



# The *BEACON*

*News from*

## *The Coalition for Excellence in Science and Math Education*

Volume III, No. 3

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**In this issue: We've done it! NM now has a good set of science standards. 501(c)(3) Tax Exempt, Non Profit Status at Last! Focus on HOTSPOTS. Science Advances. "Just" a Theory. Instructional Materials Commission. Visit our web site: [www.cesame-nm.org](http://www.cesame-nm.org)**

### **A Battle Won: A War Remains**

Today, (October 8, 1999) good science won a major victory. As CESE members moved to the Board podium to speak, I continued to flash back over the last three years. Each eloquent speaker was so moved that sometimes their voices cracked. It was not nervousness. It was anticipation, excitement, and the deepest sincerity. This was indeed an historical moment.

We have built a powerful organization of intelligent, dedicated, hard working, unselfish, and highly motivated people. We have begun to build a legacy for our children's education. No work is more important. But this is not a time to relax. Creationists have scored heavily around the country. Perhaps it is only natural for attacks on science to wax and wane over the decades. But we cannot afford to lose any more battles.

The struggle between ignorance and knowledge is eternal. History also tells us how powerful a small group of highly dedicated people can be. We will assist our friends in other states to the best of our abilities. Here in New Mexico, I think our next challenge is to raise the achievement of *all* children. This is a monumentally difficult task. First we must define the highest quality standards. Then we must identify those schools which are not performing for whatever reasons. But the identification process is not to be considered accusatory. There are very good reasons why poor kids and those with limited English proficiency are not succeeding.

We must help the teachers develop improved skills and content knowledge. We need to help turn teaching into the respected profession that it should be. This will take reallocation of existing funds, and the injection of new funding.

We are only beginning. Thanks for being who you are.

*Dr. Marshall Berman*  
*Founding President CESE,*  
*Member New Mexico State Board of Education*

### **Kansas – A Symptom: Hotspots – A Cure**

As Marshall Berman so eloquently stated: we won the battle. So why talk about Kansas in a newsletter intended for New Mexico? Good question! For those of you who are not aware of what has happened in Kansas, and indeed, around the nation, a very short summary is in order.

It seems that the Kansas School Board (KSB) did something very similar to what the New Mexico School Board did three years ago. A select writing committee consisting of qualified educators and scientists developed a set of science standards. The standards were offered for public review. Strangely enough, they were "edited." Not by the writing committee, but by a member of the KSB. Many scientists and scientific organizations begged the KSB not to adopt the corrupted standards, but to no avail. Sounding familiar.

The edited standards deleted references to evolution, the age of the earth, etc. Kansas students will not be tested on evolution and several related topics. The KSB actually went a little further backward than did the New Mexico School Board. But, it is simply a matter of degree – not intent. The fiasco has been written about and reported on in every major news outlet in the nation. Indeed, the news made it to the outside world—from England and Germany to South Africa, Australia, and Japan at a minimum. A book publisher that provides a Kansas history book removed all pertinent references to Kansas' geological past.

**The Beacon is published by the Coalition for Excellence in Science and Math Education (CESE) on a quarterly (almost) basis. CESE is a nonprofit corporation, incorporated in the State of New Mexico. See [www.CESAME-NM.org](http://www.CESAME-NM.org), the new CESE web address.**

***The Coalition for Excellence in Science and Math Education (CESE) is composed of interested citizens throughout New Mexico and the nation, including scientists, engineers, educators, university faculty, members of the clergy, and parents. CESE is nonpartisan and non-sectarian, and welcomes members of all religions and political philosophies. This coalition works to improve science education and science literacy for all citizens. The organization also provides support to teachers, students, the public, and state officials who deal with education issues. We want to ensure that the Beacon of Enlightenment is not extinguished in 21<sup>st</sup> century America.***

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**Membership Information:** please contact any of the above officers. The only requirement for CESE membership is the acceptance of our mission, above, as a statement of the organization's purpose. The CESE annual dues are currently \$25 for an individual, \$35 for a family membership, and \$10 for students. This is to help defray costs of postage, insignia, envelopes, etc. No members will be asked to do anything more than they wish to do on behalf of the common cause. Please make checks payable to CESE and mail to 11617 Snowheights NE, Albuquerque, NM 87112.

Similar efforts to corrupt science standards in various ways are occurring in Washington, Oregon, Idaho, California, Arizona, Colorado, Nebraska, Iowa, Minnesota, Illinois, Kentucky, Alabama, Louisiana, and who knows where else. At least one large corporation is openly reconsidering whether they should establish operations in Kansas because of the KSB action. How many other businesses might be similarly inclined? This could actually have happened in New Mexico too, had the School Board not taken action!

We've had two things to consider: 1) short-term solutions to the corrupted New Mexico science standards, and 2) the long term solutions to science illiteracy. Obviously, the first item has been taken care of regarding the required fixes. New Mexico is well on the road to recovery. In fact, New Mexico is viewed by many as the leader. Others are looking to us to share our leadership and experience.

What is the long term solution? Ultimately, it must involve teaching the teachers science. How is it possible for teachers to impart knowledge in a subject in which they are not well versed? Currently, the state of New Mexico has abysmal scores on science and math national tests. Certain schools stand out as excellent, but, they are few and far between. So, along with upgrading standards and the processes, it is absolutely necessary that teachers be well versed in scientific content and methodology. In particular, this is important for elementary school teachers. They provide the students' first exposure to science.

CESE members have addressed this issue by being a driving force and an integral part of a program called HOTSPOTS. The teachers expressed overwhelming enthusiasm. They have hands-on learning and they received a stipend for their time. This pilot program is unique. Please read the write-ups that follow for more details. This is the way to the future, and CESE is helping New Mexico to get there.

*M. Kim Johnson  
President, CESE*

## **CESE Is Officially a Non-Profit, Tax Exempt Corporation!**

***It's official. You may now deduct your CESE dues (or any other contributions you wish to make) from your income tax. The ruling is retroactive to September 28, 1998. Sorry it wasn't in time for 1998 taxes. We now have potential access to many different kinds of funding to work such programs as Hotspots (see article in this issue).***

***The status is provisional for three years. This is normal for new corporations. We will be re-reviewed at the end of the period for permanent status. We have arrived!***

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# HOTSPOTS Learning Project

## Project Objective:

Create an innovative professional development program in the Earth Sciences that is directly linked to the New Mexico Standards for K-12 science education.

## Goal:

Provide a focused opportunity for teachers to learn new content in the Earth Sciences, thereby enhancing instructional effectiveness and student achievement.

Write geology curricular units for dissemination in district using student field work at HOTSPOTS.

## The Team :

- Mr. Leon Bartels, Principal, Inez Science & Technology Elementary, Albuquerque
- Teachers: Teri Brown, Sarah, Bunting, Cindy Chapman, Linda Charlton, Kathy Harvey, Liz Baudino-Lannon, Margaret Phillips, Judy Taylor
- Geoscience Educator, Dr. Stephen Getty

## Partners :

### SEDL: - Southwest Educational Development Laboratory

- Professional development expertise.
- Over \$30,000 in teacher and principal stipends, consultant costs, conference expenses.

### CESE - Coalition for Excellence in Science and Math Education:

- Content expertise.
- Private donor support.

### APS - Albuquerque Public Schools

- Substitute and In-service support (e.g., Eisenhower funds)

## Program Features :

- ✓ Develop content expertise in the Earth Sciences for core group of 8 teachers.
- ✓ Rapidly implement curricular development and standards in Inez Elementary.
- ✓ Maintain program continuity over 2.5 years.
- ✓ Include administration support, and active participation of Principal Bartels.
- ✓ Foster instructional creativity, collegiality, and team-work within teaching staff; develop mentorship structure for new staff.
- ✓ Identify teacher-experts to work with teachers from other schools.
- ✓ Visit repeatedly the HOTSPOTS; teacher and student testing, assessment.

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## Daily Log, Week #1

### July 12, Monday:

- discussion of HOTSPOTS objectives for (1) field work, and (2) curriculum development
- pre- HOTSPOTS assessment of teacher knowledge
- fieldwork at Hondo Canyon HOTSPOT (Sandia Mts.)



### July 13, Tuesday:

- fieldwork at Albuquerque HOTSPOTS
- fieldwork at Rio Grande HOTSPOT

### July 14, Wednesday:

- geology summary discussion at Inez Elementary
- discussion of New Mexico State K-12 Science Standards, and A.P.S. competencies in Earth, Life, and Physical Sciences

### July 15, Thursday:

- special field trip to Mesozoic at San Ysidro, New Mexico, with Dr. John Geissman, University of New Mexico.
- independent field mapping exercise at Placitas, New Mexico.

### July 16, Friday:

- intensive curriculum development per grade level, including content summary, comparing notes regarding preparing site guides.

## Daily Log, Week #2

### July 19, Monday:

- special field trip to late Paleozoic and Mesozoic at Sandia Mountains, with Dr. Maya Elrick, University of New Mexico.

### July 20, Tuesday:

- geology summary discussion at Inez Elementary
- intensive curriculum development per grade level, including content summary, comparing notes regarding preparing site guides.

### July 21, Wednesday:

- discussion regarding grade-to-grade work with HOTSPOTS, and review of site activities for students.
- review of A.P.S. competencies explicitly addressed by student fieldwork

### July 22, Thursday:

- fieldwork at Albuquerque Volcanoes; the base of the flows
- fieldwork in the Tertiary Santa Fe Group, the record of the Rio Grande from approx. 2-25 My
- fieldwork at Rio Grande HOTSPOT

(More HOTSPOTS on next page)



*The Motley Crew on Safari*

## HOTSPOTS Results

The second week of the HOTSPOTS Learning Project went extremely well. The group had a chance to absorb more geology in the field, and to plan an integrated curriculum for grades 1 through 5 in Earth Sciences. Our trips to the HOTSPOTS will impact more than 200 kids in their Earth and Life Sciences lessons next year. I've also been in contact with Dr. Elizabeth Everitt at A.P.S. to keep them apprised of our progress.

Besides curriculum development, a main objective of the program is to increase substantively the content knowledge of the Inez team in the Earth Sciences. We now have some data on this front.

I gave the team tough pre-project and post-project assessments equivalent to college-level tests. The goal was

to measure changes in content knowledge. Teacher assessments comprised essay question, definition, hand-sample identification, and cross-section construction to demonstrate local geology concepts and features. Questions were grouped randomly on either test, and then each of the full tests could have served as pre- or post-tests. Both were prepared in advance and then sealed in folders until being given.

The average score on the pretest was 34 out of 100, with a "stdev" (n only 9) indicating a spread of  $\pm 13.4$ , or  $\pm 39\%$ . The low score was 10—not surprising on their first day ever of learning geology—and the high was 52 for one who'd been on a few field trips with me. For the post-project assessment, the average score was 84, with a "stdev" parameter of  $\pm 11.2$ , or a percent error of  $\pm 13\%$ . The low score was 63, and the high 97.5, with 3 additional

scores in the 90's. Several folks, quite excited by the whole endeavor, were studying college texts at night.

I'm thrilled that this group stuck with me for a fast-paced, 2 weeks of learning. Equally interesting, we can now also argue that there is less of a gap in understanding of the Earth Sciences fundamentals among program participants; the spread in test scores decreased by a factor of 3, from 39% to 13%. Although this group is REALLY good, I wouldn't have predicted such a pronounced decrease in the spread.

The HOTSPOTS program was presented to the State Board of Education and was well received.

*Dr. Stephen Getty, CESE Past President,  
Colorado College  
Geology Department  
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## Advances in Science

The Centers for Disease Control and Prevention has published a list of the “Ten Great Public Health Achievements” in the United States for this century (MMWR.1999;48:241-243).

The net effect of these advances in public health has been astonishing—the addition of 25 years of life to each person living in the United States—comparing the average life span at the beginning of the century to now. These advances are due to the application of scientific methods to ever-broadening aspects of human life. Personally, I cannot think of a more powerful argument for support for basic science and science education than a review of what has been accomplished:

1. Development and application of vaccines have saved hundreds of thousands of lives that would have been lost to measles, small pox, tetanus, diphtheria, and Haemophilis influenza type b. Vaccines have also eliminated or virtually eliminated the crippling caused by rubella and polio.

2. Advances in the care provided to pregnant women and newborn children have reduced deaths of mothers in childbirth by more than 99% and deaths of infants by more than 90%.

3. Smoking prevention programs spawned by the epidemiologic investigation of the relation between smoking and death have prevented millions of smoking-related deaths.

4. Deaths due to coronary artery disease have declined 51%, just since 1972, due to efforts at prevention and treatment.

5. Occupational deaths, once a common occurrence, have become rarities. The decline in occupational deaths, just since 1980, has been 40%.

6. Widely available, safe methods for control of human conception have allowed people to plan their families and gain greater economic control over their lives.

7. Supplementation of foods has virtually eliminated coronary diseases due to nutritional deficiencies.

8. Development of antimicrobials and sanitation improvements have tamed infectious diseases which used to be the major causes of loss of human life and function.

9. Water treatment has eliminated diseases, and fluoridation has reduced tooth decay and tooth loss by 40-70%.

10. Investigations of injuries and means of injury prevention have led to safer homes, hobbies, and mode of transportation.

Science has been the engine of these changes. The scientists’ skepticism—questioning why things are the way they are, not accepting them as preordained—has been at the be-

ginning of all these advances. Science education is a key to continuing advances such as these.

*Dr. Toby Merlin is the Chief Medical Officer and Senior Vice-President of Lovelace Health Systems and a CESE member. He has a background in pathology and infectious diseases, and serves on numerous national boards and panels for health care organizations, including the Centers for Disease Control and Prevention in Atlanta. We invited him to offer his thoughts about the importance of science education.*

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## Instructional Materials Report

CESE was well represented this year on New Mexico’s Instructional Materials Commission (IMC). The state Board of Education (SBE) created the IMC to provide recommendations on all matters pertaining to the instructional materials process. One of the commission’s responsibilities is to report annually to the SBE the screening recommendations for new educational materials. The SBE appoints twenty commissioners for this purpose; 10 educators and 10 parents from all over the state. Each commissioner serves for a two-year term, and each year, ten new positions become available. Commissioners from CESE are Jeremy Boak, Mark Boslough, Timothy Moy, Marilyn Savitt-Kring, and Sema Wynne.

The orientation meeting in May was conducted by the IMC’s bureau chief, Mary Jane Vinella. We were asked to choose a specialty from the subject matter of math, art, and music. Math was further subdivided into categories of elementary, mid-school, algebra, geometry, and advanced high school levels. We were advised that our role is to screen; the local districts do the actual reviewing. We were also asked to organize a subcommittee to help with the process.

At the June meeting, the publishers presented the items that were being sent to us for consideration. Then, the enormous number of boxes began to arrive. The variety of books, software, video and audio tapes, visual aides, and manipulatives was truly impressive, and the task of organizing, distributing, and screening all these educational items was daunting. It could not have been accomplished without the help of all the people who volunteered to serve on the subcommittees.

Many thanks to the CESE screeners: Steve and Karen Brugge, Cindy Chapman, Arthur Edwards, Larry Golden, Kim Johnson, Michael Kring, Bill MacPherson, Jesus Martinez, Walter Murfin, Nancy Shelton, Richard Talley, Eva Thaddeus, and Robert Vardeman.

After the screening was completed, the IMC met again in August to discuss and vote on the rejected items. The Commission is organized so that three commissioners screen



identical materials. Each group of three met to decide on the rejected materials. If two out of three voted to reject, then the item was presented to the entire commission for a vote. Nearly every item was approved. The exceptions were mostly software that was either available free over the Internet or that didn't work properly.

The IMC elected CESE member Timothy Moy as chair and Paula Dean as vice-chair for next year's IMC meetings.

(Late breaking news: Mary Jane Vinella is retiring. Also, two standing committees, the Legislative Finance Committee (LFC) and the Legislative Educational Study Committee (LESC) recently audited the IMC. They will make recommendations at the November School Board meeting—one of which may be to abolish the process. Please call Marilyn Savitt-Kring for details at 856-6654.)

*Marilyn Savitt-Kring is a microbiologist, an active CESE Board member, and the mother of twins.*

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## **“Just” a Theory**

How many times have you heard it? Evolution is “just a theory.” (I cannot tell you how many times I've heard this in conversations, during question and answer sessions, and so on.) The toughest thing about handling this statement is that it is, in some sense, partially true. But only partially.

Is evolution a theory? Yes, but it is also a fact. Worse yet, the fact of evolution and theory of evolution are different things; they are related, but they are not identical. The fact of evolution is, like all scientific facts, observable and repeatable: the genetic makeup of a population of organisms will change over time. We know this is true from population studies of microbes, reptiles, birds, mammals, and even humans.

The *theory* of evolution is something else: the idea that the fact of evolution can account for the diversity of life on Earth. This, of course, is the focus of most of the controversy about teaching evolution in science classes, and it is different from the fact of evolution. It is related to the fact of evolution, but it is not the same thing.

But there's a more important complication. Even if we focus only on the theory (not the fact) of evolution, it would be a mistake to call evolution *just* a theory; evolution is a theory, but it is not just a theory. This would be like saying that Dwight Eisenhower was “just a five-star general” or that Mark McGwire hit “just 70 home runs.” These are all true statements, but the word *just* simply does not make sense here.

The confusion arises because the word *theory* means fundamentally different things in science and in everyday

language. In casual conversation, a theory is a kind of educated guess, an informed and insightful hunch. You might have a theory on why your car won't start, or why McGwire broke the single-season home run record last year (or, better yet, why both he and Sammy Sosa did it in the same season). And these would be *just* theories—tentative explanations that may later be supplanted by real, complete answers.

But in the sciences, *theory* has historically meant something very different. The best, most thoroughly tested, best corroborated ideas are called theories. The idea that matter is composed of atoms is called, redundantly enough, the atomic theory of matter. The idea that disease can be caused by microorganisms is still called the germ theory of disease. The idea that electricity and magnetism are related and travel in waves—even though this is one of the fundamental ideas of modern physics—is still called the theory of electromagnetism. The same goes for most of our best ideas in the sciences: the theory of relativity, quantum theory, and so on.

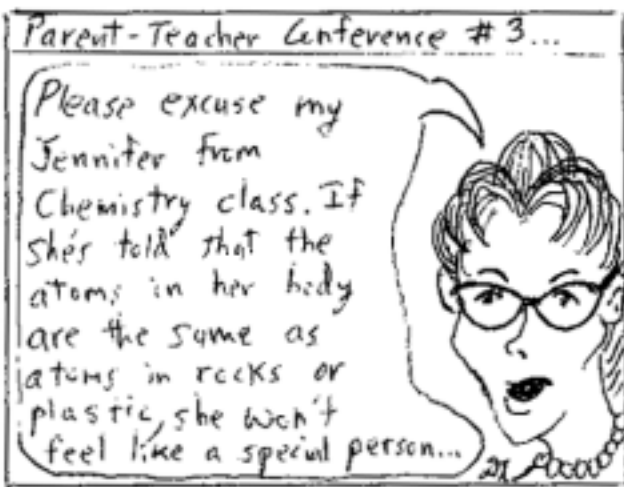
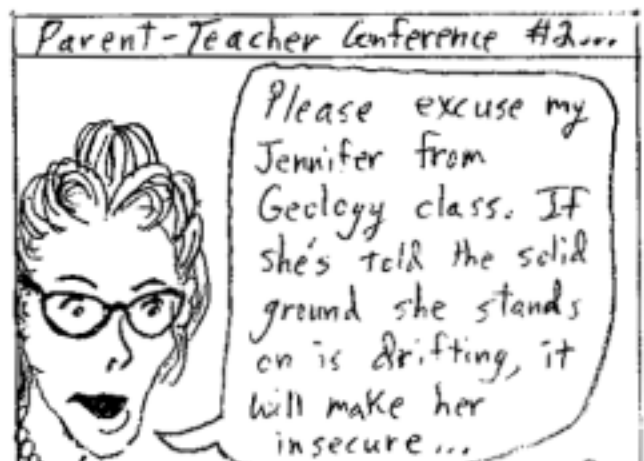
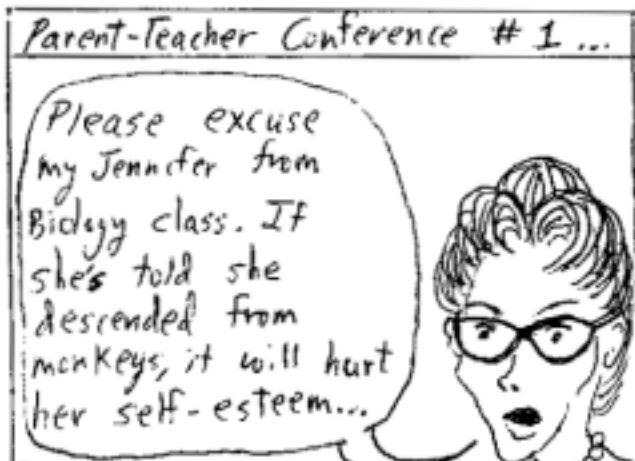
I once heard someone in a public hearing describe how science progresses. Ideas start out as theories, he said; we then gather more data; and if the theory holds up, it becomes a law. (He then went on to say that, therefore, evolution is suspect because it is still “just a theory.”) As a historian of science, I could not help but cringe. This particular progression sounds reasonable enough. The problem is that it has never happened in the entire history of science.

Historically, scientific theories and scientific laws have never transformed from one into the other. I cannot think of a single historical instance when scientists got together and had a little graduation ceremony where a theory became a law. The Second Law of Thermodynamics was never, ever the Second Theory of Thermodynamics. Newton's First Law of Motion was never, ever Newton's First Theory of Motion.

Oddly enough, what scientists usually call *laws* are actually subordinate to theories. When scientists talk about laws, they are usually referring to a specific mathematical relationships between quantities; think of Coulomb's Law, Hooke's Law, or the Law of Gravity. Each of these is simply part of an over-arching theory; for example, the Law of Gravity (the inverse-square law) is really just a mathematical detail of the Theory of Gravity.

So, yes, evolution is “just” a theory. But in the sciences, it just doesn't get any better than that.

*Dr. Timothy Moy, CESE Charter Member,  
Professor  
UNM History Department*



*Education is the answer to ignorance*

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## Summary of Recent State Board of Education Meetings—Marshall Berman

The New Mexico average annual dropout rate in grades 9 through 12 is 7.1% per year. This represents a 0.7% decline from last year. Although an improvement, it still means that between one-quarter and one-third of our kids drop out of high school. The Hispanic dropout rate is almost twice that of "Anglos." A great deal of improvement is needed. The dropout rate in Albuquerque was 8.8%; in Santa Fe, 10.8%; in Los Alamos, 1.4%. As a comparison, I was told on July 9<sup>th</sup> that the dropout rate in all Texas schools was 1.7%; in the Brazosport Independent School District in Texas, the rate was 0.1%! Clearly, New Mexico can do much better.

School accreditation is an important area of SBE responsibility. The entire process is under review, and I expect major changes in both definitions and process. Accreditation is a powerful accountability tool that can be used to improve school and district performance.

The social studies standards are being revisited. The SBE did not adopt the wholesale replacement of the current social studies standards, as several members had urged.

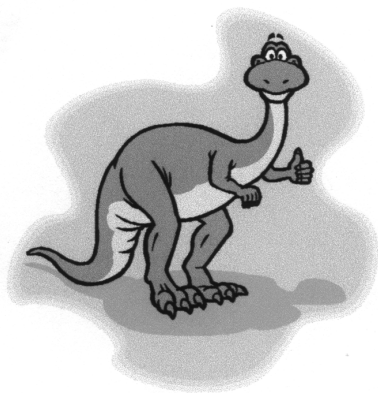
However, a new writing committee will be established, and the process will begin again. The Board proposed a set of policy guidelines for developing, assessing, implementing and reviewing these standards. This policy was adopted in the October Board meeting.

Perhaps the most important result of the Board meetings was the adoption of a Strategic Plan. This plan is being distributed extensively throughout the state for public comments and is available on the SBE website ([www.sde.state.nm.us](http://www.sde.state.nm.us)). The plan will guide the development of an SDE Operational Plan and will strongly influence education reform in New Mexico for many years to come. Extensive input from the public was very complimentary, and several suggested modifications were made. The Board unanimously approved the final version.

New Mexico's application was accepted to participate in the Baldrige in Education Initiative (BiE IN). We were one of six states selected from 16 considered. The Baldrige criteria constitute a rigorous assessment framework used by organizations to achieve performance excellence in leadership, customer focus, strategic planning, process management, human resources, information and analysis, and performance results.

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## Return Service Requested



*(Beaconosaurus)*

## For Your Information

- We will be formulating questionnaires to submit to Y2K political candidates. Results will be published. This will be non-partisan in accordance with 501(c)(3) rules.
- A Phone Tree is being implemented (evolution is occurring).
- Future CESE Board meeting summaries will be published.
- We welcome your suggestions for future action items.
- Ask about CroSSlinks, a program to link scientific resources for teachers, parents and kids. More in the next Beacon. (Ask Jon Weiss or Mark Boslough.)

[illegible]

Good works—HOTSPOTS, Science Fair Awards, Scholarships, etc., etc., etc.— require financing. Your dues and donations are needed. Remember, they are *tax deductible*!

**(The due date for your dues is shown on the mailing label.)**

[illegible]