



Learning on the Land

A Conservation Education e-Newsletter



February 2007

www.sjma.org

San Juan Mountains Association—For Lands' Sake!

Welcome to our e-Newsletter!

We hope you enjoy SJMA's newsletter created solely for educators - whether you teach in the classroom or outdoors, this newsletter is for you! In each monthly issue, you will receive helpful information on natural and cultural resources found in the Four Corners area, as well as field and classroom activities to do with your students.

The San Juan Mountains Association is the educational nonprofit partner for San Juan National Forest and Bureau of Land Management. If you received this newsletter and do not wish to continue receiving it, send an "unsubscribe teacher newsletter" email to gabi@sjma.org. If a friend or colleague sees this newsletter and is interested in receiving it, please have them send an email to gabi@sjma.org.

The Winter Sky

The longer hours of darkness in the winter make it a perfect time of year for stargazing (night starts early, so you don't have to stay up too late to enjoy the stars!). The air temperature is cold, offering a clear view without much dust or moisture in the air. While it is more difficult to experientially study the Winter Sky (lacking a rocketship), you can further encourage natural world appreciation, awareness of cycles, and our innate curiosity of this unknown astro-world.

What is a Star?

Many cultures have developed stories of how the stars came to be. Spear-marks in a large blanket, jewels thrown across the sky, eyes of the ancestors blinking down ... beautiful explanations of the nighttime sky. Scientists have identified "stars" as heavenly bodies that emit their own light. "Planets" are heavenly bodies that reflect light. To the naked-eye, the amount of stars we can see appears to be limitless, but the eye can really see only about two thousand stars in the sky at one time. We are also able to see the glow of the Milky Way, which comes from thousands of millions of stars.

Our Closest Star - the Sun

The Sun is our own special star. Over four and a half billion years ago, a spiral-arm broke off of a larger star system, deep in the Milky Way Galaxy. This cloud of gas and dust eventually became our Sun, the planets of our solar system, and our Earth. The cloud swirled and compressed due to gravity, the Sun became the central focus. But because the cloud was spinning, not all of the gas and dust became part of the Sun - some of it formed the rest of the planets. The material of the Sun continued to shrink into itself, which made the Sun grow hotter. Finally, the temperature at the core got so hot - a fire ignited (nuclear fusion). Pressure from these reactions balance the inward force of gravity, and this energy cycle in the Sun continues today. Energy created at the center of the Sun can take a million years to reach the surface - and be sent out into space. It then takes seven minutes (traveling at the speed of light) for the energy from the Sun to reach our Earth.

Life as we experience it on Earth could not be sustained without the energy of the Sun – the base of our food web relies on sunlight for energy (green plants). All other life depends on these plants to live, whether directly (plant-eaters) or indirectly (flesh-eaters that consume plant-eaters). Temperature on Earth is moderate, because of our location to the Sun.

Falling Stars

Falling stars . . . or shooting stars . . . are not really stars at all! These streaks of light are caused by tiny bits of dust and rock that fall into the Earth's atmosphere and burn up. The correct term is "meteors." Rarely, a piece of the dust or rock particle will survive all the way to the Earth's surface, and the remaining bit is called a "meteorite." For a spectacular story of a meteorite hitting the Earth, research the Arizona meteor crater at www.meteorcrater.com

At certain times of the year, you are more likely to see meteors streaking across the sky. These are called meteor showers, and are caused when the Earth is moving through debris clouds.

Constellations

Constellations are groups of stars that have been given names – such as the Big Dipper or the Little Dipper. Some constellations are easy to recognize in the sky, and can be used to find other star locations. Each season of the year has its own star constellations, because of our view of the sky at that time. In the Northern Hemisphere, a few winter constellations include the Big Dipper (part of Ursa Major), Orion, Cassiopeia, and the Pleiades (Seven Sisters). Most ancient cultures saw pictures in the stars of the night sky. These legends come from Greek and Roman times:

Orion is a great warrior. Many stories are told about Orion, including that he was the son of Neptune (the god of the sea) and Queen Euryale (an Amazon huntress). Orion inherited his mother's talent but was also very boastful of his skill. He bragged that he could best any creature on Earth. A single scorpion stung him and killed him.

Cassiopeia was a beautiful queen, and the mother of Andromeda. She made the mistake of bragging that she was more beautiful than the goddesses, who were insulted and went to Neptune (the god of the sea) to complain. Neptune sent a sea monster to destroy the coast. The sea monster was defeated by a hero who then married the daughter named Andromeda. Neptune placed Cassiopeia and her throne in the sky, in such a way that she is upside down for half of every night.

The Pleiades are a star cluster, though seven stars can be clearly seen. These Seven Sisters called out for help to Zeus as Orion (the great warrior) was pursuing them. Zeus changed them into doves, and sent them into the sky. A Native American legend says that these were seven children, lost on a walk.

For downloadable star-maps of these constellations, as well as information on additional constellations, go to www.skymaps.com or www.space.com/stars

The Big Dipper

The Big Dipper – though technically a part of the larger constellation of Ursa Major – is one of the first objects in the sky that we learn to identify. Especially easy to see in the summer sky, the Big Dipper is prominently located in the north. In the nineteenth century, African-Americans escaping slavery “followed the drinking gourd.” Three stars form the handle; four stars form the bowl. Trace a line from the edge of the bowl to the North Star. Known in Britain as the Butcher’s Cleaver, the Big Dipper has been used by ancient sailors as well as cowboys to tell time as it moves through the sky.

Classroom Activities

That’s about the Size of It

The Sun is 109 times the size (volume) of the Earth, with a diameter of 864,938 miles. The Sun only looks small because it is 93 million miles away. In a size comparison, if the Sun was the size of a basketball, the Earth would be the size of the head of a straight pin. Imagine that one penny represents the Earth. On the sidewalk, line up 109 pennies. Put a circle of construction paper under Penny #54 (the central penny). This now represents the diameter of the sun. Starting with Penny #54, make radiating lines of pennies out, with fifty-four more pennies in each line. Use chalk to draw the outside lines of the circle. This is how big the Sun is compared to the Earth. (You can also use chalk and a piece of string cut to the length of 54 pennies, or 150 cm, to draw the circle.) How many Earth’s would fit inside the Sun? One million!

The diameter of the Earth is approximately 8,000 miles.

The Moon is approximately 1/4 Earth’s diameter, 1/50 the volume of the Earth, and 1/80 the mass of the Earth. Conduct a science experiment using spherical objects such as ping pong balls, golf balls, or beads as the Moon ... compared to balloons that students blow up to an appropriate size for the Earth. www.learner.org/teacherslab/pup/earthmoon This is a great spatial demonstration and fun! Use paper and rulers to make to-scale models of the Sun, the Earth, and the Moon.

How big is our Solar System? The classic exercise for students to visualize a scaled size of our Solar System is the thousand-yard model, known as “The Earth as a Peppercorn” - excellent, easy-to-follow writeup. www.noao.edu/education/peppercorn/pcmain.html

Moon Journal

Journal-keeping can be done by any age of student, using a variety of picture-drawing, and words/sentences/paragraphs based on the skills of students. Use creative art projects for younger students to make a cover for their journal. Ask students to observe the Moon, every night for two weeks (start on a New Moon and watch the Moon cycle to a Full Moon). Perhaps students will continue to watch and record the cycles. Provide information appropriate for the level of your students, including terms like “waxing” (before the Full Moon) and “waning” (after the Full Moon). Encourage students to draw their observations and ask questions.

Field Activity—Family Star-gazing Night

A Take-Home Worksheet

We have been studying stars—but only during the day! We encourage you and your family to plan a fun, star-gazing night, and enjoy the mysteries of the Winter Sky. Imagine—a night-time excursion. A dark night with no moon is ideal, although moon-gazing is also spectacular.

Everyone should dress warmly. If you can, star-gaze in your own backyard. Experience this familiar setting at an unfamiliar time. If you need to find a place away from outside lights, let a friend or neighbor know where you are going and how long you expect to be.

You might want:

- A thermos of hot chamomile tea (its almost bedtime!).
- Lawn chairs or blankets so you are comfortable while looking up at the sky.
- Star charts can be downloaded at www.skymaps.com or check at your local library.
- Bring along some stories about major constellations or astronomy, such as
 - Sky Sisters
 - A Child's Introduction to the Night Sky
 - Dot to Dot in the Sky series
 - Search online for constellation print-out stories, read ahead of time to make sure they are appropriate for your children.
- Bring binoculars (ideally one pair per kid).
- Cover the reading flashlight with blue or red cellophane (found at craft/grocery store), or a bandana. Rubber-band it around the light. This will keep ambient light at a minimum and add to the mystique!

It takes 30 minutes for your eyes to fully adjust to the darkness. The longer you are able to stay out safely (remember, its cold!), the more stars it seems “come out.” If you star-gaze in your backyard, you can turn off interior lights, give everyone a subdued flashlight to use, and spend twenty minutes inside adjusting your eyes to the darkness.

Look for the Milky Way, a glowing band across the sky from east to west. Find primary winter constellations such as the Big Dipper or Orion. As you become more familiar with the Winter Sky, look for other constellations like Cassiopeia (the big W). Don't let frustration of not seeing the star groupings ruin the night, especially with younger children. Bring notebooks and pencils, to draw what you see.

If possible, make this a monthly ritual, a special time for your family.

www.skytonight.com

www.astronomy.com

www.skymaps.com



Extend the Experience

- Visit www.durangonaturestudies.org or call 970-382-9244 to find out the location of the next Full Moon Walk on San Juan Public Lands, or take your own, impromptu walk under the moon.
- Hang a Moon Calendar in the classroom.
- Go on a virtual field trip with the Hubble Telescope at www.hubblesite.org
- Try these excellent astronomy resources
 - Astronomy for All Ages by Harrington and Pascuzzi
 - Galileo for Kids by Panchyk and Buzz Aldrin
 - Astronomy Made Simple by Marvel
- Helpful websites:
 - www.dustbunny.com/afk/ (Astronomy for Kids)
 - www.astronomy.com
 - www.kidsastronomy.com
- Distribute star charts (without constellations labeled) to students. Similar to a dot-to-dot, have them identify their own constellations, using 7 – 10 stars. On another sheet of paper, draw the stars that make up their constellation, in similar formation. Have students name the constellation, and draw artwork of the name given around these stars. Write a corresponding legend.
- Research and write short biographies of different astronomers, such as Galileo, Aristotle, Copernicus, Albert Einstein, or Carl Sagan.

Announcements

SJMA Offering FREE Winter Discovery Walks

This February, SJMA is offering free, winter discovery walks. These may take place on San Juan Public Lands, or even in your own schoolyard! Contact Alex Prime for more information at alexprime@mac.com. Space is limited, so reserve your spot now!

SJMA Offering FREE Classroom Presentations

SJMA is offering classroom presentations, including Tree-mendous Trees; Fire in the Forest; Walk the Walk Outdoors; and Pumas on Parade. Call 970-385-1256 or email education@sjma.org

Schedule your Spring Field Trip to Public Lands Now

SJMA continues to offer spring field trips to a variety of public land sites. Schedules for the April and May visits are filling up, so make your spring outdoor education plans now. For more information, contact education@sjma.org

Educators—Become a member of SJMA today and receive a 20% off coupon to our bookstore!

Whether you're a 'formal' K-12 school teacher or a non-formal educator, to receive your 20% off coupon valid at any of SJMA's bookstore locations, simply print this or a future newsletter and bring it and your new membership information in to one of our bookstores (Durango, Pagosa Springs, Bayfield or Dolores).

The San Juan Mountains Association has been around since 1988. For 18 years, SJMA has been establishing a legacy of caring for the land. Side by side with our members and volunteers, we are helping to ensure the survival of Southwest Colorado's natural glories for generations to come. For more information, visit our website at www.sjma.org, or call 970-385-1256.

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