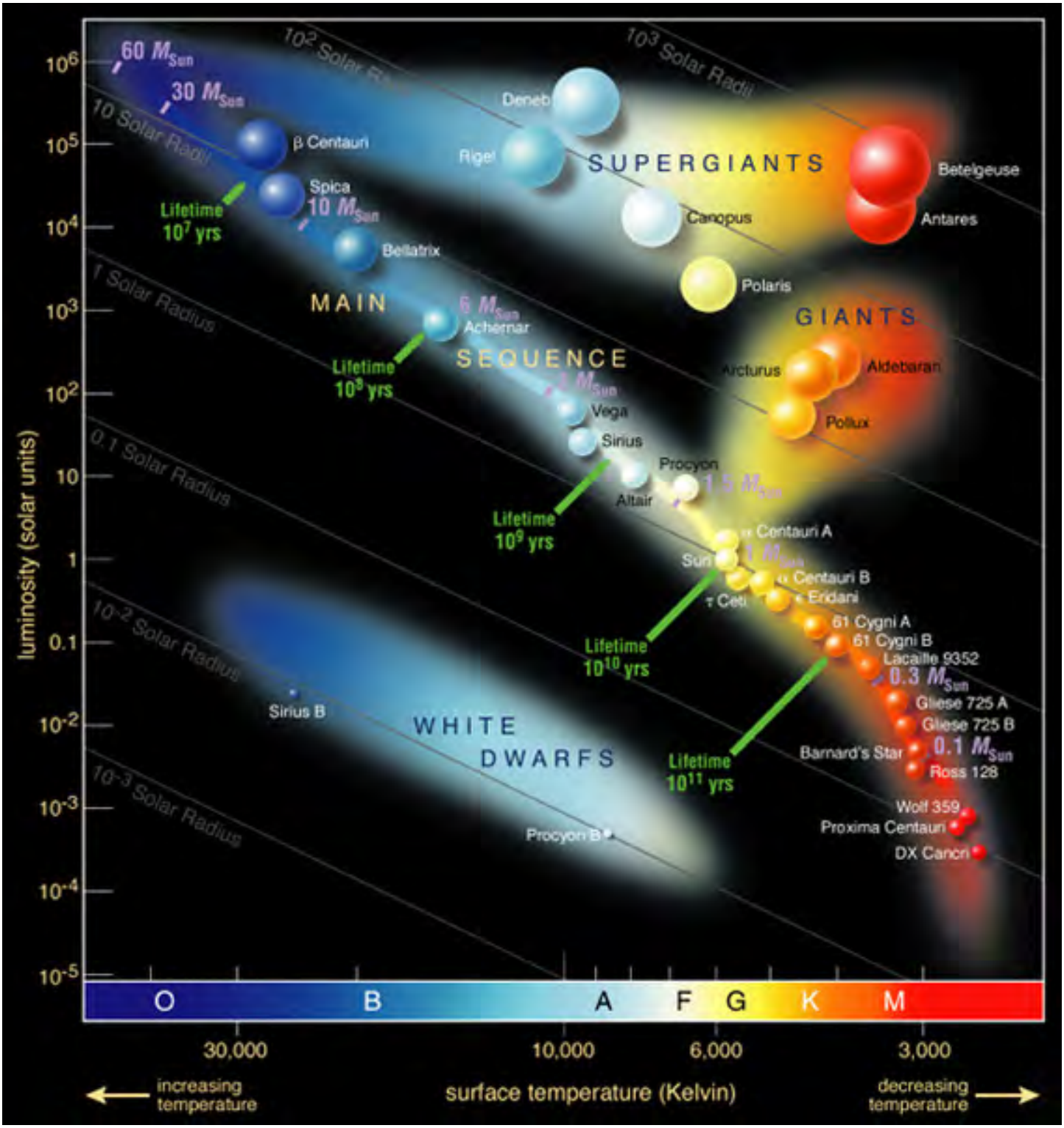


Figure 5: ***Hertzsprung-Russel Diagram***

The Hertsprung-Russell diagram created from modern stellar data. The surface temperature, spectral class, diameter, and expected lifetime are all related to the absolute magnitude for main sequence stars. Stars in the other bands have a different relationship and are generally dying stars that had previously been on the main sequence.

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Photo of the Month

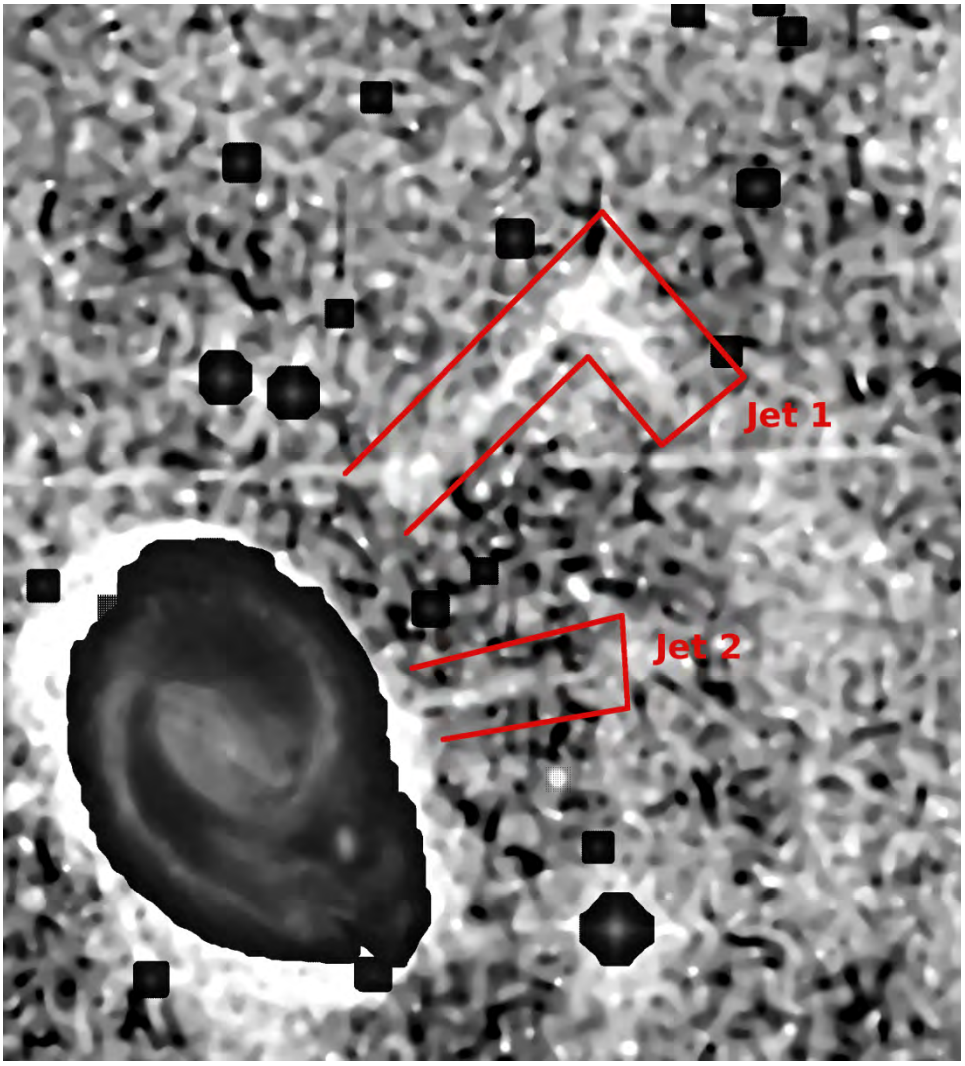
OBJECT **Galaxy NGC 3184** Distance: 40 million light years
Telescope Takahashi TOA-130F @ f/7.7
Mount Takahashi EM200 Temma II
Camera QSI 540wsg @ -15C
Filters Astrodon Tru-Balance I-Series LRGB Gen 2
Guider SX Lodestar
Settings 14x10min L (bin1x1); 4x5min ea RGB (bin2x2); AstroArt5, CS4 (uncropped, 10xdarks/flats/fdarks/bias)
Date/Location 1 February 2017 - Las Cruces, NM
Notes This image is LRGB. The very bright orange star to the right in this image is HP50389, which is about 1050 light years from Earth. Copyright Jeffrey O. Johnson

Photo of the Month

NGC 1097 Barred Spiral in Fornax, about 45M Light Years distance. It is a Seyfert Galaxy with a super-massive black hole at its center. Jets of stars (next slide) emanating from the galaxy are interpreted as the shattered remains of devoured dwarf galaxies.

iTelescope T32: 17”/f6.8, PL16308
Minimalist exposures:
R: 7x600” G: 8x600” B: 7x600” L: 7x600”

PixInsight and masks with GIMP 2.9.4 Alex Woronow



NGC 1097

Two of the three jets of stars emanating from the galaxy. This image is based on the same set of images in the preceding slide.

Alex Woronow