Snake River Skies

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President's Message

It is August already, and instead of a regular meeting we are planning a potluck picnic at the Herrett Center. We will start at 7:00 PM, on the deck outside the Rick Allen room. The club will provide drinks (NO ALCOHOL on campus!) and grills. Bring your own meat, and maybe a side dish to share with others.

Please call or email Ken or Rick if you are planning on attending so we have an idea of how many people will attend. Guests are welcome!

We may open the observatory early for solar viewing, and may get very good evening view of Jupiter.

We are looking for donations for a MVAS Stellacam to complete the SHARE system. We already have several hundred dollars pledged, but need $800 to order the camera.

I am looking at doing a MVAS night at the observatory sometime this month. This will be a night just for the Society to come and have some fun with the Herrett telescope and to learn more about the other things available at the observatory, or bring your own scope to the observers' deck. We can also start learning more about the SHARE system and how it operates. This night will be just for us, with no public. We can choose a night at the meeting. I would like to see this continue monthly, if there is interest.

Next month we have Dr. Candace Wright, of Twin Falls High School, who will be speaking on Exo-Planets. It should be a very interesting meeting!

Ken Thomason
President.

The Magic Valley Astronomical Society Board invites you and your family to a society picnic and the public observing session on Saturday, August 12, 2006 at 7:00 p.m. on the lawn in front of the Herrett Center. Please bring your own food, the drinks and grills will be provided. Following the picnic there will be an observing session using the Herrett Telescope in the Centennial Observatory. Other telescopes will be on the stargazer's platform outside. If you have not previously been to see the Herrett Telescope, now is your chance.

Idaho Skies

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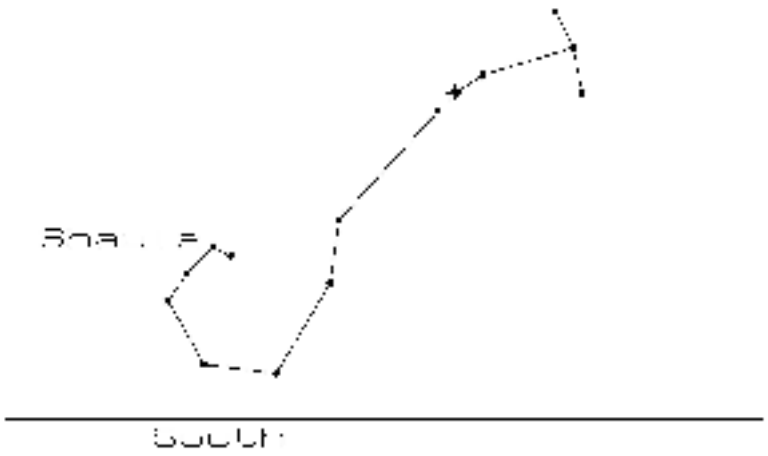
Idaho Skies is a column for beginning amateur astronomers and those interested in astronomy. Suggestions about the column are gladly accepted by the columnist, at paul.verhage@boiseschools.org

This month look for the star Shaula in Scorpius. Shaula is known to astronomers as Lambda Scorpii and is the second brightest star in Scorpius. Shaula means stinger in Arabic and was given this name because Shaula, along with its neighbor, represents the stinger at the end of the tail of the scorpion.

Shaula is 700 light years away. Therefore the light you see from Shaula this year left in the year 1306. While Shaula is easily visible from earth, our sun would be visible in only the largest telescopes at Shaula. Shaula is 11 times heavier than our sun. This makes its surface four times hotter and 35,000 times brighter (that is if you include its ultraviolet radiation). Shaula is classified as a subgiant star. It's near the end of its hydrogen fusing life and is about ready to expand into a giant star. The mass of Shaula is low enough that it will probably escape from blowing up as a supernova (unless a star is really heavy, it can usually shed enough mass to become a stable white dwarf).

Look for Shaula in the low south to southwest early August evenings.



August Overview

Early August is filled with meteor showers. But by mid-month moonlight will interfere with them. So plan your meteor watching for early and late August this year.

The moon leads the way to Uranus on the 10th. This is a binocular event.

Two star parties take place this month. Unfortunately they occur over the same weekend.

August 1 – 7

A mild meteor shower peaks on the night of the 1st and morning of the 2nd. The Alpha Capricornids tend to be slow meteors and it produces an average of six meteors per hour. However, this meteor shower does produce some of the brightest meteors you're liable to see from a regular meteor shower. Other meteor showers are active at the beginning of August, so you'll see more than just six meteors per hour tonight. Since the moon doesn't reach first quarter until tomorrow the sky is dark after midnight (the best time to watch meteors anyway). Alpha Capricornid meteors appear to originate from the south after midnight. For the best view of them, just lie down on a blanket and look up.

The moon is at first quarter on the 2nd at 1:46 AM (12:46 for Oregon and 2:46 for the Midwest). If you own a small telescope, then the first week of August is your best time to observe the moon. You'll be pleased with your telescope's low power images of the moon, so don't skip low magnifications for higher ones. Eyepieces that produce low power images are those with the longest focal lengths. Typically telescopes have a 25mm or longer focal length eyepiece as its lowest power eyepiece.

The Russians celebrate a space anniversary on the 6th. The second cosmonaut in earth orbit was launched 45 years ago in 1961. Gherman Titov was launched onboard the Vostok 2 spacecraft. Unlike the previous three humans in space, Titov spent an entire day in orbit (Gagarin only remained in orbit for 90 minutes and the flights of Shepard and Grissom only lasted 15 minutes. Titov has the distinction of being the first person to suffer from space sickness, a condition brought about by the body's reaction to weightlessness. Vostok 2 was to be Titov's only flight into space.

On the 6th in the year 1181, Chinese and Japanese astronomers discovered a supernova in the constellation Cassiopeia. Modern astronomers have detected the remnant of this supernova and it's a neutron star. You can read more about neutron stars at the end of this month's column.

August's second meteor shower peaks on the 6th. The Southern Iota Aquarids (there's a northern branch peaking next week) is another weak shower. But combined with the currently active Alpha Capricornid meteor shower and the soon to peak Northern Iota

Aquarids and Perseids means the night sky is pretty active with shooting stars. Unfortunately, the moon is rapidly approaching full and its light will wash out the fainter meteors.

On the morning of the 7th, innermost planet Mercury is at its greatest elongation from the sun. Mercury will be a bit difficult to see, but Venus will help you locate it. Look low in the east-northeast at 6:00 AM. In the brightening twilight you'll see Venus as the brightest star in that part of the sky. Center your binoculars on Venus and Mercury will appear as the bright star 2/3rds of the way to the bottom of your binocular's field of view.

How about some recent history? Ten years ago on the 10th, NASA held a news conference about a meteor that had been found in the Alan Hills of Antarctica. After some investigation, a research team believed the meteorite from Mars contained evidence for life on Mars. This conclusion was based on several lines of evidence and no single piece of evidence was by itself good to prove the existence of life on Mars.

Inside the rock were tiny globes of carbonates similar to limestone on earth. On earth, carbonates usually form in the presence of water, but not always. Inside the carbonate globes of ALH84001 researches discovered organic compounds called polycyclic aromatic hydrocarbons (PAHs), iron sulfides, and iron oxides. Each of these compounds is created by life on earth, but also by some non-organic processes. It was their close association with each other and size and shape that lead researchers to believe they were evidence for life. Finally, electron microscope images showed what appeared to be the fossilized remains of bacteria, although, much smaller than bacteria on earth today (it was suggested they represented the fossil remains of nanobes, or nano-sized versions of microbes).

As of today, few if any biologists are convinced that the evidence contained in ALH84001 is sufficient to support the conclusion of past Martian life. Perhaps we just need to go to the planet and find out for ourselves.

August 8 – 14

Five years ago on the 8th, NASA launched the Genesis spacecraft. In September 2004 the spacecraft returned to earth with samples of the sun. Genesis was designed to sit at the balance point between the earth and sun's gravity. There it exposed five plates of 55 samples of sapphire, silicon, gold, aluminum, diamond, and other materials to the solar wind. Solar wind is an incredibly thin wind from the sun that contains all the elements found in the sun's surface. When the solar wind impacted Genesis' plates, atoms in the solar wind were implanted into them. Since the surface of the sun is far too hot to collect samples from, its wind is the next best source of solar material. Studies of the elements found in the Genesis plates will tell astronomers exactly what elements and their percentages that formed the solar system. That information then tells us the history of the stars that existed before our solar system formed.

You may recall that the Genesis return capsule did not return to earth properly. The capsule's g-switches, which detected deceleration forces and determined when to deploy the parachute, were installed improperly. The return capsule instead crashed into the Utah desert. Investigators for the Genesis mission have since cleaned the sample plates and are now analyzing the elements and their isotopes n the plates.

The moon is full on the 9th at 4:54 AM (3:54 for Oregon and 5:54 for the Midwest). This year the full moon is so close to August 11th that the annual Perseid meteor shower will be washed out. That's a pity because the Perseids are usually the year's best meteor shower.

The last Soviet mission to the moon, and the last mission to the moon until 1994, was launched on the 9th thirty years ago. Luna 24 was a sample return mission, and the third one by the Soviets. It landed in the Sea of Crisis on the 18th and collected about 1/3rd of a pound of lunar material. After sealing the sample inside its return capsule, a rocket sent the sample back to earth. The Apollo missions returned over 800 pounds of rocks and dust along with their context (context is the information on where the sample were collected and is important for understanding the meaning of the samples). On the other hand the three Soviet unmanned Luna missions returned just over ½ pound of material, and without a context for the samples.

The moon is at perigee on the 10th at noon (11:00 AM for Oregon and 1:00 PM for the Midwest). Its distance from earth is its closest for the month at 223,537 miles.

The tenth is the 40th anniversary of the launch of Lunar Orbiter 1. In order to find safe landing sites for the Apollo astronauts, NASA launched a series of space probes into lunar orbit. There, they photographed the lunar surface in detail, looking for locations that were safe but still interesting. Lunar Orbiter 1 orbited the equator of the moon and approached to within 25 miles of the lunar surface (try that on earth!). About 130 images of the moon where taken over 11 days and transmitted to earth. The first picture of the earth taken from the moon was recorded by this spacecraft. The spacecraft began failing earlier than planned, so mission controllers commanded it to crash on the moon on October 29th. The Lunar Orbiter was roughly cone-shaped and stood about five tall and five feet wide. Its four solar arrays provided power and expanded the spacecraft to about 12 feet wide at the base. All five of the Lunar Orbiters were successful and demonstrated that the Apollo astronauts would be safe from meteoroids and radiation while on the moon.

You can find Uranus in binoculars on the night of the 10th and morning of the 11th. Uranus is the brightest star two lunar diameters above the moon. In binoculars you'll see the following star pattern above the moon.

As you drive to work on the 11th (that is if you leave before sunrise), look for Venus and Mercury close together in the low east-northeast. Venus will be the brilliant star eight degrees above the horizon at 6:00 AM. Eight degrees is about the width of your palm when your arm is fully extended. Mercury is the only star you'll see just below Venus. They two are separated by four lunar diameters, or two degrees.

The Perseid meteor shower reaches its peak on the night of the 11th and morning of the 12th. Normally this is the best meteor shower of the year. But this year's nearly full moon lights up the night sky, especially after midnight when the meteor shower is at its best. However, if you're already camping, I'd still recommend watching it. I've seen some very bright meteors in this shower.

August 15 – 21

The moon is at third quarter on the 15th at 7:51 PM (6:51 for Oregon and 8:51 for the Midwest). At third quarter the western half of the moon is visible. The western half of the moon is largely filled with the maria and the largest is named the Ocean of Storms. There seems to be fewer interesting things to see on the third quarter moon (as compared to first quarter), but if you're up late, take a look at the moon at a phase that most people don't see.

Speaking of the moon, it's very close to the Pleiades on the morning of the 16th. The best view is before sunrise, so plan to take a peek at 5:30 AM. This grouping between the moon and Pleiades is perfect for your binoculars.

The United States launched Pioneer 7 into solar orbit 40 years ago on the 17th. The 138 pound probe was one of four launched into orbits that were free of the earth. In their orbits around the sun, they studied the solar wind and cosmic rays without the interference of earth. They discovered that the solar wind was at times turbulent and capable of affecting cosmic rays entering the solar system. These Pioneers are among the oldest still functioning spacecraft.

August 22 – 31

The moon is new on the 23rd at 1:10 PM (12:10 for Oregon and 2:20 for the Midwest). Now we'll have some dark skies at night again. Unfortunately, this is also when school is starting back up, so teachers won't be able to take as much advantage of the darker night sky.

The United States wasn't the only country launching spacecraft into lunar orbit. The Soviet Union launched Luna 11 into orbit around the moon 40 years ago on the 24th. Luna 11 studied the lunar environment just like the American Lunar Orbiters. But unlike them, Luna 11 didn't photograph the lunar surface. Like Lunar Orbiter, it studied the

radiation and meteoroid environment around the moon. Luna 11 ran off batteries and stopped transmitting on October 1st.

If you live in the Pacific Northwest, there are two star parties for you to attend this month. The fist, and largest, is the Oregon Star Party (OSP). It runs from the 24th to the 27th and is held at the Ochoco National Forest (close to mid state Oregon). There's more information at their website, http://www.oregonstarparty.org/. The second star party is closer. The Idaho Star Party (ISP) takes place from the 25th to the 27th at Bruneau Dunes State Park, near Mountain Home, Idaho. There's more information on this star party at the BAS website, http://www.bosieastro.org.

The moon is at apogee on the 25th at 7:00 PM (6:00 for Oregon and 8:00 for the Midwest). Apogee is the point in a satellite's orbit that is its greatest distance from earth. This month the moon is 252,443 miles away at apogee. That's 28,906 miles farther than it was on the 10th at perigee.

Venus passes just ½ degrees from Saturn on the morning of the 26th. The two will be very low in the twilight sky. Your best time to see them is around 6:15 AM. If you go out much earlier than 6:15 they're too low to the horizon and if you go out later than 6:15 the sky is getting too bright. Venus is the bright star about three finger widths above the east-northeast horizon. Saturn is the fainter star located just below Venus. Use binoculars for the best view. Saturn is on the far side of the sun and climbing away from the sun. This means Saturn is getting higher above the horizon every day. Venus on the other hand is approaching the near side of the sun and getting closer to the horizon every day.

The third spacecraft to visit Saturn flew past it a quarter century ago on the 26th. Voyager 2 is a remarkable spacecraft. It visited the planets Jupiter, Saturn, Uranus, and Neptune and is still going strong. Along with its twin, Voyager 1, it's returning data on the space between the solar system and the stars. Voyagers are now embarked on what NASA calls the Voyager Interstellar Mission (VIM). We may continue to hear from Voyager 2 until 2020 when its radioactive power source grows too weak to power the spacecraft. However by then, it should be traveling through interstellar space. Because of the vast distances between the stars and their tiny sizes compared to those distances, Voyager 2 will most likely travel the galaxy without colliding with a star or planet for as long as the galaxy exists. Traveling at a speed of 3.3 Astronomical Units per year (or just over three times the distance between the earth and sun), Voyager 2 will not make a close approach to a star until the year 298,000 AD. Where will we be by then, I wonder. The first star Voyager 2 passes is Sirius, the brightest star in our sky. The distance between them will be 4.3 light years or roughly half the distance between earth and Sirius now. So Sirius will be four times brighter to Voyager 2 than it is to us now. That will be cold comfort for the long dead Voyager 2. But in case Voyager 2 or its twin is discovered by intelligent life in the distant future, both spacecraft carry a phonograph record of the sights and sounds of earth. The record is predicted to survive in a playable state for another one billion years. Therefore our record to the stars will out survive life on our

little blue planet (unless we do something to prevent the sun from making the earth uninhabitable in a few hundred million years).

The moon is at first quarter on the 31st at 4:56 PM (3:56 for Oregon and 5:56 for the Midwest). It's time to begin moon watching again.

This Month's Topic

Visiting a Neutron Star

As the name implies, a neutron star is a star consisting of neutrons instead of atoms. The neutron is one of the two subatomic particles found in the nucleus of the atom. The other particle in the nucleus is called the proton. Neutrons have no charge, unlike the positively charged proton and the negatively charged electron (which orbits outside the nucleus). Inside of each neutron is a proton and electron. And left to itself in an environment where a lower energy level is available (like outside of a nucleus), a neutron will eventually decay into electron and proton.

While a star is happily fusing the fuel in its core, it consists of a plasma, or ionized gas (a mixture of nuclei and free electrons). At the end of its life, when fusion can no longer support its weight, gravity crushes the star into a dense sphere. In the case of a neutron star, electrons and protons are squeezed into neutrons. And unless the star weights more than 140% than the sun, its neutrons will resist any further crushing.

Atoms are mostly empty space and their electrons contain an insignificant amount of mass. This means that most of the mass of an atom resides within its incredibly tiny nucleus. When a neutron star is formed, the empty space within each atom is filled with the nuclei of other atoms. The mass of the core of a collapsing star doesn't change much as it changes from a star to a neutron star (although the outer layer is blown away). However the volume that the star occupies becomes a tiny fraction of its original volume. Our sun has a diameter slightly greater than 860,000 miles. A neutron star, which is 40% heavier, has a diameter of only 12 miles across. So when a neutron star forms its diameter shrinks by a factor greater than 60,000. Therefore its volume becomes 300,000,000,000,000, or 300 million-million times smaller.

At that level of compression, you could fit every human inside a sugar cube. A spoonful of neutron star is solid neutrons whereas a spoonful of earth is mostly empty space. So while a spoonful of earth weighs (on average) as much as a nickel (or 1/16th of an ounce), a spoonful of neutron star weighs one billion tons. That's twice the weight of all the world's automobiles (passenger cars) and it fits inside one of your teaspoons!

The strength of a star's surface gravity depends on its mass and diameter. If you double the weight of a star then you double the strength of its surface gravity. Unlike mass, the diameter of a star affects the surface gravity of a star by the square of the change. So if a star is crushed to half its original size, its surface gravity becomes four times greater. Remember that the mass of a neutron star's core doesn't change (significantly) when it

forms, but its diameter shrinks dramatically. The surface gravity of a neutron star becomes 1,000,000,000,000 (one million-million) times greater after its collapse. The work required to climb Mt. Everest (29,000 feet tall) on earth is equal to the work required to climb 1/250,000 of an inch on a neutron star. That's a height smaller than some viruses.

Because of its small size, you can approach closer to a neutron star's center before touching its surface. This means the gravitational field around the neutron star grows stronger than it does when you approach the surface of the sun or earth. At the same time, the difference in the distance between your toes and the top of your head is significantly greater in relationship to the diameter of a neutron star than it is for the sun and earth. The change in gravitation force between your toes and top of your head is called tidal force. On earth, because the weakness of earth's gravitational field and its relatively large diameter, the tidal force between your head and toes is small (on the order of 5% of one gram). According to my calculations, the tidal force pulling your toes away from the top of your head when you stand on a neutron star will be greater than six million tons!

Objects get hotter as they are compressed into a smaller volume. The surface of a neutron star cools over time, but a young neutron star will still have a surface temperature of around five million degrees Fahrenheit. It may surprise you to know that the surface of a neutron star doesn't appear bright white. The colors we see depend on how electrons interact with photons of light. There are no electrons on the surface of a neutron star with energies low enough to interact with visible light. Besides, we can't see x-rays, which is one of the colors of light that neutron stars emit.

Not only does density increase as a star shrinks into a neutron star, but so does its magnetic field. Neutron stars have magnetic fields a trillion times greater than earth's. Some neutron stars, called magnetars, have magnetic fields even greater still. A magnetar has a magnetic field strength of 44 trillion gauss. Your refrigerator magnet has a field strength of about 100 gauss, or nearly two hundred times greater than the earth's magnetic field. A magnetar's powerful magnetic field can pull the change out of your pocket and erase the magnetic strip on your credit cards from a distance equal to the distance between the earth and moon. The magnetic field is so strong that it could also move a locomotive from the same distance.

A neutron star is surrounded by a thin atmosphere. Our atmosphere is over 100 miles thick. On a neutron star, it's only inches deep and the gravity of a neutron star gives that thin atmosphere a pressure tremendously greater than earth's.

The outermost layer of a neutron star is a hard crust about one mile thick. But remember, this is a solid crust far hotter than molten lava. Star quakes have been detected on neutron stars. These most likely occur when their hard crust cracks and shifts or when their powerful magnetic fields get so twisted that they snap like rubber bands. The energy released by a neutron star quake would make the great San Francisco earthquake look like a pip squeak. The 1906 quake released enough energy to knock over buildings

and start fires. A neutron star quake releases the energy of over 100 million, million, million San Francisco earthquakes.

Below the hard crust of a neutron star is its liquid interior. The liquid is a flowing sea of hot atomic nuclei. Closer to the center, neutrons are able to escape from their atomic nuclei and wander freely within the molten core. Perhaps at even greater depths are rare subatomic particles and perhaps even free quarks (the sub-nuclear constituents of neutrons). Astrophysicists believe the core of a neutron star flows without friction due to quantum effects.

So upon approaching a neutron star, one would be stretched out and ripped apart by tidal forces, turned into a pate as atoms in the body align with the neutron star's magnetic field and shred cells, fried to a crisp and vaporized by the neutron star's intense heat, and killed by radiation poisoning from its x-rays.

The science fiction author Arthur C. Clarke once wrote a short story about the discovery of a star ship that had passed too close to a neutron star. In his story, Neutron Tide, the only identifiable object remaining from the ship's encounter with a neutron star was a single "star mangled spanner"

August's Website

This month check out the website for the Genesis spacecraft. Genesis, the search for origins, is a JPL designed spacecraft sent to collect atoms from the sun.

This is a JPL website, so it follows their standard design for space mission websites. At the very top is a search window. Below the search window are links that take you out of the website. These links are to, JPL Home, Earth, solar System, Stars and Galaxies, and Technology.

Below that are the major links for Genesis proper. These are Mission, Science, Technology, Education, People, Multimedia, Gallery, Get Involved, and Genesis Home. When you click these links, a drop down menu appears.

Under the Mission link are five sub-links where you can find out more about the Genesis spacecraft, the team that designed and operated it, fact sheets, a timeline of events, and milestones of the mission. Under the Genesis Spacecraft sub-link you'll learn more about the current status of the Genesis bus, the part of the spacecraft that is still in space. You can also download a paper model of the spacecraft and look at an image of the spacecraft that briefly explains how its three instruments work. Under the Team sub-link is listed the organizations involved with Genesis. There are over a dozen fact sheets in the Fact Sheets sub-link, but most of them are on general space science. There was only four that related directly to the Genesis spacecraft when I checked it out.

The Science link is another link to fact sheets, but this time they're combined with science projects related to Genesis.

The Technology link has three images of science instruments. Click on them and you're taken to a link of the science teams.

In the Education link are four sub-links to Activities, Interactive Simulations, Under a Different Angle, and Creator's Kitchen. The Under a Different Angle sub-link adds language arts and social studies to space science. The Creator's Kitchen sub-link is for teachers and gives advice and resources for classroom activities.

The People link is what looks like a list of sub-links to everyone involved with Genesis.

The Multimedia link is a webpage that requires Active X. So I couldn't check it out on my PC at school.

The Gallery link takes you to images of the spacecraft, its mission, its samples, and activities at NASA.

The Get Involved link contains some links that are out of date. Students have written poetry for Genesis and you can read them under this link. There's also links for activities geared to Boy ands Girl Scouts.

The Genesis Home link takes you back to the home page and is available no matter how deep in the website you manage to get yourself into.

Below the links described above are hot links with small images and short text. They're arranged in two columns and contain news and features. On the very left is a time line of Genesis activities.

You'll find the Genesis website at, http://genesismission.jpl.nasa.gov/mission/index.html

This Month's Sources

Observer's Handbook 2006, The Royal Astronomical Society of Canada
Space Calendar, http://www.jpl.nasa.gov/calendar/
Night Sky Explorer (software)
Stars, http://www.astro.uiuc.edu/~kaler/sow/
http://comets.amsmeteors.org/meteors/showers/alpha_capricornids.html
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Dark Skies and Bright Stars,
Your Interstellar Guide