



REPORTS

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THE
NATIONAL CENTER FOR SCIENCE EDUCATION

DEFENDING THE TEACHING OF EVOLUTION AND CLIMATE SCIENCE

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Typhoon Nina (1987). Photo courtesy United States National Oceanic and Atmospheric Administration

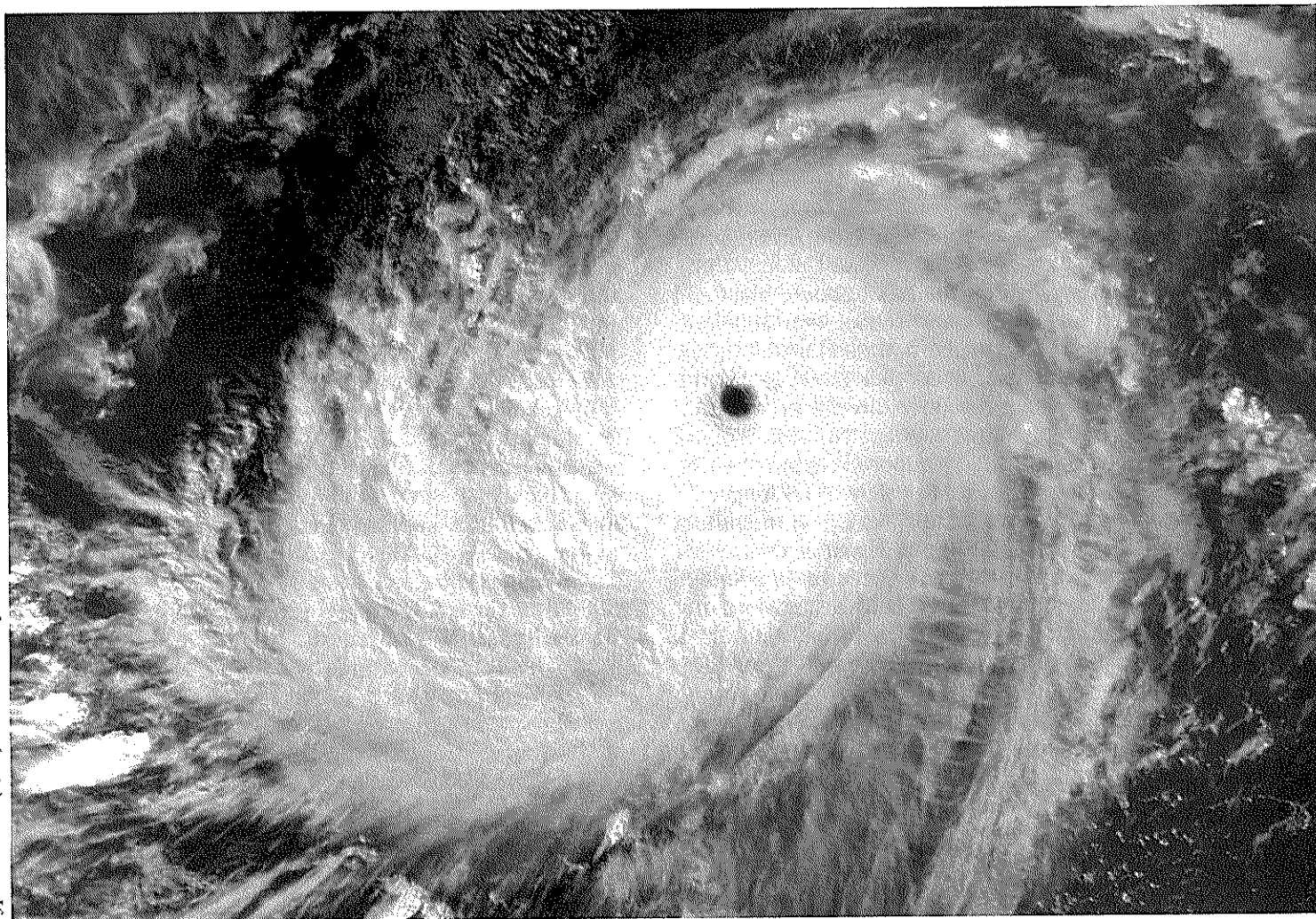


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UPDATES

Hawaii: House Resolution 145, introduced in the Hawaii House of Representatives on March 7, 2014, would have, if enacted, recognized February 12 of each year as Darwin Day “to celebrate all of Charles Darwin’s achievements in the field of science.” The resolution was unusual in attempting to establish Darwin Day on a perennial basis: previous Darwin Day resolutions, such as Virginia’s House Resolution 884 in 2009, typically designate February 12 of the current year as Darwin Day. The sole sponsor of HR 145 was Kaniela Ing (D-District 11). The bill died in committee on April 10, 2014, when a legislative deadline passed.

Louisiana: There was a settlement in a Louisiana case centering on a sixth-grade teacher’s advocacy of creationism. According to a March 14, 2014, press release from the American Civil Liberties Union (ACLU), “[u]nder the consent decree, the school board must end official prayers during class and school events, refrain from disparaging any particular faith, and prohibit staff from teaching creationism and other biblical doctrine as fact.” Marjorie Esman, executive director of the ACLU of Louisiana, was quoted as saying, “No child should feel that a teacher is trying to impose religious beliefs, and this agreement ensures that this will no longer be the case at Sabine Parish schools. We’re glad the school board worked with us to bring this matter to a quick and amicable resolution.” The case, *Lane et al v Sabine Parish School Board et al*, was filed in January 2014; documents from the case are available from the ACLU’s website (<https://www.aclu.org/religion-belief/lane-v-sabine-parish-school-board>).

As NCSE previously reported, the complaint in the case alleged that the teacher “treats the Bible as scientific fact, telling students that the Big Bang never happened and that evolution is a ‘stupid’ theory that ‘stupid people

made up because they don’t want to believe in God,” tells her students, “if evolution were real, it would still be happening: Apes would still be turning into humans today,” repeatedly instructed students that evolution is “not valid as a scientific theory and that God made the world 6000 years ago,” and awarded extra credit for writing “Isn’t it amazing what the Lord has made” on assignments and examinations. After the administration was not responsive to complaints, the Lanes filed suit, citing a pattern of “official promotion and inculcation of religion generally, and Christianity, specifically” on the part of the district in asking for a judgment against the district.

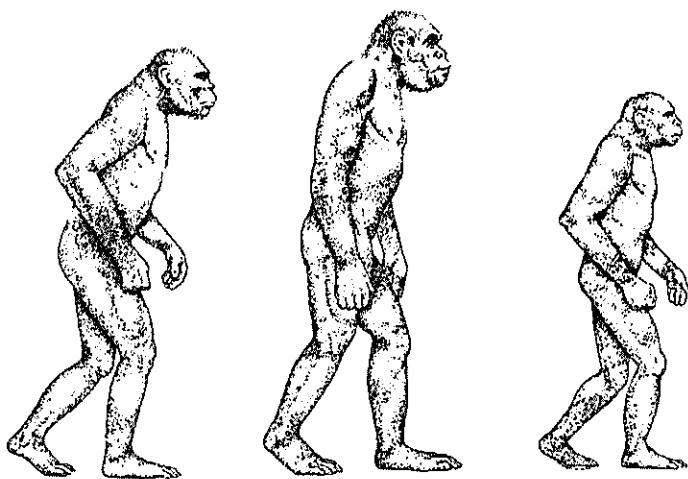
Louisiana: Louisiana’s Senate Bill 70 would, if enacted, have repealed the state’s Balanced Treatment for Creation-Science and Evolution-Science Act, which was made law in 1981 and declared to be unconstitutional by the United States Supreme Court in *Edwards v Aguillard* in 1987. Yet the law remains on the books. SB 70 was prefiled by Dan Claitor (R-District 16) on February 17, 2014, and referred to the Senate Committee on Education.

It was Claitor’s second attempt to repeal the Balanced Treatment Act. In 2013, he amended Senate Bill 205, which concerned foreign language immersion programs in public school districts, to repeal the obsolete law. The amended bill passed the Senate, despite the opposition of Ben Nevers (D-District 12), the senate sponsor of the so-called Louisiana Science Education of 2008, who argued that it would be useful for the law to be on the books in case the *Edwards* decision is ever reversed.

When SB 205 went to the House Education Committee, however, the provision repealing the Balanced Treatment Act was stripped from the bill, in part owing to the bill’s original sponsor describing it as “oddball.” The Senate rejected the House version of the bill, but a conference committee then agreed on a version that lacked the repeal provision, which was subsequently passed by both houses of the legislature, leaving the Balanced Treatment Act intact.

“This is encouraging, if overdue,” commented Barbara Forrest, Professor of Philosophy at Southeastern Louisiana University and a member of NCSE’s board of directors. “It shouldn’t take 27 years and a Supreme Court case to convince the legislature to repeal the Balanced Treatment Act. But if the legislature is really serious about science education in Louisiana, it will focus on getting the equally pernicious Louisiana Science Education Act off the books.”

SB 70 passed the Senate Education Committee on March 12, 2014, “without action,” which the New Orleans *Times-Picayune* (2014 Mar 12) explained allowed the committee “to move the bill to a vote of the full Senate without formally approving or opposing it.” At



the hearing, Lenny Ditoro, who is reportedly associated with the Louisiana Family Forum, spoke in opposition to SB 70, saying, “the legislation represented the opinion of [the] Louisiana legislature at the time [and] is a matter of history of this body.”

But ultimately the bill was rejected on a 5–2 vote by the senate on March 24, 2014, according to the New Orleans *Times-Picayune* (2014 Mar 24). There was reportedly no debate. Jean-Paul Morrell (D–District 3), one of the five senators to vote for SB 70, attributed its defeat to the inattention of his colleagues. “Everyone was half listening and nobody read the bill,” he commented. “It’s disappointing that even though people know this bill is the right thing to do ... there is a lack of political will to do it.”

Louisiana: Senate Bill 175, prefiled in the Louisiana Senate on February 25, 2014, and referred to the Senate Committee on Education, would, if enacted, have repealed Louisiana Revised Statutes 17:285.1, which implemented the so-called Louisiana Science Education Act (LSEA), passed and made law in 2008. Governor Bobby Jindal told NBC News in 2013 that the LSEA permits the teaching of creationism, including “intelligent design.” The bill to repeal the LSEA was introduced by Karen Carter Peterson (D–District 5), who sponsored the identical SB 70 in 2011, SB 374 in 2012, and SB 26 in 2013. The Senate Committee on Education voted 5–1 to shelve SB 70 in 2011, 2–1 to shelve SB 374 in 2012, and 3–2 to shelve SB 26 in 2013.

The law targeted for repeal calls on state and local education administrators to help to promote “critical thinking skills, logical analysis, and open and objective discussion of scientific theories being studied including, but not limited to, evolution, the origins of life, global warming, and human cloning”; these four topics were described as controversial in the original draft of the legislation. It also allows teachers to use “supplemental textbooks and other instructional materials to help students understand, analyze, critique, and review scientific theories in an objective manner” if so permitted by their local school boards. A sponsor of the bill told the *Hammond Daily Star* (2008 Apr 6) that the bill was aimed at promoting the discussion of “scientific data related to creationism.”

Since 2008, antievolutionists have not only sought to undermine the law’s provision allowing challenges to unsuitable supplementary materials but have also reportedly invoked the law to support proposals to teach creationism in at least two parishes—Livingston and Tangipahoa—and to attack the treatment of evolution in biology textbooks proposed for adoption by the state. Meanwhile, the Society of Vertebrate Paleontology urged

Louisianans to repeal the law in 2008, and the Society of Integrative and Comparative Biology decided to hold its conferences elsewhere while the law remains on the books (relenting only in the case of New Orleans after the Orleans Parish School Board prohibited the teaching of creationism in its science classes).

Endorsers of the repeal effort include a group of 78 Nobel laureates in the sciences (representing nearly 40% of living Nobel laureates in the science), the National Association of Biology Teachers, the Louisiana Association of Biology Educators, the Louisiana Coalition for Science, the American Association for the Advancement of Science, the American Institute for Biological Sciences, the American Society for Biochemistry and Molecular Biology, the American Society for Cell Biology, the Society for the Study of Evolution together with the Society of Systematic Biologists and the American Society of Naturalists, the Clergy Letter Project, the New Orleans City Council, and the *Baton Rouge Advocate*.

Subsequently, the *Baton Rouge Advocate* (2014 Mar 9) reaffirmed its editorial support for the repeal effort. “If Louisiana allowed teachers to instruct students that the sun revolves around the Earth, there would likely be outrage at such an affront to science and education,” the *Advocate’s* editorial commented. “Yet that is just about what is in state law when it comes to evolution and the processes by which life developed on Earth. It’s just as mistaken to allow—actually, encourage—teachers to adopt ‘supplemental materials’ that ‘critique’ evolution, because evolution is as fundamental to biological sciences as the planets are to astronomy.” The editorial also expressed hope that “the Legislature will listen to reason and repeal the statute.”

Ultimately, however, SB 175 was tabled on a 3–1 vote in the Senate Education Committee on April 24, 2014, which effectively killed the bill in committee, according to the *Baton Rouge Advocate* (2014 Apr 24). On the day preceding the committee hearing, Zack Kopplin, the young activist spearheading the repeal effort, was quoted in the *Advocate* (2014 Apr 23), as saying, “Whether we pass or fail tomorrow, it does not really matter because this is sort of ground zero for a much larger fight for science in this country.” He expressed optimism about the future of the repeal effort after the November 2015 elections, which might bring new members to the Senate Education Committee.

Missouri: Two antievolution bills died in committee in the Missouri House of Representatives on May 16, 2014, when the legislature adjourned. House Bill 1472 would have, if enacted, required school districts to allow parents to have their children excused from learning about

evolution: "Any school district or charter school which provides instruction relating to the theory of evolution by natural selection" would have to have "a policy on parental notification and a mechanism where a parent can choose to remove the student from any part of the district's or school's instruction on evolution." Parents and guardians would receive a notification containing "[t]he basic content of the district's or school's evolution instruction to be provided to the student" and "[t]he parent's right to remove the student from any part of the district's or school's evolution instruction." Interviewed by the *Kansas City Star* (2014 Feb 6), the bill's sponsor Rick Brattin (R-District 55) described evolution as "just as much faith and, you know, just as much pulled out of the air as, say, any religion." HB 1472 was passed by the House Committee on Elementary and Secondary Education on March 12, 2014, but subsequently died in the House Rules Committee.

House Bill 1587 would have, if enacted, deprived administrators of the ability to prevent teachers from miseducating students about "scientific controversies," specifically citing "the theory of biological and hypotheses of chemical evolution" as controversial. HB 1587 would have required state and local educational authorities to "assist teachers to find more effective ways to present the science curriculum where it addresses scientific controversies and permit teachers "to help students understand, analyze, critique, and review in an objective manner the scientific strengths and scientific weaknesses of the theory of biological and hypotheses of chemical evolution"; it would have prevented such authorities from "prohibit[ing] any teacher in a public school system of this state from helping students understand, analyze, critique, and review in an objective manner the scientific strengths and scientific weaknesses of biological or chemical evolution whenever these subjects are taught." The bill was referred to the House Committee on Elementary and Secondary Education, where it died without a hearing.

Oklahoma: Oklahoma's Senate Bill 1765, which would, if enacted, have deprived administrators of the ability to prevent teachers from miseducating students about "scientific controversies," died in the Senate Education Committee on February 24, 2014, when a deadline for senate bills to pass committee expired. The sole senate sponsor of SB 1765 was Josh Brecheen (R-District 6), who introduced similar legislation in two previous legislative sessions; Gus Blackwell (R-District 61) was listed as its sponsor in the House. The bill was opposed by the National Association of Biology Teachers and the American Institute of Biological Sciences, as well as by the grassroots Oklahomans for Excellence in Science Education.

Oklahoma: Oklahoma's House Bill 1674, which would, if enacted, have deprived administrators of the ability to prevent teachers from miseducating students about "scientific controversies," died in the Senate Education Committee on April 3, 2014, when a deadline for House

bills to be passed by their Senate committees expired. HB 1674 previously passed the Oklahoma House of Representatives on a 70-6 vote on March 3, 2014.

As introduced in February 2013, HB 1674 specifically mentioned "biological evolution, the chemical origins of life, global warming, and human cloning" as subjects which "some teachers may be unsure" about how to teach. Later, in February 2014, Gus Blackwell (R-District 61), a sponsor of HB 1674 along with Sally Kern (R-District 81), Arthur Hulbert (R-District 14), and Josh Brecheen in the Senate (R-District 61), amended the bill to omit the specific details.

According to KFOR television in Oklahoma City (2014 Mar 27), "Blackwell says the bill's current language doesn't mandate teaching creationism in the classroom, but instead gives teachers the right to talk about scientific evidence that challenges Darwinian evolution." Bob Melton of the Oklahoma Science Teachers Association retorted, "There is no doubt, or discussion, or controversy about evolution or climate change."

In all, seven antievolution bills have been introduced in five states (Missouri, Oklahoma, South Carolina, South Dakota, Virginia) so far in 2014; none won passage.

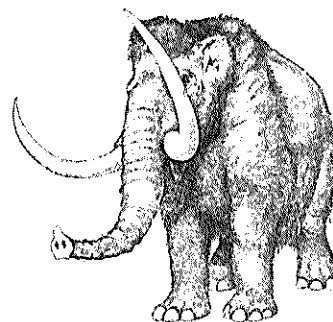
South Carolina: Was the mammoth "created on the Sixth Day with the other beasts of the field"? According to the Senate version of House Bill 4482 in South Carolina, it was.

HB 4482, as introduced in the House on January 14, 2014, designated the woolly mammoth as the official state fossil of South Carolina. According to *The State* (2014 Apr 2), the proposal was due to eight-year-old paleontology enthusiast Olivia McConnell, in part because "its teeth were one of the first vertebra[te] fossils found in North America, dug up by slaves on a South Carolina plantation in 1725."

Amended to specify that the Columbian mammoth (*Mammuthus columbi*) would be the official state fossil, HB 4482 passed the House on a 94-3 vote on February 19, 2014, and proceeded to the Senate. The Senate Committee on Judiciary tinkered slightly with the language of the bill, but reported it favorably to the Senate.

When the bill reached the Senate floor in late March 2014, however, controversy ensued.

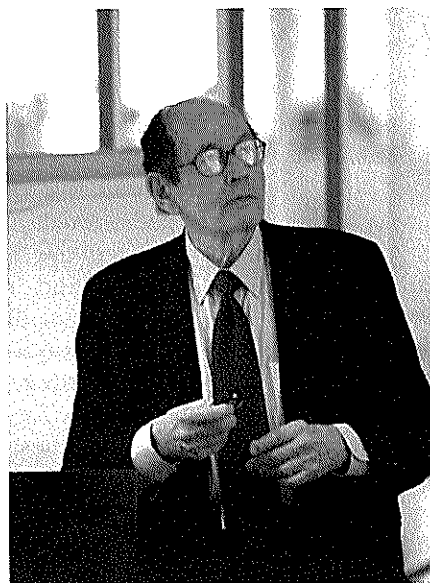
On March 25, 2014, while HB 4482 was under discussion, Kevin L Bryant (R-District 3) sought to amend the bill to designate Genesis 1:24-25, which describes the sixth day of creation, as the official state passage from an ancient historical text. His amendment was ruled out of order as introducing "new and independent matter." NPR (2014 Apr 2) reported that Bryant explained on his website, "I attempted to recognize the creator."



GERALD EDELMAN

The eminent biologist Gerald Edelman died on May 17, 2014, at the age of 84, according to *The New York Times* (2014 May 22). In 1972, Edelman and Rodney R Porter shared the Nobel Prize for Physiology or Medicine “for their discoveries concerning the chemical structure of antibodies.” In addition to immunology, Edelman was interested also in neurobiology, founding the Neurosciences Institute, “a non-profit scientific research organization dedicated to learning about the brain for the benefit of mankind,” in 1981, and in consciousness, expounding his ideas in such books as *Neural Darwinism* (Basic Books, 1987), *Bright Air, Brilliant Fire* (Basic Books, 1993), and *Wider than the Sky* (Yale University Press, 2004).

In his work on immunology and consciousness alike, Edelman stressed the usefulness of Darwinian thinking. In *Bright Air, Brilliant Fire*, for example, he wrote of the immune selective system, “Here is a molecular recognition system that is noncognitive and highly specific, the explanation of which is a marvelous example of population thinking—the essence of Darwinism. Like evolution, it has a generator of diversity ..., a means of perpetuating changes by a kind of heredity ..., and a means of differentially amplifying selection effects.” Similarly, he wrote that his theory of neuronal group selection “has definite parallels to Darwinian notions ...



Photograph: Anders Långberg
(Anders Zakrisson) via Wikimedia Commons

In evolution, differences among various organisms’ adaptations to the environment lead to differences among reproductive processes, which lead in turn to changes in the frequencies of genes in the population. In neuronal group selection, differences in connectivity, synaptic structure, and the morphology of neurons in the primary repertoire, after confrontation with different correlated patterns of signals from the environment, lead to differences in the probabilities of their responses as groups. This reflects changes in the patterns of their synaptic

strengths. There is differential reproduction in one case, differential amplification in the other.”

Edelman was born in Queens, New York, on July 1, 1929. He received his BS from Ursinus College in 1950 and his MD from the Medical School of the University of Pennsylvania in 1954. After stints at the Massachusetts General Hospital and in the US Army Medical Corps, he enrolled at the Rockefeller Institute, from which he received his PhD in 1960. He remained as a professor at Rockefeller University until 1992, when he joined the Department of Neurobiology at the Scripps Research Institute. Besides the Nobel Prize, his honors included the Eli Lilly Award in Biological Chemistry given by the American Chemical Society in 1965, membership in the National Academy of Sciences, and at least 16 honorary degrees.

Regrouping, Bryant sought to amend the bill to add “as created on the Sixth Day with the other beasts of the field” after each instance of “mammoth.” He told the *Greenville News* (2014 Apr 1), “Since we’re dealing with the fossil of the woolly mammoth then this amendment would deal with the beginning of the woolly mammoth.” He also suggested that the bill would survive constitutional scrutiny “because it doesn’t point to a single religion.”

The bill with Bryant’s amendment, along with a further amendment establishing “a moratorium on the enactment of legislation establishing official state symbols and emblems,” proposed by a senator who told *The State*, “It’s past time for the state of South Carolina to recognize we have enough state official whatevers,” was passed by the Senate on a 35–0 vote on April 2, 2014.

The bill then returned to the House. On April 9, 2014, the House rejected the Senate’s version of the bill on a 72–30 vote, and the bill therefore proceeded to a conference committee. In all, four of the six members of the legislature who were appointed to the conference committee—including Bryant—already voted for the “Sixth Day” version of the bill.

Yet the committee prepared a version of the bill omitting any reference to the Sixth Day of creation. The amended version of HB 4482 was passed on a 98–0 version in the House on May 8, 2014, and passed on a 32–3 in the Senate on May 13, 2014. Governor Nikki Haley signed the bill into law on May 16, 2014, making the Columbian mammoth the official state fossil of South Carolina. ■

From time to time we like to report on what our members are doing. As the following list shows, they — and we — have a lot to be proud about!

Tim M Berra returned from lecturing at Charles Darwin University in Darwin, Northern Territory, Australia. Berra presented three lectures based on his recent Darwin books and papers: *Charles Darwin: The Concise Story of an Extraordinary Man* (Baltimore [MD]: The Johns Hopkins University Press, 2008), *Darwin and His Children: His Other Legacy* (New York: Oxford University Press, 2013), and "Wallace's acceptance of Darwin's priority in his own words" (*The Linnean* 2013;29(2):23–40). The lectures began on Darwin's birthday, February 12, and included the Australian launch of his book on Darwin's children. The last lecture was given in association with the Museum and Art Gallery of the Northern Territory and its Wallace Exhibition that ran through June 2014. Berra is Professor Emeritus of Evolution, Ecology, and Organismal Biology at The Ohio State University, University Professorial Fellow at Charles Darwin University, and Research Associate at the Northern Territory Museum.

Richard E Broughton contributed a column to the *Norman Transcript* (2014 May 18) criticizing the Oklahoma House Administrative Rules and Government Oversight Committee's vote to reject the proposed Oklahoma Academic Standards for Science. Noting that the committee was reportedly motivated by the treatment of climate science in the standards, Broughton wrote, "A rejection of proposed education standards by the legislature is unprecedented and nothing but censorship for political purposes," adding, "It appears that Committee members believe standards with any reference to climate might be used to force students to understand the science of climate change. Isn't it ironic that a state with world class research on weather and climate would effectively reject that same science because teachers might broach the topic in 3rd or 4th grade?" He concluded, "Opposition to the new standards has no justification in science or education, but is purely a political statement by those who do not understand science." Broughton is Assistant Professor of Zoology at the University of Oklahoma and a member of the board of governors of Oklahomans for Excellence in Science Education.

Taner Edis and Maarten Boudry contributed "Beyond Physics? On the Prospects of Finding a Meaningful Oracle" to *Foundations of Science* (forthcoming; published on-line in March 2014). The abstract of their article:

Certain enterprises at the fringes of science, such as intelligent design creationism, claim to identify phenomena that go beyond not just our present

physics but any possible physical explanation. Asking what it would take for such a claim to succeed, we introduce a version of physicalism that formulates the proposition that all available data sets are best explained by combinations of "chance and necessity"—algorithmic rules and randomness. Physicalism would then be violated by the existence of oracles that produce certain kinds of noncomputable functions. Examining how a candidate for such an oracle would be evaluated leads to questions that do not admit an easy resolution. Since we lack any plausible candidate for any such oracle, however, chance-and-necessity physicalism appears very likely to be correct.

Edis is Professor of Physics at Truman State University and *RNCSE's* associate editor for physics and astronomy.

Larry Flammer's e-book *Science Surprises: Exploring the Nature of Science*, was published. The *Evolution and the Nature of Science* Institutes describe this peer-reviewed and field-tested book it as follows:

If you're looking for a unit to effectively teach the nature of science (NoS), with lessons for practicing critical and skeptical thinking, this is it. This new text supplement is intended for students in any science class, grades 7–10. It can replace the usual [chapter 1] in most secondary science textbooks with an updated and more accurate treatment of how science works, what it can and cannot do, and why it's so effective for increasing our understanding of the natural world. It particularly addresses the many misconceptions about NoS. It also satisfies virtually all of the new NoS science standards (NGSS and CCSS). This student text is designed to be tightly integrated with several of the free NoS lessons on the ENSI site. Teaching strategies are based on research pointing to those that are most effective, [for example] the 5E approach and student interactive discussion. There is a *Teaching Guide* to help do this most effectively.

The e-book of *Science Surprises* is available from Smashwords for \$3.99 (<http://www.smashwords.com/books/view/415809>); the *Teaching Guide* is available at no charge from Flammer (flammer4@gmail.com).

Michael E Mann contributed "False Hope" to the April 2014 issue of *Scientific American* (78–81), explaining that despite a plateau in the rate of global temperature rise,

Global warming continues unabated, and it remains an urgent problem. The misunderstanding stems from data showing that during the past decade there was a slowing in the rate at which the earth's average surface temperature had been increasing. The event is commonly referred to as "the pause,"

Glenn Branch is NCSE's deputy director

but that is a misnomer: temperatures still rose, just not as fast as during the prior decade.

Mann warned that if fossil fuels continue to be consumed at the current rate, the planet will warm by 2°C—harming all sectors of civilization—by 2036. A member of NCSE's Advisory Council, Mann is Distinguished Professor of Meteorology at Pennsylvania State University and the author of *The Hockey Stick and the Climate Wars: Dispatches from the Front Lines* (New York: Columbia University Press, 2012).

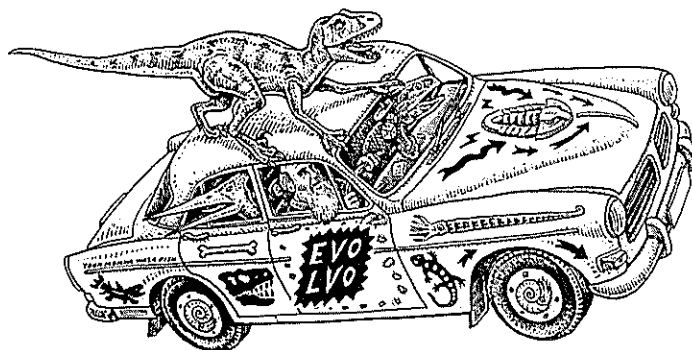
Randy Moore contributed "Did Humans Live with Dinosaurs? Excavating 'Man Tracks' along the Paluxy River" to *The American Biology Teacher* 2014;76(4):243–246. The abstract of his article:

The alleged "man tracks" beside dinosaur tracks near Glen Rose, Texas, are among the most enduring pieces of evidence used by young-Earth creationists to reject evolution. Despite the tracks' fame, their most persistent advocate—that is, Carl Baugh of the Creation Evidence Museum—has published neither (1) peer-reviewed papers in scientific journals about the tracks nor (2) clear, convincing, unenhanced photographs of unaltered tracks taken during an excavation. I participated in an excavation sponsored by Baugh's Creation Evidence Museum that uncovered three "man tracks" that Baugh and his assistants verified as being made by humans. These "tracks" are presented here and are among the first clear, unenhanced photographs of freshly uncovered "man tracks" taken during a Baugh-led excavation. They look no different than any of the countless other scuffs, cracks, and erosion marks in the area.

A former editor of *The American Biology Teacher* and a regular contributor to *RNCSE*, Moore is the HT Morse-Alumni Distinguished Professor of Biology at the University of Minnesota.

James Randi devoted his regular column in *Skeptical* (2014;19[1]:4–5) to the creationism/evolution controversy, writing, "The well-established fact of biological evolution is being increasingly and frantically denied in the USA by creationists ... Not accepting the reality of biology evolution is equivalent to not accepting the stark fact of gravity. ... Evolution is the single, unifying explanation for the diversity of life on Earth, and the foundation upon which the biological sciences are built." A conjuror, writer, and debunker, Randi is a member of NCSE's Advisory Council.

Michael Ruse was named the recipient of the annual award from the Bertrand Russell Society. A May 4, 2014, press release about the award praised Ruse for exemplifying "the kind of dedication of science and reason that was championed by Bertrand Russell," citing (among other achievements) Ruse's testimony in *McLean v Arkansas*, the 1982 case challenging the constitutionality of the state's law requiring the teaching



of creation science. A member of NCSE's Advisory Council, Ruse is the Lucyle T Werkmeister Professor of Philosophy at Florida State University.

NCSE's **Eugenie C Scott** received a Lifetime Achievement Award from the Center for Inquiry and Committee for Skeptical Inquiry in October 2013. In his presentation of the award at a conference of the two organizations in Tacoma, Washington (published in the March/April 2014 issue of *Skeptical Inquirer*), Ronald A Lindsay said:

Where would we be without Eugenie Scott? ... Despite the fact that creationism is an outdated myth, evolution's opponents have been tenacious, determined, and even at times, clever. ... In other words, no one political or legal win for science spells the end of the creationist assault on education. At least not so far. But we would be in a much worse position if not for Eugenie Scott. ... In every new case, in every bad bill in a state legislature, or backward curriculum from a creationist school board, the NCSE has not only brought to bear intellectual and scientific firepower, but in the person of Dr. Scott, science education has perhaps its greatest ambassador.

Scott was executive director of NCSE from 1987 to 2014, when she was succeeded by Ann Reid; she now serves as chair of NCSE's Advisory Council. She is a long-time fellow of the Committee for Skeptical Inquiry; she received the Public Education Award from the Committee for Skeptical Inquiry in 1991 and the Defense of Science Award from the Center for Inquiry in 2003.

James Walker donated a collection of his papers, photographs, and published writings to Kent State University, which will house them in its library's archives. In 1989, while teaching seventh-grade science in Massillon, Ohio, Walker was forced to file suit in both federal and state courts against his local school district, which, he alleged, punished him after local parents complained of his teaching evolution. Both suits were settled in his favor, and Walker continued to teach in the district until 2004, after which he taught physics and mathematics at Stark State College from 2005 to 2010. Walker's memoir *Before I Go: My First Fifty-Six Trips around the Sun* (Bloomington [IN]: Xlibris, 2003) was reissued as a Kindle e-book in 2011. ■

It's the new installment of "NCSE and me," the occasional feature in which we interview our favorite people—members of NCSE's board of directors, supporters of NCSE, recipients of NCSE's Friend of Darwin award, and the like—about their experiences with and thoughts about NCSE and its work defending the integrity of science education.

Judy Scotchmoor was the assistant director of the University of California Museum of Paleontology for Outreach and Education until her retirement in 2013. She received her BS in biological sciences from the University of California, Berkeley, in 1966, and her secondary teacher credential from Hayward State University in 1967. She taught mathematics and science at the middle-school level for 25 years before joining the museum. Among her major accomplishments there were the Understanding Evolution and Understanding Science websites. She received the Joseph T Gregory Award from the Society of Vertebrate Paleontology in 2004, the Education Award from the American Institute of Biological Sciences in 2006, and both the Stephen Jay Gould Award from the Society for the Study of Evolution and the Friend of Darwin award from NCSE in 2013.

Of your activities to promote the teaching of evolution, what do you consider to be the most important?

Most definitely the development of the Understanding Evolution website (www.understandingevo.org). In 2000, we hosted a conference on evolution instruction that brought together stakeholders from education, academia, and the media. That meeting (described by some as the "meeting with legs" due to the number of long-lasting collaborations that resulted) provided the incentive to UCMP and NCSE to work together to develop a much-needed resource for clarifying misconceptions about evolution and to provide resources for effectively teaching evolutionary biology. With funding from the National Science Foundation and then the Howard Hughes Medical Institute, the Understanding Evolution website was built, targeting K–16 teachers, their students, and the general public. At the time, it was a beautiful experiment in building an online educational resource. I don't think that any of us realized what a resource it would become for so many.

We brought together an advisory board of scientists, web designers, authors, and master teachers to create a vision for the project and assist with developing content. The teachers guided us every inch of the way, and all content was reviewed by science experts. The result was a rigorous site that worked for K–16 teachers—our primary audience. The teacher advisors stayed with us



over the years and were joined by others, and the site continued to grow and evolve to meet their needs.

Beyond the basic content provided within the Evolution 101 section of the website, the teachers requested resources that engaged students with data, explored scientific reasoning and current research efforts, and demonstrated the relevance of evolution to everyday life. So that is what we provided. Since its launch in 2004, the impact of Understanding Evolution has grown. The site averages well over a million page accesses each month during the academic year and is available in multiple languages. That really makes us all smile. But perhaps what I treasure most is a book that resides at UCMP—a hard copy of the Evolution 101 section of the website that has the English version on one side of a page mirrored by the same information in Tibetan on the other side of the page. This was published as part of the Dalai Lama's Emory-Tibet Science Initiative. That to me is symbolic of the far-reaching impact of the Understanding Evolution resource.

What hands-on materials would you recommend for teaching/introducing the key concepts of evolution (or nature of science)? For elementary students? Secondary?

Understanding Evolution, of course! Part of the site's amazing success has been the input from the numerous teachers from all grade levels involved in the project. In particular, I recall a second grade teacher who remarked, "I teach second grade. I don't teach evolution. Why is your site useful for me?" That really set us thinking and led us to develop another unique resource—a conceptual framework that is "aligned across grade levels and helps instructors to identify age-appropriate learning goals for their students and understand how concepts taught at one grade level lay the groundwork for more sophisticated concepts later on" (<http://evolution.berkeley.edu/evolibrary/teach/framework.php>). A similar format is now used in the Next Generation Science Standards, and it was relatively easy for us to align our framework with that of the NGSS.

But back to that second grade teacher ... There are definitely key concepts that younger students can grasp that will support later learning goals. For instance, we broke natural selection down into four essential components: variation, inheritance, selection, and time (VIST). By the end of second grade, students can understand that all individual living things, from kittens to kids, have features that they inherited from their parents, but they don't look exactly like their parents or exactly like one another. They can also grasp that closely related individuals (such as litter mates or siblings) look more similar to one another than to distant relatives (such as other cats or cousins). So they have grasped two essentials, variation and inheritance, which will

be important for understanding the process of natural selection later on.

So the Understanding Evolution site provides the learning goals for each grade span (K–2, 3–5, 6–8, 9–12, and undergraduate). But we did not stop there. Each of the learning goals is linked to a variety of vetted resources effective for teaching that concept. There are a huge number of available resources for teaching evolution, but teachers do not have time to go through and evaluate them all. Understanding Evolution does that for them. We have a group of reviewers who examine new resources to see how effective they are both scientifically and pedagogically. Successfully vetted resources are all available on the Understanding Evolution website in a database searchable by grade level, topic, learning goal, and so on. So we are providing a “one-stop shop” on evolution for teachers. That was our goal.

What lessons have you learned from creating UCMP's online resources about how evolution education stands now, and how it will be changing over the next decade?

One thing I've learned, regretfully, is that Genie Scott is right: NCSE will never be without a job. Unfortunately, there will always be a segment of our population that cannot accept evolution, and for a variety of reasons. And regretfully, there are those whose motivation is to build tension, mistrust, or misinformation about science—not only evolution, but also climate change. But we also learned that there is also a segment of the population whose “mistrust” of evolution stems from something more basic—a poor understanding of how science works, what science is, what science is not, and what is not science. And of course, that led us to develop a sister site to Understanding Evolution—the Understanding Science website (<http://undsci.berkeley.edu/>).

What one concept in science do teachers have the hardest time conveying to students? (Or the hardest time understanding themselves, for that matter!) What's the best tactic for dealing with that concept?

Understanding how science really works. Most of us were brought up with the five-step recipe referred to as the scientific method, but that is *not* how science is really done. Science is far more creative, dynamic, and iterative. I think that my dream would be that every teacher of science at every grade level would have the opportunity to *experience* science. Not just learn stuff, but actually *do* science. Then it would be far easier for them to incorporate that experience into their classrooms and to explain how science as a process is highly relevant to our everyday lives. We had a wonderful opportunity to work with the Oakland Unified School District in a great collaboration called CALBLAST that provided an authentic field research experience for more than thirty elementary school teachers, most of whom were rather intimidated by science. The results were extraordinary.

They had no idea that they could actually *do* science. That it was not all about learning facts. Now what they are doing in their classrooms is amazing.

So focusing on the nature and process of science is really critical, but it can't just be introduced in the first week of the term. It needs to be made explicit and reinforced throughout our teaching. The Understanding Science project and the “science flowchart” (http://undsci.berkeley.edu/article/0_0_0/howscienceworks_02) it created will always be what I am most proud of—being involved in that effort. I am pleased that it has reached several textbooks, and that the ideas promoted within the Understanding Science website are now at the core of numerous efforts, including COPUS (the Coalition on the Public Understanding of Science: <http://www.copusproject.org/>) with a focus on what science is, who scientists are, what they do, and why science matters.

How did you originally become involved with NCSE?

During my years as a middle school science teacher, I attended annual meetings of both the National Association of Science Teachers and the California Science Teachers Association, and each time that I saw Eugenie Scott's name listed as a speaker, I would attend. Not only was she a great speaker, but also she opened my eyes to the misconceptions held by so many about a part of science that I simply took for granted—evolution. It was not until a student in my own seventh-grade class asked the question: “But Mrs Scotchmoor, how can we be part of the ‘animal kingdom’—didn't God make us special?” that I realized that I was unprepared to answer. I did not have the tools necessary that Genie had been talking about and that NCSE was helping to provide.

When I began my career at the UCMP in 1993, I was fortunate to interact with NCSE in a variety of ways as my involvement with evolution education increased. Genie and I initiated some projects together and were both advisors to several others through the years. And of course, NCSE was our primary collaborator in developing the Understanding Evolution website.

Do you have any personal experiences with NCSE and its staff that you'd like to share?

The process of initiating and implementing such an undertaking as the Understanding Evolution website required input from multiple advisors and weekly project team meetings. NCSE was always there every step of the way, in particular three staff members: Alan Gishlick, a post-doc at NCSE; Eric Meikle, NCSE Outreach Coordinator; and of course, Genie, as the executive director. They were deeply involved in discussions, writing, and review, editing, and rewriting for more than a year before we even began to consider the website structure. Having their perspectives was critical in providing the information teachers needed to effectively teach about evolution—in particular in the areas of student misconceptions and teachers' legal responsibilities.

My encounters with other NCSE staff have been numerous and very, very positive. NCSE has been highly supportive of our teacher workshops, providing a variety of resources for attendees and/or speakers. I had the pleasure of initiating an annual summer institute on evolution working with Louise Mead who was, at the time, the education program director. Her energy and expertise brought smiles to all with whom she engaged and working with her was a great partnership. I cannot even begin to think of the number of times I have called Glenn Branch, knowing I would always get a supportive and knowledgeable response. And more recently, UCMP has had the pleasure of working very closely with Mark McCaffrey and Minda Berbeco on the Understanding Global Change project, and they, too, are extraordinary. So, to me, the NCSE staff are almost an extension of our UCMP team—always there, always knowledgeable, always ready to help.

Which of NCSE's accomplishments have you been the most proud of?

Overall, its ability to listen and to respond effectively—whether to a question posed by an individual teacher, a

school board, a parent, or to someone who questions the validity of evolution. There is a calm, well-grounded professionalism to everything that NCSE does. NCSE is also all about networking and that has contributed to the emergence of a highly collaborative evolution education community, whose members are supportive of one another. The work of NCSE is now leading to a similar community focused on global change.

Of course, more specifically I would have to applaud the services offered by NCSE during the Dover trial. They were critical in choosing and preparing the expert witnesses and in providing explanations of scientific and technical materials for the legal team.

And more recently I am really proud of the newest collaboration between UCMP and NCSE—the Understanding Global Change initiative (expected launch in spring, 2015), which will be resulting in a freely accessible and engaging web-based resource that provides K–16 science educators with an improved understanding of the processes, causes, and rates of global change and how science arrives at its current thinking. ■

The image shows two overlapping website screenshots. The top screenshot is for 'Understanding Evolution', described as 'your one-stop source for information on evolution'. It features navigation tabs for 'EVOLUTION 101', 'TEACHING MATERIALS', and 'RESOURCE LIBRARY'. A 'Welcome!' message invites users to take a site tour, find out what's new, or subscribe for updates. Below this are sections for 'Evolution 101' (with an 'Evo 101' icon), 'Teaching materials', and 'Resource library'. A 'Quick links' section lists: Main page, Mechanisms, Microevolution, Macroevolution, Speciation, and Misconceptions. A 'Recent news on the silent cricket' article is highlighted, mentioning that in 2006, the first reported silent males were shown on the entirely independent case of evolution. The bottom screenshot is for 'Understanding Science: how science really works'. It also has a 'Welcome!' message and similar navigation tabs. A 'Quick links' section lists: Main page, What is science?, How science works, Why science matters, Science toolkit, and Science database. A 'Cells within cells' article is featured, discussing the merging of cells and the role of evolution. Another article, 'The structure of DNA: Cooperation and competition', discusses how knowing the structure of DNA has helped push biology into new realms. A 'How Science Works on iTunes' section promotes a course to learn how to incorporate the nature of science into teaching.

Creationist Ministries Provide a Distorted View of Human Evolution

Adam Benton

INTRODUCTION

One of the most popular young-earth creationist arguments is that “there are no transitional forms,” a criticism frequently leveled at human evolution. This claim is simply wrong. We have found tens of thousands of hominin fossils (remains more closely related to modern humans than chimpanzees), representing over 6000 individuals (Smithsonian 2014).

Yet many young-earth creationists still criticize the “lack” of evidence for human evolution, with some asking at the recent debate between Ken Ham and Bill Nye, “Why is there only one Lucy?” (Stopera 2014). Lucy (AL 288-1), is an important fossil and arguably the most well-known hominin. I hypothesize that the large young-earth creationist ministries are not providing accurate representations of the human fossil record, instead only discussing a few examples, thus creating the false impression that the number of hominin fossils is much smaller than it actually is.

MATERIALS AND METHODS

The websites of three of the largest creationist ministries—the Institute for Creation Research (ICR), Answers in Genesis (AiG), and Creation Ministries International (CMI), were examined for references to five critical hominin fossils. The number of references to these fossils was then compared to the number of references to Lucy. The five fossils are:

Sabelanthropus tchadensis Uncovered in 2002, this fossil is notable for being the oldest known hominin, dating to 6–7 million years ago (Brunet and others 2002).

“Selam/Lucy’s baby” Discovered in 2003, this juvenile *Australopithecus afarensis* died ~3.3 million years ago and provides evidence about how our ancestors grew and matured (Alemseged and others 2006).

“Nariokotome boy/Turkana boy” Discovered in 1984, this individual was 7–8 years old when he died ~1.5 million years ago and is one of the most complete examples of *Homo erectus* (Graves and others 2010).

Australopithecus garhi Discovered in Ethiopia in 1996, this fossil is associated with the earliest evidence of stone tools, dating to ~2.6 million years ago (de Heinzelin and others 1999).

Dmanisi specimens Since its accidental discovery in 1991, several skeletons of the earliest individuals to migrate out of Africa ~1.8 million years ago have been found at this Georgian site (Gabunia and Vekua 1995).

RESULTS AND DISCUSSION

The number of references to each of these fossils is presented in Table 1. The data reveal that ICR, AiG, and CMI reference Lucy an order of magnitude times more than they reference the others. When the same

methodology was applied to hominin hoax Piltdown man, I found more references to it than to all the legitimate fossils except Lucy.

TABLE 1 The number of pages from the ICR, AiG, and CMI websites discussing each of the fossils under consideration.

	ICR	AiG	CMI
<i>Sabelanthropus tchadensis</i>	2	13	3
Selam	2	10	2
Nariokotome boy	0	2	4
<i>Australopithecus garhi</i>	0	3	3
Dmanisi specimens	1	4	4
Lucy	44	569	69
Piltdown man	9	65	79

CONCLUSION

It is apparent that ICR, AiG, and CMI are presenting a distorted view of human evolution (although I do not mean to argue that this distortion is intentional). Importance should be placed on rectifying this situation and improving science education. Simply dissecting young-earth creationist arguments is not enough; more work has to be done to raise the level of knowledge.

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AUTHOR'S ADDRESS

Adam Benton c/o NCSE
PO Box 9477
Berkeley CA 94709-0477
info@ncse.com

Adam Benton is a paleoanthropologist currently working towards a master's degree in the subject at the University of Liverpool. He routinely writes about the subject on his blog, <http://evoanth.wordpress.com>, where he can be contacted.

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A Land Use Puzzle: Piecing Together How Forests, Croplands, and Residential Neighborhoods Interact with Climate

Alexandra Contosta

Earth's surface is like a giant reflector. Sometimes, the reflector is clean and bright, like an open field after snowfall, causing most of the incoming solar radiation to be returned to space. Other times, the reflector is very dirty, as in black tar roof tops and roadways, causing most of the sunlight to be absorbed and reradiated as heat near the surface. In most cases, the reflector is somewhere in between.

How well a surface reflects incoming sunlight is called its *albedo*, and albedo plays a major role in determining the amount of heat trapped in Earth's atmosphere. The higher the albedo of a surface, the more sunlight is reflected back to space. It turns out that the "just right" temperature of our planet is, in part, regulated by the albedo of plant life that covers about 20% of its surface.

The albedo of vegetation is not uniform across Earth, however. Grasslands and croplands have relatively high albedo and therefore can have a cooling effect on regional and global climate. By contrast, forests have relatively low albedo and therefore can have a warming effect. But albedo is not the only thing that matters when thinking about how plant cover might influence climate. Take surface heat flux, for example. When Earth's surface absorbs sunlight instead of reflecting it, some of the resulting energy is reradiated by either heating the air above the surface or by causing water to evaporate from soils, water bodies, and plant canopies. This evaporation provides a cooling effect much like that of perspiration evaporating from your skin. Areas covered with houses and roads do not have as many plants performing photosynthesis and releasing water to the atmosphere. As a result, most of the solar radiation absorbed in residential areas reenters the atmosphere as something called "sensible heat," which can be both measured and felt.

Land cover can also influence climate through the storage and release of carbon. This is important because most carbon in the atmosphere occurs as carbon dioxide (CO_2), a greenhouse gas that traps some of Earth's heat. In fact, most land management policies addressing climate change focus on ways to keep carbon out of the atmosphere by sequestering it in soils and plant biomass. A mature hardwood forest, for example, has a positive net carbon balance. If you cut down a forest and convert it to a residential development, most of its stored carbon is lost to the atmosphere where it has a warming effect on climate.

In addition to the loss of aboveground carbon storage, physical disturbance of soils during land use change exposes long-protected organic matter to the air, where it can be decomposed by soil microbes and lost as CO_2 . Even when soils are stable, they naturally emit greenhouse gases as plants respire and soil microbes decompose organic matter. Temperature and moisture, which are two of the primary controls on soil CO_2 loss, vary from a forest to suburban lawn. For example, the warmer conditions in a lawn environment receiving direct sunlight might cause higher soil CO_2 fluxes as compared to lower fluxes from a cooler, shaded forest floor. However, lawn soils are often drier than forest soils, in part because they lack a thick leaf litter layer to protect them from evaporative moisture loss. During droughts, when temperatures are high but water is scarce, soil CO_2 fluxes might be lower in lawns than in forests due to moisture stress.

If all of this sounds complicated to you, then you are beginning to get a sense of why comprehensive studies of land cover, land use change, and climate impacts at the local scale are needed in the scientific literature. Here on the seacoast of New Hampshire, my colleagues and I are trying to address that need. Over the past three years, we have been quantifying the ways that our local forests, farms, and housing developments interact with climate. Population growth over the past fifty years has resulted in a 60% loss of farmland and forests and a corresponding increase in residential and commercial areas. The phrase, "smart growth" is usually applied to prevent urban sprawl associated with rapid development, but for us, "smart growth" might also be a way of crafting land use policies that balance the food, housing, and recreational needs of local communities with the ability of the surrounding landscape to mitigate climate change.

AUTHOR'S ADDRESS

Alexandra Contosta
Earth Systems Research Center
8 College Road
University of New Hampshire
Durham NH 03857
alix.contosta@unh.edu

Alexandra Contosta is a research scientist at the Earth Systems Research Center at the University of New Hampshire.

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Chronicles of the Sixth Extinction: Interview with Elizabeth Kolbert

Joshua Rosenau

On April 23, 2014, just after Earth Day, I talked by phone with Elizabeth Kolbert, a staff writer at the *New Yorker*, about her new book, *The Sixth Extinction: An Unnatural History* (New York: Henry Holt, 2014; see review summary on page 15). The book chronicles how scientists came to understand the five great mass extinctions that have occurred in Earth's history, and how research on these events and their causes has guided scientists studying and confronting the current period of mass extinction. Extending a theme from her reporting on climate change, Kolbert documents the efforts of conservation biologists attempting to salvage biodiversity, while at the same time, she asks hard questions about how realistic those plans really are. Some highlights from the interview:

On the complexity of communicating and teaching about slow-moving disasters like climate change:

With climate change, both the timescale and the scale of the issue are incommensurate with the news cycle, and I think there are a lot of us out there in the journalistic world, in the scientific world, trying to figure out how do you deal with that problem. ... I'm always thinking: "Climate is still changing, how can I write that story again in a way that brings something new to the table?" ...[Y]ou have heard a lot already, but that doesn't mean that it doesn't have to be told again, because clearly on some level the message isn't getting out. ...

It's a grim topic, and people may sort of shy away from it if they feel like "oh, I don't have the answers to tell these kids." But I really think we're doing our kids an incredible disservice if we don't talk about things because they're not so fun. It's really important that kids understand what's going on. That's certainly true of climate change. We're not dealing with this problem by not talking about it, and not making kids aware of what's going on.

On "functionally extinct" species—species that are still alive but are likely incapable of meaningful recovery:

This gets to some delicate issues, and I admire the people doing that work. I'm not a conservation biologist, I'm not in a position to say at what point these efforts to save endangered species are futile or just don't justify their own cost. But I think it's clear...that in many cases these animals are "conservation dependent." They cannot survive without constant care, because they're really no longer wild animals. Someone wrote a good piece about "triage" in conservation biology, and in effect we are practicing that, obviously. Just not necessarily in a systematic way. ... A condor is a classic example of an animal that is

absolutely conservation-dependent. ... There are now four hundred and something condors out there, but without constant care and millions of dollars worth of effort every year, there would be very few pretty quickly. So where have we gotten? That bird still exists, and I think that is a tremendous achievement, but it raises a lot of questions, a lot of pretty tough questions.

On the causes of extinctions:

I defy someone to name a species where you can say absolutely that humans were not involved in this extinction, for the last 500 years. Up to now, I have not yet been able to find anyone to point to one, and I don't think one exists—but maybe your readers can prove me wrong. ... Twenty years from now it's going to be pretty widely accepted that all the megafauna extinctions were caused by humans. It's very clear what happened in New Zealand, it's very clear what happened on Hawaii. Pretty clear what happened on Madagascar. So, it's only when it's in the distant misty past that we can entertain the possibility that it wasn't people, but when you think about these paradigms, the pattern seems pretty overwhelming. And in those cases, certainly when we arrived at islands, places like Hawaii, we brought with us species that were absolutely devastating to the native fauna.

On the discovery of extinction:

You could argue that Darwin could never have gotten where he got without the previous generation or two generations earlier having realized that there was extinction. It's quite recent and there's a lot of really interesting moments where people, especially as Europeans came to this country in fact, where there's a lot of not really fossilized, sub-fossilized material lying pretty closely to the surface and they didn't know what to make of it. It's quite an interesting story. [It involves Thomas Jefferson and Lewis and Clark.] Ben Franklin was involved. A lot of that generation, they were great naturalists, they were very interested in these bones that were being uncovered.

AUTHOR'S ADDRESS

Joshua Rosenau
NCSE
PO Box 9477
Berkeley CA 94709-0477
rosenau@ncse.com

Joshua Rosenau is a biologist and programs and policy director at NCSE.

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Big Bone Lick

Randy Moore

Big Bone Lick is a swampy area in Boone County, Kentucky, that was discovered in 1739 by Charles Le Moyne as he led French soldiers down the Ohio River from Canada. The area was described in 1740 as “the place where they found the elephant bones in 1739.” The bones in question were abundant and large; vertebrae were big enough to be used as chairs, and ribs were used as tent poles. Big Bone Lick later became renowned for its mineral-rich springs, which had lured animals such as bison (both ancient and modern), primitive horses, ground sloths, mammoths, and mastodons to the area. After its discovery, Big Bone Lick became a center for the salt-making industry; workers used 600 gallons of water to produce one bushel of salt. When cheaper sources of salt were found elsewhere and the salt-making businesses closed in the early 1800s, Big Bone Lick once again became famous for its fossils (Hedeen 2008).

In 1803, Thomas Jefferson—an avid paleontologist—sent Meriwether Lewis to Big Bone Lick to collect fossils. Lewis packaged some of the area’s fossils in a crate for Jefferson, but it (and the boat it was shipped aboard) sank near Natchez, Mississippi. Four years later, Jefferson sent General William Clark and ten other men to collect fossils at Big Bone Lick. Clark’s three-week excavation—the first organized vertebrate paleontology expedition in the United States—established American vertebrate paleontology. Clark and his crew shipped more than 300 bones and teeth, primarily from Pleistocene mammals, to the White House, and this time, they made it safely. Jefferson kept some of the specimens for himself and sent others to the America Philosophical Society and to collectors in France. (Today, bones from Big Bone Lick are displayed at Monticello, Jefferson’s home.)

Fossils from the Lick were studied by a variety of famous scientists, including Georges Louis Leclerc de Buffon, who identified the fossils he received as two species: a hippopotamus and an elephant-like mammoth. Buffon’s claim that the mammoth “no longer exists anywhere” supported extinction and contradicted the prevailing Judaeo-Christian belief in a perfect, static creation. Jefferson, who rejected extinction, used fossils of mammoths to counter Buffon’s claims about American degeneracy—that is,

that animal species in North America were inferior to those of Europe because America’s soils and

climate were inferior to those of the Old World. (The longest chapter of Jefferson’s only book, *Notes on the State of Virginia*, was devoted to debunking Buffon’s claim.) Jefferson acknowledged that some species might have disappeared from eastern America, but they could still be living in the unexplored West. However, Jefferson was wrong, and fossils from Big Bone Lick helped convince people that extinction was real, and that some species had vanished from Earth.

Bones from Big Bone Lick were well-known among scientists and others. Georges Cuvier, who documented extinction, published a sketch of a 100-centimeter-long femur collected at Big Bone Lick in 1739, and Benjamin Franklin noted that fossils from Big Bone Lick (“the Great Licking Place”) resembled those of elephants that “now inhabit naturally only hot countries where there is no winter, and yet these remains are found in a winter country.” In 1841, Charles Lyell visited Big Bone Lick, and many other people (for example, Jean-Baptiste Lamarck) sought fossils from Big Bone Lick to study.

By the early 1800s, Big Bone Lick was a famous health resort, and the first hotel there (the Clay Hotel) opened in 1815 to accommodate visitors who came to enjoy the Lick’s medicinal powers. Physicians claimed that water from the Lick helped treat and prevent maladies such as boils, tuberculosis, hemorrhoids, rheumatism, uterine trouble, and skin parasites, and that it was also useful as “a useful hair tonic” that provided “a peculiarly stimulating bath.” In 1870, a second hotel opened at the Lick, but tourism began to fade, and in 1945, the remains of the last hotel at the Lick were sold for scrap materials.

Big Bone Lick (“the tomb of the mammoths”) is located just north of Answers in Genesis’s Creation Museum, which is ironic given its importance to vertebrate paleontology. Its importance as a scientific and historical resource is reflected in the fact that Big Bone Lick became Big Bone Lick State Park (Figure 1) in 1960, and was designated a National Historic Site in 1971, a Lewis & Clark Heritage Trail Site in 2002, and a National Natural Landmark in 2009. Big Bone Lick State Park, which covers 525 acres, is between Rabbit Hash and Beaver Lick; its museum includes fossils, art, and a half-ton skull of a mastodon.

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AUTHOR’S ADDRESS

Randy Moore
University of Minnesota, MCB 3-154
420 Washington Avenue SE
Minneapolis MN 55455
rmoore@umn.edu

Randy Moore is the HT-Moore–Alumni Distinguished Professor of Biology at the University of Minnesota. His latest book (with Sehoya Cotner) is *Understanding Galápagos: What You’ll See and What It Means* (New York: McGraw-Hill, 2013). People & Places of Evolution is his regular column in *RNCSE*.

Summary of *RNCSE* 2014; 34(4):3.1–3.3; the full text is available from: <http://reports.ncse.com/index.php/rncse/article/view/307/525>

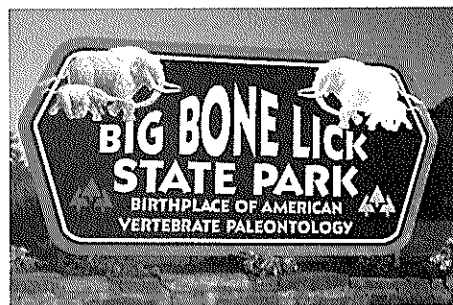
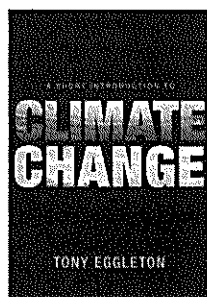


FIGURE 1
The sign at the entrance to Big Bone Lick State Park.
Photograph: Randy Moore.

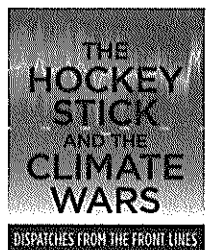
SUMMARIES OF BOOK REVIEWS



A Short Introduction to Climate Change by Tony Eggleton (Cambridge: Cambridge University Press, 2012; 246 pages). "It is rare for one person to encapsulate what is known about climate change in a single manuscript," reviewer **John Abraham** writes. "But Eggleton has done just that with his new text, *A Short Introduction to Climate*

Change. It is a must-read for anyone who is concerned about the climate—everyone from concerned citizens to parents, grandparents, students, and teachers. This is a book that is accessible and accurate. It is hard to imagine this could have been done better."

Summary of *RNCSE* 2014;34(4):5.1–5.3; the full text is available from: <http://reports.ncse.com/index.php/rncse/article/view/274/516>

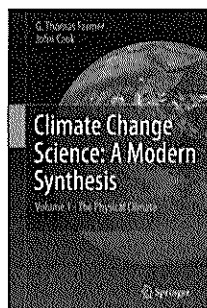


Michael E. Mann

The Hockey Stick and the Climate Wars: Dispatches from the Front Lines by Michael E. Mann (New York: Columbia University Press, 2012; 384 pages). "Michael Mann has arguably been subjected to more abuse than any other scientist in modern history," writes reviewer **Mark Boslough**. "For over a decade he has endured an unimaginable

torrent of hate and vitriol inflamed by fossil-fuel-funded interests, politicians, and right-wing pundits, and stoked by a growing wild-west blogosphere in which anybody can be an 'expert,' and everybody can pile on." Boslough was especially appreciative of the section of the book in which Mann debunks his critics.

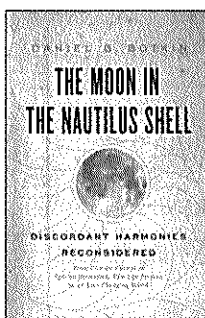
Summary of *RNCSE* 2014;34(4):6.1–6.3; the full text is available from: <http://reports.ncse.com/index.php/rncse/article/view/235/517>



Climate Change Science: A Modern Synthesis, volume 1: The Physical Climate by G. Thomas Farmer and John Cook (New York: Springer, 2013; 564 pages). Praising its comprehensive and interdisciplinary coverage and its direct addressing of climate change denial, reviewer **Jonathan Cole** nevertheless writes, "its laudable ambitions are under-

mined by editing issues, numerous scientific errors, and unsubstantiated claims that make it difficult to recommend as a college text." He was also critical of the book's discussion of policy, remarking, "Climate policy must be informed by science, but also involves personal values and calls for a nuanced and thoughtful discussion not in evidence here."

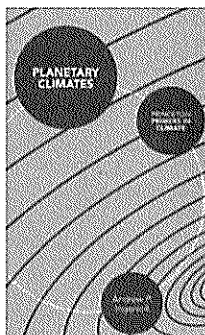
Summary of *RNCSE* 2014;34(4):7.1–7.3; the full text is available from: <http://reports.ncse.com/index.php/rncse/article/view/257/518>



The Moon in the Nautilus Shell: Discordant Harmonies Reconsidered by Daniel Botkin (New York: Oxford University Press, 2012; 448 pages). "*The Moon in the Nautilus Shell* ... comes as a timely gift of talking points to climate change deniers," reviewer **Charles Gasparovic** warns. "Though mostly a critique of wildlife management—a history of errors in

the ways of ecologists and the policies they influence—the final few chapters of the book take on climate science, in a portrayal of that field that is likely to resonate in the public forum much more than the rest of the book."

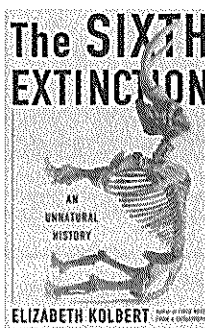
Summary of *RNCSE* 2014;34(4):8.1–8.4; the full text is available from: <http://reports.ncse.com/index.php/rncse/article/view/250/519>



Planetary Climates by Andrew P. Ingersoll (Princeton [NJ]: Princeton University Press, 2013; 288 pages). In *Planetary Climates*, according to reviewer **Jonathan Mitchell**, Andrew P. Ingersoll "takes us on a 'grand tour' of the Solar System and beyond as has been revealed through an era of rapid and unparalleled discovery. Ingersoll

illustrates the physics of climate using the Solar System planets as examples and drawing on his experiences as a planetary scientist. This book demonstrates some of the things I appreciate most about him: Ingersoll is a great storyteller with a modest attitude and a passion for discovery."

Summary of *RNCSE* 2014;34(4):9.1–9.3; the full text is available from: <http://reports.ncse.com/index.php/rncse/article/view/312/520>



The Sixth Extinction: An Unnatural History by Elizabeth Kolbert (New York: Henry Holt, 2014; 319 pages). Alluding to five great extinctions in geological history and a sixth under way, reviewer **Joshua Rosenau** writes, "Elizabeth Kolbert's *The Sixth Extinction: An Unnatural History* takes readers on a tour of these great extinctions, some of the

species that went extinct and which are going extinct, the science which lets us track and—perhaps—avert extinctions, and the complex history of the very idea of extinction." He praises "[h]er ability to meld history and science with vivid nature writing, vibrant personalities, and vigorous adventures."

Summary of *RNCSE* 2014;34(4):10.1–10.3; the full text is available from: <http://reports.ncse.com/index.php/rncse/article/view/309/521>

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