

INTERCHANGE

November 2004

Volume 11, Number 5

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.*

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Prepare for the sixth annual **Michigan Statistics Poster Competition** and learn how to **combine literature and science**. Stories on *page 3*

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Interested in getting together with other **chemistry teachers**? Want to study the **natural history of Trinidad and Tobago**? Need a **free engineering resource**? It's all on *page 6!*

The **Calendar of Events** covers meetings, workshops, and seminars into the new year, *page 7*

An **evolution education website** is available online and find out why 2005 is the **World Year of Physics** on *page 8*

Don't Miss the 20th Fall Science Update Seminar!

The Regional Math and Science Center cordially invites you to join us as we celebrate the 20th anniversary of the Fall Science Update Seminar on Wednesday, November 17 from 4:00 to 9:00 p.m. on Grand Valley State University's Allendale campus.

The theme for this year is "*Changes in Science Education: Developing a Passion for Science.*" This theme was chosen to reflect the past 20 years of scientific changes and gains in education.

See "Fall Science Update" on *page 2*

Learning by Inquiry

Are you looking for ways to help your students understand and achieve on the state MEAP tests and for the rest of their lives? The Learning by Inquiry series, facilitated by Karen Meyers and Linda Decker of the Regional Math and Science Center, explores the characteristics of inquiry teaching and learning and will demonstrate strategies to help you create a motivating classroom environment. These workshops are based on inquiry learning principles, utilizing a multitude of activities and assessments including video vignettes from the C.P.B. Annenberg project.

See "Inquiry" on *page 2*



Young scientists learn how to collect and record data on the Earth's surface temperature during the GLOBE program. Read more about the GLOBE summer program on *page 2* of this issue.

Fall Science Update

continued from page 1

As always, there will be a wide range of grade-appropriate sessions that you may choose to attend. Sessions will provide content information and teaching strategies in biology, forensic science, chemistry, earth science, physical science, and engineering. Opportunities for student learning adventures at the John Ball Zoo and the Outdoor Discovery Center; both as field trips and/or classroom experiences, will also be presented. Whether you are a new or returning teacher, this mini-conference promises to be an informative and relaxing evening where you can enjoy collegiality with other teachers, as well as take time to explore new trends and ideas in education.

A brochure can be downloaded from the RMSC web site at www.gvsu.edu/rmsc or call (616) 331-2267 for additional information.

INTERCHANGE

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These materials were developed under a grant awarded by the Michigan State Board of Education.

Inquiry

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Topics include: *Understanding Inquiry Learning*, December 8, 2004; *Designing Inquiry Learning*, January 5, 2005; and *Assessing Inquiry Learning*, January 19, 2005. The resource book, *Inquiry and the National Science Education Standards*, will be provided to each participant. Sessions will be held at the RMSC in Henry Hall on the Allendale Campus, GVSU from 8:30 a.m. to 3:30 p.m. The cost of the series is \$150, which includes three full-day meeting dates, lunches, and all materials. For information, contact RMSC at (616) 331-2267. The workshop brochure can be downloaded from our website at www.gvsu.edu/rmsc.

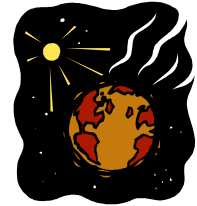
Local Students Work With GLOBE Scientist!

Recently Dr. Kevin Czajkowski of the University of Toledo, lead scientist on a remote sensing and global change NASA research project, visited the Regional Math and Science Center at GVSU. The purpose of his visit was to train area GLOBE teachers and their students how to collect and record data on the Earth's surface temperature using an infrared thermometer.

Globe Learning and Observations to Benefit the Environment (GLOBE) is a worldwide program coordinating the work of students, teachers, and scientists to study and understand the global environment. GLOBE is an international partnership involving countries around the world. NASA is a major sponsor of GLOBE. For the past several years the RMSC, in conjunction with the Annis Water Resources Institute, and the Michigan Environmental

Council, has offered GLOBE training to area teachers through a free, weeklong summer workshop. Visit the GLOBE website at www.globe.gov for more information on the GLOBE program.

Dr. Czajkowski is a GLOBE scientist who is working on a NASA project involving the detection of climate change (global warming) from satellites. He



found out about our program and invited our GLOBE schools to join other students from the Midwest in collecting information about snow, clouds, and surface temperature. Meteorological stations around the earth have shown that the Earth's temperature has increased by 0.8° over the past 100 years. But scientists do not know if the temperature increase is due to humans, a natural occurrence, or errors associated with the measurements. This data will be used to help interpret satellite images, better determining the difference in those satellite images between clouds and snow, and more accurately calculating the Earth's temperature.

Schools that participated in the training and will collect data for this project include: Grand Haven High School, Hudsonville High School, Martin L. King Elementary (Muskegon Heights), Mill Creek Middle School (Comstock Park), Orchard View Middle School (Muskegon), W.C. Abney Academy (Grand Rapids), and Whitehall High School. Kudos to these dedicated young scientists and their teachers!

For more information on next summer's GLOBE workshop, watch the RMSC website at www.gvsu.edu/rmsc.

Get Your Statistics Posters Ready!

The Department of Statistics at Grand Valley State University (GVSU), the Regional Math and Science Center at GVSU, and the Michigan Council of Teachers of Mathematics are pleased to announce the Sixth Annual Michigan Statistics Poster Competition for K-12.

The *NCTM Standards for Curriculum and Evaluation in School Mathematics* presents the vision that problem solving is a primary goal of mathematics instruction and recommends student involvement in statistical activities at all grade levels. According to the *Standards*, and echoed by the benchmarks in Michigan's Curriculum Frameworks, statistical thinking should begin in the primary grades with the creation of student data from class activities. In upper grades, collecting, organizing, summarizing, and interpreting data are emphasized. The statistical poster competition is a powerful tool for attaining these goals while exercising essential communication skills. In addition, the competition provides a means for students to be creative and to have fun.

A statistics poster tells the story of a data set through numbers and graphs. A series of four articles that explain the process used to create a statistics poster can be obtained by visiting the MSPC website at www.gvsu.edu/stat/statposter or by contacting John Gabrosek at (616) 331-3691 or via email at gabrosej@gvsu.edu. All students in K through 12 residing in Michigan are eligible to submit statistics posters to the competition.

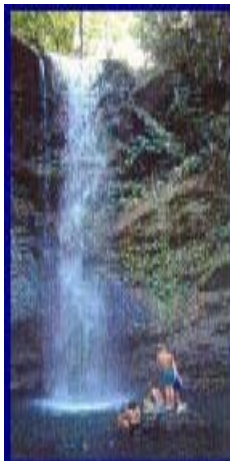
Entries will be judged in four different grade level categories: K-3, 4-6, 7-9, and 10-12. Students may work individually or in teams. For

the K-3 category, there is no restriction on the size of the team; it may be as large as the entire class. For the other three categories, the team may have up to four students.

There is no entry fee. The deadline for submitting a poster to the Department of Statistics at GVSU is February 25, 2005 and prizewinners will be notified by April 1, 2005. First, second, and third place prizes in the amounts of \$72, \$48, and \$36, respectively, will be awarded in each of the grade levels, and winning entrants' schools will receive plaques signifying the honor. Honorable mention certificates will be awarded, as well.

You can register online. Posters can be entered through the competition website www.gvsu.edu/state/statposter.

We had more than 500 entries involving more than 1000 students in last year's competition. We also had the 1st place finisher in the national competition in the 7-9 grade level category, 2nd place finishers in the K-3 and 10-12 grade level categories, and the 3rd place finisher in the 7-9 grade level category! For more information, contact event organizer John Gabrosek at (616) 331-3691 or gabrosej@gvsu.edu.



Interested?
See: "Explore
Nature in Trinidad
and Tobago" on
page 6

Combine Literature and Science

The Regional Math and Science Center invites elementary teachers to attend an all-day workshop that will show them how to successfully integrate reading, writing, and science. The workshop will be led by Battle Creek Math and Science Center's science outreach consultants, Nancy Karre and Jackie Zanotti.

Teachers will learn to:

- recognize the different types of reading and writing opportunities within the science curriculum,
- develop strategies for inquiry that integrate reading, writing, and assessment and has purpose and meaning for students,
- analyze science benchmark clarifications and develop literacy benchmarks that can be developed within the same lessons,
- incorporate meaningful literacy skills in the science classroom using the Battle Creek Science Kit Student Journals and other resources,
- evaluate students' understanding of the concepts taught, with MEAP-like assessments and performance-based assessments,
- develop expectations for written responses at their grade level, and
- select trade books using science and literacy goals.

The workshop is scheduled for Thursday, December 2, 2004 from 8:30 a.m. to 3:30 p.m. in 303 Henry Hall on the Allendale campus of GVSU. The \$45 fee includes continental breakfast and lunch. The deadline for registration is Tuesday, November 16, 2004. Brochures may be downloaded at www.gvsu.edu/rmsc.

The Geologist's Pebble

Douglas Furton, Physics Department

The other day I was talking to a Geologist friend of mine who told me about a pebble she had discovered that held a clue to the concentration of carbon dioxide in Earth's atmosphere 3.2 billion years ago. The walnut-sized pebble, she explained, was found in a core sample drilled from a gold mine in South Africa. The pebble's timeworn surface had been weathered by running water resulting in a composition of quartz and iron-rich carbonate minerals. Pebbles like this one that are weathered in equilibrium with today's atmosphere end up with crusts containing iron-rich silicate and iron oxide minerals. The iron-rich carbonate could have only formed in a chemical environment with very little oxygen.

I wondered why this was important, until I ran into an Astronomer friend of mine who told me about a star he had observed that held a clue to the temperature of the Earth 3.2 billion years ago. The sun-like star, he explained, appears young and cool through the slender line of sight of his telescope. Its shimmering surface emits just 70% of the energy that the sun does today. Stars like this one—and like the sun—blaze brighter as they age to maturity. The sun must have been much less of a source of light and heat 3.2 billion years ago than it is today. And the Earth must have been cooler.

Just how much cooler, a Physicist

friend of mine was later enthusiastic to calculate, assuming the Earth and its atmosphere were back then as they are today. Earth's average global temperature is set by the balance between the energy absorbed from the sun and the energy radiated back into the blackness of space. When the sun was 30% less intense, according to the laws of thermal physics, the balance would have shifted Earth's average global temperature from comfortably above to a

3.2 billion years ago, the sun must have been much less of a source of light and heat than it is today

few degrees below the freezing point of water.

But what about evidence in the geologic record of great quantities of liquid water? What about the formation of life in warm, quiet ponds? The Geologist's pebble helps answer these questions. It is well known that carbon dioxide and other "greenhouse gasses" make it more difficult for Earth's atmosphere to reradiate absorbed sunlight. If the concentration of greenhouse gasses in Earth's atmosphere 3.2 billion years ago was significantly higher than it is today—as the pebble's weathered rind indicates—then Earth may have been on average as warm as it is today in spite of the young, cool sun.

History Of Science: a Livesaver?

Sheldon J. Kopperl, Biomedical Sciences Department

As an historian of science, I am always happy to see that my discipline has found a practical use in contemporary society. I admit, however to being truly surprised to see an article in the October 11, 2004 issue of *The Scientist* discussing a current project at the Mayo Clinic of Rochester, Minnesota.

Briefly, what Eric Buenz and his colleagues have done in the Bioprospecting Historic Texts Project is to have scanned numerous *herbaria* (books describing plants with possible medical value) dating back to the first use of the printing press in Europe (the mid-1400's) into a computer program. This allows the researchers to use character recognition and literature databases to identify plants with therapeutic potential. Interestingly the "herbalists" (people who were interested in medicinal plants) were the first of the scientific investigators of this late medieval/early Renaissance period to use the printing press to produce illustrated books thanks to the new technique of woodcut illustration.

The investigators have even devised a "usefulness" index based on criteria that reflect modern practice. Using this technique, they have found that the 18th century text *Herbarium Amboinense* contains references to nine possible pharmacologically useful plants that have not been found in the scientific literature.

One major problem facing 2004 researchers is that of nomenclature differences. This issue is discussed in the article in a sidebar. An equivalent problem for secondary and post-secondary school teachers and students is the following situation. With all of the relatively new essential material that must be included in an introductory chemistry course, how much time can be devoted to major historical figures in the history of chemistry, let alone early nomenclature. Most of my GVSU senior health science majors know Linus Pauling's name (if at all) only from his vitamin C work.

Try to identify the following by their modern chemical name: *aqua fortis*, *aqua regia*, muriatic acid, oil of vitriol, dephlogisticated air, and fixed air. I shall gladly provide the answers to people who write me at kopperls@gvsu.edu. This is the problem that is most vexing to the research team. If chemistry students do not know these "archaic" names, how can the computer programmers be expected to know them?

Regardless of these difficulties, an automated scanner can run through the texts at 1000 pages per hour. My own research interests are much slower: I am trying to find "hidden" medical ideas in an early medieval Rabbinic text, the Babylonian Talmud, that is a key document in the study of Judaism. While my work is "small scale," the Mayo project leads me to speculate on whether in the near future one will be able to say that the history of science actually saved her life.

Michigan's Ancient Fish

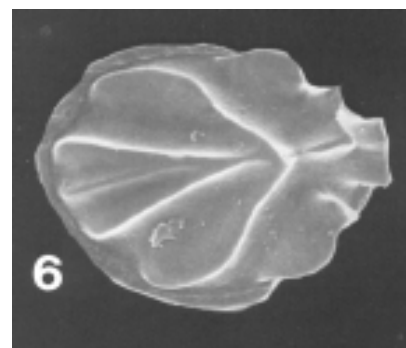
Steve Mattox, Department of Geology

Fish seem part of the culture here in Michigan but some of our rocks have provided critical information about fish evolution. A beautiful cliff of limestone rises above Lake Michigan at Fayette State Park in the Upper Peninsula. Most of us can recognize a brachiopod or a fossil clam but we seldom venture into the realm of microfossils.

our rocks have provided critical information about fish evolution

Careful study of the rocks at Fayette revealed the presence of early vertebrates called thelodonts. These organisms swam in the ocean, above the bottom dwellers like stromatoporoids and corals, and have been a revelation for paleontologists. But you will need more than a hand lens to find these fossils. Researchers collected about ten pounds of rock from several different Silurian exposures. Back at the lab they "digested" the rock by crushing it into small pieces and then dissolving it with weak acid. Only microfossils made of calcium phosphate survived the process. Thelodonts are some of the earliest ancestors to modern fish.

If you are good at Latin you have already translated the name, nipple (*thelo*) scale (*dont*). The Michigan fossils are some of the earliest scales ever found, more than 20 million years before the earliest sharks. The fossils are the scales; complete skeletons have not been found in Michigan. The scales are commonly 0.1-0.8 mm long but some reach about 2.4 mm. Most are oval or tear-dropped shaped and grooved (see below).



The thelodonts themselves were a bit over two feet long and covered with about 20,000 scales (one ten pound sample of rock contained more than 1,000 scales). Some of the scales might have been internal, leading scientists to speculate that they led way for the development of teeth. A tail and sets of fins made thelodonts recognizable as fish.

Based on Turner, Kuglitsch, and Clark, 1999, Llandoveryan Thelodont scales from the Burnt Bluff Group of Wisconsin and Michigan: *Journal of Paleontology*, v. 73, p. 667-676. The research was supported by the Australian Research Council and the family of Jeff Kuglitsch.

These pages are produced by faculty from GVSU.

Chemistry Teachers Share and Learn

The Regional Math and Science Center along with GVSU and the Western Michigan section of the American Chemical Society supported a high school chemistry teacher's workshop at Grand Valley last July. Thirty-eight teachers attended the workshop. The workshop involved lectures by the Flinn teaching staff of well-known high school teachers, demonstrations, and laboratory experiences. Teachers received a 250-page binder of teaching ideas and the inspiration to change the way they teach high school chemistry. In the words of one of the participants, "I was very impressed with the collegial attitude and the spirit of sharing which dominated the five day workshop." Each day featured a time when workshop participants shared their favorite demonstration or teaching ideas.

One of the outcomes of the workshop session was the desire to continue the collegial atmosphere by creating a high school chemistry teachers group that will meet periodically to share teaching ideas. The inaugural meeting was held October 6 at Jenison High School. Twenty chemistry teachers from all over the area attended. Teachers brought demonstrations and teaching tips for Mole day and for teaching first semester chemistry.

The next meeting of the group will be hosted by Grandville High School sometime in December. The date and topics have not been finalized yet. If teachers want to join the group or learn about future meetings or be added to the e-mail list they can contact Alice Putti, chemistry teacher at Jenison High School. She can be reached at (616) 457-3400 (school phone) or by e-mail at ashin@remc7.k12.mi.us.

Explore Nature in Trinidad and Tobago

Trinidad and Tobago was originally part of the South American continent; therefore its flora and fauna are extremely diverse for a country of approximately 1,900 square miles. The islands are 11 degrees north of the equator, a perfect stopping point for Northern or Southern migratory birds, butterflies or anything drifting in the ocean or wind currents. Habitats include Tropical Rain Forest, Savannah, Semi-deciduous Forest, Mangrove Swamp and Marsh Lands. Over 600 species of butterflies and 430 species of birds have been recorded in Trinidad and Tobago. Approximately 260 species of birds breed here and more than 150 migrate from North and South America.

This field course, designated SCI 580, will introduce students to tropical flora and fauna through the study of species indigenous to the Southern Caribbean and South America. The course will also explore the coexistence of indigenous and exotic species as evident in tropical agricultural systems. Students will study the species that inhabit several plant and animal refuges of Trinidad and Tobago.

Students enrolled in this three-credit course will come away with a clear understanding and appreciation of the diversity of Southern Caribbean people. From June 23 to July 9, 2005, you will have an opportunity to be immersed in the culture and spend time with the islanders away from the tourist traps. As you experience the history and cultural geography of these tropical islands you should begin to appreciate what it means to be Caribbean. For additional information please contact Dr. Jann Joseph, GVSU Biology Department, at josephj@gvsu.edu or call (616) 331-3454.

Go Engineering!

Teachers are invited to check out a valuable new resource, a free newsletter from the American Society for Engineering Education (ASEE). The monthly newsletter addresses the growing role of engineering in the K-12 classroom and reaches several thousand K-12 teachers, guidance counselors, and outreach program leaders, who have an interest in promoting science, mathematics, and engineering in the K-12 world.

Go Engineering! explores the many ways that engineers can help teachers make mathematics and science come alive for students. The newsletter covers the exciting successes of K-12 engineering outreach programs, where educators from higher education, industry, and K-12 are using engineering as a vehicle to teach science and mathematics. It highlights news, events, and ideas that illuminate the exciting connections taking shape between engineering and the K-12 classroom. It also examines how these connections are affected by funding and policy developments from Washington and across the country.

A typical issue includes feature articles on topics such as *Visions from Future Engineers* and *I'll Take 7 Weeks of Engineering, Please!*, News Bytes, Factoids- Interesting Facts and Statistics for You to Use in the Classroom, Outreach up Close, and links to related websites. The homepage offers customized links for students, parents, teachers, engineering faculty, corporate partners, and outreach program leaders. To learn more or to sign up for the newsletter, visit: www.engineeringk12.org/newsletter. Another way to sign up is by sending an email to minimalist@asee.org with "subscribe go-engineering" in the subject line.

CALENDAR OF EVENTS

NOVEMBER

2 Tuesday

Elementary Mathematics Series: Geometry & Measurement continues. 4:30–8:30 p.m. on the GVSU Allendale Campus. Series continues November 9, 30 and December 14. For more information contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

3 Wednesday

NEED Energy Education Workshop for upper elementary and middle school teachers from 8:30 a.m. to 3:00 p.m. at the Grand River room of the Kirkhof Center, GVSU Allendale Campus. See story in October issue for details.

9 Tuesday

Elementary Mathematics Series: Geometry & Measurement continues. 4:30–8:30 p.m. on the GVSU Allendale Campus. Series continues November 30 and December 14. For more information contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

12 Friday

Michigan Aerospace Challenge uses various types of rockets to teach math and physics. Designed for middle and high school teachers. Taught by Gregg Zulauf from 8:30 a.m. to 3:30 p.m. at the MAISD Regional Math & Science Center, Room 5 in Muskegon. Contact Barb Smith at (231) 767-7318 for registration, cost, and credit information.

17 Wednesday

Michigan Alliance for Environmental and Outdoor Education Reception. 5:00–7:00 p.m. at Amway Grand Plaza, Grand Rapids, Michigan. Contact Ranger Steve at (616) 877-1852 or stevemueller@kentisd.org.

17 Wednesday

Fall Science Update Seminar, “Changes in Science Education: Developing a Passion for Science” from 4:00 to 9:00 p.m. on Grand Valley State University’s Allendale campus. The program features dinner, keynote presenters, and dozens of break-out sessions. Visit www.gvsu.edu/rmsc or call (616) 331-2267 for additional information.

30 Tuesday

Elementary Mathematics Series: Geometry & Measurement continues. 4:30–8:30 p.m. on the GVSU Allendale Campus. Series continues December 14. For more information contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu

DECEMBER

2 Thursday

Science and Literature Integration Workshop by Nancy Karre and Jackie Zanotti from 8:30 a.m. to 3:30 p.m. in 303 Henry Hall on the Allendale campus of GVSU. See story in this issue. Brochures may be downloaded at www.gvsu.edu/rmsc.

8 Wednesday

The Learning By Inquiry Series begins with **Understanding Inquiry Learning** at the RMSC in Henry Hall on the Allendale Campus, GVSU from 8:30 a.m. to 3:30 p.m. For information, contact RMSC at (616) 331-2267. The workshop brochure can be downloaded from our website at www.gvsu.edu/rmsc.

14 Tuesday

Elementary Mathematics Series: Geometry & Measurement concludes. 4:30–8:30 p.m. on the GVSU Allendale Campus. For more information contact Karen Meyers at (616) 667-2278 or meyersk@gvsu.edu.

JANUARY

1 Saturday

Kent County **Christmas Bird Count.** 7:30 a.m. to 5:00 p.m., Kent County Conservation League, 8461 Conservation NE, Ada, MI. Birders of all skills are needed to help cover a 15-mile circle. Contact Ranger Steve at (616) 877-1852, or stevemueller@kentisd.org.

5 Wednesday

The Learning By Inquiry Series continues with **Designing Inquiry Learning** at the RMSC in Henry Hall on the Allendale Campus, GVSU from 8:30 a.m. to 3:30 p.m. For information, contact RMSC at (616) 331-2267.

19 Wednesday

The Learning By Inquiry Series concludes with **Assessing Inquiry Learning** at the RMSC in Henry Hall on the Allendale Campus, GVSU from 8:30 a.m. to 3:30 p.m. For information, contact RMSC at (616) 331-2267.

FEBRUARY

24 Thursday

Math In Action Conference at GVSU’s Eberhard Center in Grand Rapids with Ed Roeber, Michigan Department of Education, speaking on “Assessment through algebra and number: utilizing multiple benchmarks”. More details in the next issue of the *Interchange*.

25 Friday

Deadline for poster submission to **Sixth Annual Michigan Statistics Poster Competition** for K-12. For details see www.gvsu.edu/state/statposter.

Evolution Education Website Available

National Alliance of State Science and Mathematics Coalitions Reports that the Museum of Paleontology at UC Berkeley has developed a Web site to help teachers pick their way through the evolution vs. creationism minefield. The project is supported by a grant from the National Science Foundation,

The site: evolution.berkeley.edu explains the scientific basis for evolution and the history of evolutionary thought. It also offers advice on how teachers can correct misconceptions about evolution and avoid potential pitfalls when confronted with contradictory points of view.

For example, teachers are urged to emphasize, "there are no alternative scientific theories to account for the observations explained by evolutionary theory. Alternative 'theories' that have been proposed for insertion into the science curriculum have not been supported by valid science and are often based on belief rather than science."

The National Center for Science Education reports that the teaching of evolution is currently under attack in four state legislatures, four state departments of education and five local school boards.

Just last month, an attorney in the Sacramento suburb of California sued the local high school district, charging that they have unconstitutionally refused to provide students with "all sides" of the scientific debate over the origin of life. Eugenie Scott, executive director of the science education center, says the motive for such attacks is grounded in religion, not scientific thought.

WYP 2005: Einstein in the 21st Century

What is WYP 2005? The World Year of Physics (WYP 2005) is a worldwide celebration of physics and its importance in our everyday lives. Physics not only plays an important role in the development of science and technology but also has a tremendous impact on our society. WYP aims to raise the worldwide awareness of

physics and physical science.

The year 2005 marks the 100th anniversary of Albert Einstein's "miraculous year" in which he published three important papers describing ideas that have since influenced all of modern physics. This year provides the opportunity to celebrate Einstein, his great ideas, and his influence on the 21st century. Throughout the year, there will be opportunities for involvement available to teachers and students in WYP events. Following is information on such an event.

Recreate a Momentous Experiment – More than 200 years ago, the Greek scientist Eratosthenes first measured the circumference of the Earth with an ingenious technique requiring only sticks, shadows and a little mathematics. In Spring 2005 students at separate high schools can collaborate with each other to recreate this experiment on the largest scale ever attempted. If you are a high school teacher, find out more about the experiment and register your class at: www.physics2005.org/events/eratosthenes/index.html.



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