Snake River Skies

A Publication of the Magic Valley Astronomical Society

February 2006
Volume 10 Issue 2

Club Officers

President
Ken Thomason,
president@mvastro.org
324-4532

Vice President
Terry Wolford,
vp@mvastro.org

Secretary
Rick Widmer
secretary@mvastro.org
423-5974

Treasurer
Jay Hartwell
treasurer@mvastro.org
734-6140

Publicity
David Olsen
publicity@mvastro.org

President's Message

Astronomy Day was a blur of activity. Chris Anderson really did a good job with the planning. WOW is all I can say.

Rick Greenawald did his usual great job showing the kids how to build rockets, and Nick Peterson and Eric Thomason were outside at the launcher.

The make and take went over well, thanks to Kristi Bronson and all her helpers.

Paul Verhage spent most of the day showing his model rovers, and then gave a very informative talk about the real Mars Rovers that evening.

Lee Kelly, Dean Etherington, Tony Masvidal of the local ham radio club showed the balloon package and mission control trailer.

Bobbie Kelly and I manned the MVAS table and handed out goodies.

Rick Widmer showed movies in the library.

Terry Wolford showed the Ha sun on the Stargazers Deck and Forest Ray and Willie ran the Herrett Telescope.

David West, Gwen, David Olsen, Sharissa Thomason, were all over helping out.

Many thanks to all of you for your hard work. Sorry if I missed anyone!

We just survived Astronomy Day and our next meeting is Saturday. The speaker will be Wallace Blacker, the subject Neutron Stars - where they come from and the many different kinds. I hope to see you there!

We also have an outing planned for Bruneau Dunes State Park for May 27th. This is a chance to look through a 25 inch scope at a dark site. Don't miss it!

The June meeting will feature Tom Gilbertson speaking on Telescopes - how to use and care for them. This meeting will require the assistance of all Society members.

Wow time is flying by; this year is almost half over!

Clear Skies
Ken Thomason President

Astronomy Day!

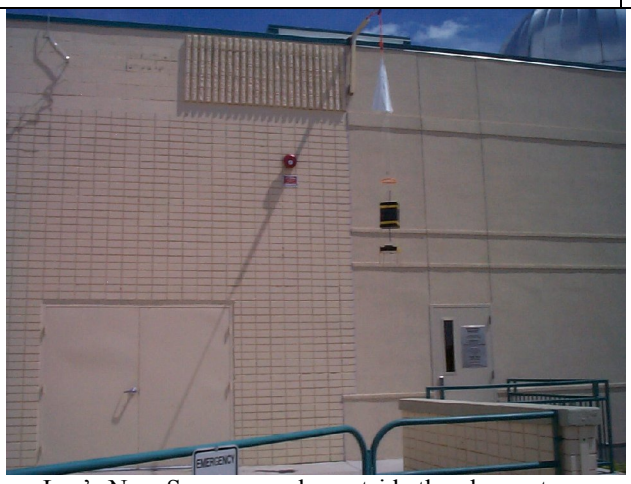
Ken and Bobbie at the MVAS table with lots of goodies to give away.

Paul's Mars Rover Races.

Chris playing firebug.
It only took four seconds to start the board on fire.

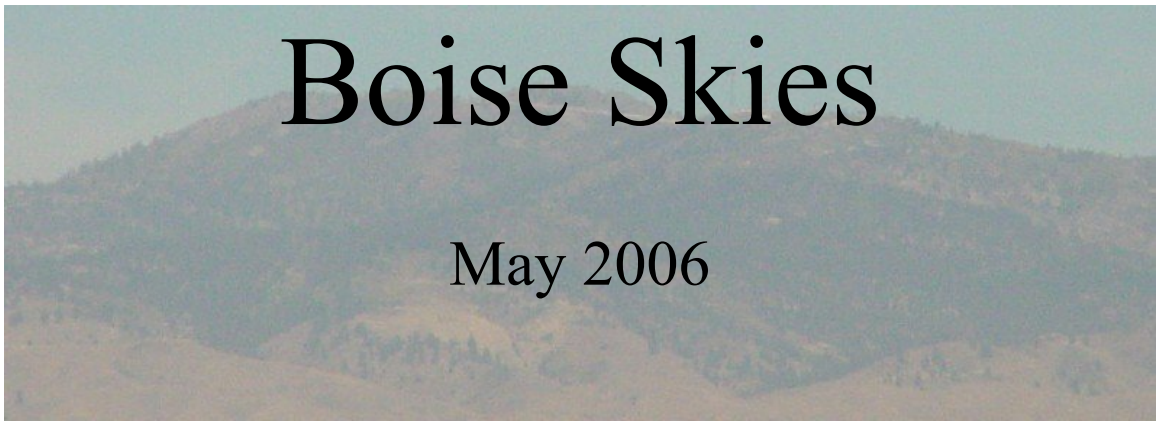
Terry manning the Ha solar telescope.

Nick manning the rocket launcher.



Lee's Near Space capsules outside the observatory.

Photos by Rick Widmer



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

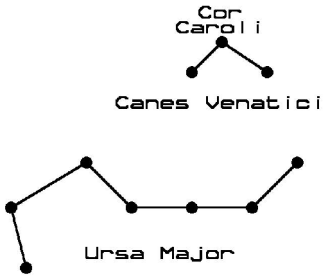
This month look for the star Cor Caroli in the constellation Canes Venatici.

Canes Venatici is the constellation of the hunting dogs. The dogs, in pursuit of the Great Bear are held by their leash by Bootes, the herdsman. The constellation is a relatively recent one, having been created by 17th century astronomer, Hevelius. Canes Venatici is a star poor constellation with only three visible stars.

Cor Caroli is Latin for Charles' Heart. Who is this Charles the star is named after? It's King Charles II of England. King Charles II was the first king of the English restoration (1660) and created the Royal Society, the oldest existing scientific society. Cor Caroli is the alpha star of Canes Venatici, so astronomers know Cor Caroli by the name Alpha Canum Venaticorum.

Cor Caroli is 97 light years away. Since it has a brightness of third magnitude, the star is enormously brighter than our sun, which would be invisible to the naked eye at this distance. The surface of Cor Caroli is twice as hot as our sun and 50 times brighter. One of the more unusual aspects about Cor Caroli is it has a magnetic field 1,500 times more powerful than Earth's. The star's magnetic field was detected with the use of a spectroscope, a tool that uses a prism or grating to separate the individual colors emitted by a star. In the presence of a powerful magnetic field, each single band of color is split into an odd number of bands in what is called the Zeeman Effect. Cor Caroli's powerful magnetic field may be responsible for the star's unusual elemental composition. Many rare elements like mercury and europium appear in the star's spectrum, but not in normal stars like the sun.

You'll find Canes Venatici and Cor Caroli just beneath the big bear's tail. Here's a map to help you find this constellation.



North

May 1 – 7

Astronomy Week begins on the 1st and ends on the 7th. If you have a telescope, then take time to share the sun, moon, stars, and planets with friends and neighbors.

If you're not certain where Mars is located, then let the moon guide you to the red planet on the evening of the 1ST. Mars is the yellow-orange star to the left of the thin crescent moon and their distance apart is about the width of three fingers when your arm is fully outstretched. Earth is pulling way ahead of Mars, so Mars is growing smaller and fainter by the day.

If you want help locating Saturn, then look for the moon on the evening of the 3RD. Saturn is the pale golden star to the left of the crescent moon tonight. The distance between them is also about the width of three fingers when your arm is fully extended. Whereas Mars is always a difficult object to observe, Saturn is always a gem in a telescope.

Jupiter is at opposition on the morning of the 4TH. A planet at opposition is directly opposite the sun in our sky. This means as the sun sets, Jupiter rises and as the sun rises, Jupiter sets. At opposition planets are their largest and brightest. However Jupiter is a distant, large, and bright planet. So in the small telescope, Jupiter is always a magnificent sight whether or not it's at opposition. But for smaller and closer Mars, opposition makes a profound difference in what you can see on its surface. In a small telescope you can watch four moons orbit Jupiter and see two of the planet's equator-straddling cloud belts.

The moon is first quarter on 4th at 11:13 PM (10:13 PM on the 4th for Oregon and 12:13 AM on the 5th for the Midwest). The first quarter moon is the best moon to observe. You'll be surprised at the amount of surface detail visible in even simple field binoculars. To see even more detail, practice. Be a moon watcher and over time your eye and brain will detect more subtle terrain features on the lunar surface.

On the morning of the 5TH, the Eta Aquarids meteor shower reaches its peak. This shower has two strikes against it; it's a weak shower and it occurs on a workday morning. The shower may produce 10 meteors per hour and they'll appear to originate from the eastern horizon. The moon sets at 3:30 AM so you'll only have two hours to watch the meteor shower in darkness before twilight begins. What makes this meteor shower so interesting is the meteoroids you're watching fry themselves in the upper atmosphere came from the tail of Comet Halley.

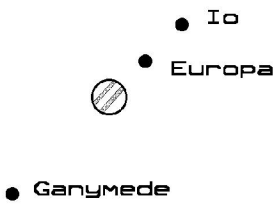
Alan Shepard, the first American in space, was launched 45 years ago on the 5TH. He rode his Mercury space capsule Friendship 7 to an altitude of 116 miles, but he didn't go into orbit. NASA wasn't ready to send a human into orbit so the mission of Friendship 7 was to briefly test the Mercury capsule. The other reason Shepard didn't go into orbit is that his Mercury was lofted on top of a Redstone rocket. Redstone was designed to carry a nuclear payload for an intermediate range of only 200 miles. With such low power, Friendship 7 didn't have the energy to get into space with the necessary speed to remain. It took the more powerful Atlas Intercontinental Ballistic Missile (ICBM) to put the Mercury into orbit. Shepard's flight took 15 minutes and he was weightlessness for 5 minutes of it. Friendship 7 reached a maximum speed of 5,000 mph and experienced 11 gees of acceleration.

Astronomy Day is the 6TH. Weather permitting; the Boise Astronomical Society will set up telescopes for public viewing at the Discovery Center. If you're visiting Twin Falls, then stop by the CSI Herrett Center. The Magic Valley Astronomical Society will have public viewing and model rovers. Check with your local astronomy club as chances are good they'll set up telescopes for public viewing also.

The moon reaches the apogee of its orbit on 7th at 1:00 AM (2:00 AM for the Midwest and midnight for Oregon). Its distance, the greatest for this month, is 251,389 miles. That's equal to 2 billion 600 million dollar bills placed end to end.

May 8 – 14

One of the best planets to observe is Jupiter. If you're not certain where Jupiter is located, then the moon is here to help on the evening of the 11th. The moon and Jupiter rise together shortly before sunset, but wait until after 9:30 PM. Jupiter is the bright star to the moon's left. In a small telescope you'll easily see the flattened disk of Jupiter and three of its moons. The poles of Jupiter are flattened by its rapid rotation (the huge planet rotates in just 10 hours) and its fourth bright moon, Callisto, is hidden behind the planet. In a small telescope you'll see the following arrangement of planet and moons.



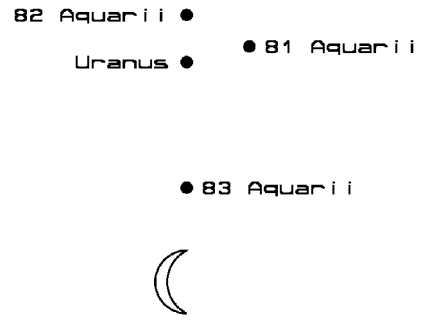
If you decide to use binoculars instead of a telescope, then you won't see the planet's two equatorial belts and the arrangement of moons will be flipped around.

The moon is full on the morning of the 13th (late night of the 12th for Oregon). The full moon of April is called the Flower Moon.

May 15 – 21

The moon is at third quarter on the morning of the 20th at 3:20 AM (4:20 for the Midwest and 2:20 for Oregon). I don't find the third quarter moon quite as interesting as the first quarter because of its greater number of lunar maria. But it does have some pretty bright rays around the craters, Copernicus, Kepler, and Aristarchus. Rays are churned up lunar dust. Over a billion years micrometeoroid impacts and cosmic rays will darken the rays to the point where they look like regular lunar soil and disappear. Lunar soil is properly called regolith because it's crushed rock and contains no organic matter.

Uranus, our 7th planet, can be difficult to locate. Even though it's often just bright enough to see with the naked eye, it's still faint enough to get lost in the crowd. However, the moon is your guide to finding this planet on the morning of the 21st. Put your binoculars on the moon at 4:00 AM and you'll see the following scene.



To help find Uranus, look for the triangle pattern formed by 81 and 82 Aquarii and Uranus. Uranus and the three stars on this map are roughly the same brightness. Uranus will be about three lunar diameters above the moon.

May 22 – 30

The moon reaches perigee on the morning of the 22nd. That's its closest distance to Earth this month. The moon will only be a measly 229,042 miles away.

The moon and Venus are close together on the morning of the 24th. You'll need to go out around 4:15 AM to see them very low in the east. Venus will be the morning star until September.

Forty-five years ago on the 25th, President Kennedy publicly committed the United States to the challenge of landing a man on the moon and returning him safely to earth by the end of the decade. At the time, the Soviet Union had put the first satellite, the first animal, and the first human into orbit. And the United States had only lofted an astronaut on a brief suborbital hop into space. Everyone knows how this story ends (the good guys win). You can read President Kennedy's speech at,
http://www.luminet.net/~tgort/moon.htm

The moon is new on the 26th at 11:26 PM (10:26 for Oregon and 12:26 AM on the 27th for the Midwest). The new moon is as close to the sun as it can get for the month, so it's normally not visible for a day or two. This month in Idaho, the moon may just be visible on the evening of the 27th at 9:30 PM. If so, it will only be 22.5 hours old. That's a pretty young moon, so expect it to be difficult to see.

The 28th is the 35th anniversary of the launch of a Soviet spacecraft named Mars 3. Like the American Viking spacecraft that would leave for Mars six years later, the Mars 3 spacecraft consisted of a combined orbiter and lander. But unlike Viking, the Mars 3 lan der separated from its orbiter as they approached Mars rather than after entering Martian orbit. This means the Soviets were unable to delay the landing of Mars 3. As a consequence, the Mars 3 lander attempted to land during a massive dust storm. The lander only transmitted for 20 seconds before stopping. The orbiter did a bit better. Its main engine didn't fire properly and the spacecraft was left stranded in a higher than planned orbit. The orbiter transmitted back a limited number of images before shutting down. I guess the warranty on Soviet spacecraft isn't very good.

Thirty-five years ago on the 30th, the American Mariner 9 spacecraft was launched to Mars. About every two years Mars is in a good position for a spacecraft launch. So it's not surprising the Russians and Americans launched spacecraft to the planet at nearly the same time. Mariner 9 was the first American spacecraft placed into orbit around Mars. Before that, our Martian spacecraft just flew past the planet, taking pictures and collecting data as they did. At the time the reliability of our spacecraft wasn't very high, so as a precaution, two spacecraft were launched 22 days apart. It's a good thing too. Mariner 8 was destroyed when the second stage of its Atlas-Centaur launch vehicle went

out of control. We're also lucky the Mariner 9 was an orbiter, because had it been a flyby spacecraft, the mission would have been a failure. A large dust storm (the same one that doomed Mars 3) covered the entire planet at the time Mariner 9 arrived. So the spacecraft had to wait in Martian orbit for the storm to subside. One of the first features to poke its nose out of the dust was the solar system's largest volcano, Olympus Mons (which was previously known as the marking, Nix Olympia or Snow of Olympus). Later Mariner 9 would discover the solar system's largest canyon, the Valley of the Mariners, or Valles Marineris.

Also celebrated on the 30TH is the 40TH anniversary of the launch of Surveyor 1. The moon's surface was not well understood in the mid 1960's, at a time the United States was planning to land astronauts. So the Surveyor program was created. The Surveyors proved we could land a spacecraft on the moon and they also discovered what the moon's surface was like. The Surveyors were a ten foot tall tubular aluminum frame carrying rocket engines, cameras, and several experiments. Surveyor's flight to the moon took 63 hours so next month we'll look at its landing.

On the evening of the 31ST at 10:00 PM, the moon is four degrees from Saturn and the Beehive star cluster. You'll find the moon low in the southwest after dark and all three objects will be visible in a pair of binoculars.

This Month's Topic

White Dwarfs

The first white dwarf was discovered in 1862. Before its discovery, it was known a companion star orbited the bright star Sirius. But strangely enough, this star was invisible when it should have been easy to see. When the companion star was finally discovered, it was found to be very hot, and therefore to have a high surface brightness. But since the star was faint, it had a tiny diameter. Nineteenth century physics was unable to understand the nature of a star like this. They were called white dwarfs on account of their high surface temperature and small size.

Today we know white dwarfs are old stars. They're also lightweight stars. Only stars that weigh less than 1.4 times the sun can become white dwarfs. Heavier stars are too unstable to form a white dwarf. When their nuclear fuel runs low, they detonate instead. That doesn't mean that a heavy star can't become a white dwarf though. Some heavy

stars shed mass like humans going on a diet. These heavy weight stars can lose enough mass to become a stable white dwarf.

During most of its life, a star supports its crushing weight by making its interior incredible hot. A temperature greater than 10 million degrees is generated in a star's core by the fusion of hydrogen fuel into helium. But when the fuel runs out, gravity wins and crushes the star into a smaller volume. As it gets smaller, the star heats up and the outer layer of the star is blown away. The temperature reached inside the core of a white dwarf is not high enough to fuse carbon and oxygen, so the fusion process stops. The blazingly hot surface of the white dwarf generates lots of ultraviolet light which makes its expanding shell of gas glow like the interior of a fluorescent light bulb. So early in its white dwarf state, the star is surrounded by gently glowing shells of expanding gas. These are called planetary nebulas and in a telescope they look like a ghostly Cheerio or dumbbell. Over time the gas dissipates and the white dwarf cools. So the planetary nebula fades away and the star becomes a black dwarf. It takes a white dwarf about 100 billion years to cool into a black dwarf, so even the oldest white dwarfs are still hot.

Electrons in a white dwarf stop the star's further collapse when fusion can't. For quantum reasons, electrons can't share the same quantum state (the quantum state refers to things like an electron's spin and energy level). When the electrons inside a white dwarf occupy every available quantum state, gravity can no longer squeeze the star into a smaller volume. Matter in this condition is called degenerate. Degenerate matter can support the weight of 1.4 suns without collapsing further. But when the weight goes above 1.4 solar masses, gravity crushes the white dwarf to the point where electrons and protons are combined to form neutrons which can still support its weight. The 1.4 solar mass limit is called the Chandrasekhar limit after its Indian discoverer. By the way, the Chandra x-ray telescope is named after the same physicist.

White dwarfs are stars squeezed to the size of the earth but having a mass equal to the sun. Its high mass and small volume means a white dwarf has an incredible density. A teaspoon of white dwarf would weigh between one and four tons. This is like smashing your car into a volume that will fit within a half teaspoon.

On the hot surface of a white dwarf, gravity pulls with a force 100,000 times greater than on Earth. The average person would weigh 15 million pounds (or 7,500 tons) standing on a white dwarf (as if someone could stand up against this amount of gravity). Under that force, a human would flow like water across the sizzling hot surface of the white dwarf. A white dwarf's powerful gravity pulls the gases around the white dwarf into a layer of atmosphere less than 1,000 feet thick (compared to Earth's 100 mile thick atmosphere).

Possibly, a white dwarf's gravity will compress the star's carbon into a crystalline shell of diamond. If its gem quality, no one can currently say. But don't expect to get a white dwarf diamond anytime soon. No rocket we can design is capable of lifting off the surface of a white dwarf. And remember, that diamond would weigh several hundred pounds.

Some white dwarfs closely orbit a normal companion star. The white dwarf's powerful gravity is capable of pulling gas off its companion star and accreting it. This means the white dwarf gains weight by cannibalizing its neighbor. In some cases, the gas impacts the white dwarf's surface and explodes. Sometimes the gas builds up until the white dwarf weighs more than the Chandrasekhar limit and the white dwarf explodes as a type Ia supernova. A type Ia supernova is a gigantic hydrogen bomb and one of the most powerful explosions in the universe. The white dwarf is destroyed in the explosion and its flash of light can be seen across most of the universe.

May's Website

This month check out the website, Scale Models: Spacecraft, Rockets, Missiles, and X-Planes!

If you like to build space related plastic and paper models, then this is your website. Here's where you can get the latest information on model companies, model kits, and sources for the model making supplies.

If you're just beginning to make models, or would like to improve your model-making skill, you'll find the reports on the tools and techniques used by model makers very helpful. On the site there's a report on how models are judged in competitions - very useful if you plan to compete in shows. Before beginning the construction of a model you can find images of the same model that other people have completed. If you're a historical buff and would like to find some of the old model kits from when you were young, you'll find a list of old model kits and their distributors. Not only will you find information on plastic and resin kits, you'll also find a list of paper models that are available. Some of these paper models are free and others are for purchase. Got questions about assembling a model kit? There's a FAQ file to answer many of your questions. Along with discovering new and old model kits, you can read what other modelers have to say about them (not all model kits are created equal). And for the greatest accuracy, you'll want to check out the photo gallery of images of the real thing.

Your author finds this web site useful as he begins building all those plastic models he has collected over the last 20 years. You'll find the Scale Models website at, http://www.ninfinger.org/~sven/models/models.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/
Gary Kronk's Comet & Meteor Showers,
http://comets.amsmeteors.org/meteors/showers/eta_aquaridobs.html
Mercury, KSC

http://www-pao.ksc.nasa.gov/kscpao/history/mercury/mr-3/mr-3.htm
http://en.wikipedia.org/wiki/White_dwarf
NASA's Imagine the Universe
http://imagine.gsfc.nasa.gov/docs/science/know_l2/dwarfs.html
Mars 3, http://nssdc.gsfc.nasa.gov/database/MasterCatalog?sc=1971-049A

Dark Skies and Bright Stars,
Your Interstellar Guide