Snake River Skies

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President's Message

Wow, what an exciting meeting we had in February. Bob Niemeyer spoke about the planetary such as Cassini, the Huygens mission to Titan, and the rovers on Mars... The Bureau Dunes State Park is working in a number of astronomy related projects, but it will not be done in time for the Messier marathon.

Paul Verhage is planning a balloon launch on April 22nd, a one week robotics class here in the Magic Valley and a robotics competition in Boise latter this year.

Cal Sandfort answered questions on CCD imaging. Taking the image is only a small start of the process! We need to spend more time on image calibration, and post processing. . We have learned a lot, but what we have learned is only allowing us to ask better questions. Cal also touched on using digital SLR cameras.

The MVAS meeting will be March 11th. Our topic this month is Charles Messier and his list of objects not to be mistaken for a comet. Rick Widmer will tell us about the Night Sky Network from the Jet Propulsion Laboratory.

On March 25th, the Herrett Center will present the second annual Video Messier Marathon. We will need all the volunteers we can get! We will then have a dark site marathon at the Jerome Gun Club with the Jerome Astronomy Club. As with all astronomical events they are all weather permitting.

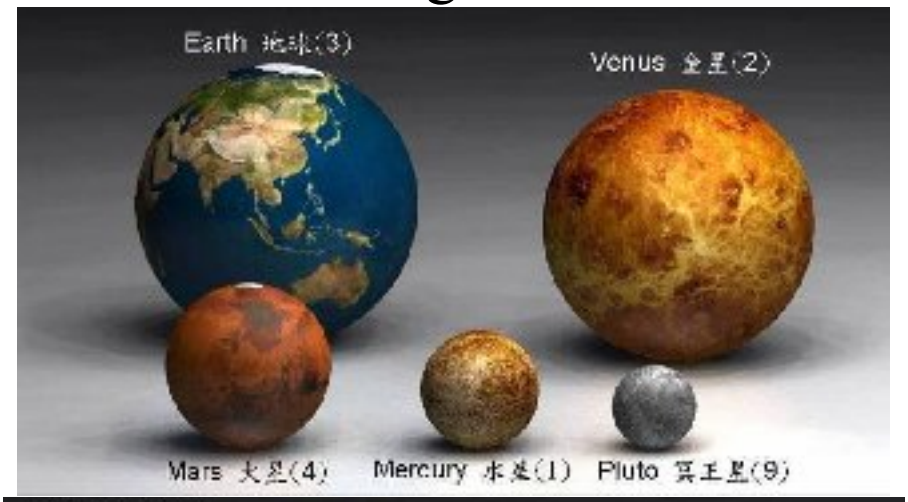
Looking ahead Paul Verhage will be back in April to announce the balloon launch. A major goal of this launch will be the creation of a Near Space Project display for May 6th , Astronomy day.

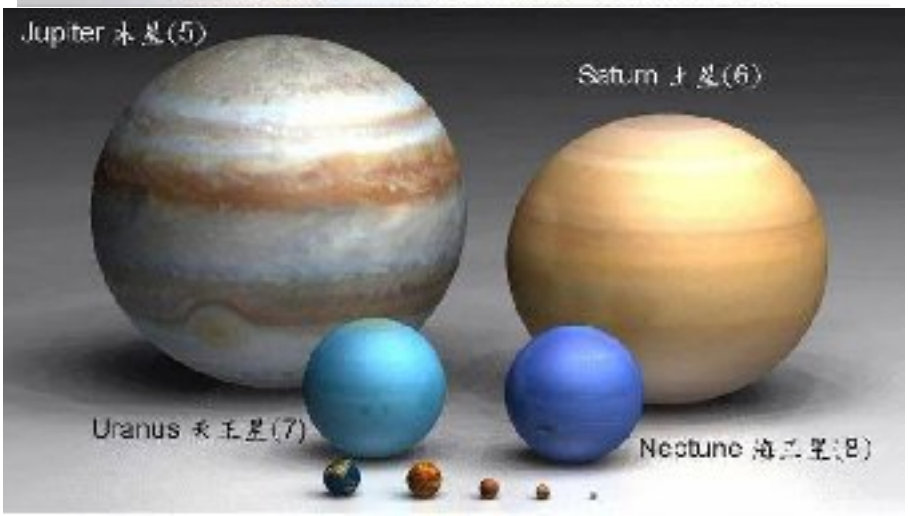
Please mark these items on your calendar.

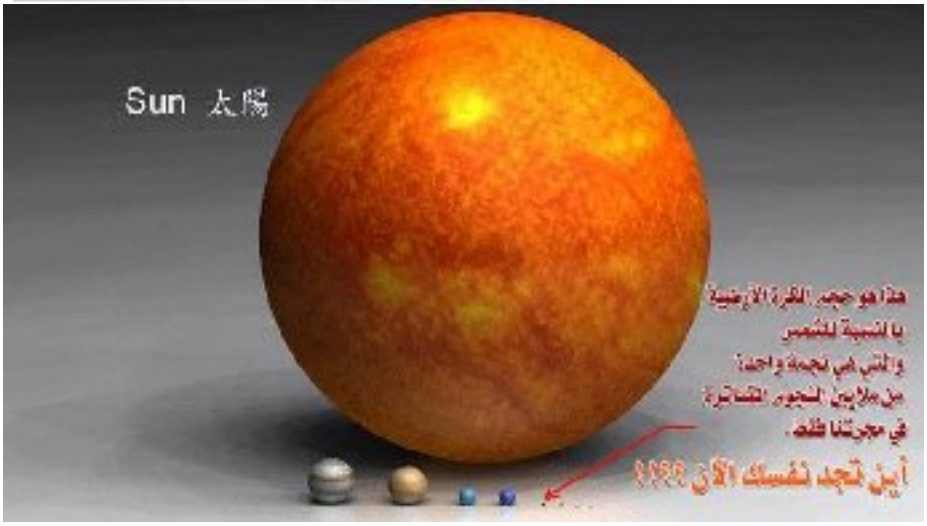
Clear Skies

Ken Thomason, President

How big is BIG?







Just when I needed to find a picture for the newsletter, someone sends me these in a chain letter.

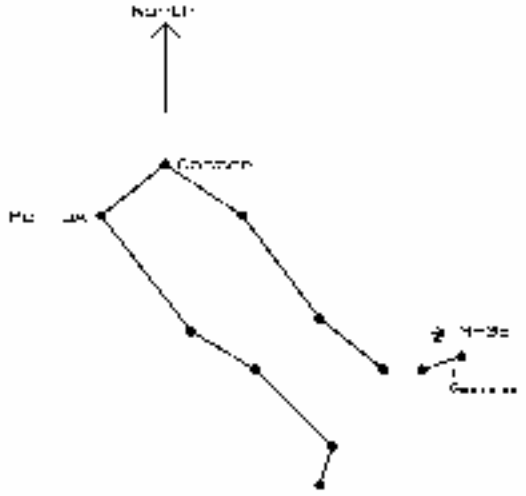
Boise Skies

March 2006

Boise 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

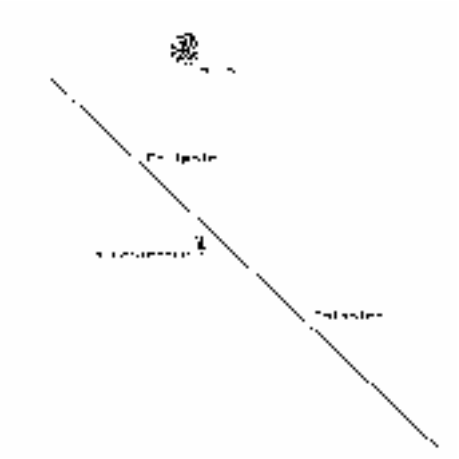
This month look for the star, 1 (one) Geminorum, in the constellation of Gemini.

Gemini is an ancient constellation representing Castor and Pollux, the twin heroes of Sparta. Their father was the Greek god Zeus, and their mother was the mortal Leda. The twins were renowned for their friendship for each. So great was it that when the mortal Castor died, his immortal brother Pollux offered his own life in order to bring his brother back.



This month's star, 1 Geminorum, represents the very end of Castor's foot. The star is 151 light years away. So the light you see from it tonight really left in the year 1855. That's the year that astronomer Percival Lowell was born and the first Archaeopteryx fossil was discovered. 1 Geminorum is a 4th magnitude star, and so it's visible in reasonably dark sky. The star is a binary star, meaning there's a companion star orbiting around it. The two stars shine at nearly the same brightness and are separated far enough apart to be resolved (seen as separate stars) in a good telescope. The primary star is spectral class G5, so it's hotter and brighter than our sun. Standing on a planet in orbit around 1 Geminorum, you could easily see the sun with a pair of binoculars.

There are two things that make this rather bland star so interesting. First is that it's the closest bright star to the sun's position on the summer solstice. The sun is just one degree away from 1 Geminorum on the first day of summer. The second is that 1 Geminorum makes a great guide to a very nice star cluster called M-35.



You'll need binoculars to see M-35, which will appear as a small sprinkling of stars. The cluster is even better through a small telescope, because the telescope gathers more light and is steadier than binoculars. You'll need to use your telescope's lowest magnification on this cluster. Too much magnification and the stars of the cluster expand beyond the telescope's field of view.

Gemini is in the south and almost straight up in the sky by 8:30 PM at the beginning of March.

March Overview

This March is the 20th anniversary of European, Russian, Japanese and American spacecraft flybys of comet Halley.

There's a nice astronomical grouping on the evening of March 5th.

There's a second nice grouping on the evening of the 10th.

The moon passes close to Spica on the night of the 16th.

Spring begins on the 20th.

March 1 – 7

Receding Mars lies close to Hyades star cluster for the first half of March. The Hyades are the stars that form the face of Taurus the bull. The bright orange star next to the Hyades is called Aldebaran and it represents the eye of the bull. However, Aldebaran is

not a part of the Hyades. Aldebaran is only 65 light years away and the stars in the Hyades are around 150 light years away.

The 1st is the 40th anniversary of the Venera 3 impact on Venus. Venera 3 was a Soviet spacecraft and is the first one to land on Venus (the hard way). The Soviets made eight earlier attempts to reach Venus, the planet closest to Earth. Venera 3's communication system failed, so no data was returned from the spacecraft. The spacecraft did however carry several medallions in addition to its silent scientific instruments. The medallions are now probably corroding on the planet's surface. It took several more landings before we finally learned just how inhospitable the Venusian surface is.

If you're not certain where the Hyades are located in the sky, then look for the nearly first quarter moon on the 5th. The moon will be located between the Pleiades, the Hyades, and Mars. High in the southwest you'll find this arrangement of astronomical objects.

This grouping spans 10 degrees across the sky, or just a bit more than the field of view of the ever popular 7X50 field binoculars.

As the moon sets at 1:00 AM on the 6th, you'll find Mars two degrees (four lunar diameters) away from it.

Twenty years ago on the 6th, the Soviet VEGA 1 spacecraft flew to within 5,500 miles of the comet Halley's nucleus. VEGA 1 did not return a lot of information on the comet, but several countries did contribute to its success.

The moon is first quarter on the 6th at 1:13 PM (2:13 PM Midwest and 12:13 Oregon). With the warmer weather of March, this evening will be a great time to explore the moon through your telescope or binoculars. Be sure to pay particular attention to the lunar terminator, or the boundary between night and day. You'll see much more lunar detail here than on any other part of the moon.

March 8 – 14

The 8th is the 20th anniversary of the Japanese spacecraft Susei's flyby of comet Halley. Susei, Japanese for comet, was one of two spacecraft Japan sent to comet Halley. Susei returned images of the comet and measured the solar wind near it. Susei detected comet

Halley emitting molecules of water, carbon monoxide and carbon dioxide. Susei was supposed to fly past a second comet, but it ran out of fuel before this could happen.

Sputnik 9, or Korabl-Sputnik 4, was launched 45 years ago on the 9th. The spacecraft was a test flight in preparation for the Soviet launch of a human into space. Sputnik 9 carried a dog named Chernushka (Blackie) on a single one orbit around Earth. In addition to the dog, there were also mice and a guinea pig onboard. The last passenger was Ivan Ivanovich, a mannequin. The mannequin was ejected out of the spacecraft during its return to Earth in a test of the recovery system that Yuri Gagarin would use the following month. Ivan was fully dressed in a working spacesuit. So to prevent Russian peasants for mistaking Ivan for a real human being, a sign labeled MAKET (Russian for dummy) was attached to his face. All of Sputnik 9's passengers safely returned to Earth.

The 9th is also the 20th anniversary of VEGA 2's flyby of comet Halley. VEGA 2 passed 5,000 miles from Halley and carried the same instruments as its twin VEGA 1. The images of Halley from VEGA 2 are small and show very little detail since the comet was photographed from its sunlit side (where there are no shadows to bring out surface detail). Along with imaging, VEGA 2 also studied the dust and plasma around Halley and how they affected the interplanetary magnetic field.

The United State's next Martian spacecraft, the Mars Reconnaissance Orbiter (MRO), is scheduled to enter Martian orbit on the 10th. Check out its website at http://marsprogram.jpl.nasa.gov/mro/ for more information.

On the evening of the 10th, the moon, Saturn, and the Beehive cluster form a small grouping suitable for your 7X50 binoculars.

Sakigake, the second Japanese spacecraft sent to comet Halley, flew past the comet twenty years ago on the 11th. Sakigake is Japanese for pioneer. Sakigake passed comet Halley at a distance of 4.3 million miles. Unlike its twin Susei, Sakigake did not carry imaging equipment. The Susei and Sakigake spacecraft weighed just over 300 pounds each.

French astronomer Urbain Leverrier was born 195 years ago on the 11th. Leverrier is best known for his discovery of Neptune. However, there's a twist. He didn't actually use a telescope to discover the planet. Instead he calculated the position of this unknown planet based on discrepancies in the motion of the most distantly known planet, Uranus. Astronomers in France used his prediction to find Neptune in less than an hour of

searching. Years later Leverrier noticed that the position of Mercury, our innermost planet, didn't match its predicted position either. Therefore he hypothesized the existence of a new inner asteroid belt or planet - the planet he named Vulcan. Leverrier's Vulcan is not the planet Vulcan of Star Trek. The discrepancy in Mercury's orbit turns out to be an effect of Einstein's general theory of relativity. The sun's immense gravitational field is warping space-time in the region of Mercury and affecting its orbit.

The moon is at apogee on the evening of the 12th. The distance between the centers of Earth and the moon is 252,449 miles tonight.

The second to last spacecraft to fly pass comet Halley was the European spacecraft Giotto, twenty years ago on the 13th. Giotto is named after the 14th century Italian painter Giotto di Bondone. After seeing what turns out to be comet Halley, Giotto added its image to a painting of the nativity. Giotto was supposed to have an American companion spacecraft. But shortsightedness, under the excuse of cost cutting, cancelled our participation. Giotto returned by far the best images of the peanut shaped comet Halley's nucleus. And until two years ago, Giotto's images were our best views of a comet nucleus. The four previous spacecraft of the Halley Armada worked as a team to get Giotto very close to the comet's nucleus. And surprisingly, Giotto survived its passage, even though it was bombarded with cometary dust. One of the impacts was so hard that it spun the spacecraft out of alignment with Earth for 32 minutes. Another impact struck its camera and destroyed Giotto's ability to record any further images. After Halley, Giotto was redirected to pass a second comet in 1992.

Two hundred and twenty-five years ago (in 1781) on the 13th, German astronomer William Herschel discovered the first planet in modern times, Uranus. Looking at past astronomical records, it turns out that Uranus has been seen several times before, but was not recognized as a planet (this doesn't speak highly of their telescopes). The first five planets were known from antiquity, so the discovery of a new planet was a pretty big deal in 1781. Herschel, a German, was working and living in England at the time. He wanted to name the planet after the current king of England, King George III (of American Revolution fame). So Herschel called the new planet, George's Star, or Georgium Sidus. Fortunately, other astronomers were above this and we now call the planet as Uranus (perhaps Georgium Sidus would have been a better pick after all). Uranus is our solar system's third largest planet. It has a diameter of 32,000 miles, or about four times larger than Earth. It takes Uranus 84 years to orbit the sun on account of its nearly 2 billion mile distance from the sun (which is over 20 times greater than Earth's distance from the sun). Six years after his discovery of Uranus, Herschel discovered its first two satellites, Titania and Oberon.

The moon full on the 14th at 4:35 PM (5:35 for the Midwest and 3:35 for Oregon). The moon passes through the edge of Earth's shadow, so there's a penumbral eclipse for those living on the other side of the world. The full moon in March is called the Sap Moon.

March 15 – 21

Look for Spica, the lucida of Virgo, close to the rising moon at 11:30 PM on the 16th. Spica approaches closer, to within one lunar diameter or ½ a degree of the moon, at 3:15 AM on the 17th (4:15 for the Midwest and 2:15 for Oregon).

The 16th is the 40th anniversary of the launch of Gemini 8. The astronauts onboard Gemini 8 were Neil Armstrong and David Scott, both future moon walkers. The goal of the Gemini program was to practice the many techniques American astronauts would need to fly a mission to the moon. In the case of Gemini 8, the astronauts were to dock with a second spacecraft in Earth orbit and later to perform a space walk. Their target was an unmanned Agena upper stage, and 34 minutes after launch, Gemini 8 successfully docked with it. Thirty minutes later though, the Gemini-Agena combination began to roll. Armstrong fired thrusters on the Gemini to stop the rotation, but it wouldn't quit. Assuming that it was a problem with the thrusters in the Agena, Gemini 8 undocked from the Agena and backed away. But instead of settling down, the rotation picked up speed and got worse. That was the clue the astronauts needed to know the problem was with their spacecraft. Armstrong shut off fuel valves in the Gemini 8's primary thruster supply and then fired a second set of thrusters that were only used for returning to Earth. If he hadn't, the astronauts would have blacked out from the acceleration they were experiencing and the Gemini 8 would have pulled itself apart. When the seals for these reentry thrusters were broken, the rules stipulated that the astronauts must immediately plan for a return home. NASA didn't want to risk having the reentry thrusters leaking their fuel and stranding the astronauts in orbit, hence the immediate return to Earth rule.

The 16th is also the 80th anniversary of the first liquid fueled rocket launch by Robert Goddard (which was also the first liquid fueled rocket launched in the United States). The engine of Goddard's rocket was positioned above its fuel and oxidizer tanks, and not at the bottom of the rocket like they are today. To Goddard, having the engine pull the rocket up seemed to make the rocket more stable. Goddard's rocket propellants were gasoline and liquid oxygen. He launched the rocket at his Aunt Esther's farm. For the first 20 seconds the rocket just sat in its launch stand, burning off fuel until it was light enough to lift itself. By that time, the film in his camera had run out so there is no footage of this historical flight. The rocket rose to an altitude of 41 feet before arcing over and returning to the ground without a parachute. The flight took less than three seconds and achieved a maximum speed of 60 miles per hour. Today, rockets achieve altitudes in excess of 100 miles and speeds greater than 17,000 miles per hour, and all within about 10 minutes. Sometimes it begins with small steps.

Beginning on the 17th and running until the end of the month, the moon is a late riser and the ecliptic (the path that the sun travels across the sky) rises steeply in the west after sunset. This combination creates the prime time to look for the Zodiacal Light. Look in the west after sunset and in dark skies you'll see what looks like the light of dusk, except that the glow goes straight up rather than hugging the horizon. The Zodiacal Light is created by sunlight reflecting off of dust in orbit around the sun. Over time this dust meets one of two fates. The smallest particles are blown out of the solar system by

sunlight and the larger particles spiral into the sun and vaporize. But the Zodiacal Light is in no danger of going away. Its dust is replenished every time two asteroids collide or a comet creates a tail.

After midnight on the 19th, bright Jupiter and the gibbous moon rise only 5 degrees or ten lunar diameters apart from one another. This is a good night to look at Jupiter through a small telescope as you'll see all four of its Galilean satellites. Here are the names and positions of the moons, as you will see them in a telescope. In binoculars the moons will be more difficult to see and upside down from the diagram below.

On the 20th at 11:26 AM (12:26 PM of the Midwest and 10:26 AM for Oregon), the sun passes over Earth's equator. This is the beginning of Spring and is called the Vernal Equinox. Today the day and night both last for 12 hours and the sun rises due east and sets due west. However, because of our atmosphere and the refraction it creates, the sun actually rises about five minutes earlier and sets five minutes later.

Early on the morning of the 21st, Antares is 4 degrees away from the moon. You'll see them together in the south if you leave for work before sunrise.

March 22 – 31

The moon reaches the third quarter phase on the afternoon of the 22nd. You'll have to wait until after midnight if you want to see the moon.

Early in the morning of the 25th, Venus reaches its greatest distance from the sun (from Earth's perspective). But on March mornings the ecliptic, the path the sun and planets travel around the sky, is very low with respect to the horizon. This prevents Venus from getting very high above the horizon, even when it's far from the sun. Venus is located low in the southeast at about 5:30 AM. Look for the thin crescent moon to the right of Venus this morning.

Remember March 25th in 1996? That's the day comet Hyakutake passed its closest to Earth. The comet appeared as a large glowing green streak in the sky. It was our brightest comet in about two decades. But it was surpassed in size and brilliance by comet Hale-Bopp the following year. At its closest, comet Hyakutake was only 9 million miles from Earth, or 36 times farther away than the moon. For comets, that's pretty close

and that's the only reason comet Hyakutake appeared so bright in our sky. On the other hand, comet Hale-Bopp truly was a bright comet.

There's another anniversary on the 25th. Forty-five years ago the Soviets launched Sputnik 10. Onboard the spacecraft was a dog named Zvezdochka, or Little Star. The Sputnik 10 launch was the last test of the Vostok spacecraft, a spacecraft that would carry a total of six Russian cosmonauts into Earth orbit, including the first woman. Also onboard Sputnik 10 was Ivan Ivanovich (this is equivalent to calling someone John Doe in the United States). The flight was successful, although, because of snow, recovery of its crew was delayed for one day.

At midnight on 28th, the moon is at the perigee of its orbit around Earth. The moon is only 223,176 miles away, just a hop, skip, and a jump away compared to the rest of the solar system.

The 28th is the 20th anniversary of the United States contribution to the exploration of comet Halley. NASA couldn't get the money to build and launch a dedicated comet Halley spacecraft, so they redirected a spacecraft that was already performing a mission to fly pass comet Halley. Our spacecraft, ICE, passed comet Halley at a very great distance, farther than any other spacecraft in the Halley Armada. ICE only measured interplanetary magnetic fields and carried no imaging equipment.

The moon is new on the 29th at 3:15 AM (4:15 for the Midwest and 2:15 for Oregon). On the other side of the world, they get to watch a solar eclipse as the new moon covers the sun. From on our side of the world, we only see stars because the eclipse occurs during our night.

Forty years ago on the 31st, the Soviet Union launched Luna 10 into orbit around the moon. Luna 10 carried no cameras; it only measured the magnetic fields, radiation environment, and cosmic dust around the moon. The batteries on the spacecraft ran out after three months.

This Month's Topic

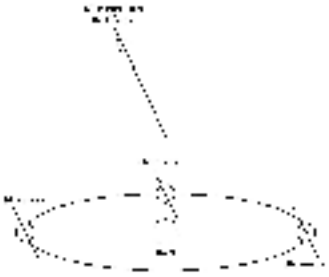
The Seasons

Seasons happen because the earth's axis of spin is not perpendicular to its orbit around the sun. It's that simple - Earth has seasons because it has an axial tilt.

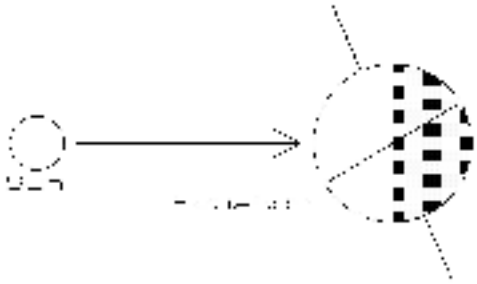
Over the course of the year, Earth's distance to the sun changes. For example, in July we're about 2 million miles farther away then we are in January. But this variation in our distance from the sun has nothing to do with our seasons (well, almost).

Earth spins about its axis, an imaginary line that runs through both the North and South Pole. We often think of this pole as being straight up and down, but it's not in relationship to the sun. It's tilted 23.5 degrees. The point in deep space at which the north end of this pole points to is close to the star Polaris, the North Star. As Earth

revolves around the sun, the North Pole remains fixed on Polaris. But the direction to the sun appears to nod up and down with respect to us standing on Earth's surface.

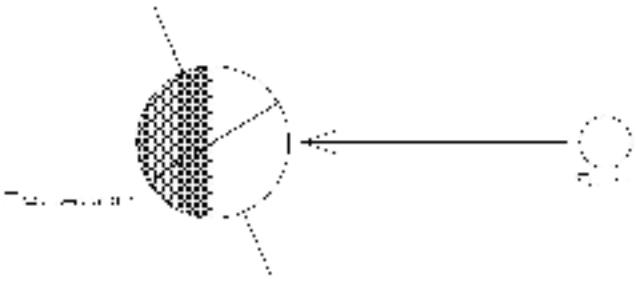


On the first day of the northern Summer, Earth's North Pole is tilted towards the sun.



During the northern summer, the sun reaches its greatest angle north of the equator. To us, the sun travels high across the sky and remains above the horizon for its greatest number of hours. There's one latitude on Earth where the sun appears to pass directly overhead and that's at 23.5 degrees north. That latitude is called the Tropic of Cancer because the sun used to be in the constellation Cancer on that day.

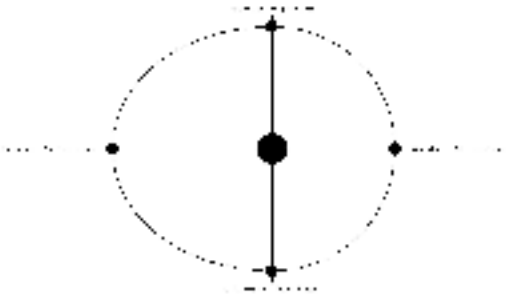
During our northern Winter we're on the other side of our orbit around the sun and the North Pole tilts away from the sun.



So the sun travels at its lowest angle above the horizon and spends its fewest number of hours in the sky. To those people living at a latitude of 23.5 degree south, the sun appears to pass directly overhead. This latitude is called the Tropic of Capricorn.

Between the first day of winter and the first day of summer, Earth's axis is not tilted directly towards or away from the sun. On that day the sun appears to pass directly over Earth's equator. Those are the first days of Spring and Autumn.

From a position above or below the plane of Earth's orbit around the sun, you can see the seasons change every time Earth travels another 90 degrees around the sun.



But notice that in my diagram Earth's orbit is not a perfect circle (which my diagram greatly exaggerates). When Earth is more distant from the sun its orbital speed decreases and it takes longer to travel 90 degrees around the sun. Therefore the number of days in each season is not equal (they would be if our orbit was perfectly circular). .

Here are the dates of the solstices and equinoxes for 2006 and the length of each season.

Spring	March 20	2:26 PM	93 days long
Summer	June 21	9:26 AM	94 days long
Autumn	September 23	1:03 AM	89 days long
Winter	December 21	9:22 PM	89 days long

The date of each solstice and equinox changes from year to year because the length of the year is not an even number of days long. From one equinox to the same equinox one year later takes 365 days, 5 hours, 48 minutes, and 45.2 seconds. This is referred to as the tropical year since it refers to the length of time it takes for the sun to return to the same point on the tropics.

The Spring Equinox can occur as early as the 19th or as later at the 21st. For the Summer Solstice the days are the 20th to the 22nd of June. For the Autumn Equinox the days are 21st to the 24th of September. Finally, the Winter Solstice can occur as early as the 20th or as later as the 23rd of December.

The middle of each season is called a cross quarter day and is celebrated as a holiday. These days were recently religious holidays, but have since become secularized. The middle of winter is Ground Hog's day, the middle of Spring is May Day, the middle of Summer is the Dog Days of Summer, and the middle of Autumn is Halloween.

The cause of the temperature changes we experience in each season is due to the angle of the sun above the horizon and the number of hours that the sun is above the horizon.

When the sun is low in the sky, its light is spread out over a larger area and therefore the concentration of sunlight is less. Less light per unit of area means the sun creates less heat per area. Because of the axial tilt of Earth (23.5 degrees), we receive only 45% as much sunlight during the winter as we do in the summer. Couple this with fewer hours of daylight and more hours for the temperature to cool during the night and you can see why it gets cold during the Winter.

With Earth's large mass of air, water, and ground, it takes time for the temperature to change. Therefore we don't see our hottest weather at the beginning of summer or our coldest temperatures at the beginning of winter. Instead we see those times around the mid point of each season, or around the cross quarter days. Some cultures recognize this fact and think of the seasons as beginning at the cross quarter days. We base our seasons on the sun's position in the sky while other cultures base their seasons on their effects on the land.

The Earth's changing distance from the sun does create a tiny effect on our climate. This makes summers below the equator a bit warmed and winters a bit colder. But the effect is small since there's only a change of 6% in the sun's intensity between perihelion and aphelion. Further moderating this effect is that the southern hemisphere has very little land and is covered mostly in water. Water takes longer to warm up and cool down and is effective at distributing its heat around.

March's Website

This month check out the New Horizons webpage.

New Horizons is the first spacecraft sent to explore Pluto. It was launched on the 19th of January and will spend the next 9-1/2 years coasting to Pluto. The Johns Hopkins Applied Physics Laboratory manages the New Horizons mission (along with JPL). These were the same people who managed the Shoemaker NEAR mission to the asteroid Eros back in 2001.

Let's take a look at their webpage. At the top you'll find a row of links for the following topics: Home, Overview, Science, Mission, Spacecraft, Education, News Center, Gallery, and Links. The rest of the webpage is a set of quick links, like news stories, to the latest topics. These stories will change from month to month, so my review will focus on the top row of nine links.

Each of the links in the top row has its own drop down menu that appears when you click on it. The first link, Home, is the link to use if you get deep into their webpage and want to start over again.

In Overview you'll discover why New Horizon is being sent to Pluto. Pluto is considered my many people to be a planet (it's not). This makes Pluto the last planet to be explored and by sending New Horizons there, humanity completes its initial exploration of the solar system. New Horizons won't stop at Pluto, it will go on to fly pass one or more

Kuiper Belt Objects (KBOs). The KBOs are basically some 10,000 giant icy comets in orbits beyond Neptune. Their composition will give us hints to the conditions found in the outer edge of the solar system during its formation. The KBOs form the reservoir of comets that will grace our skies for several billion years. In this link you'll also find a blog for the mission's PI (Principle Investigator). There are also resources like paper models and educational materials. There's also a link to the issues regarding the spacecraft's radioisotope thermal generator (RTG), or nuclear battery (which is required because there isn't enough sunlight at Pluto for solar systems to function well).

In the Science link is an overview of the science about the New Horizons mission. For example, there's a page on what we know about the Kuiper Belt (the final destination of New Horizons). You can also read how the spacecraft's collected data is sent to Earth. There's also a Frequently Asked Questions link (FAQ) about New Horizons and the Kuiper Belt.

The Mission link shows things like a mission time line, background information on the spacecraft, and the planned flybys of Pluto and Kuiper Belt Objects. In this link you can track the progress of New Horizons and read about the science team who operate the spacecraft.

The Spacecraft link talks about the science payload onboard New Horizons and how we maintain communications with the spacecraft. Did you know there's a science experiment onboard New Horizons called RALPH?. You can also learn about the spacecraft's radioisotope thermal generator, or RTG. The RTG is essentially a nuclear battery that provides all the power New Horizons needs to operate experiments and communicate with Earth. The RTG was fueled here in Idaho.

Under the Education link there are materials for teachers who want to teach about New Horizons, Pluto. Or the Kuiper Belt. Students have a link to their own set of activities, like a growth chart that will chart the progress of a child's growth compared to the distance to Pluto. There's a link to the organizations, like museums, that are providing support to the website. There's also a link to the Solar System Ambassador program under the Community link.

The News Center link is a list of news stories about the mission. This section will probably get long during New Horizons ten plus year mission. A schedule of planned events can be found here. So if you're going to be traveling, you may want to check their list of events and see if the New Horizons team is planning something close to your travels. If you're part of the media, you'll find a link the background information you'll need.

The Gallery link is a gallery of images. If you want to see how the spacecraft was constructed then check out this link (you'll find several images of the construction and testing process). There are also videos and animations available. And some of them look pretty neat.

The Links link is a miscellaneous collection of links that relate to Pluto or the mission in some fashion.

You'll find the New Horizons website at, http://pluto.jhuapl.edu/

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://www.astronautix.com/craft/vena3mv3.htm
http://www.iki.rssi.ru/ssp/vega.html
http://exobio.ucsd.edu/Space_Sciences/journeys.htm
http://www.spacetoday.org/Astronauts/Animals/Dogs.html
http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Le_Verrier.html
http://www.seds.org/messier/xtra/similar/herschel.html
http://en.wikipedia.org/wiki/Giotto_mission
http://science.ksc.nasa.gov/history/gemini/gemini-viii/gemini-viii.html
Robert Goddard and His Rockets, http://www-spof.gsfc.nasa.gov/stargaze/Sgoddard.htm
Sputnik 10, http://space.about.com/library/weekly/aa120802a.htm
http://www.svengrahn.pp.se/histind/sputnik910/sputnik910.html#Korabl-Sputnik-4
http://www.solarviews.com/span/luna10.htm
http://www.badastronomy.com/bad/misc/badseasons.html
U.S. Naval Observatory, Astronomical Applications Department,
http://www.crh.noaa.gov/ind/seasons.txt
AstronomyAnswerBook: Seasons,
http://www.astro.uu.nl/~strous/AA/en/antwoorden/seizoenen.html

Dark Skies and Bright Stars,
Your Interstellar Guide