



The BEACON

News from

The Coalition for Excellence in Science and Math Education

Volume VI, No. 4

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In this issue: INAUGURAL MESSAGE, Bill MacPherson; 2002 ANNUAL MEETING REPORT, Marilyn Savitt-Kring; DARWIN DEIFIED? Eva Thaddeus; STATISTICAL TERMS, Walt Murfin; TOON and NMSR NEWS, David Thomas, NMAS CENTENNIAL, Marshall Berman

INAUGURAL MESSAGE

In rereading Timothy Moy's valedictory message to the membership in the last issue of *The Beacon*, I just want to say that there will be no radical departures from the course the CESE has steered since its inception. We will still be fighting to keep irrational ideas from cropping up in school curricula and will still provide a voice of reason to the State's decision makers on the subject of school reform.

We will continue to seek to reinforce what Thomas Jefferson, 200 years ago, called the "wall of separation between church and state." That arm of the state that most obviously and necessarily impinges upon the life of the average citizen is education. That part of education that most offends the literal religionist is science, since science cannot support the fundamentalist idea that the Earth was created in six days, 6000 years ago and that each creature reproduced "after his kind." They don't much care for the "Big Bang" theory either, although more enlightened biblical scholars see a natural connection between the Big Bang and "let there be light."

The founders did not insist on the impenetrable wall for the sake of atheism, since there were few atheists around then, but for the sake of religion, that each may practice freely without interference from any of the others, or from the government. The United States is a much

more religiously pluralist society today than the founders could have conceived, so First Amendment protections are even more important than they were when it was written. The genius of the Constitution was that it was flexible enough to accommodate new situations and established a court system that could reinterpret the constitution for different ages.

In spite of the fact that the Supreme Court has protected us from the worst onslaughts of the Creationists in the past, the Creationists are not going away and they are constantly attempting to chip away at the granite of the impenetrable wall. Without an enlightened and aroused citizenry to guard against incursions of the radical religionists, we may some day have a Supreme Court that tilts in their direction.

So I too urge you to become more active in CESE, follow the "Duck Mail," write letters to our Senators and Representatives on important legislation, volunteer to be a Science Fair judge (that's one of our important but little heralded activities,) and maybe come up with some new ideas on how we can be more effective. As Dr. Moy said in his closing paragraph, "there is nothing more satisfying than fighting the good fight."

Bill MacPherson

CESE President

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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2002 ANNUAL MEETING REPORT

The 6th annual CESE meeting convened at the First Unitarian Church at 1P.M. on June 16, 2002. About 40 people attended, and an additional 22 sent in their proxy votes.

Timothy Moy, outgoing president, welcomed everyone, followed by individual introductions of those present..

Tim said that success is often the greatest threat to an organization's survival. That is, after the goal that founded the organization is met, sometimes the group dies. CESE has survived and is moving in many directions, such as advising legislators and other public officials to use data when considering reform. And he has found allies in Santa Fe and Washington in reforming math education to include a deeper treatment of probability, statistics, and uncertainty.

In the past year, CESE sponsored a couple of events (along with New Mexicans for Science and Reason and New Mexico Academy of Science). First was a preview of Mark Shelley's visually exquisite, PBS series, Shape of Life, shown in February at the NM Museum of Natural History & Science.

Also, Kansas physicist Adrian Melott, recently honored by the American Physical Society for his work in promoting quality K-12 science standards, spoke in April. His topic, "Intelligent Design is Creationism in a Cheap Tuxedo," resulted in a lively question and answer session.

Tim also mentioned that creationist speakers had recently visited NM and that CESE is following the Intelligent Design movement in the rest of the country. NM's science content standards will come up for revision next year, and we should not become too complacent. CESE, as other organizations, have been faced with new challenges since the events of September 11th.

He thanked the other board members for their contributions and urged the general membership to contact any board member on how to get involved.

Following Tim was the keynote speaker, Jack Jekowski, Principal Partner of Innovative Technology Partnerships. The topic of his speech was "Education in New Mexico: Perspectives on a Complex Organism, Revisited." He also said education reformers should look at data, instead of relying on opinions and emotions, that unintended consequences could result from misunderstanding or misuse of data, and that there is no quick fix for the problems in education. Jack provided handouts of his comprehensive slide presentation, that covered topics such as a flowchart of NM's public and higher educational system, some common myths, teacher quality initiatives, math and science quality initiatives, and developing strategies for improvement. For the entire presentation of Jack's speech, please see:

<http://www.cesame-nm.org/Resources/reports.html>.

Members were asked to pay dues. (They are tax-deductible.)

Continued

2002 Annual Meeting Continued.

Founding member, Alan Morgan, moved to accept the slate of officers. Several people seconded the motion, and the new slate was approved by acclamation. Officers for next year are:

President: Bill MacPherson

Vice-President/President Elect: Art Edwards

Secretary: Marilyn Savitt-Kring

Treasurer: Jerry Shelton

Past president: Timothy Moy

Board Members at Large

Marshall Berman

Paul Bolduc

Steve Brugge

Kim Johnson

Dave Thomas

Nonvoting Member

Sema Wynne

Tim turned the gavel over to Bill MacPherson. Bill spoke of the Intelligent Design (ID) movement. He said there are two ways to look at ID; one is that it threatens to undo everything science has accomplished, and the other is that ID is creationism's last gasp. Its proponents are misrepresenting the Santorum amendment that is only in the conference report of the bill, "No Child Left Behind." It was not in the legislation that was actually passed and signed into law. We will have to be vigilant for ID attempts to insert their agenda into the public school curricula, as well as individual teachers who have stealthily preached young earth creationism in the classroom.

CESE is still pushing data based decision-making concerning education. CESE's statisticians, recently revised the white paper using more current data. The basic conclusions are still valid. There is still a bimodal distribution of test scores; demographics still play a strong role in student performance, although some districts do well in spite of disadvantages, and some advantaged districts do not perform well. The challenge is to uncover and address these problems, convince other organizations, such as the Greater Albuquerque Chamber of Commerce of the merits of such a strategy, rather than completely overhauling the state's school system.

Bill suggested we contact the future governor governor with suggestions of candidates for the

five appointed members of NM's state Board of Education. It is important for scientists to get politically involved. He asked that all members become more active by recruiting new members, and e-mailing him with suggestions for the coming year. wmacpherson3@comcast.net

Following Bill's speech, board member and occasional magician, Dave Thomas, provided an amusing demonstration. For this, please see: <http://www.nmsr.org/amazing1.htm>

The meeting was adjourned, followed by lunch and conversation across the patio.

Marilyn Savitt-Kring
CESE Secretary

DARWIN DEIFIED?

I had the great good fortune to take a trip to the Galápagos this summer. The famous islands have intrigued travellers and natural scientists for centuries, but Darwin is the Galápagos' best-known visitor, because the diversity he discovered there as a young naturalist influenced his later theories of evolution. Many things in the Galápagos are named after him, including the main research station.

In this dry archipelago, human settlement has been the exception rather than the rule. However, since the growth of the ecotourist trade, there is now one substantial town: Puerto Ayora. Walking down the waterfront of Puerto Ayora, my husband and I encountered a large, colorful archway in a seaside park. Painted on the arch are famous Galápagos animals: sea turtles and sea lions, dolphins and land tortoises, dolphins and penguins. At the top, overlooking it all, is Charles Darwin, inspiration in his eye, long white hair and beard streaming, looking a lot like. . . .

"That's Darwin up there in that Godlike attitude," said the British tourist near us to his American companion.

"I wonder what the evolutionists would have to say about that," she answered. "Raising Darwin to the status of God."

"In whom he did not even believe."

Continued on page 4

Continued from Page 3

How many people know that Darwin studied to be a clergyman, and never rejected Christianity? I almost piped in to correct my neighbors, but figured that my eavesdropping would be unwelcome.

Consider these lines from the last pages of *The Origin of Species*: “Authors of the highest eminence seem to be fully satisfied with the view that each species has been independently created. To my mind it accords better with what we know of the laws impressed on matter by the Creator, that the production and extinction of the past and present inhabitants of the world should have been due to secondary causes, like those determining the birth and death of the individual. When I view all beings not as special creations, but as the lineal descendants of some few beings which lived long before the first bed of the Silurian system was deposited, they seem to me to become ennobled.”

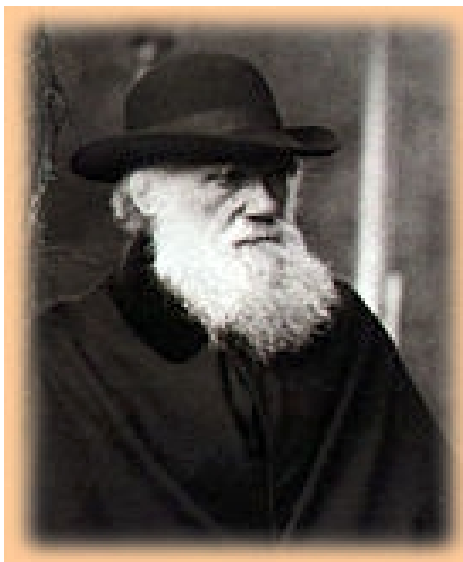
Now consider something more recent and probably more familiar: the bumper decal showing a fish with little legs, and inside it the word DARWIN. I used to find the evolved fish amusing, and I considered getting one for my dad. But my husband set me straight. “It’s making fun of someone else’s symbol,” he said. “That’s rude and inflammatory.”

As time goes by, I agree with my husband more and more. In fact, completely. The amphibious alternative to the Christian symbol sets up a

blatant opposition between religion and science. What’s more, it replaces the name of Jesus with the name of Darwin. Is that really what we want to see happen? Do we want Darwin raised to a status he never in his own life would have claimed? Do we want a divine Darwin?

You’ve probably seen the escalation of the war of the decals. The Jesus fish on the point of devouring a small Darwinian amphibian, with the motto, “Survival of the Fittest.” Reach out and mock someone else’s symbol, and they’ll fight back. Once, and only once, I saw the fish and the amphibian mouth-to-mouth in a kiss. Why not? I loved that.

If we set up science in opposition to religion, we fall right into the fundamentalists’ framework. This is what they accuse us of, isn’t it? Of reaching with overweening arrogance to explain everything in scientific terms. They accuse us of replacing the value- and meaning-laden doctrines of religion with equally “ideological,” though cold and value-neutral, doctrines of science. If there’s one message we need to keep sending, again and again, to the general public, it’s that science isn’t a substitute for religion, it’s not an ideology: it’s a method of inquiry. That good science requires an approach of humility, of acknowledging what is not yet known, of testing what is believed to be known, of looking closely and with care. This is what we need to communicate. Darwin as Jesus, Darwin as Jehovah: images like that don’t help.



***Eva Thaddeus
CESE member and first grade teacher
in the Albuquerque Public Schools***



STATISTICAL TERMS

Data analysts throw around lots of statistical terms. Often the people using the terms don't give precise definitions, or they define the terms so technically that non-specialists have little chance of understanding them. That is not entirely the specialists' fault. Many statistical terms are hard to grasp. I'll try to balance accuracy with simplicity, but probably won't always be successful.

First, let's look at the word *random*. Many people use "random" to mean completely unpredictable. However, randomness in statistics means "predictable by probability of occurrence."

In order to be statistically interesting, a thing or phenomenon must have a *measurable characteristic*. The occurrence of a measured value is an *event*. The value of the measurable characteristic in an event is a *realization*. Sometimes measurements always come in well-defined values. Look at the coins in your pocket. The face value of each coin is completely determined. There is no such thing as experimental error. On the other hand, the weight of a coin of any particular face value is not fixed. You don't know exactly how heavy any five-cent coin is until you weigh it. You can weigh many specimens, and the weights will tend to cluster around some middle value, but will not all be exactly the same. Even after you have weighed a specimen, you don't know precisely how heavy it is because your procedure always has some experimental error. No conceivable refinement of your procedure and no conceivable knowledge of metallurgy or numismatics can remove 100% of the uncertainty.

Some characteristics are *deterministic*. You know ahead of time what the value will be. The weight of a specific coin is *probabilistic*. It probably weighs close to X grams, but you can't know how close to X until you have weighed it. If you have weighed enough coins, you can estimate the probability of getting any given weight, but that does not tell you precisely how much the next coin will weigh.

The uncertainty in a probabilistic measurement can be *systematic* (your measuring device always reads too high) or *random*. Random values occur because of randomness in the phenomenon be-

ing measured, or random errors within the equipment used to measure the phenomenon, or random errors in reading the result. You can correct for systematic errors. You can refine the process to minimize random errors. You will always be stuck with randomness in the phenomenon being measured.

Suppose that you have reduced experimental errors to an insignificant level. Now you measure the weight of many five-cent coins. The weight is a *random variable*. Simply put, a random variable is one that has probabilistically predictable measurements. Fortunately, random variables aren't all over the map. Random variables exhibit patterns. Descriptive statistics is an attempt to nail down the patterns.

Random variables are said to be *discrete* if you could count the number of possible measurement values. Realizations are restricted to specific values, and never occur between those values. Random variables are *continuous* if they can take on any value within some interval. Every real thing or phenomenon is actually discrete, but when the number of possible realizations gets very large we pretend that it is continuous. Variables are *quantitative* if you can put a number to the measurable characteristic. Some random variables are *categorical*; the measurable characteristic is membership in a class, and can only have the values "non-member" or "member." Age in years is quantitative; age as infant/adult/geezer is categorical.

A *distribution* is a probabilistic model of the values of possible realizations of a random variable. That statement doesn't make it very clear, does it? It is the answer to "What's the pattern?" The *cumulative distribution function* or CDF tells us the probability that any realization of the random variable will be less than or equal to some specific number. It's the familiar "S" curve. A distribution can be given by an equation, a table, or a curve. CDFs always slope upward to the right; they are non-decreasing functions.

The distribution can also be represented by the *probability density function* or pdf. That is the probability that any realization of the random variable will be found in a little bitty neighborhood near any chosen value. It's the bell-shaped curve

Continued on page 6

Statistical Terms continued from page 5

that all people think they understand, but that very few really do. Look at any specific value "V" of a random variable. What fraction of all the possible realizations will occur within +/-10 units of V? Divide that fraction by the bandwidth, 20. Now what fraction comes within +/- 5 units of V? Divide that fraction by 10. What fraction occurs within +/- 2 units of V? And so on. As we reduce the bandwidth, the fraction divided by bandwidth gets closer and closer to the probability for a very tiny slice. It is NOT the probability of getting exactly "V". That probability is zero for a continuous random variable. Now do the same thing for many possible values of the random variable. The curve is "bell-shaped" if there is a greater probability of being near an average value than being far out. You see that the bell-shaped curve that people talk about so glibly is actually a pretty complex concept.

There are many types of distributions. Most people with a smattering of statistics are familiar with the normal distribution. An older term for it was "Gaussian," which might actually be better than "normal." Normal implies correctness, as if all others were abnormal and should be shunned.

Remember that the normal distribution is only a mathematical idealization. You won't find anything that exactly follows a normal distribution, although lots of phenomena come very close. Assumption of normality does make analysis come out cleaner. Many real distributions are lopsided or "skewed." The terms for skew might confuse you. A *negative skew* has a longer tail on the low side. That means that the hump is pushed toward the positive side. Conversely, a *positive skew* has the longer tail at the high side, so the hump is on the negative side. Just remember that "positive" and "negative" skews are the opposite of what they appear.

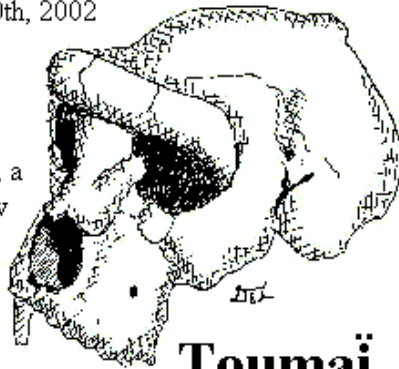
We have dealt with randomness, measurable characteristics, events, realizations, deterministic vs. probabilistic measurements, systematic and random uncertainty, discrete and continuous random variables, quantitative and categorical variables, distributions, probability density functions, and positive and negative skew. You now know more than 99% of the population. You probably know more than some people who work with statistics all the time.

Walt Murfin
CESE Statistician

Action... and... Re-Action

"**New Face in the Family**," Amanda Onion.
Source: ABCNews.com, July 10th, 2002

"A 6-7 Million-Year-Old Skull Suggests Human Evolution Was Messy ...
He had a small face, small teeth, a narrow head, a very heavy brow and he **could** be your oldest ancestor. ...
The find, which is the oldest human relative ever found, suggests humans **may** have begun evolving from chimpanzees sooner than researchers realized...
It also implies that human evolution **may** have been a much messier process than imagined...
Whether Toumai is a direct ancestor of humans remains to be seen and **may** be unlikely."



"**Fossil Shoots Another Hole in Darwinism**," Steve Jordahl.
Source: Focus on the Family, "Family News In Focus," July 15th, 2002

"Mark Edwards, a spokesman for the Seattle-based Discovery Institute, said there is very little hard evidence to bolster the theory. 'The evidence for human evolution is relatively thin, and it's merely assumed that humans have evolved because evolution is accepted already,' Edwards said."

"The trouble with the world is that the stupid are cocksure, and the intelligent full of doubt..." - Bertrand Russell

Toon by David E. Thomas

New Mexicans for Science and Reason

A New Debate is coming! The Participants are:

NMSR and TCCSA

(New Mexicans for Science and Reason) and (Twin Cities Creation Science Association)

The Topic:

“Comparisons of molecules (proteins, DNA) of various species provide independent and compelling support for the hypothesis of biological macro-evolution”

For the Affirmative, Dave Thomas

For the Negative, Walter ReMine

The first statement by Dave Thomas is expected about mid August.

This Debate will be posted simultaneously on the web sites of both

New Mexicans for Science and Reason (www.nmsr.org)

and

Twin Cities Creation Science Association (www.tccsa.tc)

DID YOU KNOW?

—that the New Mexico Academy of Science was founded in 1902, ten years before New Mexico became a state? Please join us in celebrating the Academy’s 100th anniversary at an outstanding conference that will highlight New Mexico scientists and educators, and scientific solutions to problems facing our state and nation. —> —> —> (See Page 8) —> —> —> —> —> —>

The Coalition for Excellence in Science
and Math Education (CESE)
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New Mexico Academy of Science Centennial Conference 1902-2002



***November 16, 2002
7:00 AM to 4:30 PM
Sheraton Old Town
800 Rio Grande Blvd NW
Albuquerque, New Mexico
505-843-6300***

Conference Registration Fee:

	By October 1	After October 1
Non-members (fee includes one-year NMAS membership):	\$40.00	\$50.00
NMAS Members:	\$25.00	\$35.00

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