Montana Science Teachers Association

MSTA

Dedicated to Quality Education

NEWS JOURNAL

A publication of the Montana Science Teachers Association

June 2018

In this Issue:

*** Teacher Lessons on the NGSS Practice Mathematics and Computational Thinking *Summer Professional Development * Something for the kids**

Submitting Articles to the MSTA News Journal

When submitting articles, please adhere to the following criteria:

- Electronic submissions are preferred in Microsoft Word format. These can be attached to your email message.
- If in doubt about format, submit your work in .rtf format.
- If truly in doubt, paste your submission in the body of the email message.
- Lab activities may be mailed. Please cite any references.

Judy Boyle, Editor
sagemountaintrail@gmail.com

Tentative Submission/Publication Dates
August/September (Fall Issue)
November/December (Winter Issue)
February/March (Early Spring Issue)
April /May (Late Spring Issue)

Exciting News!

You can now renew your membership online through the MSTA website! Click on the "Membership Form" tab and fill out the form then click on the red "Pay Dues" box at the very bottom of the page to pay online. It's as easy as that!

You may also fill out the form on the next page and mail the form with a check.

Montana Science Teachers Association Membership Application

Name _____ Date _____
Last First

Address _____ Phone _(_____)_____

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City County State Zip

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School Phone(___ _____

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Grade Level
___K-6
___6-9 MS or JH
___9-12
___College/Univ.
___Sup/Admin.

Subject
___All sciences
___Life Science
___Phys Science
___Biology
___Physics
___Chemistry
___Other
___Earth Science

Dues Category	
1 year	$20.00 ____
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MSTA/MEEA	$30.00____
3 years	$50.00____
Life	$150.00___
Student	$5.00_____
Retired	$5.00_____

Make checks payable to MSTA

7 Return to: Katie Capp PO Box 514,Belgrade, MT 59714

Investigating the Energy of Combustion

(Grades 9-12)

Michael Poser - MSTA Chemistry Advisory Board Member

Introduction

Energy is a particularly challenging topic for students in all science disciplines. They tend to think of energy as physically present in an object, rather than a property that results from the arrangement of matter. Our use of language is partly to blame; in physics we say that lifting a rock into the air gives it potential energy. It's cumbersome, but a more accurate description is to say that we transferred energy to the rock to create a new arrangement of matter that stores the transferred energy.

Misconceptions about energy can be exasperated in chemistry class when the arrangement of particles is sub-microscopic and cannot be directly observed. But mathematical thinking along with prior knowledge about the kinetic molecular theory of matter can help address student misconceptions about the transfer of energy. The following lab, adapted from The American Modeling Teachers Association, helps students develop a computational model of energy transformations during a combustion reaction.

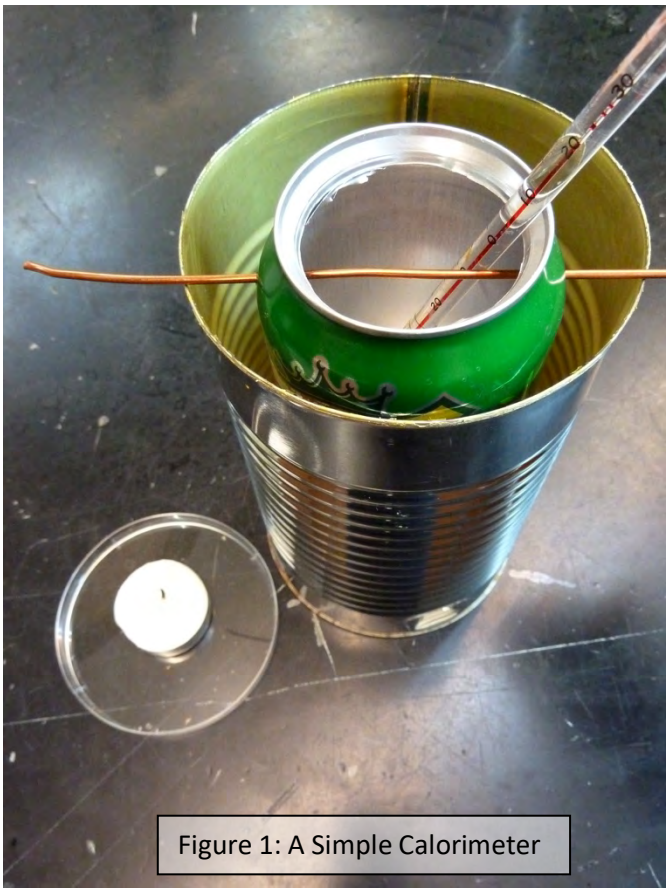

Figure 1: A Simple Calorimeter

Teacher Preparation

Students should be familiar with the kinetic molecular theory of matter, molar mass, balanced chemical equations, basics of stoichiometry, and the relationship between heating and temperature.

Figure 1 shows a simple calorimeter that can be made from an aluminum pop can nested inside a large steel can. The outer can must have holes punched in the sides near the bottom to allow air to flow through. A candle placed on a Petri plate is set inside the steel can. The aluminum can is suspended above the candle with a stiff wire. Start with ~100 mL cool water (~5˚ C). It's a humble, but functional setup that allows lots of room for students to design better data collection equipment at the completion of the lab.

Discuss with students how this devise might be used to measure the heat given off by a burning candle. Ask what kind of measurements they would need to take in order to relate this change of energy to the moles of candle wax burned. Ask what other information they might have to assume in order to calculate changes to the system. For example, they will need to use the heat capacity of water, c_{water}=4.18 kJ/(kg*K) and might use the density of water, d_{water}= 1 g/mL.

As the water heats above room temperature, it will begin to radiate energy into the surroundings. One way to minimize this effect is to start with cold water which will initially absorb energy from the

surroundings. If the water is only heated to a point where the change above room temperature is equal to the change from below temperature, energy transfers to and from the surroundings cancel out.

The expected ΔH is 15,500 kJ/mole for the combustion of candle wax.

Student Work

In prelab discussion, students should determine how to conduct the experiment. In their science notebooks they should write a brief procedure.

Students should create a data table with the following information:

- Mass of candle before combustion
- Mass of candle after combustion
- Volume of water heated
- Temperature before combustion
- Temperature after combustion

After conducting the experiment, students should answer the following analysis equations:

1.) Determine the mass of candle wax burned.

2.) Candle wax is a mixture of compounds. Assume that the formula of the wax you used is $C_{25}H_{52}$. Determine the number of moles of wax that burned.

3.) Determine the mass of water heated.

4.) Determine the temperature change, Δt, of the water.

5.) Calculate the quantity of heat absorbed by the water in the can. $Q=mc\Delta t$

6.) Calculate the quantity of heat that would be produced if one mole of the wax were burned. Express your answer in kJ/mole.

Have students share their data and then answer the following evaluation questions:

1.) How did the value you obtained for the heat of combustion, ΔH, compare to that obtained by other lab groups?

2.) Had you used a more sophisticated calorimeter, would your answer be higher or lower? Explain. What might the new and improved calorimeter look like?

3.) Write the balanced equation for the combustion of candle wax, including the energy term in the equation. Which stored more energy, reactants or products?

If time allows, have students make improvements to the calorimeter and try to obtain values with less error.

Connection to the standards

Montana 9-12 Physical Science:

- Develop a model to illustrate that the release or absorption of energy from chemical reactions is dependent upon changes in total bond energy. NGSS HS-PS1-4
- Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component and energy flows in and out of the system are known. NGSS HS-PS3-1
- Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles and energy associated with the relative position of particles. NGSS HS-PS3-32
- Design, build and refine a device that works within given constraints to convert one form of energy into another form of energy. NGSS HS-PS3-3

NGSS Science and Engineering Practices: developing and using models, planning and carrying out investigations, using mathematics and computational thinking.

NGSS Crosscutting Concepts: systems and system models, energy and matter, stability and change.

Professional Development Opportunities

From OPI

Summer Hub Courses:

Facilitated Summer Courses

Facilitator: Chris Pavlovich (capped at 15, 30 Renewal Units)
Science 3D Mentorship 101
June 4 through July 13, 2018

Facilitator: Rayelynn Brandl (cap undetermined, 20 Renewal Units)
Crosscutting Concepts: Making Learning Real Through the Big Picture
June 4 through June 29, 2018

Self-Paced Summer Courses

Montana's New Science Standards: An Introduction (1 RU)
Montana's New Science Standards 101 (2 RU)
Montana's New Science Standards 201 (3 RU)
Science Standards for Principals: A 10,000' View (3 RU)
Science Virtual Community (1RU)
Exploring Inquiry With NASA (4 RU)
Backpack Science: Mapping (2 RU)
Backpack Science: Landscape (2 RU)
Gray wolves in the Northern rocky Mountains: A Conservation Puzzle (5 RU)

~ Coming summer and fall:

Integrating Science into K-5 Classrooms
Science as an Anchor for Literacy in Technical Texts
Watershed Education in the Intermediate Grade Band
Montana's New Science Standards 301
Step It Up! Growing Your Teaching Practice
Active Science – From Start to Finish
NASA: Earth & Space Units of Study
Project Archeology: Investigating the First Peoples, the Clovis Child Burial

Earn graduate credits in one week during the summer while investigating the spectacular landscape of Montana, or through a hands-on lab experience at the MSU campus. Consider these field course options offered through the MSSE program at MSU:

Yellowstone Lake Ecology (June 11-15)
Join us to learn more about the physical, chemical, and biological processes that regulate lake systems. We will address the unique ecosystem of Yellowstone Lake with an emphasis on the aquatic invertebrate life. We will accomplish this through lecture, field investigation, and laboratory analysis. Students will synthesize and be able to apply learned skills and knowledge in their classroom (grades 5-12). The course will take place in on the MSU campus and in the Greater Yellowstone Ecosystem.

Cell & Molecular Biology (July 16-20)
An inquiry-based laboratory in prokaryotic and eukaryotic cell and molecular biology, this course provides training in microbiological techniques. Current literature and laboratory discussions cover molecular approaches for investigating complex cellular mechanisms.

Geology of Glacier National Park (July 22-27)
This field course will focus on the geomorphology and history of glaciers, stratigraphy and the history preserved in the strata, structural geology and tectonic history, and other geo-topics as revealed by the wonderful outdoor laboratory in the vicinity of Glacier National Park. Daily hiking, tent camping and outdoor cooking will be the expectation.

*Summer housing options are available to students on the MSU campus. For more information on summer courses visit*www.montana.edu/msse

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Free tuition and stipend paid for Montana teachers….

Check out this summer graduate course offered on the MSU campus July 23-27, 2018:

CSCI 582 Computer Science in the Classroom: The Joy and Beauty of Data (2 credits)

Instructor: Dr. John Paxton

- Intended for grade 7-12 teachers who want to learn how to incorporate computational ideas into the classroom.
- Teachers will extend their knowledge of the Python programming language.
- Gentle introduction to the world of data science.
- Teachers who complete this course will be better prepared to teach material covered in *CSCI 127: The Joy and Beauty of Computing* for dual enrollment.

An application is required for Montana teachers looking to qualify for paid tuition and stipend for this course. For more information please contact, Diana Paterson, at the MS in Science Education Department on the MSU campus at dianap@montana.edu.

We are excited to offer "Macro to Micro" a biomimicry teacher training that was held last year in Boston. It was really well-received and if you have interest in a nature-based learning module – we think you will really enjoy this at Salish Kootenai College in June!

The Macro to Micro course is designed for 7th grade science teachers and students (life sciences). All participating teachers will receive the lesson plans and materials needed to teach Macro to Micro in their classroom – and that includes "remote in" sessions to examine samples with a scanning electron microscope!

The cost is $100 for the 2-day workshop and OPI Professional Development credits (8) are available to all completing the training.

In addition, participating teachers will receive the lesson plans and materials needed to teach the Macro to Micro course in their classroom.

For more information, please see the attached flyer.

You can register and pay on-line: www.skc.edu or via mail (send in form and payment).

Registration details are attached.

The class is limited to 12 teachers.

Thank you and we hope to see you in June! If you have questions, please call Diana at (406) 461-4148.

Best,
Diana Hammer & Sue Okerstrom
Biomimicry Professionals/Trainers

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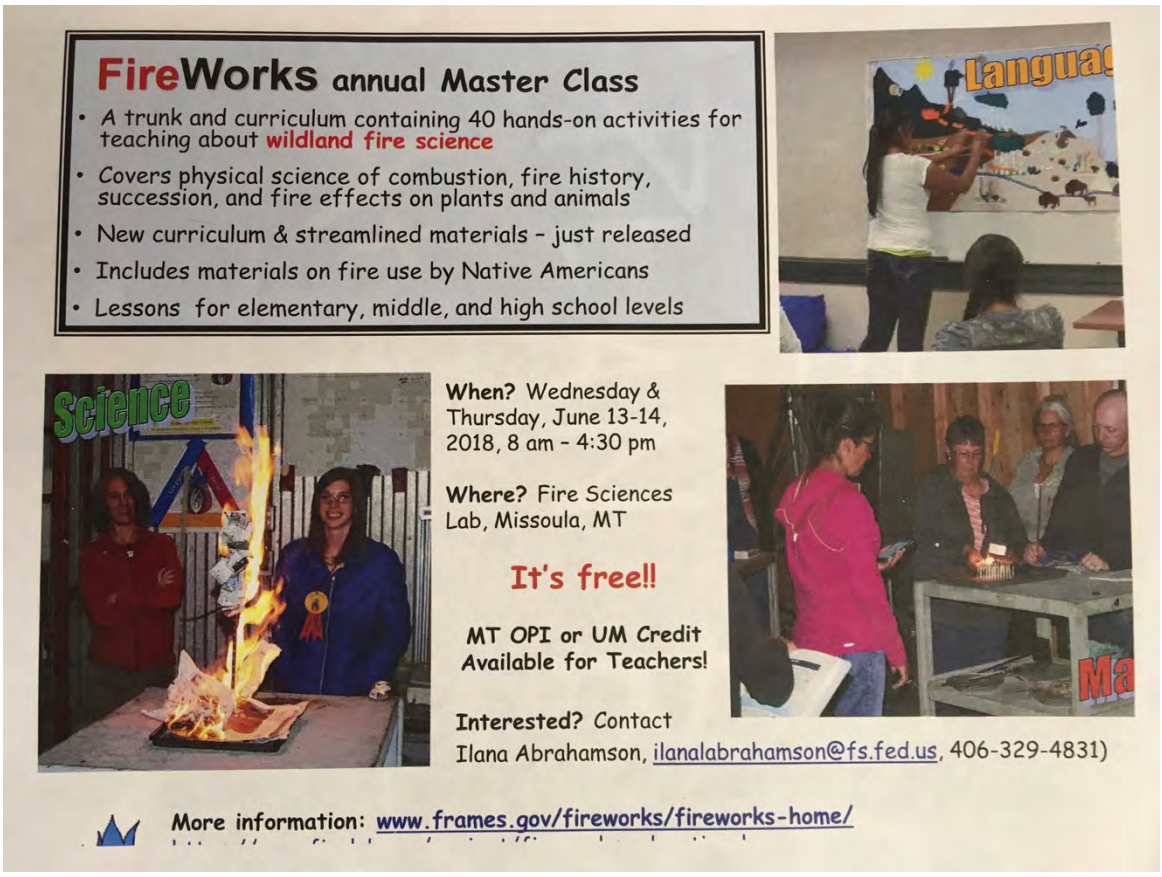
Earth Science and Me: A Teachers Workshop

When: July 9-12, 2018
Where: Heck/Quaw Elementary School
Location: Belgrade, MT
Instructors: Doug Scott& Dave Scott (Professional Geologists)

Designed for All Teachers! 2 ½ classroom days with "hands-on" Mining and Geology activities, a 1-day field trip to a talc mine and a ½ day field trip to a talc mill. You get: Activity Notebooks, posters, PowerPoint presentations: minerals. Ores, sedimentary rocks, metamorphic rocks, and igneous rocks, door prizes, continental breakfast (2 days), refreshments (4 days), and lunches (3 days). Re-certification credits- 2.0 semester hours ($155) Course number ERTH 588-50 (MSU) Tuition: $60.00 per teacher (checks payable to DST & Asso.) Mail registration to: DST & Associates, 14293 W. Baltic Ave. Lakewood, CO 80228. Questions? Call 509-270-0997



Science Camps for Kids

Montana Learning Center Summer Camps 2018

The Montana Learning Center offers camps for students entering grades 1-12. Camp staff are certified teachers, many of whom are award-winning. The student to staff ratio is 1:8. Instructors and counselors are CPR & First Aid certified.

Campers experience exciting science activities and enjoy Canyon Ferry Lake and other outdoor environments.

For full camp descriptions, scholarship information and registration, visit our website at www.montanalearning.org

Camp Discovery
Camp Discovery is a four-day, daytime only, camp for students entering grades 1-3. Campers are bused to the Montana Learning Center at Canyon Ferry Lake from Helena Monday through Thursday.

Cost: $300. Includes lunch and snacks.

Engineering in Nature: June 25-28

Making Music: July 9-12
Rolling Things: July 16 – 19
Making Music: July 23 – 26
Rolling Things: July 30-August 2

Camp Young Naturalist Adventures
Camp Young Naturalist Adventures is a five-day overnight camp for students entering grades 4-6. Students arrive on Sunday afternoon and leave Thursday afternoon.

Cost: $450. Includes lodging and meals.

The Magic of Science: June 24-28
The Wonder of Science: July 8-12
The Magic of Science: July 15 – 19
The Wonder of Science: July 22 – 26
The Magic of Science: July 29-August 2

Camp Innovations
Camp Innovations is a five-day overnight camp for students entering grades 7-9. Students arrive on Sunday afternoon and leave Thursday afternoon. Campers experience offsite fieldtrips, the night sky and tours in the Canyon Ferry Lake area and beyond.

Cost: $500. Includes lodging and meals.

Biology: July 8-12
Earth & Space: July 15 – 19
All-Girls STEAM Camp: July 22 – 26
Earth & Space: July 29-August 2

Extreme Yellowstone Expedition
Extreme Yellowstone Expedition is a five-day overnight camp for students entering grades 7-9. Camp dates are June 24-28, with students arriving and leaving in the afternoon. The American Explorers Basecamp in Paradise Valley will be the hub for lodging, science experiences and a jumping off point for excursions to Geyser Basin, Yellowstone Falls and Lamar Valley.

Cost: $1,000. Includes lodging and meals for five days.

Lewis & Clark Leadership Course
Lewis & Clark Leadership Course is an eight-day overnight camp for students entering grades 9-12. Camp dates are August 14- August 21. Campers experience the actual sites and scenes of Lewis and Clark's journey of discovery. Activities include a canoe expedition through the wild and scenic Upper Missouri River and outdoor discovery training at the lake and in the Big Belt Mountains.

Cost: $1,699. Includes lodging and meals for eight days.

For full camp descriptions, scholarship information and registration, visit our website at
www.montanalearning.org

1st Annual Summer Science Institute

MAKING SCIENCE MEANINGFUL

'Navigating the New Montana Science Standards'

August 13-14, 2018
Willson Building, Bozeman, MT

This two-day science professional learning institute for educators is a collaborative conference with national and local science educators, authors, leading professional learning providers, and exhibitors. Network and learn with and from science educators from across the state and beyond!

Engaging opportunities in three general strands:
1. Transitioning to MT's new NGSS-based Science Standards/3D Instruction
2. Deepening Core Content Knowledge
3. STEAM Cross-curricular Teaching & Learning

Featured Keynote Presentations and Workshop Sessions:

Emily Morgan,
Co-author, *Picture-Perfect Science Lessons* series and Author of *Next Time You See* picture book series
Emily, a former middle and elementary school teacher, will share key strategies for making science more meaningful for your students, including engaging their emotions, investigating relevant questions, and sharing a sense of wonder. Choose one of her *Picture Perfect* STEM books FREE with registration!

Brandon Rodriguez, Ph.D.,
Educator Professional Development Specialist, NASA JPL
Brandon, who is also a former high school chemistry teacher, will share examples from NASA that we can model in our classrooms to help students see science as more than a chapter in a textbook.

Monday, August 13 8:00-4:30 p.m. (coffee and lunch provided)	Tuesday, August 14 8:30-4:30 p.m. (coffee provided, lunch on your own)
Keynote: Emily Morgan *Making Science Meaningful* Multiple breakout sessions—see link below	Keynote: Brandon Rodriguez *Lessons in Space Science: Opportunities for Innovation in Today's Science Classroom* EdCamp-Style Morning Sessions - Problem-solve and engage in collaborative conversations about science instruction that YOU want to talk about with other educators! Multiple breakout sessions—see link below

Registration Costs
$135 (2-day institute)
$85 (1 day of your choice)

Includes your choice of one of four books from NSTA Press!

Registration and more info @ https://conta.cc/2GEe9kv

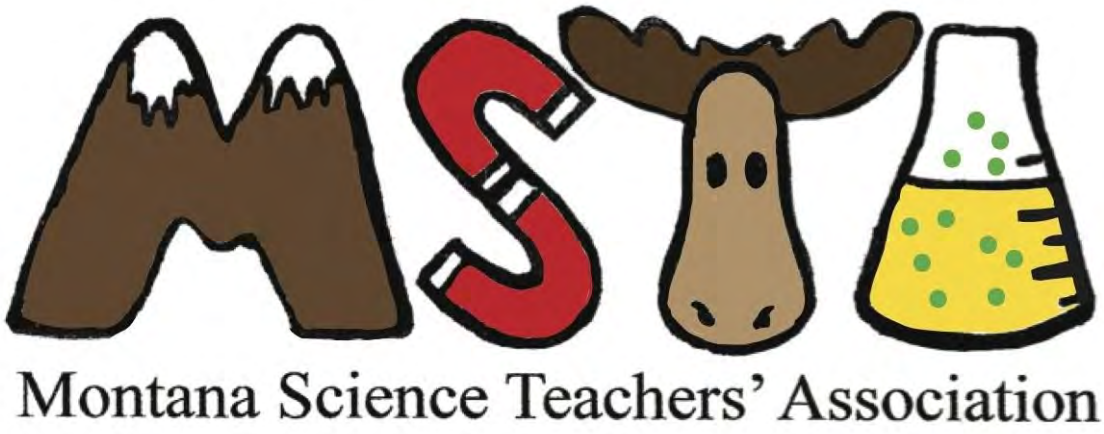
*Discounts available for SWMSS and MSTA members 2-day registration. ($15 off)
*No on site registration. Space is limited.

OPI Renewal Units and Graduate Credits are available.

Southwest Montana School Services

Questions? Please contact:
Jennifer Brekke
jbrekke@swmss.coop
406-522-6024

Elevated ideas.
Mountain Goat Instructional Design, LLC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