



The
BEACON

News from

The Coalition for Excellence in Science and Math Education

Volume VI, No. 3

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ACTION !

For the past year, it has been my great pleasure and honor to serve as President of CESE. As a founding member of the organization, I have seen CESE grow from a small handful of concerned parents, teachers, scientists, and engineers into a dedicated organization of hundreds with a strong reputation as a rational and trustworthy voice in the on-going discussion of education reform. I must admit that I am proud, as you should be, of our many accomplishments over the years.

This past year, we have done much to maintain the wall of separation between public school education and religious doctrine, and to convince legislators and policy-makers to base education reform on reliable data. But all of these accomplishments can be undone just as quickly if we fail to be watchful and ready to respond effectively. Much of CESE's greatest service has been in putting out fires - attempts by Creationists to inject religion into science classes, or poorly-conceived education reform packages that are momentarily popular in Santa Fe. We have become a kind of rapid response team, and we now play a vital and beneficial role in public education in New Mexico.

But our endeavors can only succeed with continued dedication from you, our members. It

is only our ability to respond quickly that enables us to provide some counterbalance to the much larger efforts of well-funded religious and business organizations, efforts that are only likely to increase over the coming year. National Creationist organizations clearly hope to inject "Intelligent Design Theory" into New Mexico's science curriculum standards, as they have done in other states; this past year, they sponsored several nationally-known ID proponents for speaking tours in New Mexico. In addition, the long legislative session next January is likely to include radical new plans for public education - proposals that may be well-intentioned but also poorly-conceived. We must stand ready.

So, let me urge you to become a more active member of CESE. If you are behind in your dues, now is the best time to contribute. If you have not been very active recently, drop a line or an e-mail message to one of us on the Board to see how you may help. Believe me, there is nothing more satisfying than fighting the good fight!

Dr. Timothy Moy
CESE President

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CESE annual dues are \$25 for individual, \$35 for family membership, and \$10 for students. Please make checks payable to CESE, and mail to

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Book Review

The Botany of Desire
By Michael Pollan

The subtitle of this book is "A Plant's-eye View of the World" and I suppose an argument could be made that certain varieties of plants have used the human race to further their own ends while we had the anthropocentric hubris to believe that we were using them. The book really is the story of the co-evolution of plants and humans, and Michael Pollan uses four examples of plant that were cultivated by humans for their own delectation and which have become dependent on humans for their existence. The four plants in question are the apple, the tulip, the marijuana plant, and the potato.

The desire in the apple's case was for sweetness. When apples were first cultivated there were few plants that could provide it. The apple is so at home in America that many people make the mistake of thinking that it's a native. Research has shown however, that the apple originates in Kazakhstan where the greatest genetic diversity among apples is to be found. (Genetic diversity, by the way, is one of the ways we know that the human race originated in Africa.) One of the peculiarities of apples is that they do not breed true from seed. If you plant an apple seed, you can't be sure what you'll get. This is known as heterozygosity,

and is common to a number of species (ours included.) Apples were cultivated by finding a particular individual tree that produced a good apple and reproducing that tree by grafting.

Prior to the discovery of grafting, apples were only grown for cider production, particularly hard cider. American grapes were insufficiently sweet to ferment properly and produce a good wine, so hard cider took its place. At the present time, only about five varieties of apple are the parents of all the apples sold on the market. You can probably go to your favorite supermarket and see them all at the same time in the produce section. These five are Red and Golden Delicious (they are unrelated to each other except by marketing), Jonathan, Macintosh, and Cox's Orange Pippin. The last is still popular in England but is not seen often in the US. At one time there were thousands of varieties of apples but for commercial reasons these have all disappeared from the supermarket coolers. Still all the genetic diversity of the apple resides in the seeds. It may produce one tree in a hundred that has commercial viability, but should the current method of cultivating apples lead to a disaster, one can always go back to the original genes and start over again.

The desire with tulips was for beauty, and the Dutch, went nuts over the tulip. In the seventeenth century, Holland was one of the richest countries in the

world, and the Dutch showed off their wealth with tulips. As Pollan points out, “their Calvinist faith did not keep them from indulging in the pleasures of conspicuous display. The exoticism and expense of tulips certainly recommended them for this purpose, but so did the fact that among flowers, the tulip is one of the most extravagantly useless.”

One of the most desired traits of certain rare tulips in the seventeenth century was the so-called “broken” tulip. A broken tulip would display, for no apparent reason, brilliant and symmetrical patterns of color on the normally pale monochromatic petals. These tulips, also inexplicably, produced far fewer offsets (the method of tulip reproduction) than ordinary tulips. The rarity of the broken tulip, its beauty, combined with its stinginess in producing offsets, drove the price of these tulips through the roof.

Unfortunately, a virus was the cause of the breaks in broken tulips. The tulip flower normally produces its single color from a blend of two different pigments. The virus upsets the balance between these two pigments and allows the more vibrant of the two to show up in strips interspersed with the normal blend. The virus also weakens the plant, the reason for the diminished offsets. It wasn't until the 1920's that scientists discovered the virus, and by that time the tulips had turned into a commodity. Dutch growers set about getting rid of the virus. When a color break occurred,

the plants were quickly destroyed. Something that was once prized became something detested. To quote Pollan, “for several hundred years tulips were selected for a trait that would sicken and eventually kill them.” It also shows that beauty in nature does not necessarily indicate health, at least beauty in our eyes. While the result of our unnatural selection of a particular trait was a detriment to the tulip, it was a boon to the virus. It was a brilliant survival strategy on the part of the virus to produce results that humans would find attractive and seek to propagate, as long as the humans didn't figure out what was going on.

The desire with marijuana is, of course, intoxication. Pollan goes into a long harangue against the war on drugs, however, it seems that marijuana has been the beneficiary of that war. New varieties of cannabis are smaller, hardier, more potent, and can be grown indoors under intense lighting.

Pollan decided to try planting a couple of Monsanto's New Leaf genetically modified potatoes in his backyard garden. The lure of the genetically modified (GM) plant is control over nature. As of the writing of this book (late 2000) there were over 50 million acres of American farmland planted in genetically modified crops. The modifications were intended either for the plant to carry its own insecticide, or be resistant to herbicides. In the case of the New Leaf, it contains a gene from bacillus thuringiensis or

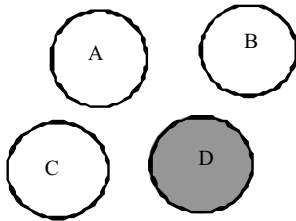
Bt, a common bacterium found in the soil, which sickens and kills, among other things, the Colorado potato beetle. It also is not too healthy for caterpillars. The human race has had a long history of interacting and co-evolving with the potato and Pollan describes the incredible nutritional benefits of the common spud. It kept several generations of Irish people alive until the recurring potato famines forced many of them to emigrate from Ireland. Pollan wonders and worries about what we may be doing to our relationship with the plant world with the advent of GM agriculture. Pollan quotes Darwin, “Man does not actually produce variability,” and continues, “Now he does. For the first time breeders can bring qualities from anywhere in nature into the genome of a plant: from fireflies (the quality of luminescence), from flounders (frost tolerance), from viruses (disease resistance) and in the case of my potatoes, from the soil bacterium *Bacillus thuringiensis*.” Nature has built walls between species to preserve genetic integrity. Nature must have had a reason for these walls.

As for the potatoes that Pollan planted, they grew very well and were impervious to the potato beetle, but he has yet to actually eat one of them.

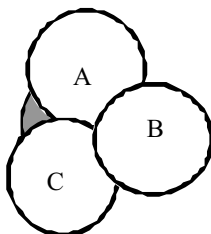
Bill MacPherson
CESE Vice President

DECIDING WHAT'S IMPORTANT

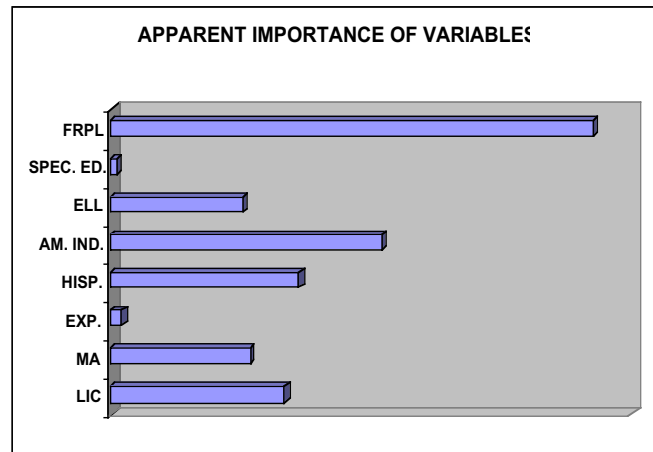
If an outcome is attributable to several input factors, it might seem obvious which factors are most important. It turns out that it really is not obvious. If you badly want to show that one factor is preeminent, you can often make your wish come true by the questions you ask and the way you ask them. Let's define "importance" as the fraction of outcome variance attributable to each input factor. It might seem reasonable to vary each input factor through its range, and see what happens to the outcome. Figure 1 shows four circles, all roughly the same size. Suppose that the area of each circle represents the variance in an outcome attributable to each of four inputs being varied one at a time. Most people would say the four factors are about equally important.



Real world inputs don't vary one at a time. Suppose that all four vary together in such a way that input D tends to vary mostly in step with the other inputs. Suppose that factor D is strongly correlated with factors A, B, and C, but those factors are less strongly correlated with each other. Perhaps the real effect is as shown below. The total effect on the outcome is the area within the combined outer boundary of the four circles. We could completely remove factor D and there would be little change in the outcome, but if we removed any of the other three factors we would make an appreciable change in the total area, that is, in the outcome.



This is important for many issues. We know that some schools are not doing as well as others. Naturally, we want to know what factors are correlated with success. I analyzed the effects of several variables on test scores. I looked at three "teacher" variables: the fraction of teachers without appropriate licenses, the fraction of teachers with an MA or better, and the average years of experience in each district. Then there are five "student" variables: the percentage of Hispanics, of American Indians, of English Language Learners (ELL), of students in special education, and the fraction eligible for Free or Reduced Price Lunches (FRPL.) The last is often used as a measure of poverty. Here is the apparent importance for test scores when each of the variables is allowed to vary one at a time (squared correlation coefficients).



Poverty as measured by FRPL seems to be overwhelmingly the most important. Ethnicity, ELL, and some of the teacher variables are not quite as large, but are not negligible.

However, the real world does not work this way. In New Mexico, students who are deficient in English are almost certain to be Hispanic or Native Americans. Many Hispanic and Indian children have fair English skills, but almost all English deficient children are Hispanic or Indian. There is also a strong correlation between ethnicity and poverty.

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The Albuquerque Business Education Compact (ABEC) has provided CESE with the following for reprint. CESE is an affiliate of ABEC.



R e a d t o M e

WHY YOU SHOULD READ ALOUD TO YOUR CHILDREN

- * **READING ALOUD** promotes early reading. Children who are read to learn more easily than those who are not.
- * **READING ALOUD** helps children develop their language and vocabulary.
- * **READING ALOUD** stimulates imagination, creativity, and curiosity.
- * **READING ALOUD** develops a love of reading.
- * **READING ALOUD** often promotes social and moral values.
- * **READING ALOUD** enhances self-confidence because youngsters feel special when read to.
- * **READING ALOUD** develops a special bond between the reader and listener.
- * **READING ALOUD** is FUN!



*Reading Aloud taken from "The New Read-Aloud Handbook" by Jim Trelease

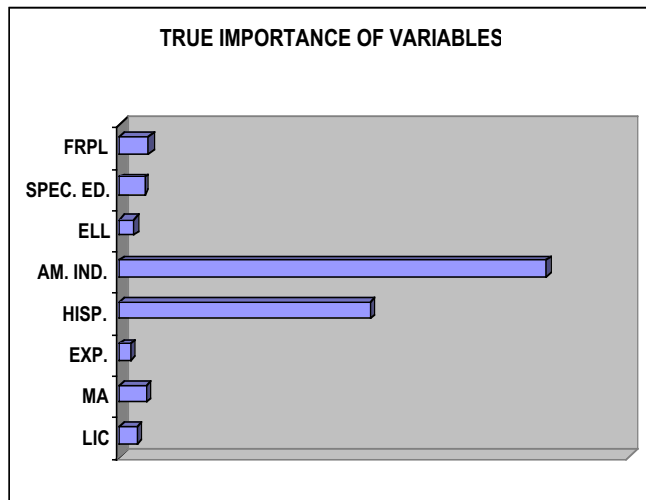
FAMILY READING TIPS

- 1 TAKE TEN MINUTES OF YOUR TIME.** Read to your child every day for at least ten minutes.
- 2 ESTABLISH A REGULAR READING TIME.** Develop a regular reading schedule with your child and make it a routine. A good time for this quiet activity is bed-time. Reading time will settle your child down for the day.
- 3 MAKE READING TIME A SPECIAL TIME TOGETHER.** Pick a cozy spot where you can hold your child in your arms or on your lap. Let your child choose the books to be read. You and your child will enjoy the warmth and fun of reading a book together.
- 4 TRY THESE SIMPLE TECHNIQUES.** Move your finger under the words as you read. Let your child help turn the pages. Act out the characters with your voice as you read. Take turns reading words or sentences or pages. Pause and ask open-ended questions like: "How would you feel if you were that person?" "What do you think will happen next?" Look and talk about the illustrations.
- 5 MAKE YOUR HOME A READING-FRIENDLY ENVIRONMENT.** Keep books, magazines, and newspapers all around your home, on the kitchen table, in the bathroom, by the bed, near the toys, everywhere. Give books or magazine subscriptions as birthday gifts or for the holiday season.
- 6 READ ALL KINDS OF THINGS TOGETHER.** Use whatever you can find - recipes, directions, sports stories from the newspaper, even the television schedule. Use your child's interests and hobbies as starting points.
- 7 LET YOUR CHILD SEE YOU READ.** When your child sees you reading and enjoying it, he/she is likely to follow your example. Turn off the television and pick up a book and talk to your child about things you've read. When your child sees you reading, you are letting him/her know that reading is a valued activity.
- 8 VISIT THE LIBRARY REGULARLY.** A trip to the library is something your family can plan together, look forward to, and enjoy together. Your child can get to know the librarian, check out books for free, and learn how to use the library.
- 9 KEEP READING ALOUD TO YOUR CHILD EVEN AFTER YOUR CHILD LEARNS TO READ.** Parents and educators sometimes think children over the age of seven or eight years old don't want to be read to. This is not true. As your child gets older and begins reading chapter books, why not join in by taking turns reading alternate chapters. You'd be surprised what a good picture book can do to entertain the whole family. Even as adults, you're never too old to be read to.
- 10 IT'S NEVER TOO EARLY TO LEARN.** From the time babies are in the womb, parents should begin reading regularly. New research states that one of the most important factors for early brain development in the first few years of life is reading to your baby.

For more information, contact the Albuquerque Business Education Compact at (505) 767-5849 or their website: www.abec-web.org

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We might not like it, but the most highly qualified teachers tend not to be found in schools with mostly poor minorities, so teacher variables are also correlated with race and poverty.



When all the variables act together in the way they work in the real world, the results are quite different. These are the so-called “squared semi-partial correlations;” they show how much each variable adds to the explanatory power of the total mix of variables. Ethnicity is by far the most explanatory factor in the real world. Poverty, English deficit, and the teacher variables are nearly covered by ethnicity. You could remove them from the mix without drastically changing the results. This is contrary to accepted wisdom.

Many people are certain that poverty has the greatest negative impact on education. It certainly is true that children in poverty tend to do less well than affluent children. There are truly damaging effects of poverty *per se*, such as inadequate health care and nutrition. However, the reality in New Mexico is that poverty is strongly correlated with race, and race alone is nearly as explanatory as race plus poverty. This does not tell us which factor “causes” low performance. This analysis tells us “what is,” not “why.” We can’t tell from the data at hand whether poverty by itself or race by itself, or neither, is a causative factor, or whether both are causes. We need a constellation of

data all pointing unequivocally to a factor before we posit causation. Even with lots of field data, we need a well controlled experiment. Then we need to wait until the experiment has been replicated a few times before saying anything very positive. Those conditions are not likely to be met soon, so claims about causes are suspect.

Race in America is an “elephant in the living room.” Everyone is painfully aware of it, but it seems to be bad manners to talk about it. On the other hand, poverty is a more socially acceptable topic. We often see percentage of students eligible for FRPL used as the factor of interest. It’s true that if you take race completely out of the mix, then FRPL usually does a good job of predicting performance, and it is apparently less embarrassing.

Policy decisions often get made on the basis of inadequately analyzed data. You can see why people on both sides of an issue can claim with apparent honesty that they have data to support their stand. Just remember that we have to be very careful about the conclusions we draw. Remember, too, that people with a deeply held agenda will advance it any way they can. If a position is based on a few isolated factoids, your index of suspicion should be high.

Walt Murfin
CESE Statistician

Stephen J. Gould 1941—2002

[Evolution popularizer Stephen Jay Gould dies](#)

(By Anne Barnard and Stephen Smith, Globe Staff) *The Boston Globe*

Dr. Stephen Jay Gould, the Harvard paleontologist who brought the science of evolution to a broad new audience, died yesterday [May 20, 2002] of metastasized lung cancer at his home in New York City. He was 60 years old.

To the Editor,

I attended the talk given by Adrian Melott, entitled: "Intelligent Design is Creationism in a Cheap Tuxedo." I learned some facts I had not previously known, and I enjoyed most of the question and answer session. I was amused when a self-confessed ID individual asked Adrian Melott if he would allow the possibility that there might have been an intelligent designer. I was pleased to hear Adrian Melott answer: "Yes." As I understand the way things are, this is the only answer any true scientist can give to that question. There is no way, at present, of conclusively confirming scientifically either the existence or non-existence of an intelligent designer. Therefore, we are required to affirm that the existence of one is possible.

As I drove home, I was disappointed in myself. I realized, too late, that I had missed the opportunity to raise my hand and ask the ID individual if he would allow the possibility that there was no intelligent designer and it all occurred through natural means. I hope I get that opportunity again in the future. It

would be interesting and possibly enlightening to hear the answer.

It seems to me that scientists are striving to arrive at the truth about the universe in which we live by examining the evidence as it is found and making assumptions from that evidence. Then, those assumptions are tested by other scientists and against subsequent evidence. In short, the scientific method is an open, on-going process, which relies on evidence and evolves as more evidence is found.

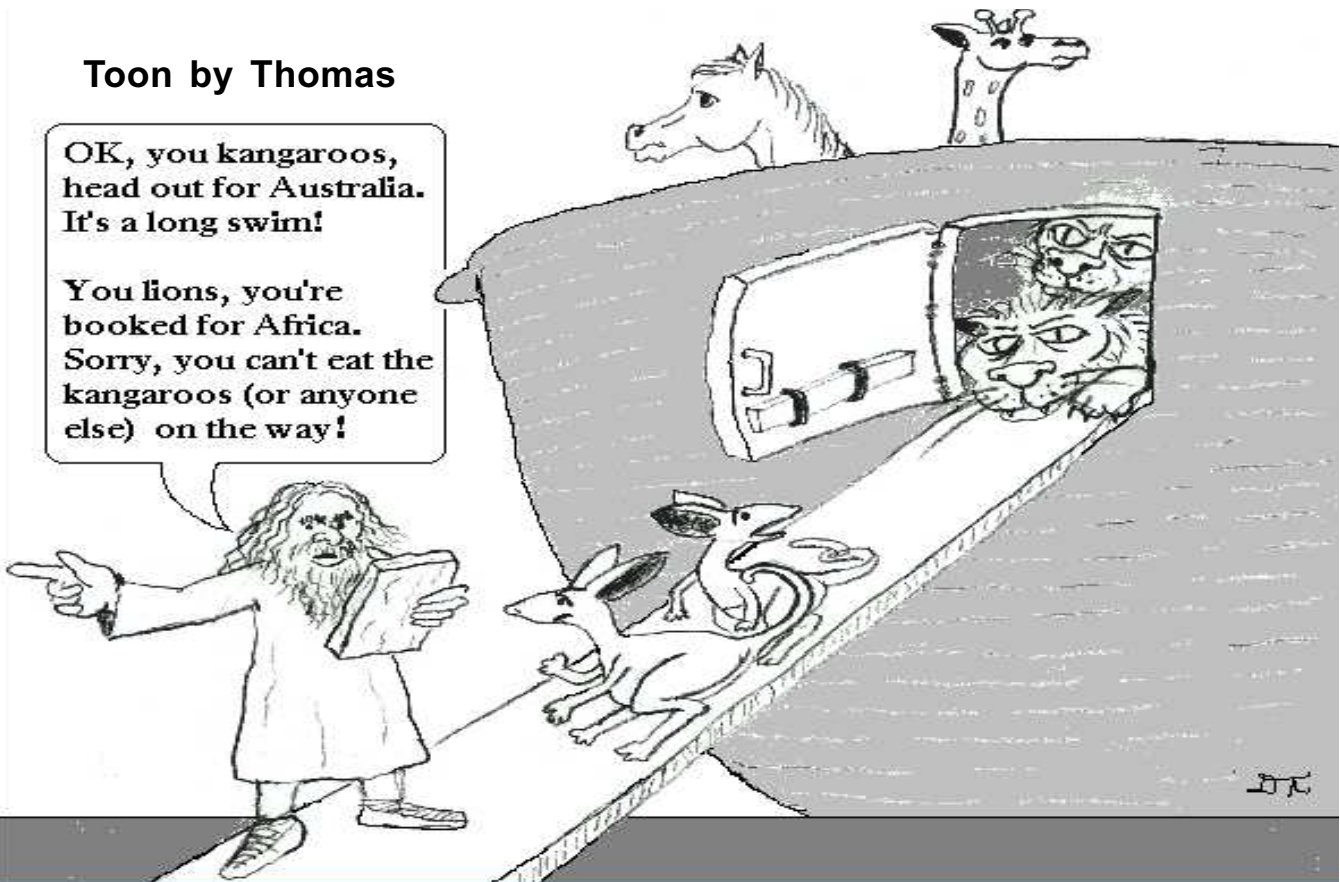
It also seems to me that creationists or ID Individuals begin by assuming "the truth" about the universe in which we live, and then proceed to attempt to find "evidence" to support their assumptions. And, any evidence which, in any way, casts doubt on their assumptions is either ignored or discounted (which is not to say that it is refuted). In short, the ID "method" is a closed, static belief system, which relies on faith and is deaf to more evidence.

Robert C. Gardiner
CESE member

Toon by Thomas

OK, you kangaroos,
head out for Australia.
It's a long swim!

You lions, you're
booked for Africa.
Sorry, you can't eat the
kangaroos (or anyone
else) on the way!



**The 6th Annual Meeting of the
Coalition for Excellence in Science
and Math Education**

Speaker: **John P. Jekowski**

***“Education in New Mexico: Perspectives
on a Complex Organism, Revisited”***

In addition to the Greater Albuquerque Chamber of Commerce, Think New Mexico, the Legislative Task Force, NM First, and many others trying to overhaul our education system, we have various federal programs and mandates, now including ESEA (Elementary and Secondary Education Act—The No Child Left Behind Act of 2001), private foundations trying to help, and local corporations fulfilling industrial revenue bond agreements, all funneling money into our state. Meanwhile, of course, our state legislature allocates almost half of the budget to education.

Few New Mexicans are more qualified than CESE member Jack Jekowski to help us make sense of this cacophony. Jack volunteers tirelessly around the state, trying to inject data-based decision-making into these various processes. He also produces a “spread-sheet,” describing organizations involved in education reform and how they contribute, which he has passed out at previous CESE meetings.

First Unitarian Church
Sunday, June 16th, 2002
from 1 to 4 pm.
3701 Carlisle Blvd. NE
(Southwest corner of
Carlisle & Comanche)

Light Refreshments

Please RSVP Marilyn Savitt-Kring
<mmkring@juno.com> or (505) 856-6654

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RETURN SERVICE REQUESTED

***Annual
Meeting***

WHAT'S HAPPENING

6th Annual Meeting (See Page 9)

Speaker: Jack Jekowski

Election of Board Members

Light Refreshments

Public Invited

Want to save postage and paper? Some people prefer not to receive a hard copy of the BEACON. If you are one of them, please notify CESE Secretary Marilyn Savitt-Kring at mmkring@juno.com to be removed from our mailing list. Then we will notify you by email when the latest BEACON is posted on our web site, www.cesame-nm.org (usually before snail mail arrives).

Dues help us to award science fair prizes, issue white papers, sponsor public events, pay for postage and printing of the BEACON, etc. If your mailing label does not show 2002 beside your name, your dues are due. (See page 2 for rates.) Please help us to continue our good work.