Science & Math CESE Education

The

BEACON

News from
The Coalition for Excellence in Science and Math Education

Volume V, No. 4 **Copyright © 2001** **August**

GREETINGS

It is a great pleasure and honor to become the fifth president of CESE. This looks to be an active and important year, and the Board and I are eager to get started.

Though we recently helped protect and stabilize the coverage of evolutionary biology in public school science classes here in New Mexico, the battle rages on in other parts of the country, and could easily flare up again in our state. Many states continue to probe the boundaries of the law by trying to introduce religious beliefs into science classes, and (as of this writing) the U.S. Congress is considering an omnibus education bill that includes an amendment that opens the door for Creationism (and its latest morph, Intelligent Design) in the classroom. Consequently, we must always be ready to resume the good fight. (*See page 7 for one response.)*

On a broader level, I'm very happy that, under Steve Brügge's leadership, CESE has acquired an accurate reputation in Santa Fe as an honest broker of information about educational reform. Over the coming year, CESE will remain an active partner in the efforts to improve public education in New Mexico.

So, there's plenty of good work for all of us. I'd like personally to encourage all CESE members, especially those who have not been as active in the past year, to lend a hand in these efforts. Contact one of the CESE board members, or drop us an e-mail message, and let us know how you might pitch in.

Some suggestions are:

- Science Fair Judge
- Instructional Materials Commission
- Liaison with other organizations
- Publicity
- Write OpEd articles or letters
- Run for School Board elections.

Together we can make this a banner year for public education and for CESE!

Timothy Moy
CESE President

ANNUAL MEETING MINUTES

The Fifth Annual Meeting of– the Coalition for Excellence in Science and Math Education (CEE) was held on June 16th, 2001 at the First Unitarian Church in Albuquerque, New Mexico. CESE founder and first president, Dr. Marshall Berman made the the introductory remarks. Berman discussed the history of CESE, its expanding goals, and its increasing influence. He said one reason we are here working together is to leave a legacy for the future.

Attendees briefly introduced themselves. Over fifty members and guests attended. Secretary Dave Thomas performed a couple of magic tricks, one with invisible cards, and another involving sticking a needle through a balloon without popping it.

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The Beacon is published by the Coalition for excellence in Science and Math Education (CESE). A 501(c)3 nonprofit corporation, CESE is incorporated in the State of New Mexico. Visit the CESE web site:

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CESE annual dues are $25 for an individual, $35 for a family membership, and $10 for students.
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Outgoing president Steve Brügge thanked the attendees for choosing science and math education as one of their causes. With so much to do in our busy lives, Steve commented, we must choose our causes carefully. Steve presented wall plaques with expressions of CESE's appreciation to our two CESE webmasters, David Beck (past) and Dave Johnson (present).

Past president Kim Johnson introduced the keynote speaker, State Representative Rick Miera, who spoke on "Education Reform, the Demise/Recapture of the Student." Miera was at the UNM psychology department for 20 years, but had to retire when he became a legislator. Besides his legislative work, which includes chairing the House Education committee, as well as co-chairing the Legislative Education Study Committee, Miera works with the Bernalillo County Juvenile Detention Center.

Miera talked about the national education reform now before Congress, and discussed the importance of accountability methods. How can we measure performance? What do we test? What methods are successful? Does putting schools on probation help? How can we stay competitive on a global scale? He also spoke about the education reform package that was passed in the legislature last spring, but which was vetoed by Governor Johnson. Miera mentioned the many players in the reform debate (including the Greater Albuquerque Chamber of Commerce, Think New Mexico, and others), who each wanted to be "the" plan. The reform package that finally emerged had a little bit for everyone, including higher teacher salaries, extended school year (more time for professional development), voluntary teacher incentive ("merit") pay, a Performance and Assessment Standards Council (for accountability), more math, three years of high school science, regional service centers to supplant the State Dept. of Education, and many other provisions, such as having local school boards implement policies, but leaving hiring and firing to administrators. In the end, the Governor vetoed the bill because he wanted a tax cut, and because the reform did not include vouchers. Responding to a question from the audience regarding whether it would have been a good compromise to accept a "small" voucher proposal in the bill to appease Gov. Johnson, Miera said this would have been a bad precedent because it would require vouchers by a statute. Rep. Miera concluded his remarks by pointing out how he thinks retaining an elected state board of education is very important.

The business meeting followed. Treasurer Nancy Shelton reported CESE had $1417.00. The slate of officers was presented and voted in. *(See left-hand column this page.)* Outgoing President Brügge then passed the gavel to incoming president Dr. Timothy Moy.

Moy said he was honored to join the company of past presidents Berman, Getty, Johnson, and Brügge. Dr. Moy said that CESE has

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Minutes Continued

survived one of the most critical tests an organization can face—success. Moy thought the organization might fade away. But, he said, it has remained a vibrant and effective group; he commented on the impact the CESE White Paper on Educational Reform made this spring at the legislature. Dr. Moy also talked about his background, and why he became a science historian. He said that science and the humanities are often in harmony, but there are those occasions where "thinking" and "knowing" counter each other. Moy talked about the need for informed skepticism—not the over-skepticism of those who say we can't know anything, but certainly more than blank acceptance of all ideas. He said it's important to know science, but also to know "about" science, not just the dry facts, but the methods and background of how science really works.

The meeting was adjourned and all met for refreshments in the Social Hall.

David E. Thomas

LOOKING BACK
from June 16, 2001

In the summer of 1996, a small group of about six people became very concerned about science education in New Mexico. Their efforts ultimately led to the creation of the Coalition for Excellence in Science and Math Education, an extremely diverse group of about 450 New Mexicans and other Americans.

Our initial goal was to improve science and math education for all New Mexicans. We later expanded our goals to improve all education. We wanted to make a difference. And we most certainly have accomplished and continue to make positive contributions.

Some people seek power and control for themselves. But I think most of the people here want to empower others, especially children; we want to make the world a slightly better place than we found it. We understand the temporal nature of life. We want to create institutions to improve people's lives. We want our children to succeed. So building organizations that grow, thrive and achieve independence of us is much like having and raising children.

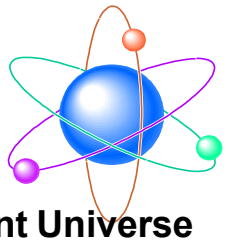
I am enormously proud of my strong, caring, thoughtful, kind, productive and especially independent children. I can't take full credit for this, but I do hope that I contributed something worthwhile.

I am in awe of the outstanding teachers in this state who devote their lives to educating children to become successful in their lives.

I respect and admire those people who sacrifice time and money to help others achieve. I am very proud of CESE and its accomplishments. I hope that it will continue to advance the noble goal of increasing knowledge and wisdom for many decades to come, long after I am gone.

Marshall Berman

Book Review



The Elegant Universe

by Brian Greene

The great controversy in physics for most of the last century is the basic incompatibility between General Relativity, which describes gravity, one of the four elemental forces in the universe, and Quantum Dynamics, which describes the other three. String Theory holds the promise of finally uniting all of physics, a task over which Einstein broke many pencils and pieces of chalk in the last years of his life.

The four basic forces are: the strong force, which holds atomic nuclei together; the weak force, which regulates radioactive decay; the electromagnetic force, which accounts for the attraction of opposite electrical charges; and gravity, which regulates the movement of the satellites, planets, galaxies and the arc of a baseball. General relativity's central tenet is a smooth and gently curving geometry that is justified in the macroscopic realm, but breaks down in the realm of the extremely small. There, quantum fluctuations govern and space is no longe smooth nor gently curving.

How small is small? In Greene's words, "the smallness of Planck's Constant, which governs the strength of quantum effects, and the intrinsic weakness of the gravitational force team up to yield a result called

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Elegant Universe continued

the Planck length which is small almost beyond imagination...." The Planck length is 10^{-33} centimeters, so incompatibility between general relativity and quantum mechanics only becomes apparent in a rather arcane region of existence. At this point one may rightly ask, why bother with a more general theory? Just use general relativity in the regions where it works, quantum mechanics in the regions where it reigns supreme, and don't worry about anything smaller than the Planck length. Many physicists would be quite happy to let it go at that.

Some physicists however are greatly disturbed that the two foundational pillars of physics are at their core fundamentally incompatible. All attempts to unite the two theories, no matter how ingenious, up till now have been failures. Super String theory looks like it will change all that.

The standard model of the atom sees the elementary constituents of the universe as dimensionless points with no internal structure. This model has been very powerful in that every prediction about the microworld, down to about a billionth of a billionth of a meter,(about the present day technological limit of measurement) has been verified. The standard model however does not include gravity, so it can't be considered a final theory. String theory was first put forth in 1984, and modifies general relativity in a way that makes it fully compatible with quantum mechanics. According to string theory, the elementary constituents are not point particles, but are one-dimensional vibrating filaments. The strings of string theory are of the size of the Planck length, so they appear point like even when examined with the best technology we have at present. The theory is capable of incorporating all four forces and all matter as well as explaining why fundamental particles have the properties they do.

The strings of string theory are tightly wound in the intersections of the three spatial dimensions and add an additional seven dimensions to the mix (including time). The strings vibrate like the strings of a violin. The different vibrational resonances of a fundamental string give rise to different masses and force charges that we observe in the usual three large space dimensions. Again, in Greene's words, "Every particle of matter and every transmitter of force consists of a string whose pattern of vibration is its 'fingerprint.'" The mathematics of string theory requires the extra dimensions to avoid mathematical paradoxes, such as probabilities greater than one. Do the extra dimensions have any physical reality? That is something that the theorists can't tell you, and since at this point, they are miles ahead of any empirical verification of the theory, the experimental physicists can't tell you either. Right now the theorists can't even say whether all of the dimensions are space dimensions, some of them could be time dimensions.

What do these additional dimensions look like? The best guess is found in the work of Calabai and Yau, and two-dimensional representations of a six-dimensional Calabai Yau space are given in the book. Calabai and Yau were not working on string theory when they came up with these shapes, but then neither were Fitzgerald and Lorentz thinking about relativity when they came up with their contraction formulae. Of course the representations in the book can only hint at what a six-dimensional figure would look like in two dimensions.

To make matters more complicated, there is not just one string theory, but five (or maybe six). But there is a theory that combines all five (six) into a new theory called M theory. It seems that the various string theories are different aspects of M theory. Something like the various descriptions of an elephant given by blind men feeling different parts of the beast. Why did they call it M theory? Nobody really knows, that's how far out it is.

The Elegant Universe is very well written. It takes a very esoteric subject and does an excellent job of explaining it for the layman. I generally find that the most elegant books explaining scientific theories are written by scientists rather than science writers. This book is true to that judgment. Greene is one of the world's leading string theorists and uses a stunning array of metaphors to explain his specialty. I don't remember who said it, but one judgment of whether a book explaining a complex scientific concept is good or not is whether it makes

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SAMPLES AND SAMPLING

The concept of sampling is important for understanding test scores. A *population* is the entire universe of a class of objects, such that all objects in the class are measurable on some criterion variable. In the case of testing, the population is all testable students. If we had access to every student and enormous funding, we could test the population. There wouldn't be any error or uncertainty; the average score would be unequivocally known. Usually, we don't have access to the entire population, so we choose a sample. We want the sample to be representative of the population on the relevant criterion variables. There are many ways to generate such a sample, and some are more clearly representative than others. The general rule is that more representative samples come at higher cost. There is a tradeoff between practicality and perfection.

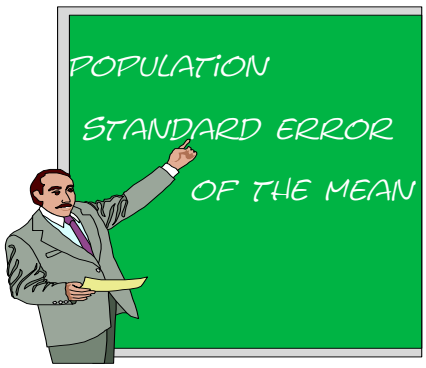
A *random sample* is commonly used when the population is not too large, is characterized by only a few criterion variables, and is known not to vary too wildly. The simplest statistical tests are based on random sampling. You could line up all the objects, and then select X1, X2, X3, etc., based on intervals from a table of random digits. You could also draw the objects from a hat, first making sure that they are thoroughly mixed. If you do it right, every member of the population has an equal chance of being drawn. However, no two samples will be exactly the same. If we draw a large number of samples, the means of the samples will be approximately normally distributed. The *standard error of the mean* is an important and easily quantified value. We have 90% confidence (meaning it's a 9:1 fair bet) that the mean of the population lies within ±2 standard errors of the sample mean.

An *available sample* is the easiest, cheapest, and least likely to be representative. In essence, you use what you have. You want to test the resistance of an alloy to corrosion, and you grab a piece that happens to be on your laboratory bench. You want to try out a test on 4th-grade children, and you just happen to be teaching a 4th-grade class, and that's what you use. Available samples can be useful for establishing the general range of parameters, but don't tell you much beyond that. An available sample is perfectly OK if you know that all objects in the class are identical with respect to the criterion variable.

Members of a purposive sample are deliberately chosen; "I want this big one, this little one, that middle-sized one...." This sample might be just as representative of the population as a random sample. However, there is also a good chance that it is not. Besides, there is opportunity for dishonesty, the results of a purposive sample can't be generalized to the population, and statistical tests can't, in general, be validly applied to purposive samples. Still, it's a good method for "data fishing"—trying to determine data ranges and likely values. It would not be good for an actual experiment if it can be avoided.

A *stratified sample* can be more representative of the population, but it's a little more trouble, maybe a lot more trouble. Suppose the population is known to be 80% *X* economic level and 20% *Y economic level*. We want a sample of 1,000 and randomly choose 800 *X* and 200 *Y* from the population. Now we know that the sample is representative of the population on one criterion variable. If we know that 30% of *X* and 5% of *Y* graduated from college, we would want to see that we have 240 *X* college graduates. But 5% of 200 only gives us 10 *Y* college graduates. The chances are too great that those 10 are unrepresentative – if only a few are unusual in some way our sample could be way off. So we could take 50 *Y* college graduates, and then weight their results so that their contribution to the whole sample is the same as if we had used only 10.

The National Assessment of Educational Progress (NAEP) uses stratified sampling as described above, but with more complications. They use a national sample of about 5,000 students. For many of their tests they also use a sample for each state of about 1,000 students. The national sample is



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stratified according to national averages for each of the criterion variables. Each state sample is stratified for the criterion variables within that state. You should note that the national sample is not the same as the sum of all the state samples. If a state has an average score close to the national average, remember that those averages were based on different samples. Each state's average score has a standard error attached to it, as does the national score. The rule of ±2 standard errors works here, too. The standard error is a different number for each state and each test, but runs about one or two scale score points. That means there could be as much as an 8-point wide uncertainty band around a state's average score. The difference between the highest state average and the lowest might be about 40 points, so the fuzziness can be a large fraction of the range of average scores.

New Mexico tries to test every child in grades 3 through 9 on the TerraNova exams. You might suppose that sampling is unimportant here because the entire population is tested. However, the percentiles so widely reported in the press are based on a sample drawn by McGraw-Hill. The test was administered to that sample a few years ago. The 50th percentile on the TerraNova does not correspond to the national average, as is often reported. It corresponds to the median of McGraw-Hill's sample. If that sample happened to be representative of the national population of school children, fine, we would be happy with that. However, I have tested McGraw-Hill's results against NAEP's, and they don't compare well. We know that NAEP went to extreme pains to get a representative sample. There is thus a presumption that although McGraw-Hill's might be fine for comparing those states that use the TerraNova, it is probably not the national norm. It can be useful for comparing schools and districts within New Mexico, but should only be used with extreme caution for comparing any New Mexico schools to the nation.

Walt Murfin

Honolulu Star- Bulletin Hawaii News

Bible gains ground at BOE

July 27, 2001

A committee instigates changes to standards that now require students to know about "multiple theories" of origin, not just evolution.

The performance standards are slated to be voted on by the full board on Aug. 2.

NEW EDUCATIONAL COLLABORATION MAY INVOLVE CESE

As a result of an ad in the Sandia Daily News for our recent annual meeting, Sandian and CESE Board member **Jonathan Weiss** received a call from the director of the National Atomic Museum in Albuquerque. The museum is associated with an educational initiative known as the Math, Science, and Technology School Partnership. This partnership, formed early this year to strengthen math and science education, involves business, educational, and governmental bodies in the state of New Mexico and elsewhere. One of several objectives of this partnership is "To build an alliance among industry, education, state, regional, and federal entities to create a mathematics, science, and technology high school and a feeder middle and elementary school system using quality principles in education." The director believes that CESE may be able to play an important advisory function in assisting the partnership. Various discussions involving the director, or other members of the partnership, and one or more CESE board members need to occur before defining our role. This is expected to happen within the next few weeks and could lead to an exciting and valuable activity for our organization

“Intelligent Design” goes to Washington

Have you been thinking that the Intelligent Design/Creation Science movement has been given a serious setback by defeats in New Mexico, Kansas, Pennsylvania and others? Think again!

The Wedge has invaded Washington, D.C. The seemingly innocuous Amendment #799 (the Santorum Amendment) to the Senate education bill, S-1, brings our focus to a new level. Following is a letter sent to Senator Santorum by constituent Andrew J. Petto, PhD.

CESE and individual members in New Mexico and other states,(e.g., Ben Shedd in Princeton, N.J.) Kansas Citizens for Science, Citizens for the Advancement of Science Education, and numerous other scientific and educational organizations have sent many letters to federal legislators in response to the Santorum amendment. However, Petto's letter is one of the most comprehensive.

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July 20, 2001

Dear Senator Santorum:

We constituents in Pennsylvania appreciate your concern for the quality of education for students in the Commonwealth and in the nation. This is why I was surprised and disappointed to learn about the Sense of the Senate on Science Education (Amendment # 799) you introduced to S. 1, the Better Education for Students and Teachers Act. It appears that you have been misled by people who wish to inject politics into the educational process and to further a political position by exploiting the public's lack of scientific literacy and sophistication.

The amendment reported in the press in Pennsylvania contains these provisions:

“Good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science.

“Where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions.”

Regarding the first, you might be surprised to know that there is not one set of science education standards or curricular materials proposed or in current use in the public schools that makes any philosophical or religious claims in the name of science. Indeed, the only curricular materials for science education that do make such claims are either frankly sectarian, such as those used in sectarian religious programs, or emanating from nonscientific organizations, such as The Discovery Institute. These programs and organizations object to current science education standards and materials precisely because they do not make the philosophical and religious claims that these organizations wish that they would.

Regarding the second, you should know that there is hardly a classroom in which biological evolution is taught without a consideration of the social, political, and religious controversies that it has engendered, and that continue to this day. But make no mistake; these are social, political, and religious controversies and not scientific ones. In recent years, organizations such as The Discovery Institute have argued that students should be taught in science classes that evolution is “controversial” without acknowledging that the so-called controversy is outside the sciences, not within them.

To be well informed citizens, our students must know that evolution is the foundation of the biological sciences because it has produced results in agriculture, medicine, physiology, genetics, in essence, all fields of biological research. The so-called “alternatives,” such as “Intelligent Design” Theory have failed to produce any scientific results; indeed in the 12 years since “intelligent design” was introduced as a competing theory, there has been not a

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single scientific paper based on this concept published in a standard scientific research journal.

I was also surprised to see you quoted in the Pittsburgh Post Gazette, "'Science has become a philosophy (that) insists that nature is all there is and that the means of creation must not have included any role for God,' Santorum said in a statement." If this quote is accurate, then this statement is troubling because it shows that someone has been trying to mislead you. If you look at any of the science education standards or teaching materials, you will not find a single statement in support of this position. Neither will you find this position in official statements of any scientific or educational organization, or governmental body that promotes science education.

What you will find repeatedly are statements to the effect that science is not equipped to judge any mechanisms or causes that are not natural. Saying that theology, not science, is the proper discipline for judging the role of God in the history of the universe is a far cry from saying that there is no role for God. Indeed, the only place that you will find this connection between science and atheism explicitly drawn is in antiscientific and anti-evolutionary organizations, such as the Institute for Creation Research and the Discovery Institute (among others).

More to the point, the Gazette attributed to you a statement to the effect that science has become a religion. Again, this is clearly a position held by antiscientific organizations, and it is clearly false. Ever since I was old enough to participate (nearly 45 years now) I have joined other congregants in my church in reciting a statement of faith at practically every service. Those who do not accept the statement of faith are not allowed to belong to the church—either prevented from joining or asked to leave.

In over 30 years as a scientist, I have never once been asked to take an oath or subscribe to a particular set of beliefs about the world. I have only been asked to present my scientific claims in the context of current scientific practice and to defend my conclusions on scientific grounds. Indeed, since most religions are intolerant of their members' belonging to other religious organizations, the 40 percent of scientists that Gallup reported as having religious beliefs would not be able to be both scientists and religious believers if your statement were true. People who make such statements are misinformed about the nature and practice of science and inappropriately try to divide the public by creating a conflict where none exists.

Again, I assume that this statement was made as a result of materials or discussions that you had with anti-evolution advocates. An even cursory exploration would identify a wealth of organizations and programs in this country which are exploring the concordances and building dialog between science and religion—including the Philadelphia Center for Religion and Science, where I serve on the Board of Directors. Our citizens need to know that scientific controversies"— *real scientific* controversies about *scientific* explanations—are settled in the marketplace of competing scientific ideas and not by legislative fiat or the political process. What other scientific concepts and material rely on Congressional action for their inclusion in public-school science education? There are still citizens who consider it "controversial" that scientists and science educators teach that the Earth is round and that it revolves around the Sun. I doubt that the Congress would go on record in support of "teaching the controversy" in these cases, but would rely on the consensus of the scientific community to determine which concepts are appropriate and on the science education community to determine how these concepts should be presented in our public-school classrooms.

We may be able to legislate what students will learn in the public-school classrooms, but the result will be only that our citizens will learn less and less about what science is and how it is practiced. Our students deserve better; and if we are to lead the world in science and technology in the future, our students need better, more realistic science education.I would appreciate the opportunity to meet with you when you return to Pennsylvania to discus these matters, or if necessary, to meet with you and your staff in Washington. In the future, I would be very happy to help you and your staff to keep on top of these issues so that

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we can work together to strengthen the scientific literacy of our students in Pennsylvania and across the nation.

Yours Very Truly,

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Elegant Universe continued

the reader feel smarter after reading it. I definitely feel smarter, (that wouldn't take much) but it also gives me a great deal of appreciation for the intellect of the theoreticians who came up with these ideas. Unfortunately, until the experimental physicists come up with ways to put string theory to the test, and they are working on it, it will be a lot like religion. Either you believe it or you don't.

Bill MacPherson

CESE Vice President

WHAT STEVE GETTY DID THIS SUMMER

Since the adoption of new K-12 science standards in New Mexico, I've become even more convinced that teachers need quality opportunities to learn and experience some of the science in the standards. This helps them develop more robust and engaging lessons. In the past few years, I've really enjoyed working with teachers to those ends.

This summer, I had the great opportunity to teach again in the Integrated Natural Sciences Summer Teacher Institute in the Education Dept. at Colorado College (6 weeks). Thirty-one elementary teachers are working toward their MAT in Science Education.While the theme of the course was Coral Reef Biology, it was easy and exciting for me to integrate content themes in Oceanography, Ecosystems/ Interdependency, Paleoclimate/ Sea Level Histories, Plate Tectonics, and Continental Margins. A key course part was 2 weeks field work on San Salva dor Island, outer Bahamas. Key exercise was comparing functions of(organ isms in Bahamian and Rocky Mountain ecosystems. The organisms could not have been more different, yet their functions were strikingly similar. For a final on-site project, the elementary teachers wrote 15-20 page research proposals for studying carbonate geology or reef ecology. They did an outstanding job.
What are a few of my thoughts, and what have I learned? Wow!

1. Have high expectations; they can do it!

2. Have teachers develop an action plan for implementing what they've learned, and seeing new approaches to teaching.

3. Don't expect new content to "sink in" over one week. A longer institute affords more learning and in-depth inquiry.

4. Follow-up during the year is key. Several mechanisms are available.

5. Teachers as learners are more tentative and reluctant than college students, so they have to be convinced to buy into the work. Still,, they are more mature learners, and they see readily how their new learning experiences will translate to their professions in the next school year.Pretty exciting!

6. Set up an exercise that requires them to measure and critically evaluate something, preferably in the field (yes-the metrics relates to the course theme). It's hard to expect teachers to be analytical or quantitative in their classrooms if they haven't had a chance to use and develop those skills.

7. Focus first on developing a more comprehensive understanding of physical or biologic processes. Some vocab is important, but fancy vocab without an understanding of physical processes can be (dare I say) very dangerous.

8. Many teachers are visual learners. Try to present the same meaterial at least 2 or 3 different ways, including diagrams and field work.

9. Be creative with funding; support is out there if you plan ahead.

Cheers,

Steve ***(CESE past president)***

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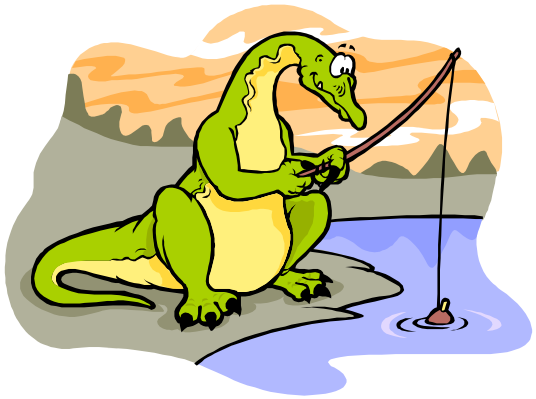

NOTES:

Some of our e-mails are bouncing. If you want to remain up-to-date on what's happening, please send corrected e-mail addresses to Marilyn.

mmkring@juno.com

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In a lead article by John Fleck in the July 31st Albuquerque Journal, page 1,)above the fold!) **Dave Thomas** (CESE board member and president of New Mexicans for Science and Reason invites all to attend the next NMSR meeting to hear Karl Pflock discuss his recent book, *Roswell: Inconvenient facts and the Will to Believe.*

The 7 p.m. meeting August 8th is in Room 2402 of the University of New Mexico Law Building, 1117 Stanford NE. Free and open to the public.

Cindy Chapman is attending her first meeting of the National Council of Teachers of Mathematics (NCTM) as an elected board member.