InterChange Newsletter

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November 2011 Volume 18, Number 7 From the Regional Math & Science Center at Grand Valley State University Our Vision: *Math and Science: Excitement in Learning for Success in Living*

Our Mission: *Provide and coordinate leadership, programs and services to achieve excellence for all in the teaching, learning and application of mathematics and science*

Still Time left to Register for Fall Science Update

The Regional Math and Science Center cordially invites you to attend the 27th annual Fall Science Update. This full-day seminar will take place on Wednesday, November 16, 2011 from 8:00 a.m. to 3:00 p.m. on Grand Valley State University's Pew campus. The theme for this year is, Cultivating Critical Thinking in Science. At the event, each participant will receive a free copy of the booklet, The Miniature Guide to Critical Thinking, Concepts and Tools by Dr. Richard Paul and Dr. Linda Elder.

Calling All MSO Coaches! Michigan Science Olympiad, Region 12 Coaches Meeting at GVSU

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The Target Inquiry (TI) program at GVSU is expanding! TI was originally developed in implemented at GSVU as a professional development program for high school chemistry teachers.

Place-Based Education Conference at the Kellogg Center in East Lansing

Join us for Michigan's first Great Lakes Basin-wide gathering about place-based education.

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Math in Action 2012 will be held on Saturday, February 25, 2012, in Mackinac Hall on the Allendale Campus of Grand Valley State University.

Area Students Experience Health Profession Careers at Summer GVSU sHaPe Camp

Local middle school students had the opportunity to experience health careers through the Grand Valley State University (GVSU) sHaPe day-camp in July 2011. Celebrating STEPS Summer Camp for Girls

Grand Valley State University celebrated the tenth year of the Science, Technology, and Engineering Preview Summer (STEPS) Camp for Girls. The Seymour and Esther Padnos College of Engineering and Computing hosted the two consecutive weeks of camp on June 18-21 and June 25-28, 2012.

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Alien, yet familiar, the planet Mars has always tugged on our collective urge to imagine and explore. Today, thanks to advancements in space technology, a trip to the Red Planet lies on our horizon.

Calendar of Events

Science and Math Update

Grand Valley faculty contribute insights into current science and mathematics topics through these provocative, in-depth articles.

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This event includes two keynote speakers with an educational emphasis on critical thinking. The elementary keynote speaker is Robby Cramer. She currently works as an Education Specialist at the Van Andel Education Institute where she teaches in an afterschool cohort program, writes inquiry-based science curriculum materials, and develops programming for students and teachers, provides staff development for teachers, and evaluates science inquiry programming.

The second keynote speaker is Dr. Christine Rener. She currently serves as Director of the Robert and Mary Pew Faculty Teaching and Learning Center at Grand Valley State University. Dr. Rener coordinates a suite of professional development opportunities, assisting faculty as they incorporate research-based pedagogical practices into their teaching. She serves as a consultant in the areas of student learning outcomes assessment and strategic planning. Dr. Rener also presents widely on topics such as assessment, collaborative learning, student motivation, and active learning practices.

Additionally, there will be thirty-two breakout sessions on various science topics and a luncheon. The sessions will provide content information and teaching strategies for K-12 teachers in biology, chemistry, Earth science, environmental science, physical science, and physics. Some sessions will feature best practice teaching strategies as well as tools for the classroom.

Pre-service teachers are highly encouraged to attend.

The brochure and registration form for this years event is posted under "Upcoming Events" on our website. The deadline for this years registration has been extended to November 9th. If you have any questions or comments please call (616) 331-2267 for more information.

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Calling All MSO Coaches!

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This years Michigan Science Olympiad Regional Tournament will be held on Saturday, March 24, 2012 on the Allendale campus of Grand Valley State University. GVSU has been very pleased to host the Science Olympiad Regional Tournament. This years tournament will celebrate its 28th year at GVSU. Last year, 50 middle school and 23 high school teams from Ottawa and Kent Counties competed. Each year, more schools and more students join in the excitement of learning science, mathematics, and technology through competition.

If your school is involved, or interested in sponsoring a team, you are invited to attend! Please register on-line for this opportunity by visiting our website or contact the Regional Math and Science Center at (616) 331-2267.

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Target Inquiry is Expanding! The Target Inquiry (TI) program at GVSU is expanding! TI was originally developed in implemented at GSVU as a professional development program for high school chemistry teachers. It was designed to help teachers improve the quality and frequency of their inquiry-based instruction. Teachers in the program conducted a summer research program alongside chemistry research faculty, became familiar with the chemistry education research literature, and developed and implemented inquiry-based activities in their classes. This program resulted not only in teachers transforming their teaching, but also in increased student engagement, comprehension, and retention. Teachers in the program have also had the opportunity to present their work at regional and national meetings. Some of the teachers have also published their work in peer reviewed journals such as the Journal of Chemical Education and the Science Teacher. We are now excited to report that we are expanding the TI program to include the other science disciplines (biology, geology, and physics). We are currently recruiting 15 TI teachers as well as 15 comparison group teachers from middle and high school teaching in the areas of biology, chemistry, geology, and Earth science; to begin in January 2013. A recent grant from the National Science Foundation and support from GVSU will provide support for TI and comparison group teachers. To download, for free, any of the teacher developed TI materials or to learn more about the TI program please check out our website. We are currently updating our website to reflect the expansion of the program which we hope to have completed by December 2011. If you are interested in being considered for the next TI cohort or as a comparison group teacher or would like more information about this, please contact our administrative coordinator, Janet VanRhee (vanrheej@gvsu.edu), to be put on our contact list. Application Deadline is April 30, 2012.

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Place-Based Education Conference at the Kellogg Center in East Lansing Join us for Michigan's first Great Lakes Basin-wide gathering about place-based education. Organized by the Great Lakes Stewardship Initiative and sponsored in part by the Great Lakes Fishery Trust, this meeting brings together practitioners in formal and non-formal education, local partners from communities across the region, and other organizations that provide vital leadership and resources to the cause of developing the next generation of environmental stewards of the Great Lakes. The two-day conference features keynote speakers, presentations about promising practices, poster sessions, panel discussions, forums for communities of practice, access to resources about place-based education, and many opportunities to network. 9: 30 AM □ 5:00 PM, Wednesday, November 9 8:00 AM □ 4:00 PM, Thursday, November 10 **SPECIAL GUESTS:**

CHRIS HEETER: Founder, Wild Institute DAVID T. SOBEL: Director of the Center for Place-based Education and Teacher Certification Program, Antioch University, New England DORIS TERRY WILLIAMS: Executive Director, Rural School and Community Trust JON YODER: Science Program Assistant, Salem-Keizer School District To register, visit the conference website. The conference will be held at Kellogg Center in East Lansing (when calling to reserve a room: use Promo Code: PSC103011).

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Save April 25, 2012 for the Michigan High School Math and Science Symposium The Michigan High School Math & Science Symposium (MHSMSS) will be held on Wednesday, April 25, 2012 at the GVSU Eberhard Center on the Pew Campus of Grand Valley State University in downtown Grand Rapids. The symposium gives students who have worked on a science research project under the mentorship of a teacher or scientist the opportunity to present their research findings to a group of peers in a setting that resembles a meeting of professional scientists. The program begins with several student presentations to the entire assembly and then breaks into smaller classroom size groups for the remaining presentations. Students can participate by presenting a project or attending as an observer. Teachers are invited to bring students who may be interested in research or contemplating a project for the next academic year. Many former participants have received recognition and scholarships for the research work they have done. A publication of the proceedings of the symposium that spotlights the students presentations and achievement in science is sent to colleges and universities in Michigan. The institutions of higher learning hold this kind of activity in very high regard. Please visit the Regional Math and Science Center website for Registration Information, Guidelines, FAQ, and Call for Proposals. All applications are due by April 11, 2012. For additional information, contact the state coordinator, Paul Bigford at paulbigford@hotmail.com or call (231) 898-2633. You may also contact the Regional Math and Science Center at Grand Valley for registration information at
(616) 331-2267.

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Contribute to Math in Action Math in Action 2012 will be held on Saturday, February 25, 2012, in Mackinac Hall on the Allendale Campus of Grand Valley State University. We are currently seeking proposals from classroom teachers, mathematics coordinators and curriculum directors, mathematicians, and mathematics educators. Conference and speaker proposal information can be found on the Math in Action website. Please save the date! If you plan to present, please submit your proposal as soon as possible.

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Area Students Experience Health Profession Careers at Summer GVSU sHaPe Camp Local middle school students had the opportunity to experience health careers through the Grand Valley State University (GVSU) sHaPe day-camp in July 2011. The Summer Health Activities and Professions Exploration (sHaPe) program gave area middle school students, mostly from urban Grand Rapids and Wyoming, hands-on exposure to various health professions.

The sHaPe program is designed for students entering 8th or 9th grade - a key time when students are considering careers. Sessions were held at the GVSU Cook-Devos Center for Health Sciences in downtown Grand Rapids. This is the second year the camp was offered. The camp was held over two, one week sessions. The students actively learned about the professions of physician assistant, nursing, and radiology; explored therapies and developed compassion for disabled patients through occupational therapy, physical therapy, and speech-pathology; and used state of the art equipment that introduced them to the field of medical lab science. Each day the students were served healthy lunches and snacks. They also exercised in fun ways (including a Zumba aerobics lesson), and participated in other activities which taught them the importance of living a healthy lifestyle. A Meijer dietician presented the □NuVal□ system of choosing healthy foods in the grocery store and the Red Cross of Ottawa County taught the students CPR.

One of the main goals of sHaPe is to make this opportunity available to minority students in Grand Rapids Public Schools. sHaPe was sponsored by the Meijer, Inc. and GVSU Regional Math and Science Center, College of Health Professions, Kirkhof College of Nursing, and Office of Inclusion and Equity. Due to sponsorships these students were able to attend the camp free of charge. In addition, transportation was provided to and from camp for those who needed it. Sixty percent of the participants were from minority populations, including African American, Asian, Hispanic, and Mixed Race.

The camp was an overwhelming success. Students were excited to learn and experience the health professions hands-on and make new friends. They were also interested in improving their personal health and had a greater interest in specific health careers. One student commented, □It was a wonderful learning experience and was also very fun and interactive□.

For more information on sHaPe 2012, visit the RMSC sHaPe website.

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Celebrating STEPS Summer Camp for Girls

Grand Valley State University celebrated the tenth year of the Science, Technology, and Engineering Preview Summer (STEPS) Camp for Girls. The Seymour and Esther Padnos College of Engineering and Computing hosted the two consecutive weeks of camp on June 18-21 and June 25-28, 2011. (STEPS) is an all-girl day camp introduction to the world of science, technology, and engineering. Program activities included designing, manufacturing, and flying a radio-controlled airplane. Students crafted their own airplane using power tools, jigs, and fixtures with enthusiastic support from GVSU engineering faculty and students, community groups of radio-control airplane hobbyists, and other community volunteers. Each team of approximately 10 girls was supervised and mentored by a female GVSU Engineering student. Each camp also scheduled a number of recreational activities that included swimming, geocaching, and a climbing wall. The weeks wrapped up with a Fly Night Graduation ceremony where the girls got to fly the airplanes that they built at a sanctioned fly field in Allendale, Michigan. Camp registration is open to any female Michigan resident, between the ages of 11 and 13, that will be going into the 7th grade in the fall of 2012. Further information about STEPS Camps can be found by downloading a brochure and application from www.gvsu.edu/steps/ after December 16, 2011. You can also contact the Padnos College of Engineering and Computing at (616) 331-6025 or pcec@gvsu.edu, or contact your schools principal or 6th grade teacher.

The success of STEPS Camps is due in large part to the volunteers. Volunteer opportunities are open to anyone with education, science, technology or engineering experience. If you are interested in volunteering check on-line at http://www.gvsu.edu/steps/volunteer-documents-1.htm after December 16, 2011 or you can contact Sara Maas at (616) 331-6025 or maassa@gvsu.edu.

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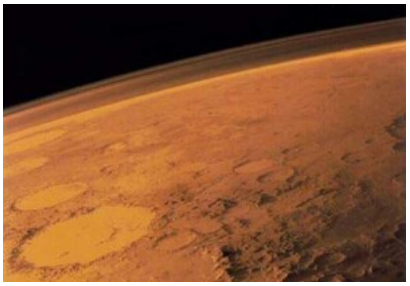

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Facing Mars from the Grand Rapids Public Museum
Alien, yet familiar, the planet Mars has always tugged on our collective urge to imagine and explore. Today, thanks to advancements in space technology, a trip to the Red Planet lies on our horizon. Facing Mars is about that drive to test our limits; to venture into new frontiers. Through 38 hands-on exhibit stations and an interpretive Astronaut Training Lab, this exhibit will challenge visitors both mentally and physically. They will learn firsthand what it takes to plan and undertake a two-year trip to Mars and back, and ponder the exhibit s parting question: Would you go?

Exhibit Themes
Would You Go? Looking for Life Should We Go? Going to Mars - and Getting Back Surviving in Space Living on Mars Getting Emotional

Educator Notes
Exhibit runs from February 11 through May 6, 2012, at the Grand Rapids Public Museum. Strong curriculum links, peaking at 4th grade, but very appropriate content for middle and high schoolers. In addition to astronomy and space exploration, Facing Mars explores a wider variety of STEM disciplines especially relevant here in West Michigan, such as aerospace engineering and medical science. Educational components designed to meet the needs of students with a wide range of learning styles. $4 per person (in addition to Museum admission); includes an additional planetarium show about the effects of outer space on the human body. Special prices for school groups. Supplemental material for classroom use: make use of a hefty Facing Mars educator resource packet for pre-/post-visit lesson planning. More information can be found at http://www.grmuseum.org, or call 616-456-3977.
For more information contact Rickey Ainsworth, Planetarium Manager, at the Grand Rapids Public Museum at (616) 929-1721.

Connections for the STEM Classroom

THE CLIMES, THEY ARE A' CHANGIN'

by Figen Mekik, GVSU Geology

"The spottier the sun, the colder it is."

My students truly believe this when they first arrive into my freshmen level ocean/climate course. It's a tough misconception to correct because it doesn't make sense to them that the sun, in its 11-year sunspot cycle, is at its "coldest" when it is a giant orange ball with no spots. They intuitively think that sun-spots are dark, dark things are not luminous, and therefore dark things must be cold. To the contrary, sunspots are regions of intense magnetism and solar radiation. Why should this misconception be corrected? Because 11-year sunspot cycles determine how cold and snowy our winter is going to be and that matters to folks in Michigan!

Moreover, our sun also has centennial cycles to its luminosity. This is the reason behind the "Medieval Warm Period" (950 - 1250 AD) and the "Little Ice Age" (1250 - 1850 AD). Does it matter that students don't know this? I don't know… But it did matter to the Mayans whose civilization was destroyed largely as a result of prolonged droughts during the Medieval Warm Period. For the Europeans, the Medieval Warm Period was the Middle Ages, and for the Vikings it was a very advantageous time because the north seas were ice-free and they could colonize Greenland. All this simply because the global average surface temperature difference between the Medieval Warm Period and today is a tiny 0.5°C (= ~1°F)!

"Modern global warming is a direct result of the recent increase in our sun's luminosity."

While this notion is certainly very common among students and lay people alike, it is absolutely incorrect. Of course, the energy source that drives our climate system is the sun, and the sun has cycles to its luminosity as I described above; but there are two other major players in the climate system: the albedo of landscapes and the composition of our atmosphere. Albedo is the ability of a surface to reflect light (energy). For example, a region covered with ice has high albedo which means that it reflects about 70-80% of the solar radiation that falls on it. Icy regions become cooler which leads to more ice formation. In essence, ice makes more ice.

The composition of the atmosphere determines how much of the energy that we receive from the sun will be trapped in the lower atmosphere. This trapping of energy is called the "greenhouse effect." Common greenhouse gases are carbon dioxide (CO_2), methane (CH_4) and water vapor (H_2O). The greater the concentration of greenhouse gases in our atmosphere, the more heat will be trapped in the lower atmosphere. This is why so many climate scientists are worried about the human-caused doubling of atmospheric CO_2 concentration in just 100 years!

There's more. Over thousands of years, on a glacial/interglacial timescale, the luminosity of the sun is not as significant in driving climate as where the Earth is in relation to the sun. The Earth's axis has a wobble (precession) with a 23,000-year rhythm, the tilt (obliquity) of Earth's axis changes on a 41,000-year rhythm, and the shape of our planet's orbit around the sun changes from a more eccentric ellipse to a more circular one with 100,000-year and 400,000-year rhythms. The combination of these rhythms are called Milankovitch cycles. Where the Earth is in these cycles determines its general proximity to the sun which can amount to the difference between a glacial and an interglacial.

In a nutshell, the climate system is very complex and is not a simple and direct result of the intensity of our sun's luminosity.

"Warm air moves up, humid air moves down."

That's another commonly held misconception. Warmer air masses are less dense than surrounding cooler air masses, so indeed warm air moves up. But so does humid air; and that is a huge eye-opener for most students. Humid air feels heavy, so why would humid air move up? Because the gases that make up most of dry air, nitrogen (N_2) and oxygen (O_2), have high molecular weight, 28 and 32 respectively. But the molecular weight for water vapor (H_2O) is only 18. So for a humid air mass, where some O_2 and N_2 molecules are replaced by H_2O molecules, the overall average molecular weight is lower than for a dry air mass. Lower molecular weight translates to more kinetic energy for the molecules, and so humid air rises. This creates a low pressure system in the atmosphere. If humid air rises high enough that temperature drops and precipitation begins, we get rain. That's where it clicks for most students because they know from the Weather Channel that generally "low pressure means precipitation."

Why does this matter for understanding climate? Because water vapor is a greenhouse gas and it is also the only gas in our atmosphere with freezing and vaporization temperatures within the natural range of temperatures at the surface of our planet. So it is the only gas in the atmosphere that is not well mixed. Its concentration changes from place to place. This makes water, with all its phases, a major component of our weather. And, climate is the long-term average of weather patterns.

"The expected 5-8°C increase in global average temperature in the next century is no big deal because the average temperature difference between night and day at temperate latitudes is about double that, and the temperature difference is even greater between summer and winter."

That sounds pretty logical, doesn't it? But it's a misconception all the same. The key words here are "global average temperature." Temperature differences between night and day and seasons vary locally and by latitude, but a 5-8°C change in global average temperature is huge. So huge in fact that it is exactly the global average temperature difference between the Last Glacial Maximum - 21,000 years ago - and today. About 6°C of global cooling would result in perennial glaciation all the way to Kansas, like it did during the peak of the last ice age. So, comparing daily and seasonal temperature changes with changes in global average temperatures is misleading.

Lastly, why is any of this important? Why should these misconceptions harbored by our students be corrected? Because climate is changing and we need to adapt. Also because every Earth citizen needs to know the foundational principles behind our home planet's many systems, of which one is climate.

Climate matters not only to climate scientists, but to civilizations, countries, individuals and all living creatures who need to adjust to new climes. If we understand why and how climate changes by understanding basic principles governing our atmosphere, we would be in a stronger position to adapt to climate change. I will leave you with a quote from William Arthur Ward:

"The pessimist complains about the wind; the optimist expects it to change; the realist adjusts the sails."

For more information about climate science go to www.realclimate.org