

May 2010 Vol. 117

## Science Teachers' Association Greetings Friends & Colleagues

Hello Everyone,

Wow, where did March and April go? It seems like our February conference was just a few weeks ago, not a few months ago. It is such a busy time of year with normal teaching, requisitions and inventory as well as the extra time needed to keep the track students up to date. I hope you all have plans for some professional development this summer along with some much needed R & R. The state of SD has so many great classes from which to choose. All should be able to find something that looks inviting.

There is a lot of uncertainty right now for school districts with the educational cuts that were made this year in SD. Higher Education and K-12 programs received serious cuts as well as DDN technologies. No doubt school districts will lose some of the technological services provided by the state. This could be detrimental to rural schools that provide a variety of classes via the DDN network. As a former DDN teacher, I realize that taking classes over the DDN network is not as good as having the teacher in your school, but, it is a very effective alternative. We are still hoping to have our summer meeting via the DDN network as it is so cost effective. Also, internet access, email and infinite campus may be impacted. The 0% increase in the per student allocation will certainly mean fewer supplies. Teachers will be asked to do more with less so be prepared. The good news is that we are from South Dakota and we are used to that. We do what is necessary to give our students the best education possible.

This past summer, I took the plunge and opened a Facebook account. There are pros and cons to Facebook as many of you know. I don't spend a lot of time on Facebook, but I realize it is a great way to reach a lot of people quickly. Consequently, I have opened a Facebook group for South Dakota Science Teachers. I think it would be a great way for us to exchange ideas. For example, if I was looking for a new physical science series, I could send out a message to all group members and then just sit back and wait for responses. It will also be a great way to

get workshop opportunities out to our teachers. If you are already on Facebook, join our group. Let's give it a try.

I think one of the most important concepts that chemistry students should understand after completing a basic chemistry course is the polarity of a water molecule and the hydrogen bonding between molecules. These forces play a huge role in our existence on earth. Students find it difficult to picture the hydrogen bonding that creates the expansion of water as it freezes. At the regional conference in Minneapolis, I bought a set of 3D molecular, magnetic water molecules. The magnetic attraction represents the hydrogen bonds between one hydrogen on one molecule and the oxygen on another. You can scrunch them together to show water at its highest density (3.98 °C) and then you can reduce the pressure and the magnets (hydrogen bonds) take hold and the water molecules move apart and clearly show the increase in volume of the solid water. You can also show the six sided snowflake. I can't tell you how many times I have used them this year in chemistry, physical science, and even biology. You might want to check them out at [3dmoleculardesign.com](http://3dmoleculardesign.com). A set of 12 water molecules is \$33.

In my last letter, I referred to the Colorado education simulations (<http://phet.colorado.edu/simulations>). Just a brief mention of another one that is awesome for teaching about light and colors. Go to the light & radiation section and click on Color Vision. The use of different colored filters with different colored lights presents a clear visual demonstration for the students.

In closing, thank you so much for all the hard work you do. Teachers are the building blocks for the future. We encourage, motivate, inspire, guide and coach. In other words, we teach. You have every right to be physically and mentally exhausted when the year ends. Teaching is hard work. Hat's off to all of you. Have a great summer.

Molly TenBroek - President, SDSTA  
Feb. 2010-Feb. 2012

# Regional Science Fairs - 2010

The SD Science Teacher's Association is honoring the junior division winner at three of the five South Dakota Regional Science Fairs. (As of this writing, abstracts have only been received from these three. If the remaining two are received, they will appear in the October Newsletter.) The best junior division project (as selected by their judges) receive a monetary award of \$30 and a certificate at their science fair. Their abstracts are printed below.



## Northern SD Science & Mathematics Fair

**Make It or Break It** by Kayla Fonder at Warner Jr-Sr High School, Warner

Problem-Which type of Silica sand will make the strongest brick?

Procedure -

- 1) First measure out 6,299 grams of #30 Silica sand
- 2) Then measure 1,630 grams of Portland Cement
- 3) Next you put them together in a wheelbarrow and add 1.4 liters of water
- 4) Mix it all together until it is creamy
- 5) Put the mixture into the molds and make sure it is filled up and smothered down
- 6) Then you do steps 1-5 over again but with silica #75 and Black Plast
- 7) Next you wait a day or 2 until they are all hard enough to take out of the molds
- 8) Build a lever system that produces 5 times the weight of the bucket
- 9) Place the brick at the hinge point of the lever
- 10) Hang the brick on the leer and slowly add sand
- 11) When the brick splits in half stop poring the sand in the bucket
- 12) Then bring the bucket over to the scale and wigh it
- 13) Do steps 9-12 for all 3 types of sand

Results

	Black Plast	silica #30	silica #75
trial 1	367.5	337.5	257.5
trial 2	402.4	255	277.5
trial 3	375	305	240
average	381.6	299.16	258.3

## Eastern SD Science & Engineering Fair

### Chemistry of Natural Plant Dyes:

**Measuring Hue and Intensity** by Katharine Young at Mickelson Middle School, Brookings

For thousands of years, natural plant dyes have played an important role in civilization. In Medieval times, dyes showed social hierarchy; only the nobility wore purple fabric. In present times, synthetic dyes are being made. Synthetic dyes pose problems for the environment, are aren't "green". It's important to understand how dying works on a chemical level to help use natural dyes. Dyes bond with fabrics in two ways; the molecules can bond at a chemical level, or particles can wedge themselves into fabric. In my experiment, I will study dye ability of different natural plant sources, the role of different fabrics, and whether pH will affect the final outcome of the dyed cloth. I will examine three different types of fabric; cotton, polyester, and a blend of both cotton and polyester. I will use four types of dyes; woad, cherries, beets, and grapes. I will dye the fabrics in neutral, low, and high pH. Dye effectiveness will be evaluated on the resulting color/hue, and intensity of stain on fabric. I hypothesized that different dye sources would have no effect on fabric, the fabrics won't absorb color differently, and pH won't change how fabrics absorb dye. After conducting this experiment, I will be able to see which dye gave the best intensity, whether pH had an effect on intensity or hue, and whether it matters which fabric type is used to dye. I hope that natural plant dying will reduce dependence on synthetic dyes, and will help save the environment.

## Change of Address

Will you be moving soon? If so, your next newsletter will not be forwarded to you.

You will need to notify us so that we have your correct address to mail the newsletter to.

Email any officer or James at  
[James@SDSTA.org](mailto:James@SDSTA.org)

## ***South Central SD Regional Science Fair***

### ***Brush the Stress Away***

by Chesney Nagel at Avon Junior High, Avon

Exercising is great, but you always want to cool down when you are done, right? Horses need to cool down after exercise too. Grooming your horse is supposed to keep its coat healthy. Could it also help your horse cool down faster than just leaving it stand? The purpose of my experiment was to find out if grooming our horse after exercise could help your horse's heart rate come down faster.

I used ten horses, four mares and six geldings, for my experiment. I took one horse's heart rate and then exercised one horse for five minutes. I took the horse's heart rate after exercising it. Then I let the horse sit for two minutes without grooming. I took the horse's heart rate every two minutes until it came back down to its resting heart rate. For the second part of my project, I took the horse's heart rate, exercised the horse, and took its heart rate again. Then I groomed the horse every two minutes and took its heart rate until it came back down to the resting heart rate. I repeated these steps with each horse.

I discovered that grooming a horse after exercising it helps the horse's heart rate come back down to its resting heart rate faster. Nine out the ten horse's heart rates came back to their resting heart rates faster when they were groomed than when they were just left standing after being exercised.

### **The Race to Space in 1935 in South Dakota The Birthplace to Space Exploration**

To quote Joe Kittinger, South Dakota became "the Birthplace of Space Exploration" in 1935 when Capt. Stevens set the world altitude record with his balloon flight into the Stratosphere. This year marks the 75<sup>th</sup> anniversary of that record setting flight from our very own Stratobowl in the Black Hills on November 11<sup>th</sup> and offers a unique opportunity for teachers and students to celebrate our "Birthplace of Space Exploration." South Dakota is also the "birthplace" of the modern hot air balloon. If you would like to learn more about these historic events, Mike Barondeau made a combination PowerPoint and video on a CD that you could use in your classroom. Also included were numerous student labs and activities related to these events that Mike has collected in his 39 years of science teaching. You can obtain a CD copy of his materials for \$5 to cover the cost of the media and mailing expenses. Contact him by email: Mike.Barondeau@k12.sd.us

## **F r e e b i e s**

**Science Companion Lessons:** Science Companion, a pre-6 inquiry science curriculum, is offering a free online pilot program via a new wiki site. Visitors to <http://science-companion.wikispaces.com> can access eight learning modules, including Rainbows, Colors, & Light (Grades preK-K); Motion (grades 1-3), Habitats (grades 3-5); and Earth's Changing Surface (grades 4-6).

**Science spot**—this website contains something for everyone interested in generating and sustaining interest in science. Go to <http://sciencespot.net> for classroom lessons, ideas for science projects, student puzzles and science trivia. This site is mainly for middle school.

**On the cutting edge:** This website from Minnesota's Carleton College (<http://serc.carleton.edu/NAGTworkshops>) features more than 1,200 teacher-contributed Earth Science activities and visual tools.

**Virtual Genetics Lab (VGL)** Through this simulation, students experience what it's like to be a genetics researcher as they design crosses of hypothetical creatures and analyze the resulting offspring. Go to <http://intro.bio.umb.edu/vgl> to download the free software or view short videos.

**Adopt-a-Classroom Grants**—Public school teachers who register at the Adopt-a-classroom website ([www.adoptaclassroom.com](http://www.adoptaclassroom.com)) can be adopted by an individual, a business, or a foundation. Once adopted, teachers will receive \$500 worth of credit to purchase items to enrich the learning environment including classroom technology.

# High School Lesson Ideas

## APEP—Alcohol Pharmacology Education Project

APEP is an online resource that provides standards-based inquiry teaching materials and activities. The APEP modules provide teachers with tools to teach basic biology & chemistry concepts using alcohol pharmacology topics of interest to high school students. This is the same group that made the pharmacology unit I presented at the SDSTA convention in Feb.

I participated in the testing of this program for the past two years. My students were extremely interested. I use the “Gender Matters” when discussing metabolic pathways. Each module begins with a “scenario” to set the stage and peak interest of the students. The

materials are provided online or downloadable to answer a series of questions.

### Module 1 - Gender Matters

This module illustrates why females have higher blood alcohol concentrations (BACs) compared to males when they drink the same amount of alcohol. The reasons incorporate several basic concepts in biology, chemistry and math. We made and tested breathalyzers using a balloon with some ethanol in it to model the lungs. I asked them what are the misconceptions about beating the breathalyzer then they tested them with the balloon. If there is

time, you can watch the MythBusters episode where they try to beat the breathalyzer (can be found on iTunes). These concepts covered in the module include:

- 1) structure of organic molecules (i.e., alcohols)
- 2) structural properties of biological membranes
- 3) transport of a chemical (alcohol) across a biological membrane
- 4) body mass and composition (fat and water percentages)
- 5) oxidation reactions (metabolism of alcohol)
- 6) enzymes as catalysts of biological reactions (e.g., alcohol dehydrogenase or ADH)
- 7) gene mutations (different forms of the same enzyme)

**The Cove, Happy Feet, Journey to the Center of the Earth, How to Train Your Dragon** (to name a few).

I purchased The Cove (won the academy award for documentary) this year to use in Environmental Science. The students map the location of sites in Japan and then can pick from several ideas for discussion. (see link)

### Freebies:

#### Website:

<http://rise.duke.edu/a pep/>

#### Other modules:

- **Module 2 - The ABCs of Intoxication**
- **Module 3 - Alcohol, Cell Suicide, and the Adolescent Brain**
- **Module 4 - Alcohol and the Breathalyzer™ Test**

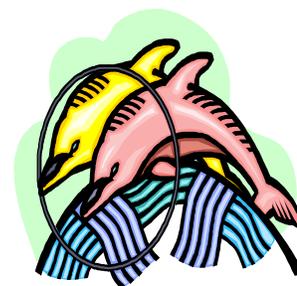
## Discussion Guides for Movies— for Biology, Environmental Science, All levels...

### Heartland Truly Moving Pictures

<http://www.trulymovingpictures.org/Movies/Pages/DiscussionGuides.aspx?&PageNumber=1>

Downloadable discussion guides to correspond with

Heartland Truly Moving Pictures! Each guide provides greater insight to the issues and concepts in the films as well as conversational, thought-provoking questions to get the discussion going after the film!



<http://www.thecovemovie.com/educate.htm> - site contains a link to a mercury calculator as well as an excellent study guide with many ideas for discussion for BOTH sides of the issue as well as background information.

## On The Web:

<http://periodic.lanl.gov/default.htm>  
Los Alamos National Laboratory's  
Chemistry Division  
Periodic Table of the Elements  
Displays the elements by atomic  
number and describes the history and  
sources of each element, as well as its  
properties and uses.

<http://mw.concord.org/modeler1.3/mirror/chemistry.html>  
Concord Consortium, National  
Science Foundation  
Presents online simulations of  
thermodynamics, states of matter,  
water, and reactions. See interactive  
visualizations of Brownian motion,  
Maxwell's speed distribution law,  
diffusion and osmosis, ion transport,  
distillation, motion of greenhouse  
gases, gas laws, liquid-solid  
comparisons, intermolecular forces,  
salt dissolving, chemical reactions,  
explosion, and more.

<http://mw.concord.org/modeler1.3/mirror/physics.html>

Concord Consortium, National  
Science Foundation  
Provides more than 40 online  
interactives that demonstrate concepts  
in mechanics, fluid mechanics and  
dynamics, electromagnetism, and  
quantum physics. Watch simulations  
of a pendulum, suspension bridge,  
charged particle in a magnetic  
chamber, hourglass, Archimedes'  
Principle of Buoyancy, electrical  
fields, gears, light-matter interactions,  
Newton's Cradle, pulleys, springs,  
water flow when a dam collapses, and  
more.

<http://epa.gov/climatechange/kids/animations.html>

Environmental Protection Agency  
shows how global warming happens.  
Learn about the carbon and water  
cycles. Take online quizzes to test  
your knowledge on global warming,  
carbon cycle, and water cycle.

[http://pbskids.org/designsquad/parentseducators/invent\\_guide.html](http://pbskids.org/designsquad/parentseducators/invent_guide.html)

PBS—Design Squad  
This guide offers six hands-on  
challenges designed to spark the  
inventive spirit of kids aged 9–12.  
Whether you're running an afterschool  
program, workshop, class, or event,  
these challenges are a fun way to bring  
invention to life for kids, get them  
thinking like inventors and engineers,  
and show them how invention  
improves people's lives. Each  
challenge takes about an hour, uses  
readily available materials, gives kids  
many ways to succeed, and is aligned  
with national science and technology  
standards.

[http://www.classzone.com/books/earth\\_science/terc/navigation/visualization.cfm](http://www.classzone.com/books/earth_science/terc/navigation/visualization.cfm)

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Q: How many physical chemists does  
it take to change a light bulb?  
A: Only one, but he'll change it three  
times, plot a straight line through the  
data, and then extrapolate to zero  
concentration.

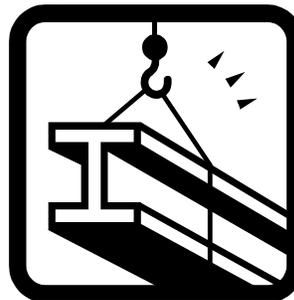
Exploring Earth Visualizations –  
National Science Foundation - features  
over 100 animations and images that  
illuminate key concepts in earth  
science. Examples are: coal formation,  
nuclear fission, growth of a continent,  
tectonic plate movement, volcanoes  
and earthquakes, fault motion, geyser  
eruption, wave motion, tornadoes,  
hurricanes, and more. Students can  
observe a single place on earth from  
multiple views, 3-D models of water  
and common molecules, different  
climate zones, and seasonal changes in  
the amount of sunlight reaching  
locations on earth.

<http://www.youtube.com/watch?v=qybUFnY7Y8w>

The music group OK Go's newest  
video showing their Rube Goldberg  
machine as set to their song "This too  
shall pass."

<http://www.songsforteaching.com/sciencesongs.htm>

Science Songs for Teaching –  
astronomy, biology, botany, physical  
science, and earth science. Listen or  
you can purchase/download.



USD is sponsoring two short courses  
this summer. July 6-9 is Math in  
Science Context and July 12-16 is  
Food & Science Goes Together Like  
Soup & Sandwich. Each course offers two  
optional credits of graduate science at a  
nominal cost and a stipend of \$400. For  
further information or to register for the course,  
please email Dr. Miles Koppang, Professor of  
Chemistry at [Miles.Koppang@usd.edu](mailto:Miles.Koppang@usd.edu)  
Information needed for registration includes:  
Name; Mailing address; School affiliation;  
Teaching assignment; Email contact and  
telephone contact

## Science Humor

### Why did the chicken cross the road?

Is it really just to get to the other  
side?

Scientific explanations:

- The fittest chickens cross roads. [Darwin]
- The road moved beneath the chicken. [Einstein]
- Chickens at rest tend to stay at rest, chickens in motion cross roads. [Newton]

- We're not sure which side of the road the chicken was on. [Heisenberg]
- There was already one chicken on this side of the road. [Pauli]





# Ancient Supernova Riddle, Solved

By Dr. Tony Phillips

*Australopithecus* squinted at the blue African sky. He had never seen a star in broad daylight before, but he could see one today. Was it dangerous? He stared for a long time, puzzled, but nothing happened, and after a while he strode across the savanna unconcerned. Millions of years later, we know better.

That star was a supernova, one of many that exploded in our corner of the Milky Way around the Pliocene era of pre-humans. *Australopithecus* left no records; we know the explosions happened because their debris is still around. The Solar System and everything else within about 300 light-years is surrounded by supernova exhaust—a haze of million-degree gas that permeates all of local space.

Supernovas are dangerous things, and when one appears in the daytime sky, it is cause for alarm. How did Earth survive? Modern astronomers believe the blasts were too far away (albeit not by much) to zap our planet with lethal amounts of radiation. Also, the sun's magnetic field has done a good job holding the hot gas at bay. In other words, we lucked out.

The debris from those old explosions has the compelling power of a train wreck; astronomers have trouble tearing their eyes away. Over the years, they've thoroughly surveyed the wreckage and therein found a mystery--clouds of hydrogen and helium apparently too fragile to

have survived the blasts. One of them, whimsically called "the Local Fluff," is on the doorstep of the Solar System.

"The observed temperature and density of the Fluff do not provide enough pressure to resist the crushing action of the hot supernova gas around it," says astronomer Merav Opher of George Mason University. "It makes us wonder, how can such a cloud exist?"

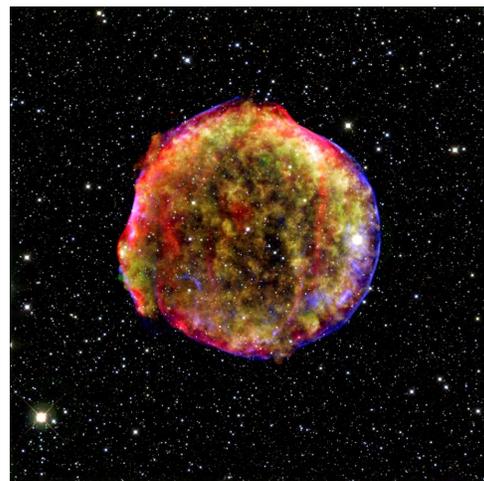
NASA's Voyager spacecraft may have found the answer.

NASA's two Voyager probes have been racing out of the solar system for more than 30 years. They are now beyond the orbit of Pluto and on the verge of entering interstellar space. "The Voyagers are not actually inside the Local Fluff," explains Opher. "But they are getting close and can sense what the cloud is like as they approach it."

And the answer is....

"Magnetism," says Opher. "Voyager data show that the Fluff is strongly magnetized with a field strength between 4 and 5 microgauss. This magnetic field can provide the pressure required to resist destruction."

If fluffy clouds of hydrogen can survive a supernova blast, maybe it's not so surprising that we did, too. "Indeed, this is helping us understand how supernovas interact with their environment—and how destructive the blasts actually are," says Opher.



*Left-over cloud from the Tycho supernova, witnessed by Tycho Brahe and other astronomers over 400 years ago. This image combines infrared light captured by the Spitzer Space Telescope with x-rays captured by the Chandra X-ray Observatory, plus visible light from the Calar Alto Observatory in Spain.*

Maybe *Australopithecus* was on to something after all.

Opher's original research describing Voyager's discovery of the magnetic field in the Local Fluff may be found in *Nature*, **462**, 1036-1038 (24 December 2009). The Space Place has a new Amazing Fact page about the Voyagers' Golden, with sample images and sounds of Earth. After all, just in case one of the Voyager's ever meets up with ET, we will want to introduce ourselves. Visit <http://spaceplace.nasa.gov/en/kids/voyager>.

*This article was provided courtesy of the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*



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Looking for a great hands-on project that ties together chemistry and geology AND keeps Spring Fever at bay for at least a little while? In my ninth grade Physical Science classes we just finished making concrete garden stepping stones! Students each brought a plastic ice cream bucket into school for their concrete form ahead of time. As part of a unit on chemical reactions we studied the composition of Portland cement and what actually happens when the cement is combined with sand and water to form the concrete. We also took a brief step back in time for a geology lesson about how the Black Hills were formed and how Rapid City happens to be "Ground Zero" for cement production (limestone, sand and gypsum), thanks to changes in sea level in this region in the past, the Black Hills Orogeny and subsequent erosion (not only making this a great place to live, but also bringing the raw materials for making concrete to the surface)! I poured the dry concrete mix into a large steel container and students used plastic cups to fill their molds.

They cut their molds ahead of time two inches high, then mixed the concrete with water (approximately 3:1 concrete to water by volume). Make sure to keep the water away from the classroom concrete container! We then used wooden paint stirrers to mix the concrete and water. Once they achieved the proper consistency and smoothed the surface students then personalized their stepping stones with items brought from home, then left them in our classroom for three days to properly harden. Once set the stones were easy to remove from the plastic forms, allowing them to be reused. This project proved to be a great way to bring chemistry alive AND supply my students with Mother's Day presents for their moms!☺



The SDSTA Newsletter is published four times a year. The May issue (this one) is mailed to 200 paid members & science organizations & a few others.

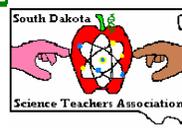
The Membership year in SDSTA starts with the February conference and ends the first of February. Dues are due at each conference for member discount rates.

SDSTA members may give a one year free membership to their student teachers by submitting the student teacher's name & address.

One free conference registration is given away to the SDSTA member that has made a submission to the newsletter (or given a presentation at the conference) and has referred at least three new members.

Members may also earn a 10% finders fee for any science related ads placed in the newsletter. Our rates are \$75 per page (or 3 to 4 quarter pages) or insert per issue or \$225 per page for four consecutive issues.

Mail to: James Stearns, SDSTA Treas  
15 North Fifth Street  
Groton, SD 57445



\$ 5 student  
\$ 5 K - 6  
\$ 20 Others

Name \_\_\_\_\_ Home Phone \_\_\_\_\_ - \_\_\_\_\_

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School Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

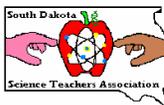
Your area K - 6 7 - 8 9 - 12 College Other \_\_\_\_\_

( circle one )

referred by \_\_\_\_\_

# South Dakota Science Teachers' Association

Julie Olson and James Stearns  
Editors, S D S T A Newsletter



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## Calendar of Events      Calendar of Events

- |               |  |
|---------------|--|
| June 10 & 29  | Contemporary Issues, BHSU in Pierre - <a href="mailto:Janet.Briggs@bhsu.edu">Janet.Briggs@bhsu.edu</a>   |
| June 11-12    | Bird Watching Tour, Wessington - <a href="http://www.SDGrass.org">www.SDGrass.org</a> <a href="mailto:jjessop@sdconservation.org">jjessop@sdconservation.org</a>     |
| June 13-18    | Inquiry Based Physics for Teachers at BHSU - Janet Briggs at 642-6875  |
| June 21-24    | Food Safety Ed Opportunity at SDSU - <a href="mailto:Joan.Hegerfeld-baker@sdstate.edu">Joan.Hegerfeld-baker@sdstate.edu</a>  |
| July 6-9      | Math in Science Context, USD - <a href="mailto:Miles.Koppang@usd.edu">Miles.Koppang@usd.edu</a>  |
| July 12-16    | Cosmic Math Workshop at SDSU - <a href="mailto:Larry.Browning@sdstate.edu">Larry.Browning@sdstate.edu</a>  |
| July 12-16    | Food & Science Goes Together Like Soup & Sandwich - <a href="mailto:Miles.Koppang@usd.edu">Miles.Koppang@usd.edu</a>   |
| July 18-23    | Physics of Atomic Nuclei at NSU - <a href="mailto:pnorris@sanfordlab.org">pnorris@sanfordlab.org</a>   |
| September 13  | Summer/Fall SDSTA Business Meeting via DDN<br>Contact <a href="mailto:Molly.TenBroek@k12.sd.us">Molly.TenBroek@k12.sd.us</a> or any officer to be connected & attend |
| October 23    | Mole Day - $6.02 \times 10^{23}$ <a href="http://www.moleday.org">www.moleday.org</a>  |
| October 27-29 | NSTA Area Conference—Kansas, MO  |
| November 11   | 75th Anniversary of the record balloon flight from South Dakota<br>( <i>Do you know from where it was launched or where it landed?</i> )                             |

February 3-5, 2011    19<sup>th</sup> Annual Joint Math & Science Conference - Huron, SD

Homepage Located At      <http://www.sdsta.org>