MSTA Newsletter

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In this Issue

From the President's Desk: Applying the Skills from a Workshop-Filled Summer in My Classroom

By Michael Sampson, MSTA President

As I continue to delve into the Next Generation Science Standards (NGSS), I keep coming across the theme of developing models and using these models to solve problems. For this article, I will focus on the Using Models in Biology workshop that was briefly discussed in the last newsletter.

I am using model-building as the foundation for a review of genetics concepts with my AP Biology class. The unit consists of a design challenge that asks groups of students to create a "unique" variation of a gecko for a zoo. The students develop a model of inheritance that they apply to a single-factor cross, then refine the model and apply it to multiple traits. The activity is very student-oriented and heavy into inquiry; the design challenge is the scaffolding that students use to construct their understanding of the genetics concepts.

We are currently six lessons into the unit and some of the students who strive for always having the "right" answer have struggled

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Thoughts From Your Executive Director

By Robby Cramer, MSTA Executive Director

On behalf of the MSTA Board of Directors and the 2013 Conference Committee, I would like to invite you to attend the 60th MSTA Annual State Science Conference March 8 & 9, 2013! The Preconference sessions will be during the day Thursday, March 7. The vendors' exhibits will open Thursday evening coupled with science demonstrations on the floor. We are delighted to be at Eastern Michigan University for the first time. The theme of our conference is *Pure Michigan Science: the Next Generation*.

For the past year and a half, leadership from Michigan Science Teachers Association, Michigan Department of Education, and the Michigan Math and Science Center Network have collaborated as members of the Michigan Next Generation Science Standards Internal Review Team. The last public review of these standards occurred early this winter. The state of Michigan has had the greatest number of respondents, and the national team has been impressed with the depth of our comments. Thus, we know that science educators and scientists across Michigan have influenced the science education standards for our students. Thank you for your efforts to make your voices heard!

Our MSTA Conference Leadership has been busy planning how MSTA can be a professional support for you in your Michigan classrooms and schools. We have designed a conference full of sessions filled with Michigan's perspectives on the Next Generation Science Standards (NGSS).

The MSTA Conference will begin with a keynote address from Dr. Joseph Krajcik, NGSS Writing Team Leader. Dr. Krajcik is presenting on *Implications of the K-12 Science Education Framework & Next Generation Science Standards for Teaching*. Dr. Krajcik is the Director of the Institute for Research in Mathematics and Science Education and Professor of Science Education in the College of Education at Michigan State University.

NGSS Panel Discussion will immediately follow the keynote. Members of Michigan's Internal Review Team will share key ideas of the Framework

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From the President - *continued from front page*

a bit. The model-building process, a key component of successfully completing the design challenge process, has been interesting to observe. The process begins with each group identifying inheritance patterns from a pair of gecko crosses. Then the groups share their observations and develop a group consensus as to which inheritance patterns they identify. The final step is to use that consensus and cross data to develop a mathematical model of inheritance. As discussed earlier, the NGSS refer to developing and using models to solve problems but they also emphasize student dialogue much the way that scientists do. I have truly enjoyed this dialogue in my classroom. It is difficult to just let them use the inquiry process and not always provide that "right" answer like they want.

The next step the class will take is to see if their model will fit a multiple trait cross and then to "design" their gecko for the zoo. My AP biology students will complete this activity in a few weeks and we then will move on to our next topic but I am really looking forward to doing the design challenge with my ninth grade biology classes next semester.

I will end this article in a similar fashion to the last one I wrote by discussing what I have learned. I have learned that an old dog can learn some new tricks and while change is looming, the Next Generation Science Standards just might make science more fun for both the teacher and the students.

Thoughts from your Executive Director - *continued from front page*

and NGSS, as well as timelines regarding Michigan's implementation. Some time will also be given for questions.

Next, NGSS Boot Camps for Elementary, Middle School, and High School will be offered to share how to unpack the new science standards with veteran teachers. They will focus on how to read and interpret the NGSS language and format. Teachers will share how they incorporate Crosscutting Concepts, Scientific and Engineering Practices, with Disciplinary Core Ideas into daily lessons and courses.

As you choose from over three hundred sessions to attend, I want to encourage you to take time to listen and ask questions of your colleagues to discover new ways to increase higher level thinking in student discussions and discourse. Think about what you are doing in your own classroom. Consider how you might share your practice with your colleagues next year.

Opportunities for you to network with your peers and gain new contacts will abound! Visit the Exhibit Floor Thursday night with science demonstrations from Ann Arbor Hands on Museum, Cranbrook Institute of Science, Impression 5, Michigan Science Center, and Dr. Zeemo!

The Michigan Science Teachers Association's State Conference is one of the largest state science conferences in the United States. The focus of the conference will help you and your school districts become knowledgeable about a Framework for K-12 Science Education and the NGSS. We hope you will attend. Please visit the MSTA web site (www.msta-mich.org/conference-a-events/msta-conference) for conference registration and more information on all the various sessions that are available!

FEATURED ACTIVITY

Introducing the "Best Of Labs" series...

What are those labs that you just can't imagine teaching without? Those activities that still drive student understanding...The ones that make them think and make connections between units...We all have them. This article begins what I hope will be the start of a recurring series of articles that share what you believe to be "the best of the best" labs. I will begin with one of my personal favorites, as I give it to my classes. I will include teaching tips and notes at the end of the activity. Enjoy!!

I encourage you to forward your "must do" activities to the newsletter editor for future inclusion. Any science discipline, any grade level! If possible, please try to obtain permission for any copyrighted material, or at least send along the citation and we will try to get a formal okay to reprint it for publication to our membership.

THE CLOSED BOX MYSTERY for High School Biology

By Cheryl Hach, Kalamazoo Area Mathematics and Science Center, MSTA Executive Editor

Introduction

The mystery of the closed box is simply stated: how do things get into and out of cells when there are no apparent openings between the cell and its environment? Far too much is going on in the cell for its needs to be supplied for very long by materials that may originally have been enclosed within its membrane. Changes involving amino acids, proteins, pH, buffers, enzymes and so forth require new supplies and the elimination of by-products and waste is necessary when materials are no longer needed.

For this inquiry, you will work with a cell model of convenient size and composition, rather than a microscopic cell. Your model of a cell will substitute cellophane for the cell membrane and contain relatively few biological molecules.

Membranes, whether cell membranes or the cellophane dialysis tubing that you will use, allow the passage of certain molecules through itself and prevents the passage of other molecules. The dialysis tubing that we will use permits slow passage of water and other small molecules, but does not allow larger molecules to pass.

H_0:

H_1:

Materials

80% glucose solution (1 ml/group)
0.3% boiled starch solution (40 ml/group)
5.0% diastase solution (6 ml/group)
Lugol's Iodine solution (5 ml/group)
Diastix strip
Benedict's Reagent (20 drops/group)
Warm water bath
Automatic pipettors (1 ml, 5 ml, 6 ml)

1.5cm cellophane dialysis tubing (2 pieces each, about 20 cm long)

2 – 25 x 200 mm test tubes
Pasteur pipettes (2/group)
Parafilm
Watch glass

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THE CLOSED BOX MYSTERY for High School Biology *continued*

Procedure

Part A - Substances in Contact with a Membrane

1. Tie a knot very tightly at a point about 1 cm from the end of a piece of dialysis tubing and fill the tube to about 5 cm from the top with soluble starch solution using an automatic pipettor.
2. Add 1 ml of glucose solution to the dialysis tubing using an automatic pipettor.
3. Tie a knot in the top of the tubing. Rinse the bag you have made under running water to remove any starch solution that you may have spilled on the outside.
4. Place the filled dialysis bag in a large (25 x 200) test tube. Fill the tube with enough distilled water to just cover the dialysis bag. Add 5 ml of iodine solution to the water in the test tube. Cover with Parafilm and mix.
5. After 15 minutes, test the external solution for glucose by adding a drop of the liquid close to the outside of the dialysis bag to a Diastix strip. A change from aqua to green, tan or brown color indicates the presence of glucose. Try to disturb the solution directly surrounding the dialysis bag as little as possible.
6. Observe the contents of the dialysis bag and the liquid surrounding it. Record any changes and record the time at which they were noted.

Part B - How Does an Enzyme Affect Diffusion?

1. Use the automatic pipettor to place 6 ml of 5.0% diastase solution into a length of tubing with one end tied off. Using a separate pipettor, add 6 ml of 0.3% starch solution to the tubing.
2. Tie off the top of the tubing, rinse it as before, and place it into a large test tube. The tube should be just large enough to hold the dialysis bag. Fill the tube with just enough water to cover the bag. Place the tube in a 37° water bath.
3. After about 45 minutes, take a 2 ml (1 finger) sample of water, trying to disturb the water as little as possible. Place this solution into a small test tube.
4. Test a drop of the above solution on a watch glass using Lugol's Iodine to indicate the presence of starch.
5. Test a drop of the solution with a Diastix strip for the presence of glucose.
6. Finally, test the remainder of the solution for the presence of monosaccharides using Benedict's reagent as follows:
   Add 20 drops of Benedict's reagent to the solution in the test tube. Place in a boiling water bath for 3 – 5 minutes. Remember that a color change to yellow, orange, red or green indicates the presence of a monosaccharide.

BIOCHEMICAL TESTS OF SOLUTIONS DIFFUSED THROUGH DIALYSIS TUBING

Table 1.

Part A - Substances in Contact with a Membrane		
	Result	**Conclusion**
Reaction of solution with a Diastix Strip		
Part B - How Does an Enzyme Affect Diffusion?		
	Result	**Conclusion**
Reaction with Lugol's Iodine		
Reaction with a Diastix Strip		
Reaction with Benedict's Reagent		

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THE CLOSED BOX MYSTERY for High School Biology *continued*

Discussion Questions

Part A - Substances in Contact with a Membrane

1. Why did you choose to accept or reject the null hypothesis?
2. On the basis of the chemical tests for starch and glucose, what (if anything) must have happened to the iodine used in Part A? To the glucose? To the starch?
3. What materials diffused through the membrane? What substances did not diffuse through the membrane?
4. What can you imagine about the structure of the dialysis tubing to account for your experimental results?
5. If a membrane permits some substances to pass through and prevents or slows down the passage of other materials it is said to be differentially permeable. Do you suggest that materials can diffuse through such a membrane in opposite directions at the same time? If so, what materials diffused in opposite directions?

Part B - How Does an Enzyme Affect Diffusion?

6. Propose an explanation for the results you obtained using the diastase.

Ref: BSCS. (1968). *Biological science: An inquiry into life* [Student Laboratory Guide], 2nd ed. New York, NY: Harcourt, Brace and World.

TEACHING NOTES:

- Because there are so many solutions to be measured, I find it useful to use repeating pipettor bottles that can be set for various volumes. These are available commercially, or maybe as lab salvage and are very useful to have around for many applications.
- The glucose solution is very concentrated, but necessary to ensure that it is identified in the solution surrounding the dialysis bag in Part A.
- Bottled starch solution from the grocery store can be substituted for the boiled solution. I have had success with a 1:5 dilution of starch solution to distilled water.
- The diastase solution (from Diastase of Malt powder, available from science suppliers) is a fairly high concentration, but again, useful to ensure that students will obtain a positive result in Part B.
- Lugol's Iodine solution can be diluted from the standard preparation and will still yield a positive result. I usually dilute it to a coppery brown color to save reagent.
- Diastix strips can be purchased from local pharmacies. To save money, I cut them lengthwise in two.
- Pre-cut the dialysis tubing and soak it in distilled water for easy use. Make sure students keep it wet. It becomes brittle when it dries out.

WHY I LOVE THIS LAB:

This is a lab that really ties together much of what we study in basic cell biology. The processes of osmosis and diffusion are critical to understanding what can pass through the cell membrane and what is excluded. The lab illustrates the importance of a concentration gradient as well as molecular size using the dialysis tubing "cell" for a hands-on example. The tests and observations are consistent with earlier study of major biomolecule types and reinforce this instruction.

Students almost always obtain good results if they are careful and their data encourages them to think deeply about what is happening across the membrane of the tubing.

Lorenzo's Oil and the Process of Science

By Lynn Thomas, Region 14 Director

Are you searching for a movie that will both entertain high school students while stimulating thought and discussion about the process of science? Lorenzo's Oil is a 1992 film based on the true story of Augusto and Michaela Odone who engaged in a dramatic search for a cure for their son Lorenzo's adrenoleukodystrophy (ALD), a genetic disease that progressively destroys the brain of young boys. Within a year children with ALD are paralyzed, blind, and unable to speak. The disease is fatal and the brain damage seems to be linked to a build up of dangerous long-chain fatty acids in the blood.

As the Odones sought to save their son's life, they performed their own scientific research. They reviewed the existing scientific literature, made hypotheses about possible treatments, experimented (on their son, Lorenzo), revised their hypotheses, and continued with further research. Eventually, Augusto Odone discovered that patients with ALD might benefit from a combination of olive oil and rapeseed oil. The oil effectively reduced the long chain fatty acids in the blood. In the movie, the oil is presented as a miracle cure, providing hope to thousands of families affected by the devastating disease. Additionally, the medical science community is portrayed as cold and uncaring. The scientist Hugo Moser is represented by the character "Professor Nikolais," and is depicted as an impersonal scientist unaffected by the suffering of his patients.

In reality, the scientist Hugo Moser - a man who cared very much about ALD, played a major role in both the treatment of Lorenzo Odone and the scientific evaluation of Lorenzo's oil. Moser conducted a controlled study and published the results in 2005. He concluded that Lorenzo's oil is ineffective in changing the course of the disease for patients who are already symptomatic, but the oil appears to be effective in preventing illness in individuals who are asymptomatic but are genetically predisposed to the disease.

Ultimately, the movie presents the conflict between parents desperate to do anything to save their child and a scientist who did not want to perpetuate false hope, choosing rather to gather data in a controlled manner. This movie is sure to generate discussions about the nature of science inquiry, raising questions such as: How do we do science? Can only scientists do science? The Next Generation Science Standards require that students develop a sense of contextual understanding with regard to scientific knowledge, how it is acquired and applied, and how science is connected. Lorenzo's Oil will certainly lead students to ponder these ideas.

Reference:

Moser, H.W., et al. (2005). Follow-up of 89 asymptomatic patients with adrenoleukodystrophy treated with Lorenzo's Oil. *Archives of Neurology,* 62(7), 1073-80.

Team-Based Learning — a New Educational Technique Comes to KAMSC

By Thomas Barth, Biomedical Sciences Student, Kalamazoo Area Mathematics and Science Center

In mid-December, Ms. Hach's KAMSC Biomedical Science students had the unique experience of participating in a new style of classroom learning; led by WMU professor Dr. Debra Lindstrom, the class employed an educational technique called *Team-Based Learning (TBL)*. Unlike the typical lecture—during which even the most focused students sometimes lose focus—while using TBL, students essentially teach one another. Though the experience took some getting used to, students came away from the two hour session with a much deeper level of understanding, and a newfound trust in their own ability to teach.

TBL is far from a passive style of learning. At the beginning of the session, students completed an eight question test that required an in-depth understanding of material learned in class. Afterwards, they compared answers in groups of four, and discussed the best way to justify their answers. Finally, each group simultaneously revealed their answers to the test questions. If all groups did not have matching answers, Dr. Lindstrom facilitated a discussion between groups. By defending their answers in front of the whole class, students were able to further hone their knowledge. When it was clear that a group had not answered the question correctly, their peers were able to show them where they had made a mistake in their thought process.

At the beginning of class, many students seemed a little unsure about this new method; it can be scary to show your answers to the whole class, let alone justify them! Yet as the period went on, I could sense everyone in the room opening up to the process. By trusting in one another as a source for learning, our class now had a much better understanding of the material. From now on, I'm sure that TBL will be an important tool for our class. Students discuss questions from the test Anatomy is fun!

Presidential Awards for Excellence in Mathematics and Science Teaching

Do you know or are you an exemplary math or science teacher in **grades seven through twelve**? Please consider nominating him/her for the PAEMST Awards. The Presidential Award for Excellence in Mathematics and Science Teaching is the highest recognition a K-12 teacher can receive for outstanding teaching in the fields of science or mathematics in the United States.

Why apply? Recipients of the award receive the following:

- A certificate signed by the President of the United States.
- A paid trip for two to Washington, D.C., to attend a series of recognition events and professional development opportunities.
- A $10,000 award from the National Science Foundation.

In addition to recognizing outstanding teaching in mathematics or science, the program provides teachers with an opportunity to build lasting partnerships with colleagues across the nation. This growing network of award-winning teachers serves as a vital resource for improving science, technology, engineering, and mathematics education and keeping America globally competitive.

Awardees are recognized for their contributions to teaching and learning and their ability to help students make progress in mathematics and science. In addition to honoring individual achievement, the goal of the award program is to exemplify the highest standards of mathematics and science teaching. Since the program's inception in 1983, more than 4000 outstanding teachers have been recognized for their contributions to mathematics and science education. If you know great teachers, nominate them to join this prestigious network of professionals.

Nominations are now being accepted online (www.paemst.org) for the 2013 Presidential Awards for Excellence in Mathematics and Science Teaching. Teachers may nominate themselves or someone else (e.g., principals, teachers, parents, or other members of the general public) may nominate them for this award. **The PAEMST Online Application is now available.** To apply, teachers must first be nominated for the award. Nominations are open now through April 1, 2013. Once nominated, teachers will receive an email with a login and password to access the online application. The application deadline for 7-12 teachers is May 1, 2013. Elementary teachers (Grades K-6) are eligible to apply in 2014.

The Michigan Department of Education has asked the Michigan Science Teachers Association to oversee this program for the State of Michigan. We are honored to be the host of this awards program. If you have any questions, please feel free to contact, Betty Crowder, our State Coordinator, at betty_crowder@msta-mich.org. In the meantime, please visit the Presidential Awards website to find the nomination form for the teacher of your choice! Why not you? For more information, check out www.paemst.org The rewards are worth the effort! You deserve it!

Congratulations to Michigan's 2011 Presidential Award (PAEMST) Winner!

Donald Pata - Grosse Pointe Woods, MI

From Don's acceptance...

The award is a way for me to honor and celebrate all of the wonderful teachers who inspired me. Education is a legacy and it is our mission to inspire students as well as other teachers toward quality education on all levels. Good teachers are continually developing and sharing quality practice. In this service we dedicate so much time and energy, and this award is an affirmation that there are tangible rewards for all of our hard work and dedication.

Don Pata has taught physics at Grosse Pointe North High School for the past thirteen years. Before that, he taught science and mathematics in Ghana in West Africa while serving in the Peace Corps. For the past three years, Don has also taught inquiry physics to physics teachers in area counties.

At his school, Don teaches all levels of physics, from conceptual to college preparatory to Advanced Placement. In addition, he serves as the Science Department Chairperson and is a member of the school's Leadership Team. After school, Don is the faculty advisor for the district's FIRST Robotics Team.

Inquiry science is the pedagogy that Don uses in the classroom: having students learn science while doing science. He turned his enthusiasm for this methodology into a four week summer workshop where he trains physics teachers in the Modeling Method, an inquiry methodology for teaching high school physics.

Don has presented at many local, state, and national teaching conferences. He has also been published in The Physics Teacher Magazine and the Michigan Science Teachers Association Journal.

Don has a B.S. in biochemistry and an M.A in teaching from Wayne State University. In addition, he received inquiry physics training at Arizona State University. He is a certified physics and chemistry teacher.

Are You Prepared...

to Teach in the 21st-Century Classroom?

Lawrence Technological University Can Help!

MASTER OF SCIENCE EDUCATION

- This graduate program in science education includes $1,218 per course scholarships for all K-12 educators (DI or non-DI endorsement).
- Majority of courses are now offered online, with a science experiment component completed using science kits and activities.
- Developed by Lawrence Tech in partnership with the Detroit Zoological Institute, Cranbrook Institute of Science, Aquinas College, and the University of Detroit Mercy.
- Courses aligned with the Michigan Department of Education requirements for Science and the DI (Integrated Science) Endorsement.

MASTER OF EDUCATIONAL TECHNOLOGY

- Master technologies that are revolutionizing the classroom and online teaching and learning: Web-based learning tools, streaming video, electronic communication, and software and hardware options.
- This practice-oriented program offered by Lawrence Tech in partnership with Marygrove College features $1,218 per course scholarships for all participants.
- Complete the seven required courses of the Master of Educational Technology degree and be eligible for the NP endorsement on your existing teaching certificate.
- Classes are offered in a 100-percent-online format.
- Training and Performance Improvement track (30 credits) and graduate certificates (12 credits) in Robotics Education, Instructional Technology, Project Management*, Nonprofit Management and Leadership*, and Workplace Technology* are available.

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In Support of the NGSS

by David B. McCloy, MSTA Region 8 Director

With much of the scientific community focusing on the introduction of the new Next Generation Science Standards (NGSS) due for release in a few months, what's available right now for the teacher who would just like a little help understanding what the big deal is all about? *What's about to change in my life, why do I need to make a change, and where can I go to get some answers . . . NOW? Convince me that this is all for the good and that my students will benefit from these changes.*

You've been hearing for months (or has it been years now?) that a super committee has been working diligently to improve science education, and yes, all for your students' betterment. A consortium of lead states, as many as twenty-six at last read, has been working since its initial formation in the summer of 2011 to make the improvement. And, yes, Michigan is one of those in this debate. But with every new iteration of the next best thing, comes concern and some convincing that change will bring the desired improvement touted by the many who support the change. The NGSS is no different. I, like a lot of you, am sitting on the sidelines wondering what's coming and why. It hit me one day, as I prepared for our annual Regional Directors retreat back in the fall, that I needed some tutoring, and fast. Where could I go to get some quick answers about timelines with simple, concise explanations about what to expect in the coming months ? . . the Cliffs Notes version of NGSS, if you will?

Debate all you want the merits of change, the fact of the matter is that this is the direction we've been moving in for several years now, that being one of a more nationalized curriculum (witness the Common Core) rather than separate individual state benchmarks. This would seem to be one step closer to that eventuality. The sites that follow are meant to be sources of an informational primer of where we're headed. They will provide a brief look at some web-based material which, if you haven't done so already, may help you clarify you own stance on the impact of the NGSS on your professional life.

It turns out that there has been much work already done preparing for the mid-March release of the NGSS. For a closer look at the time-line for all this, you can go to http://www.nextgenscience.org/development-process to see the sequence of events to date and what's coming in 2013. Needless to say, none of this speaks to the adoption and implementation of these standards here in Michigan. You can expect to hear much more about that in the coming months.

Of course, "googling" "NGSS" will provide you with the expected avalanche of sites from which to choose. But for a quick overview of NGSS, I'd praise and recommend these sites for their brevity:

- www.nextgenscience.org/
  In addition to the Next Generation Science Standards, this site includes information *About the Development / Why Science Standards / Implementation*

- http://www.nextgenscience.org/faq
  Provides brief answers to some common questions

- http://www.nsta.org/about/standardsupdate/default.aspx
  NSTA has taken an active lead in insuring that members and non-members are provided with information about the latest NGSS updates, recent NSTA articles on the subject as well as teacher blogs and community forums for deeper NGSS discussions

- http://learningcenter.nsta.org/products/symposia_seminars/Ngss/webseminar.aspx
  Opportunity to view the eight free web seminars which cover some of the practices outlined in *A Framework for K-12 Science Education* upon which the NGSS are based

With the exception of the web seminars (each about 90 minutes), the information provided by these links should get you enough of a head start in a relatively short period of time to be the envy of your next departmental meeting. I might recommend, too, the upcoming MSTA Conference in March which will provide the very latest information about NGSS including an address by keynote speaker, Dr. Joseph Krajcik, who has been on the frontlines of NGSS development. Go to http://www.msta-mich.org/index.php/ for conference and registration information.

Web Gems- Physics and Physical Science

By Pete Peterson, MSTA, Region 7, Shelby High School, Shelby, MI

We all know that with today's tech savvy students, we have to do more than just "stand and deliver" a lecture if we hope to engage our students. YouTube, video clips and interactive simulations have all become avenues for us to reach our students.

In last spring's newsletter, Mike Klein introduced everyone to the useful and free online simulations from the University of Colorado at Boulder (www.phet.colorado.edu). These simulations provide students with interactive experiences of a wide array of physics and chemistry phenomena. The site also provides additional teacher resources and lesson plans for use with individual or groups of students. Within the same realm is the wonderful simulation program that I came across earlier this year- http://www.theuniverseandmore.com/. This website is an interactive game which has the students explore the graphical connections between motion, time, velocity and acceleration. I used the website as an end of unit review activity in my Physics I class. I can confirm that my students thoroughly enjoyed the simulation and showed an increase in understanding of these sometimes difficult topics.

Lately, I have spent time trying to locate STEM (Science, Technology, Engineering and Math)-related examples of science concepts. I have found two interesting examples of practical uses/applications of electromagnetic force and destructive interference of waves (sound).

The Navy has developed an electromagnetic rail gun which can shoot a projectile over 100+ nautical miles at speeds of up to 5,600 mph. The gun works by using electromagnetic force to propel a conductive "slug" down a barrel. http://www.youtube.com/watch?v=-uV1SbEuzFU&feature=player_embedded

The next example comes from a car commercial for Acura which is touting its noise-reducing technology using waves to destructively cancel waves. http://www.youtube.com/watch?v=U6DBfrpRhFQ

OUTSTANDING BIOLOGY TEACHERS??

CALL FOR NOMINATIONS!

Do you know an outstanding Michigan biology teacher who develops creative, engaging lessons for their students? Is this educator involved in helping students succeed in science experiences outside of the classroom (e.g. science clubs, research opportunities, etc.)? Does he/she share their innovative practices with other biology teachers (e.g. leadership roles, publishing articles, professional presentations at conferences, etc.)? Then nominate him/her for the Michigan 2012 Outstanding Biology Teacher Award (OBTA) presented by the National Association of Biology Teachers. Contact the Michigan OBTA Director, Rebecca Brewer, at obta.mi@gmail.com by **Friday, March 1st** to request a nomination form.

Apply for $1000 Professional Development Scholarships

By Frances Gatz Ph.D., Director, Rainforest Workshops

http://www.amazonworkshops.com/educators--naturalists.html *(case sensitive)*

Educator Academy in the Amazon Rainforest + Machu Picchu

The July 2-11, 2013 Educator Academy is a cross-curricular professional development workshop for K-12 formal and informal educators to learn and use:

- **21st Century Instruction:** 5E Lesson Design, Inquiry-Based Exploration, STEM Problem-Based Learning
- **Inquiry Protocols:** Project Learning Tree, GLOBE, Project Noah
- **Global and Cultural Perspectives:** Service Learning, Sustainability, Global Education

Join Dr. Mo Walters, ASU; Al Stenstrup, Project Learning Tree (PLT); Christa Dillabaugh, Amazon Rainforest Workshops; and work side-by-side with scientists Dr. Steve Madigosky, Widener University; and Randy Morgan, Curator/Entomologist, Cincinnati Zoo. The Amazon experience is a real world lens through which to view global issues as -- climate change, global health, sustainable development, energy, population, water, quality of life and the meaning of service. Experience:

- a 1/4-mile Rainforest Canopy Walkway and research on Weather and Climate Change
- interactions with Indigenous Yagua, Riberenos and a Village Service Project
- ReNuPeru Ethnobotanical Garden and problem solving inspired by Biomimicry
- Monkey Island Conservation Project

PLT Certification and PD Hours included. Academic Credit and Machu Picchu Extension optional. Land cost is $1985, plus air. $1000 scholarship deadline March 8. Land cost is $985 for scholarship winners. Open registration through April if space is available. See Syllabus on Webpage: http://www.amazonworkshops.com/educators--naturalists.html *(case sensitive)*. Contact christa@amazonworkshops.com or 1-800-431-3634.




STEM EDUCATION OPPORTUNITIES AWAIT! Let us bring the field trip to you! Great Lakes Energy Service, Inc.'s Renewable Energy Mobile Classroom is packed with hands-on learning stations that are designed to encourage inquiry and develop understanding of the mechanics of renewable energies. For more information, visit www.greatlakesenergyservice.org or call (517) 669-5389.




Save The Date

Come Celebrate!

Michigan Science Teachers Association's

60th Annual Conference

March 8-9, 2013

At Eastern Michigan University's

NEW **Science Building & Student Center**

(Professional Development sessions will be offered on Thursday, March 7, 2013

Michigan Math & Science Centers Are Making Engineering Fun

Hands-On Family Engineering Nights based on Michigan Tech Program

The Michigan Mathematics and Science Centers Network (MMSCN) hosted a total of 58 Family Engineering events from January to May 2012 with funding from the National Defense Education Program and Square One Education Network. All 33 math and science centers in Michigan held at least one event reaching nearly 5000 elementary students and their parents throughout the state.

The 2,852 K-5 students attending the Family Engineering events participated in a pre/post test of five questions to measure their change in understanding and interest in engineering and engineering careers. On a scale of 1-5, an increase of 0.5-1.25 was measured across all grades K-5.

Each math and science center attended a training workshop and received a copy of the recently published *Family Engineering Activity & Event Planning Guide* (2011) developed by Michigan Technological University and their partners, the Foundation for Family Science & Engineering and the American Society for Engineering Education, with funding from the National Science Foundation. The Family Engineering program is being disseminated across the United States. More information may be found at: http://www.familyengineering.org/

This MMSCN effort is part of the Michigan STEM Partnership (http://mistempartnership.com/), a statewide collaboration of leaders from education, business and industry, philanthropy, economic development, government, military, and other organizations dedicated to elevating STEM literacy and proficiencies in a way that increases Michigan's economic strength to attract and retain desirable jobs.

Elementary school students and their parents participated in a variety of Family Engineering activities--- from designing a prosthetic hand using popsicle sticks, rubber bands, plastic spoons and masking tape that can pick up a marble or a cup, to "mining for chocolate" using a paper clip to remove the chocolate chips from a cookie while trying to keep the cookie intact.

"These activities are a great way to introduce students and parents to the exciting world of engineering and the many possible careers in engineering," says Neil Hutzler, professor of civil and environmental engineering at Michigan Tech. "Family Engineering provides a wonderful opportunity for parents and their children to have fun learning about engineering together."

Hutzler is one of the developers of the Family Engineering Program.

For more information:
Joan Chadde, Education Program Coordinator, Michigan Tech Center for Science and Environmental Outreach and Western U.P. Center for Science, Math & Environmental Education.
Phone: 906-487-3341; Email: jchadde@mtu.edu

Megan Schrauben, President, Michigan Mathematics & Science Centers Network
Phone: 517-768-5281; Email: Megan.Schrauben@jcisd.org

Science Outreach Opportunities

Michigan Science Olympiad Promotes Excellence in Science!

By Michele Svoboda, Mill Creek Middle School, Michigan Science Olympiad Board Member

Michigan Science Olympiad is primarily a volunteer organization with the mission to promote excellence in science education in all Michigan schools. Middle and high school students have the opportunity to demonstrate their expertise and knowledge of scientific concepts in a fun and competitive tournament format.

Science Olympiad is an academic-based program which consists of twenty-three different events encompassing all scientific disciplines. These events mirror current scientific explorations on timely topics such as climate change and alternative energy sources. Many events can be altered slightly to fit into your curriculum. I've used Road Scholar practice materials to help students understand how to read topographic maps and have asked students to build a Mission Possible-type device to learn about energy transfer. There is a correlation to the science standards available on our web page.

The Olympiad is divided into two separate divisions, middle and high school. Teams compete in a regional tournament as a first step. Those teams that qualify may complete at the State Tournament in late April with the top two teams advancing to the National Tournament in May.

Participation in Science Olympiad provides recognition for teams and schools for academic achievement. The diversity of events allows students to explore areas of study that may lead to a career. Parents/guardians, community members, etc. are afforded the opportunity to get involved with the program through a variety of outlets. Coaching events, providing materials or resources, providing transportation to practices or competition, and being a guest speaker are just some of the many ways to participate.

I became involved with Science Olympiad about 16 years ago when I volunteered to coach a middle school event called "Egg Drop." Participants constructed a base that would safely catch an egg when dropped from various heights. Students spent practice time testing and modifying the device before the competition. Our egg survived, but we didn't win a medal. I enjoyed the experience so much that I went on to become Head Coach. Most recently, I have taken a position with the State Science Olympiad Board.

Teams consist of up to fifteen members. Science Olympiad is not only for the academically gifted student, it is for all students who have a desire to be on the team. Students who participate can be as diverse as the events offered. My teams have been diverse, including honor roll students and special education students. Some only participate one year, but most stay for three or four. They enjoy the experience so much that they're already thinking about what they'll do next year before the regional competition has finished. Many of my high school students come back to help coach the middle school if their school doesn't have a team.

There are many ways to run a team for competition depending on how involved you wish to become. You can participate in all twenty-three events or choose to participate in a limited number. Most students will compete in two to four events. Practices are usually held after school and sometimes on Saturdays from one to three hours or more. This is how I ran my team for many years. For the past five years, my middle school has attended the regional competition for fun, rather than focusing on moving to the next level of competition. Most of my students compete in at least two events. Practices were scheduled each week for approximately one hour per event. I only run events that have a coach; however, sometimes that means that I end up coaching six or seven events.

Science Olympiad can be very rewarding for both you and your students. It's fun, it promotes the learning of a variety of science topics, and it can provide wonderful memories for your middle or high school student. It is very simple to register your team. Visit our website: http://www.mi-so.org or the national website: http://www.soinc.org for an introduction.

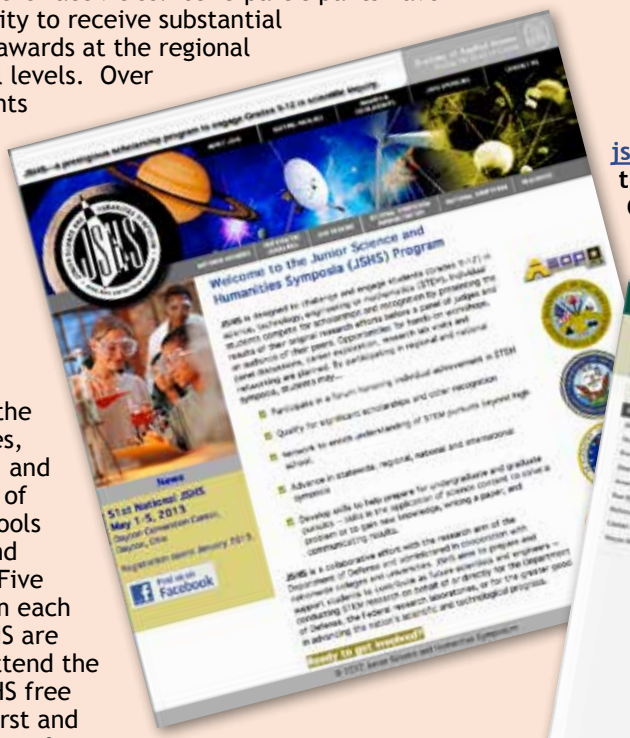
The Junior Science and Humanities Symposium (JSHS):

A Showcase for the Practice of Student Research

By Sandra Yarema, Director at Large

The 49th Annual Southeast Michigan Junior Science and Humanities Symposium will take place on Thursday, March 28 and Friday, March 29, 2013, at the McGregor Conference Center on the main campus of Wayne State University. The Junior Science and Humanities Symposium (JSHS) Program is sponsored by the Academy of Applied Sciences and the U.S. Army, Navy, and Air Force. Since its inception in 1958, the primary aims of JSHS are to promote research and experimentation at the secondary school level and to recognize students for original research achievements.

Every year, high school students throughout southeastern Michigan attend a **no-cost**, two-day symposium, coordinated by the College of Education at Wayne State University, where they present their research and participate in a number of other activities. JSHS participants have an opportunity to receive substantial scholarship awards at the regional and national levels. Over 1,000 students and their teachers participate annually in 48 regional symposia held at university campuses throughout the United States, Puerto Rico, and Department of Defense schools in Europe and the Pacific. Five finalists from each regional JSHS are invited to attend the National JSHS free of charge; first and second finalists from each region present their research at the National JSHS (May 1-5, 2013 in Dayton, Ohio). The first place finalists in each category at the National JSHS (over 400 from 60 nations) are invited to attend the London International Youth Science Forum (July 27- Aug 10, 2013) with all expenses paid.



Significant awards are available to regional and national JSHS presenters. Scholarship recipients must be USA citizens or permanent USA residents.

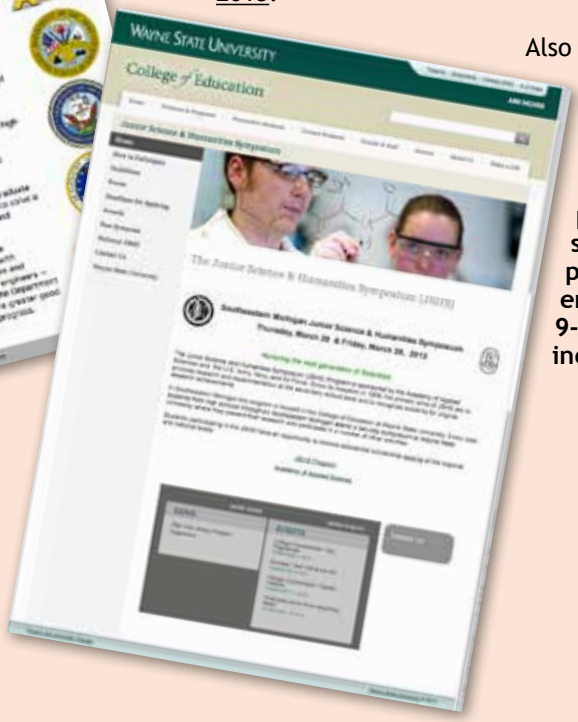
Three scholarships are awarded to the finalists of the *regional JSHS*:

- $2,000 to 1st place
- $1,500 to 2nd place
- $1,000 to 3rd place

These scholarship awards are payable upon matriculation at the university of the student's choice. The teacher of the first place finalist from each region also receives a $500 honorarium. Finalists in each of the categories at the *National JSHS* are additionally awarded:

- $12,000.00 to 1st place
- $8,000, 00 to 2nd place
- $4,000.00 to 3rd place

Please **visit** http://coe.wayne.edu/ted/science/jshs/index.php **to attend or to find out more about the 49th Southeast Michigan JSHS: Nurturing the Next Generation of Scientists.** The deadline for Application forms for students to **Present Research** is January 15, 2013.



Also visit the national website http://www.jshs.org/ for more information about **JSHS- a prestigious scholarship program to engage Grades 9- 12 in scientific inquiry.**

Calling Science Students!!

World of 7 Billion Video Contest

Bring technology and creativity into your high school science classes by incorporating the World of 7 Billion video PSA contest into your syllabi. Challenge your students to create a 30- to 45-second video PSA illustrating the connection between world population at seven billion and one of the following: food security, wildlife habitat, or the global status of women/girls. Students can win up to $1,000, and their teachers will receive free curriculum resources. The contest deadline is February 21, 2013. Full contest guidelines, resources for research, past winners, and more can be found at www.Worldof7Billion.org.

Contest for Students

Making a Difference...One Tree at a Time

From Jennifer Hunnell, Education Program Coordinator, Eaton Conservation District, Charlotte, MI

The Michigan Arbor Day Alliance's Go Green Youth Challenge (GGYC) program encourages preK through 12th grade students to help make Michigan greener by collecting coins in an effort to plant trees in Michigan. Prizes are awarded to participating students and all money raised goes directly to funding tree planting projects.

Since its creation in 2011, this program has raised over $36,000 and planted 612 trees across the state and we're looking to expand even further. Please join us by participating in the 2013 Challenge which runs from **January 14 through April 1**.

New for 2013

Announcing the GGYC Creative Writing Contest!

Open to all K-12 Michigan students, our new Creative Writing Contest is an addition to the program and will coincide with the coin collection timeline. Youth are encouraged to utilize their originality and imagination to tell us **"What Do Trees Mean to You?"** Any type of creative writing (essay, short story, poem, etc.) is eligible. Through the use of creative expression, we hope participants will gain a greater feeling of connection and appreciation for our state's natural resources.

Details, tips and resources can be found on our website at www.miarbordayalliance.com/ggyc. If you have questions or would like to receive our newsletter, email us at miarborday@gmail.com. We're also a part of the social networking world! Follow us on Facebook or Twitter and get all the latest updates. Just search for 'Michigan Arbor Day Alliance.'

The Michigan Arbor Day Alliance is a program of the Eaton Conservation District in Charlotte, MI.

Are You Getting All of Your Member Benefits?

Did you know these museums may offer discounts to MSTA members? Check them out!

A.E. Seaman Mineral Museum
Focus: Minerals
Address: 5th Floor EERC Bldg. CM Tech Center, Houghton, MI 49931
Phone: 906-487-2572
Website: www.museum.mtu.edu
MSTA Member Benefits: 10% Discount in Museum Gift Shop

Air Zoo
Focus: Science and history of flight
Address: 6151 Portage Road, Portage, MI 49002
Phone: 269-382-6555
Website: www.airzoo.org
MSTA Member Benefits: None at this time.

Ann Arbor Hands-On Museum
Focus: Interactive Science and Technology Museum
Address: 220 E. Ann St, Ann Arbor, MI 48104
Phone: 734-995-5439
Website: www.aahom.org
MSTA Member Benefits: Admission fee waived to MSTA members with current membership card and ID.

Impression 5 Science Center
Focus: Hands-On Science
Address: 200 Museum Drive, Lansing, MI 48933-1912
Phone: 517-485-8116
Website: www.impression5.org
MSTA Member Benefits: Purchase an Impression 5 Family or Grand Parent membership, at a 10% discount off purchase of same, with proof of MSTA membership. Regular price of family membership is $60; Grand Parent is $55, with reduced or free admission to over 400 science centers and children's museums.

Iron County Museum

Focus: Iron County History & Art
Address: 103 Museum Road, P.O. Box 272, Caspian, MI 49915
Website: www.ironcountyhistoricalmuseum.com
MSTA Member Benefits: None at this time

Kalamazoo Valley Museum
Focus: Showcases a wide variety of historical, technological exhibits and hands on activities.
Address: 230 North Rose Street, Kalamazoo, MI 49003
Website: www.kalamazoomuseum.org
MSTA Member Benefits: none at this time.

Kingman Museum
Focus: Natural history (plants, animals, dinosaurs culture, ice age, human body, planetarium, astronomy)
Address: 175 Limit Street, Battle Creek, MI 49037
Website: www.kingmanmuseum.org
MSTA Member Benefits: 10% Gift Shop discount for MSTA members. Group rates are available.
Additional Details: Additional Details: Kingman Museum is open Saturdays and Sundays from 1 to 5 pm. Admission is $7 for adults, $6 for seniors, and $5 for students. This includes the Planetarium shows. Open weekdays by appointment only. Group Rates are available. Call 269-965-5117 for more information.

Michigan Science Center
Focus: Hands-on museum that inspires children and their families to discover, explore and appreciate science, technology, engineering and math in a fun, dynamic learning environment.
Address: 5020 John R. Street, Detroit, MI 48202
Website: www.Mi-Sci.org
MSTA Member Benefits: Receive 20% discount off any level of membership to the Michigan Science Center (Mi-Sci). Mi-Sci membership include FREE general admission for an entire year, deeply discounted or FREE admission to Planetarium, IMAX, and special exhibitions, exclusive invites to member events and previews, special pricing on workshops, camps and more!

The Great Lakes Children's Museum
Focus: See, touch, explore and discover water and the Great Lakes in our hands-on, interactive gallery.
Address: 13240 SW Bayshore Drive, Traverse City, MI 49684
Website: www.greatlakeskids.org
MSTA Member Benefits: Admission fee waived for MSTA members with current member card and ID.

U of M Exhibit Museum of Natural History
Focus: Prehistoric Life and Evolution, Michigan Wildlife, Human Cultures, Planetarium
Address: 1109 Geddes Ave., Ann Arbor, Mi 48109-1079
Website: www.lsa.umich.edu/ummnh
Phone: 734-764-0478, Fax: 734-647-2767
Group reservation coordinator: Marina Mayne 734-764-0480
Assistant Director of Education: Kira Berman 734-647-8574

The Fledgeling

The Fledgeling flies! MSTA science lessons for elementary teachers is published as a recurring feature in the MSTA Newsletter. Establishing good science practices are essential for a solid science program. This is true for all age groups. Through hands-on, Inquiry based science, special needs students are achievers too! The Fledgeling is edited by Sally DeRoo, MSTA.

SNOW, SNOW AND MORE SNOW: THOUSANDS OF TINY ICE CRYSTALS, FORMED IN THE CLOUDS, FALLING TO THE GROUND. NO TWO CRYSTALS ARE ALIKE. THOUSANDS OF SNOWFLAKES, THOUSANDS OF DIFFERENT PATTERNS. THE PATTERN IS DESIGNED AROUND A SOLID CENTER. THE CENTER IS THE COMMON POINT OF THE SNOWFLAKE. EVERY SNOWFLAKE MUST HAVE SIX SIDES OR BRANCHES ATTACHED TO THE CENTER. THE CENTER IS A SOLID PARTICLE: "COSMIC DUST?" THE ICE CRYSTALS RADIATE OUT FROM THE CENTER.

CLASSROOM INSTRUCTION

Provide some background information as to the formation and design of snowflakes. Prepare the students as to "what" they are to look for and "observe" when observing falling snow. Search for photographs of snowflakes to share. Using the diagram provided, make a few snowflakes to demonstrate the design and pattern to observe. Remember: DO NOT CUT OUT THE CENTER. A SNOWFLAKE MUST HAVE SIX SIDES AND A CENTER.

Observing snowflakes

Collect and observe snowflakes during a light snowfall.

YOU NEED:

Warm clothing for all students is a must! Black construction paper, a clip board or firm writing surface (cardboard), pencil, hand lens, plain paper, scissors, string, tape, white chalk or white pencil, outdoor thermometer, science journal.

OUTDOOR OBSERVATIONS:

1. Assign the students into groups of three. Assign duties: Recorder, etc.
2. Supply each group with a hand lens, clip board, black paper, pencil and journal data sheet (plain paper) and thermometer.

OUTDOOR OBSERVATIONS: *continued*

3. Instruct students to record the date, time and temperature on the journal data sheet (see sample on page 23.)
4. Hold the black construction paper as "flat" as possible. Collect the snowflakes and take turns observing the patterns. If students are very quiet, they will hear the ice crystals hitting the paper.
5. Question if the snowflakes fall as single flakes or are they in a bunch?
6. Students should quickly record the patterns they observe. Count the sides and look for the center point.

CLASSROOM FOLLOW UP:

1. Upon returning to the classroom, compare notes and listen to student reports as to their observations.
2. Provide each student with black paper and chalk to record via illustrations, the patterns of the snowflakes they may have observed.
3. Groups should share their experience as record the events in their SCIENCE JOURNAL.
4. Provide the clear paper and scissors to cut out snowflakes. Once again note, no two flakes will be alike, variety is wonderful. For younger children, it maybe necessary to pre fold the snowflake patterns and mark the cutting lines. Do consider children with coordination difficulties.
5. Attach the snowflakes to a string and hang them around the room to form an "indoor snowstorm."
6. Ask students to research the formation of snowflakes. Do go beyond the internet and select reading supplements.

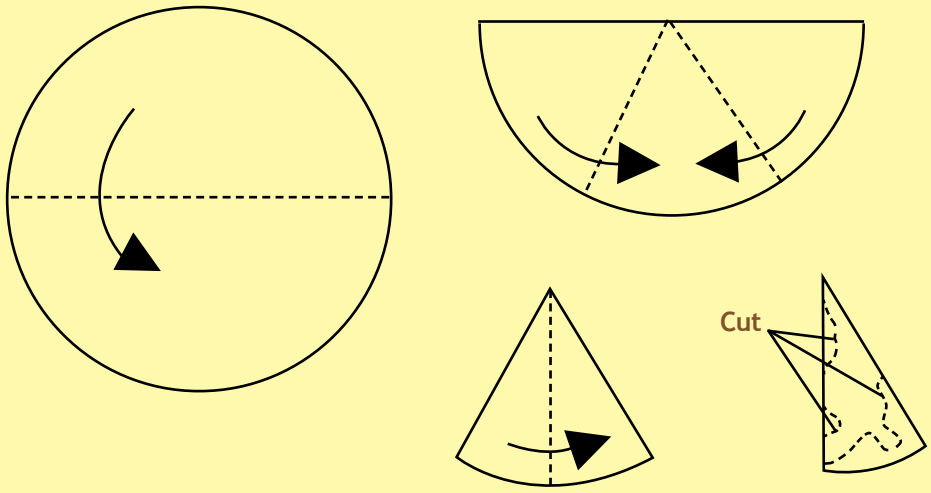
Students can learn that a developing snowflake requires specific atmospheric conditions as to moisture, temperature and altitude of the snow forming clouds.

A snowflake begins to form around a tiny particle of dust in a cloud. When the water freezes it collects and freezes around the center. Scientists learned that heat is released as the water freezes. The heat produces the environment in which the snowflake is formed. According to the International System of Grouping, there are at least ten different types of snow and ice crystals. The grouping is based the structure of the crystals.

Make A Snowflake - Pattern

Start with a circular piece of paper. Fold the circle in half. Then fold in half again (see diagram). Cut a pattern into the paper being careful not to cut the center Finally, cut the pattern at an angle at the top folded edge. The "cut" will form the six sided shape of the snowflake.

It might take a little practice if this is the first time you have cut a snowflake.



Science Journal Data Sheet

	Date	Time	Temperature	Snowflake Observation/Notes
Snowflake #1				
Snowflake #2				
Snowflake #3				

Fledgeling snowflake reference books for students:

McVey, Vicki, *The Sierra Club Book of Weatherwidom*, Scholastic: ISBN 0-059-20725-3

Martin, Jacqueline Briggs, *Snowflake Bentley*, Hougton Mifflin Company, Boston ISBN: 0-395-86162-4

We would like to hear from you. Contact MSTA at scampbell@managedbyamr.com and let us know how we can help you with the challenges of Teaching Good Science. Be sure to use "*Teaching Good Science*" in the subject line.

Explore the good, the bad and the uncomfortable about how your body works at *Grossology: The (Impolite) Science of the Human Body* at Imagination Station, coming May 18, 2013.

Sometimes it's stinky; sometimes it's crusty; and sometimes it's slimy. Explore why your body produces mushy, oozy, crusty, scaly and stinky gunk at *Grossology: The (Impolite) Science of the Human Body* during its appearance at Imagination Station on the Downtown Toledo riverfront.

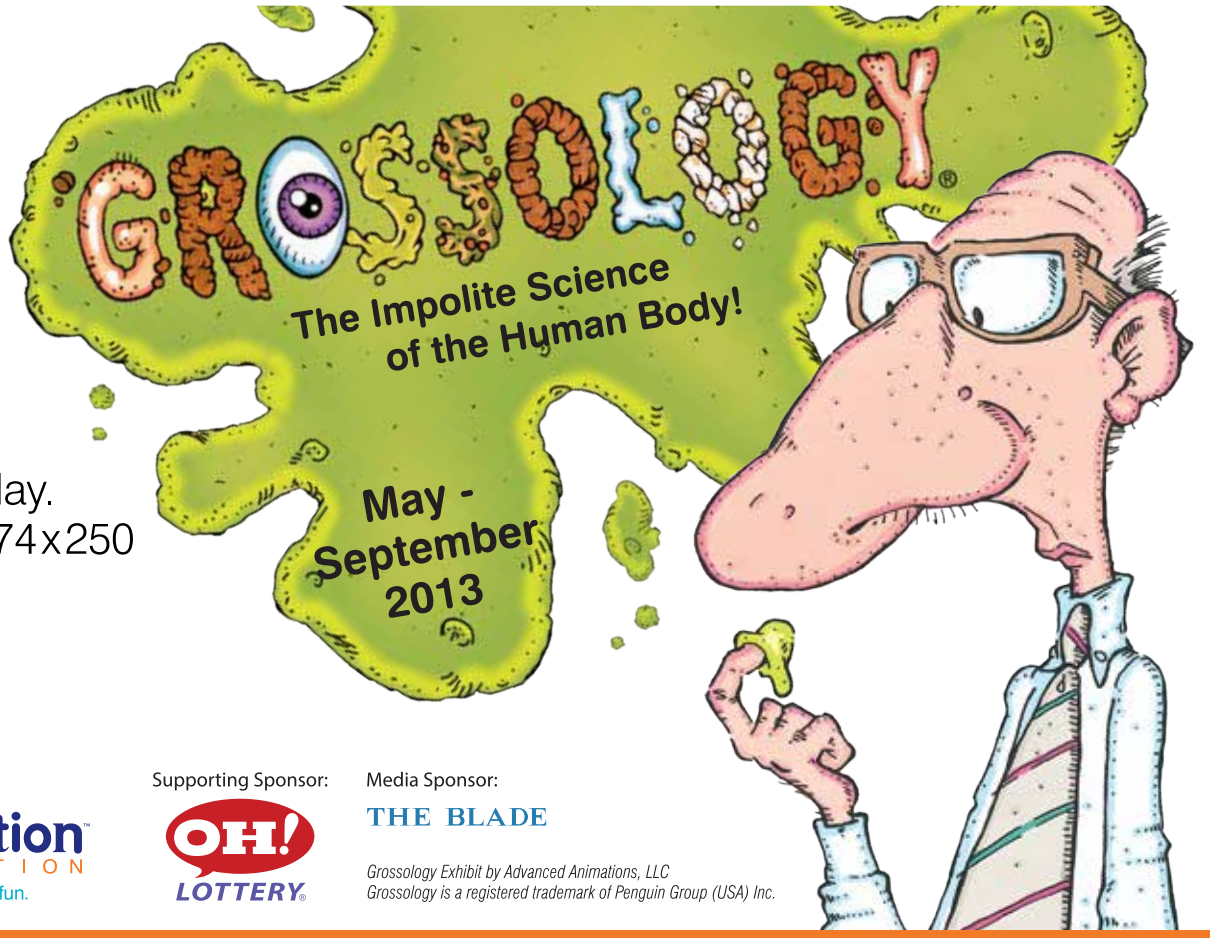
Based on the best-selling book *Grossology*, this exhibition uses sophisticated animatronics and imaginative exhibits to tell you the good and the bad about runny noses, body odor and much more. Grossology will be featured at Imagination Station until September 2013.

Take a "Tour du Nose" to explore 10 nasal features, including how your snout acts as an air filter, a smell sensor and a mucus producer. Play the pinball game "Gas Attack" by scoring off bumpers dressed up as food items that cause gas. Mimic the build up of acid indigestion by causing the "Burp Machine" to release a giant belch. Explore the role of the kidney in a virtual reality experience in "Urine: The Game." Take a ride on the GI slide, climb a large-scale replica of human skin, and discover other mysterious ways your body's biology does what it needs to do to keep you healthy.

Grossology is a collaboration between Science World, Advanced Exhibits, and *Grossology* author Sylvia Branzei. As a teacher, writer, curriculum designer and microbiologist, Branzei explains the concept of Grossology as a learning tool. "This is science in disguise," she says. "If we teach students in their own words, they'll understand better and actually learn something.

Grossology is supported by the Ohio Lottery. Media Sponsor is The Blade.

For more information or to book a field trip, call 419.244.2674 ext. 250, or visit **imaginationstationtoledo.org**. You may be eligible to receive **Adopt-a-School funding** to bring your classroom to Imagination Station for free.



Book your field trip today.
419·244·2674x250

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Grossology Exhibit by Advanced Animations, LLC
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Pure Michigan *Science*

THE NEXT GENERATION

MSTA Registration Form

MSTA 60th Annual Conference - March 8-9, 2013
Eastern Michigan University, Science Building & Student Center - Ypsilanti, Michigan

Note: Early Bird Deadline Ends February 11, 2013.
Please use ONE FORM for each registrant (photocopy if necessary).
*All confirmations and communications will be done via e-mail. You MUST provide a valid e-mail where this information can be sent.

Registration Information:

Print first and last name here as you wish it to appear on your name badge.

First Name Last Name

Full Name of School/Institution/Business Name

Preferred Address: ❑ Home ❑ School ❑ Business

Street Address

City State Zip

County Daytime Phone

E-mail*

Primary Responsibility:

❑ School District/Central Administration ❑ Lower Elementary (K-2)
❑ Upper Elementary (3-5) ❑ Middle/Junior High School (6-8)
❑ High School (9-12) ❑ College

Discipline:

❑ Biology ❑ Chemistry ❑ Earth Science ❑ Physics
❑ General Science ❑ Other: _____

Payment Information:

No Purchase Orders Accepted! Note: Billing address and name on card has to be *as it appears on the credit card billing statement or card will not be processed*.

❑ Credit Card: ❑ Visa ❑ MasterCard ❑ Check/Money Order:_____

Make checks payable to Michigan Science Teachers Association (MSTA)
(Tax ID# 38-2320469)

Name on Card

Billing Address

Billing City/State/Zip

Signature Date

Card Number CVV Code* Exp. Date
*3 or 4 digit code on back of card

MSTA Member Specials!

Member Type:

❑ Member ❑ Non-member ❑ Joint Member ❑ Institutional Member

MSTA Membership Dues*:	Fee	Total
MSTA New Member	$45**	$____
MSTA *Emeritus (Retired)* Membership Renewal	$30**	$____
MSTA College Student Dues (*Full-time Undergrad or Graduate*)	$30**	$____
MSTA *Individual* Membership Renewal	$45**	$____
MSTA *Family* Membership Renewal	$50**	$____

*By paying MSTA Dues you are eligible to pay member rates for conference registration.
**You may deduct $10.00 from the Membership fee if you choose NOT to receive Journals via the mail. You will receive an e-mail when Journals and Newsletter are available on-line.

Joint Membership Dues†:	Fee	Total
Joint Membership	$60†	$____
Joint Institutional Membership	$175†	$____

†By paying Joint Membership dues you automatically become a member of MSTA, MCSS, and MCTM and are eligible to pay member rates for conference registration.

Member Registration Specials: *All registrations MUST be sent in the same envelope.*	Fee	Total
2 Day "Team" Registration Class A&B Schools (*must send at least 5 registrations) - Save $10 per person!*	$80 x _____	$_____
2 Day "Team" Registration Class C&D Schools (*must send at least 3 registrations) - Save $10 per person!*	$80 x _____	$_____
2 Day Registration 1st Year Teacher OR 1st Time Conference Attendee	$80 x _____	$_____

Registration Options:	Fee	Total
Members:		
Registration One Day: ❑ Friday or ❑ Saturday (*$105 after February 11, 2013*)	$65	$____
Registration Two Day (*$115 after February 11, 2013*)	$90	$____
Student and Emeritus Registration One Day:** ❑ Friday or ❑ Saturday (*$45 after February 11, 2013*)	$20	$____
Student and Emeritus Registration Two Day:** **Must be a FULL time undergrad student. Grad students need to pay regular registration rate. (*$60 after February 11, 2013*)	$35	$____
Non-teaching Spouse	$35	$____
Non-Members:		
Registration One Day: ❑ Friday or ❑ Saturday (*$160 after February 11, 2013*)	$125	$____
Registration Two Day (*$185 after February 11, 2013*)	$150	$____
Student* and ❑ Emeritus Registration One Day: ❑ Friday or ❑ Saturday (*$85 after February 11, 2013*)	$65	$____
Student* and ❑ Emeritus Registration Two Day: *Must be a FULL time undergrad student. Grad students need to pay regular registration rate. (*$100 after February 11, 2013*)	$80	$____
Non-teaching Spouse	$35	$____

Other Registration Options:	Fee	Total
Friday Luncheon (*11am-1pm*)	$25	$____
SB-CEUs	$15	$____
Please consider making a donation to the Michigan Science Teachers Association. Funds collected will be used in the advancement of Science Education throughout Michigan.		Total
❑ $2 ❑ $10 ❑ Other - please indicate amount $_____		$____
Total	Grand Total	$____

For early registration rates, registration and payment MUST be received by February 11, 2013. Submit your registration by mail to: MSTA, 1390 Eisenhower Place, Ann Arbor, MI 48108 or FAX to (734) 677-3287 when paying by credit card. On-line registration is also available at the MSTA website - www.msta-mich.org. **Registrations after February 11th are subject to late registration rates and MUST be done on-site at the conference. Payment must accompany each registration.** No refunds will be made after February 20, 2013 (request must be made in writing). Substitutions may be made on or before February 20, 2013. *MSTA is a professional conference. Attendance for Friday and Saturday is designed for attendees 18 years and older. No children will be allowed to attend (EXCEPT for Thursday evening Vendor Open House).*

MILK: NUTRIENT POWER HOUSE

An 8-ounce serving of milk, flavored or not, gives kids as much ...

- **Vitamin A** *as 2 hard boiled eggs*
- **Riboflavin** *as 1/3 cup of whole almonds*
- **Phosphorus** *as 1 cup of canned kidney beans*
- **Vitamin D** *as 3/4 ounce of cooked salmon*
- **Calcium** *as 10 cups of raw spinach*
- **Potassium** *as one small banana*

USDA National Nutrient Database for Standard Reference, Release 24

Nutrients included are either a good/excellent source in one 8-ounce serving of lowfat milk and lowfat flavored milk, and/or nutrients lacking in America's diets.

got milk?®

MilkPEP® Milk Processor Education Program

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Got Questions? Call 1-800-241-MILK (6455)
WWW.UDIM.ORG