

reports

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2016 In Review

NCSE BY THE NUMBERS p. 3

THE HORROR! THE HORROR! (2016 EDITION) p. 4

RANDOM SAMPLES...WITH KEVIN PADIAN p. 6

HOW TO SUPPORT SCIENCE EDUCATION p. 10

FEELING A CALL TO ACTION? SO ARE WE p. 12

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Dear NCSE members,

These are troubling times for science education. After eight years of science fair winners shooting marshmallow cannons in the White House, a vigorous and creative Office of Science and Technology Policy, and substantive U.S. participation in international climate change negotiations, we have an incoming president who has declared climate change a Chinese hoax and a vice president who has denounced evolution from the floor of the House of Representatives.

If teachers were reluctant to teach climate change and evolution before, surely they will be even less confident now. And surely those school board members and state legislators who favor “teaching the controversy” will feel emboldened. That’s a bad combination. So NCSE is likely to face an uptick in threats to science education—and we will need the support and encouragement of our members like never before.

In this issue, you’ll find the most egregious examples of interference in science education during 2016 in Glenn Branch’s “The Horror! The Horror!” (p. 4). Let us all sincerely hope that these examples do not seem tame by this time next year.

Unsettling as these times are, none of us should sit idly by; we need to get to work! So also in this issue, you’ll find a whole host of things you can do to make a difference in your community (“How to Support Science Education,” p. 10). You’ll also find encouraging evidence that our Science Booster Clubs are measurably increasing science literacy in local communities (“Feeling a Call to Action? So Are We,” p. 12).

As this year makes clear, the battle to protect our nation’s science classrooms is far from over. Whether you’re a brand-new NCSE member or you’ve been a loyal contributor for decades, you surely want NCSE to thrive for as long as its unique resources are needed. A new way to support NCSE is by joining our Legacy Society, comprised of members that include NCSE in their estate plans. Of course we hope that you continue to be a living, breathing, butt-kicking defender of science for many years to come, but remembering NCSE in your will means that we will continue kicking butt even after you’re gone.

No matter the form or amount of your donations, we will put every penny to work ensuring that teachers have everything they need to teach evolution and climate change openly, honestly, and completely, and that anyone who tries to stop them meets stern resistance.

With optimism,



Ann Reid is the
executive director of NCSE.
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ncse

BY THE NUMBERS

2016*



ncse

membership



3500
Members



510
Sustaining
members



523
Grad student
members

social media

800
@NCSE tweets



ncse 9484
Twitter followers

17,232
YouTube followers



50,895
New YouTube views



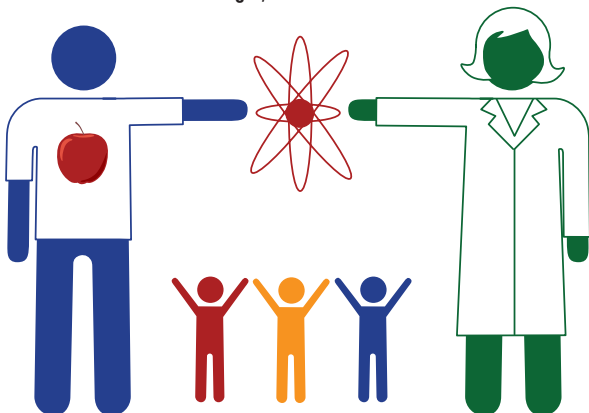
174,524
Facebook fans

NCSEteach

5930
Teachers enrolled,
covering all 50 states



105
Teacher-scientist matches in
Scientists in the Classroom,
serving 2,500 students



booster clubs

4
Science
Booster Clubs



780
Volunteer hours
contributed

872
SBC members



54,000
Attendees at
SBC events

15
SBC-funded
teacher grants,
benefiting 4,200 students



*Accurate as of December 15, 2016

For the last thirty years, NCSE has been fighting to defend the integrity of science education, and by now the veterans on the staff are fairly blasé. A teacher including the sentence “ISN’T IT AMAZING WHAT THE _____ MADE!!” on a test and penalizing students who failed to supply the word “LORD”? A parent demanding that a middle school host a debate on the reality of climate change? A bill that would require equal treatment of evolution and “intelligent design” in all public schools—including all public colleges and universities—in the state? All in a day’s work at NCSE headquarters. But occasionally something comes along that disappoints, disturbs, or dismays even the most jaded among us. In 2016, we were favored with three such cases.

Alabama Disappoints Yet Again

In Alabama, the state board of education voted on March 10, 2016, to retain a disclaimer about evolution mandated in the state’s textbooks. Now, disclaimers in Alabama’s textbooks are nothing new. In 1996, the board mandated a disclaimer that (among its many flaws) described evolution as “a controversial theory some scientists present.” The rationale was that such a disclaimer was necessary to align the textbooks with the state science standards—which the board, under the tutelage of local creationists, had already tampered with to undermine the treatment of evolution. A later revision of the standards prompted a revision of the disclaimer in 2001, which described “[t]he theory of evolution by natural selection” as controversial.

THE HORROR! THE HORROR! (2016 EDITION)

by Glenn Branch

A MESSAGE FROM THE ALABAMA STATE BOARD OF EDUCATION

The word “theory” has many meanings. Theories are defined as systematically organized knowledge, abstract reasoning, a speculative idea or plan, or a systematic statement of principles. Scientific theories are based on both observations of the natural world and assumptions about the natural world. They are always subject to change in view of new and confirmed observations.

Many scientific theories have been developed over time. The value of scientific work is not only the development of theories but also what is learned from the development process. The Alabama Course of Study: Science includes many theories and studies of scientists’ work. The work of Copernicus, Newton, and Einstein, to name a few, has provided a basis of our knowledge of the world today.

The theory of evolution by natural selection is a controversial theory that is included in this textbook. It is controversial because it states that natural selection provides the basis for the modern scientific explanation for the diversity of living things. Since natural selection has been observed to play a role in influencing small changes in a population, it is assumed that it produces large changes, even though this has not been directly observed. Because of its importance and implication, students should understand the nature of evolutionary theories. They should learn to make distinctions between the multiple meanings of evolution, to distinguish between observations and assumptions used to draw conclusions, and to wrestle with the unanswered questions and unresolved problems still faced by evolutionary theory.

There are many unanswered questions about the origin of life. With the explosion of new scientific knowledge in biochemical and molecular biology and exciting new fossil discoveries, Alabama students may be among those who use their understanding and skills to contribute to knowledge and to answer many unanswered questions. Instructional materials associated with controversy should be approached with an open mind, studied carefully, and critically considered.

Alabama biology books still carry this evolution disclaimer.

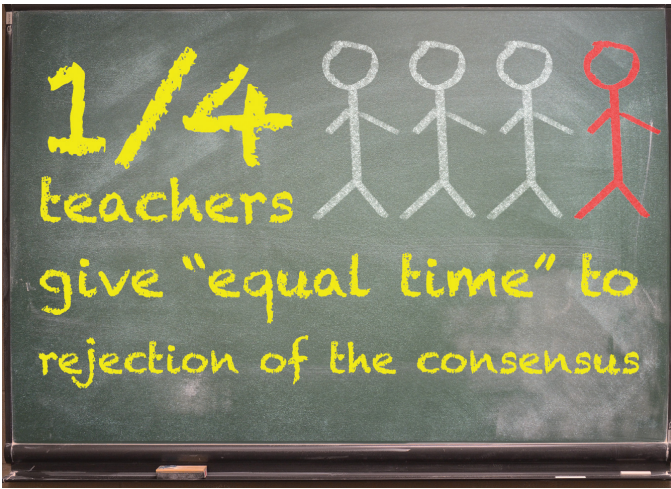
In 2005, the standards were revised yet again, but the board voted to retain the second version of the disclaimer, rather than update it to reflect the somewhat improved treatment of evolution

in the standards. So in 2015, when Alabama adopted a new set of state science standards in which evolution was described—correctly—as “substantiated with much direct and indirect evidence” and in which there was no language that a reasonable person could regard as

justifying the retention of any evolution disclaimer, we were hopeful. Ideally, the board would not even have considered whether to retain a disclaimer. In the event, however, the board lamentably voted to retain the scientifically unwarranted and pedagogically irresponsible message.

Disturbing Findings in Climate Change Education Survey

The news from Alabama was profoundly disappointing, but news from our national survey on the teaching of climate change was profoundly disturbing. Conducted with researchers at Pennsylvania State University, the survey asked thousands of science teachers in public middle and high schools about their attitudes toward and practice in teaching climate change. To quote “Mixed Messages” (<https://ncse.com/files/MixedMessages.pdf>), NCSE’s comprehensive report on the survey, “Most teachers are unaware of the scientific consensus on the causes of climate change. Less than half of all science teachers are aware that more than 80% of climate scientists think that global warming is caused primarily by human activities.” (N.b.: the actual level of consensus is 97%.)

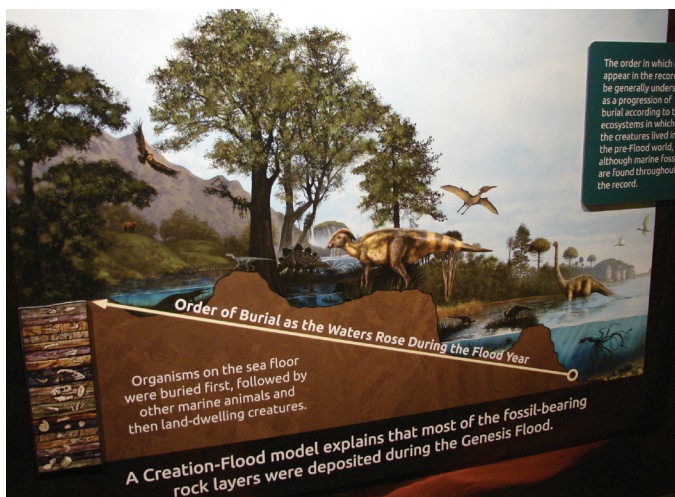


Key finding from our 2016 Climate Education survey.

It was clear, moreover, that awareness of the scientific consensus mattered. Those who correctly responded that 81–100 percent of scientists agree that global warming is caused mostly by human activities were significantly more likely to emphasize the scientific consensus—and less likely to present it as a matter for debate. They were also less likely to attempt to defuse the issue by allowing students to opt out of the portions of the class in which climate change is discussed. Meanwhile, thirty percent of respondents reported that in their classrooms they emphasize *both* the scientific consensus *and* “that many scientists believe that recent increases in temperature [are] likely due to *natural* causes”—a practice guaranteed to foment confusion among their students.

New Ark Park Dismays

From Kentucky, the news was neither disappointing nor disturbing, but dismaying. Ark Encounter, Answers in Genesis’s Noah’s-ark-themed amusement park, opened in northern Kentucky in July 2016. Writing for *New Scientist*,



Sign at the Ark Park describing a (completely unfounded) creationist explanation for the order of fossils in the fossil record. photo: Dan Phelps

NCSE’s Josh Rosenau aptly described it as “a hard-core creationist extravaganza replete with pseudoscience . . . From astrophysics to zookeeping, the visitor is deluged with misinformation. It may be impossible to find a single sign in the park that is free of scientific errors.” (A wag on the internet asked, “Not even EXIT?”) None of that was unexpected, of course; Answers in Genesis, after all, erected its Creation “Museum” in northern Kentucky in 2007, prompting over a thousand scientists in the area to decry its scientific inaccuracy.

The truly dismaying aspect of Ark Encounter was its invitation to local public schools to flout the principle of church/state separation by bringing students there on field trips, at a special discounted rate. (A preemptive warning issued by the Freedom From Religion Foundation as well as

Disappointing, disturbing, and dismaying as these episodes are, dealing — and helping people to deal — with their like is exactly what we at NCSE are here for.

reportedly disappointing early attendance figures may have prompted the invitation.) In his column, Rosenau warned not only of the constitutional problems of organizing a public school field trip to the Ark Encounter but also that “a visit wouldn’t educate or entertain, it would misinform and browbeat.” But judging from reports received by NCSE over the years, public school

excursions to creationist attractions are not uncommon, despite the scientific, pedagogical, and legal problems.

Disappointing, disturbing, and dismaying as these episodes are, dealing—and helping people to deal—with their like is exactly what we at NCSE are here for. For example, we helped a local teacher to write a column for Alabama’s largest newspaper decrying the board’s decision to retain the disclaimer; we published a report on the NCSE/Penn State survey in the pages of *Science*, thus alerting a broad audience about the state of climate education; and we helped to coordinate the response to the opening of Ark Encounter, including Josh Rosenau’s column. That’s not all we did in 2016, to be sure, and it’s not all that we will do in the future. But all of it is work that we couldn’t have done, and can’t continue to do, without you and your generous support.



Glenn Branch is Deputy Director of NCSE. branch@ncse.com



David Amidon

NCSE is pleased to congratulate **David Amidon** for receiving a Presidential Award for Environmental Educators for 2016, presented by the Environmental Protection Agency (EPA). According to the EPA's announcement, Amidon "has engaged students in a variety of lessons to improve their understanding of the human impacts to ecosystems and environmental sustainability." Amidon, a middle school science teacher in LaFayette, New York, is a member of NCSEteach's advisory board and a participant in its Scientist in the Classroom program.

NCSE is delighted to congratulate **Jay Labov** on receiving the Distinguished Service to Science Education Award from the National Science Teachers Association (NSTA). The

award is presented to "NSTA members who, through active leadership and scholarly endeavor over a significant period of time, have made extraordinary contributions to the advancement of education in the sciences and science teaching." NCSE's founding executive director **Eugenie C. Scott** received the award in 2014. Labov is Senior Advisor for Education and Communication for the National Research Council and the National Academy of Sciences. He received NCSE's Friend of Darwin award in 2013.



Naomi Oreskes

NCSE is delighted to congratulate **Naomi Oreskes** on receiving the Stephen H. Schneider Award for Outstanding Climate Science Communication for

2016. Presented by Climate One, a project of the Commonwealth Club of California, the award is "given to a natural or social scientist who has made extraordinary scientific contributions and communicated that knowledge to a broad public in a clear and compelling fashion." **Ben Santer**, a member of the award jury as well as a member of NCSE's board of directors, commented in a press release, "Oreskes is one of the world's pre-eminent historians of science," adding, "Her 2004 *Science* paper ["The Scientific Consensus on Climate Change"] helped to quantify, for the first time, the broad scientific consensus on climate change. Her recent research unmasked the forces behind denial of human effects on climate and improved our chances of having a responsible, science-

Random Samples

with Kevin Padian

NCSE is only as good as its members. Luckily for us, our members include countless extraordinary individuals. We thought it'd be fun to use a corner of *RNCSE* each quarter to highlight an NCSE member by asking him or her a few quick questions to be answered in just five minutes. Our first subject is likely not a stranger to many of you: paleontologist and past NCSE president Kevin Padian.

First, quick word associations. What's your immediate reaction to the following?

- **NCSE?**
All that saves us from anti-science.
- **Science?**
Testing hypotheses with independent lines of evidence.
- **Future?**
When I get up in the morning. If I'm not in the obituaries, I'll make coffee.

You get one sixty-minute lecture to cover evolution—what do you spend your time on? Major transitions in the history of life: how tetrapods gained ground, how birds evolved flight, and how whales went back into the ocean.

What's the most problematic misconception about evolution and why? Extrapolationism: people thinking that variations in fruit fly bristles, writ large, can really explain the diversity of life—how we get lions and tigers and bears.

It's not that the bristle work is wrong: it's just that it's looking at the wrong level, and it's not respecting the totality of evidence. Simply extrapolating up from fruit fly bristles won't convince anyone that we understand the mechanisms that gave us dinosaurs and birds and so forth.

You have five minutes to try and turn an evolution-doubter to an evolution-acceptor—what would you say or what evidence would you present?

based discussion of climate change solutions." A professor of the history of science at Harvard University, Oreskes is the author, with Erik M. Conway, of *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco to Global Warming* (2010). Her previous honors include the 2009 Francis Bacon Medal for scholarship in the history of science and technology, the 2011 Climate Change Communicator of the Year, and NCSE's Friend of the Planet Award in 2015.



Andrew J. Petto

NCSE is pleased to very belatedly congratulate **Andrew J. Petto** on receiving the Evolution Education Award for 2015 from the National Association of Biology Teachers, sponsored by BSCS (Biological Sciences Curriculum

Study) and the BEACON Center for the Study of Evolution in Action. The award recognizes innovative classroom teaching and community education efforts to promote the accurate understanding of biological evolution. Senior Lecturer in Anatomy and Physiology at the University of Wisconsin, Milwaukee, and co-editor (with **Laurie R. Godfrey**) of *Scientists Confront Creationism: Intelligent Design and Beyond* (2008), Petto is the former editor of *Reports of the National Center for Science Education*, a former member of NCSE's board of directors, and a recipient of NCSE's Friend of Darwin award.

NCSE is pleased to congratulate **Judy Scotchmoor** on receiving the Pojeta Award, which recognizes



Judy Scotchmoor

"exceptional professional or public service by individuals or groups in the field of paleontology above and beyond that of existing formal roles or responsibilities," from the Paleontological Society. Formerly the Director of Education and Public Programs at the University of California Museum of Paleontology, where she oversaw the development of the popular Understanding Evolution and Understanding Science websites, Scotchmoor is a long-time member of NCSE and a recipient of its Friend of Darwin Award.

—GLENN BRANCH



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I actually wouldn't try. I don't think my job is to try to convince them to abandon their worldviews, and I certainly couldn't do it in five minutes. I respect people who think differently than I do. I might only say that, as a scientist, the question I ask myself many times a day is: How would you know if you were wrong? And I wonder if evolution-doubters (of which there are many sorts) could ask themselves the same question.

Why did you decide to put NCSE in your will? As Genie [Scott, founding executive director of NCSE] says, when we founded NCSE we hoped we'd be out of

business by now. Well, that ain't gonna happen soon. Despite our amazing successes—the *Kitzmiller v. Dover* trial was the greatest one-sided victory in American jurisprudence, and it would never have happened without NCSE—science education is still in trouble across the country. Woody Guthrie wrote "This Land is Your Land," which should by rights be the national anthem, but even if it isn't, we ought to take his message to heart. Bill Clinton, as president, said that a fact should be a fact in Maine and Mississippi and Montana (I don't remember the exact states), and we shouldn't be educating

Americans differently in different states just because some people don't like evidence. I don't see anyone doing this job better than NCSE. I was there when we cobbled together the organization out of a grant that Stan Weinberg (bless his heart) got to try to assemble the Committees of Correspondence into a true centralized organization, rather than a loose network, and I then served on NCSE's board for sixteen years, as its president for fourteen years. How could I not remember NCSE in my will?

—STEPHANIE KEEP

UPDATES

ncse.com/updates

Do you want to let us know about threats to effective science education near you? Or do you have any cause for celebration to share? E-mail any member of staff or info@ncse.com.

ARIZONA

A new lawsuit, *Doe v. Heritage Academy*, challenges a chain of public charter schools in Arizona for their religious advocacy. The complaint contends, among other things, that the schools use instructional materials that inappropriately argue in favor of creationism.

One book allegedly used by the schools claims that there must be a Creator because the “mind ... will not accept the proposition that the forces of nature, churning about among themselves, would ever produce a watch, or even a lead pencil, let alone the marvelous intricacies of the human eye.”

COLORADO, COLORADO SPRINGS

Instructors of the “Medical Humanities in the Digital Age” course at the University of Colorado, Colorado Springs, announced, in response to inquiries from their students, that the course “is based on the scientific premise that induced climate change is valid and occurring ... We will not ... debate the science of climate change”; students who found the guideline problematic were encouraged not to enroll. The announcement caused a stir in conservative media and among a number of regents of the University of Colorado system.

KANSAS

The creationist lawsuit seeking to reverse Kansas’s 2013 decision to adopt the Next Generation Science Standards on the grounds that the state thereby “establish[ed] and endorse[d] a non-theistic religious worldview” is now under appeal to the U.S. Supreme Court. In April 2016, the Tenth Circuit Court of Appeals upheld a district court’s dismissal of the case because the plaintiffs lacked standing. Documents from the case, *COPE et al. v. Kansas State Board of Education et al.*, are available on NCSE’s website.

MONTANA

In September 2016, the Montana state board of public education unanimously approved a new set of state science standards, based on, but modified from, the Next Generation Science Standards. Among the modifications was a de-emphasis of climate change: a reference to how “relationships among Earth systems ... are being modified due to human activity” was replaced by a reference in the Earth and Space Science standards for ninth through twelfth grades to relationships among natural resource management, sustainability, and biodiversity.

OHIO, YOUNGSTOWN

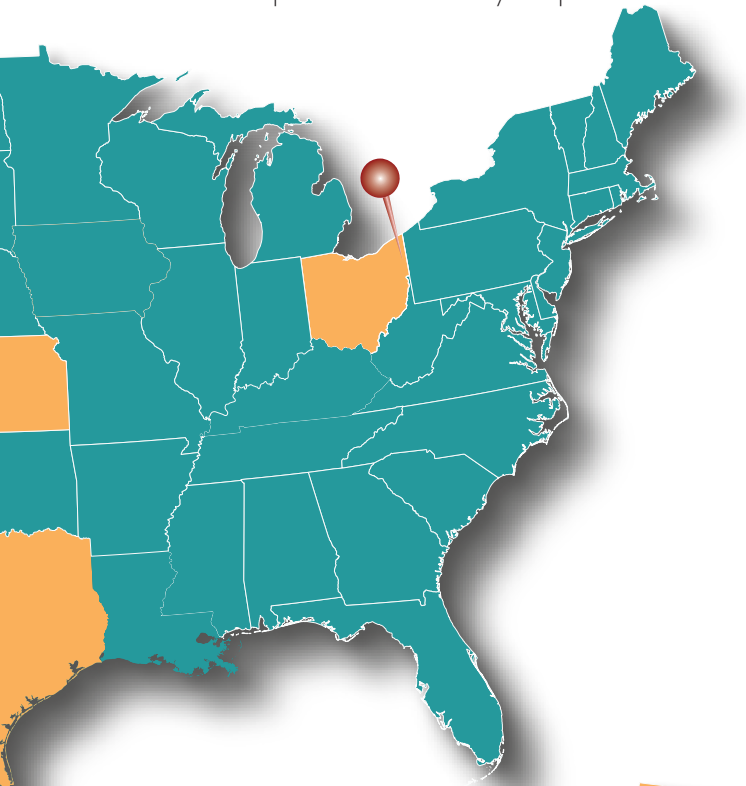
The chief executive officer of the Youngstown Schools directed that “beginning this 2016–2017 school year any reference to intelligent design, creationism, or any like concepts are eliminated from the science curriculum.” The directive was in reaction to the discovery of a video produced by the Islamic creationist organization that publishes under the name Harun Yahya on a recommended tenth-grade science curriculum for the Youngstown public schools. The incident received international attention, in part because of Harun Yahya’s history of Holocaust denial.

TEXAS

A panel of educators and scientists currently working on streamlining the state science standards for biology was attacked during a meeting of the Texas state board of education in September 2016. Raymond Bohlin, himself a member of the panel, criticized the panel for its preliminary vote to remove antievolution standards that were inserted, without input from scientists or educators, by the board during the last revision of the standards in 2009. A number of members of the board were reportedly sympathetic.

WYOMING

The Wyoming State Board of Education unanimously approved new state science standards in September 2016. In 2014, the state legislature passed a law to block the planned adoption of the Next Generation Science Standards (NGSS), owing to concerns about their treatment of climate change. The law was swiftly repealed, but the board elected to devise a set of standards different from—though based on—the NGSS. Both climate change and evolution have been somewhat deemphasized in the newly adopted standards.



CANADA, SASKATCHEWAN

Sun Wenqing, a Chinese businessman and a recent convert to Christianity, “wants to build a biblical theme park in southern Saskatchewan with a massive replica of Noah’s ark complete with animal reproductions and a digital experience of the life of Jesus,” reported the Canadian Press (September 22, 2016). While a proposal for a park south of Moose Jaw was already approved, the idea of a giant ark was not included, and will require further review from the local authorities. This would be Sun’s second Bible-themed park, joining one in China.



UNITED KINGDOM, ENGLAND, NORTH SOMERSET

The Noah’s Ark Zoo Farm in Wraxall, North Somerset, found itself in the headlines owing to its exhibit exploring “the scientific and geological evidence in support of the biblical tale of Noah’s Ark.” Criticism of the farm’s creationism originally surfaced in 2009; the latest bout is due to the revelation that over four thousand students from local government schools have visited the property in the past three years. The proprietors claim, however, that these students were not shown the Noah’s Ark exhibit.



UNITED KINGDOM, NORTHERN IRELAND

Thomas Buchanan, a Democratic Unionist Party member of the Northern Ireland Assembly, representing West Tyrone, was in the news for endorsing a young-earth creationist event entitled “Reaching Children in an Evolutionised World,” cosponsored by Creation Ministries International and Creation Outreach Ministries. He reportedly said, “I long to see the day when every school in Northern Ireland will stand up and teach creationism, and turn away from the peddled lie that is evolution.” His remarks were criticized by atheist and humanist groups.



How to Support Science Education

From the fuss over science standards in Wyoming to the opening of the Ark Park in Kentucky—not to mention the results of the election—events in 2016 have kept us here at NCSE busy making sure that good science is being taught. You may be wondering whether you can help to support science education in your own community. Yes indeed! To illustrate, here are ten ways you can support science education in your community—some big, some small; all helpful.

Photo: istock.com/Vimvertigo

- 1. If you are a parent, be sure to tell your children's science teachers that you support evolution and climate change education.** Ask the teachers how you can better support their teaching socially controversial areas of science honestly, accurately, and thoroughly. Offer to help organize a field trip to a local science center or natural history museum, or see what else you could do to be supportive.
- 2. Help to connect teachers and scientists with our initiatives.** NCSE has specialized programs and resources for teachers and scientists alike, all designed to help get science educators the support they need to do their jobs effectively. Highlights include NCSEteach, our teacher network, and Scientists in the Classroom, our program connecting early career scientists to public schools. We also have lists of vetted (and free!) resources and a network of teachers and scientists that can help you implement them successfully.
- 3. Become involved with your local school board.** Take the first steps by attending meetings, paying attention, and asking questions. What are the board members' views on science, particularly evolution and climate change? Are they thinking about making any changes to the science curriculum, and if so what? How do children in your community learn about evolution and climate change? Who makes the decisions about textbooks and other materials? When election season comes around again, encourage local media to ask school board candidates similar questions so you know who you're voting for.
- 4. If you have the means, donate accurate, age-appropriate, and up-to-date science books, DVDs, and instructional materials about evolution and climate change to your school's library and classrooms.** Be sure to ask in advance what sorts of materials would be the most helpful.
- 5. Organize or join a science booster club.** From reading NCSE's blog, you have already learned about Emily Schoerning's adventures with a pilot science booster club, including running an evolution summer camp and doing outreach events on evolution at the Iowa State Fair. We are getting ready to share information about how to start and run such clubs! If you want to help boost science education in your community, get in touch and we can get you started.
- 6. Attend or organize a Darwin Day Celebration or an Earth Day event.** These events are great ways to do outreach to the general public. For example, in 2016 NCSE's executive director Ann Reid visited to Iowa to speak at a Darwin Day event, thus bringing attention to evolution, Darwin, and the good work we are doing at NCSE. If you're interested in organizing a similar event, NCSE is happy to connect you with like-minded organizations and to help you find local speakers (or an NCSE staff member!) to provide the keynote address.

PLACE & TIME

Grand River Museum

- 7. Be an advocate for science.** Be a sound and supportive voice for science education when there is controversy in your community. Write local officials and journalists; be willing to attend and testify at hearings; energize your friends to get involved. You'd be surprised how effective you and like-minded supporters of science education can be! Be a vocal majority and have your issues addressed.
- 8. Get the word out!** Do you belong to a local civic or religious group? Share with it what you've learned from NCSE about evolution and climate change, and help change minds in your community. You don't have to be a teacher or a scientist to do so—you just have to be well-informed, articulate, and concerned.
- 9. Reach out for help.** Let NCSE know if issues arise in your community. We are here to help and will work with teachers, scientists, and parents to ensure good science is being taught. If you find that creationism is being presented in a local school or that a board of education is tampering with climate change standards, just send us an e-mail or give us a call. That's our specialty, and we're happy to help.
- 10. Join NCSE and follow us on our website, blog, Facebook and Twitter and more!** By supporting NCSE, you make sure we are able to keep the good work going to support science education in public schools. And by following us online—and sharing our resources—you can help to amplify our voice.

—NCSE staff 

South Dakota ranchers Lisa and Stuart Schmidt founded Grand River Museum in 1998, billing it as “a cowboy museum that teaches creation” and “houses the beasts that drowned in Noah’s flood.” Stuart was prompted to open the museum when he discovered dinosaur fossils along the Grand River. Many of his original finds, including fossils of *Edmontosaurus*, *Triceratops*, *Pachycephalosaurus*, *Tyrannosaurus*, and *Albertosaurus*, are displayed in the museum alongside exhibits about ranching and local and Native American history and culture.

Like most creation museums, Grand River Museum promotes young-earth creationism, claiming that Earth and all its basic kinds of life came into existence in 4004 B.C.E., that a global flood occurred 1656 years later in 2348 B.C.E., and that “all historical data of man has to be since then.” A foundation of young-earth creationism is that humans and (non-avian) dinosaurs coexisted, both having been created on Day 6 of Creation Week. Not surprisingly, a sculpture outside Grand River Museum depicts a cowboy riding a *Triceratops*—the state fossil of South Dakota. The museum, which is “set apart from most dinosaur museums because of its commitment to Creation Science,” is proud of the sculpture because “the concept of a cowboy riding a dinosaur fits in with the creation theme found throughout the inside of the museum.” A ten-minute video entitled “Creation on the Grand” informs visitors of the area’s history, and a preparatory lab enables visitors to watch volunteers prepare fossils for display in the museum.

Exhibits titled “Faith,” “Fossils,” “Flood,” and “Creation Science” promote the museum’s message, including claims that there are no transitional fossils, that evolutionary biologists hide their



Grand River Museum in Lemmon, South Dakota, is advertised by this roadside sculpture by local artist John Lopez showing a cowboy riding a *Triceratops*.

Photo: Randy Moore

“assumptive arguments ... in sophisticated-sounding terms and definitions,” that “evolutionism is an atheistic religion,” that “all of the most famous advocates of evolutionism ... have been not only atheistic but anti-theistic,” that Noah’s flood was the mechanism for the breakup and drift of continents, that

radiometric dating has been misused and misunderstood, that “science through DNA studies and population growth shows no evolution,” that “evolution is a religion,” and that Neanderthals were “simply human beings cast out from the Tower of Babel into a harsh and unforgiving climate.” After touring the museum, visitors can purchase souvenirs and young-earth creationist books by Ken Ham, Carl Baugh, and others in the museum’s gift shop.

Just a few blocks from Grand River Museum is Lemmon’s Petrified Wood Park, where an entire city block is covered by sculptures and buildings made of petrified wood. According to handouts distributed in the park’s gift shop, the petrified wood is 65 million years old, but a worker there told me that the wood was formed “a few thousand years ago during Noah’s flood.”

Grand River Museum, which charges no admission fee, is at 114 10th Street West in Lemmon, South Dakota. The museum is open daily May 1 through October 1. About 800 people visit the museum each month.

Randy Moore is author of *A Field Guide to the Scopes Trial* (Rhea County Historical and Genealogical Society, 2016) and co-author (with William McComas) of *Images of America: The Scopes Monkey Trial* (Arcadia Press, 2016). He is the H. T. Morse–Alumni Professor of Biology at the University of Minnesota, Twin Cities. RMoore@umn.edu





news from the booster clubs

Feeling a Call to Action? So Are We

If you care about science education, you are probably looking for a way to help to support embattled teachers in the wake of the recent election results. A great way to do that is through contributing to the Science Booster Club program.

Support Our Expanding Operations

In 2016, we engaged more than 54,000 Iowans. In 2017, we plan to build upon these successes and expand dramatically. Currently, we have volunteers organizing new clubs in towns and cities in Tennessee, Virginia, Rhode Island, Michigan, Washington, Ohio, Colorado, Nebraska, New York, West Virginia, and Texas.

Reaching out to people with friendly, accessible, fun, hands-on information about evolution and climate change is going to be more important than ever. With deniers of climate change and evolution holding power at the national level, the actions we take now are crucial. NCSE's science booster clubs can act to counter misinformation by supplying accurate, accessible, nonpartisan information about crucial scientific issues directly to the American people.

But we can't do it alone. We need volunteers and resources to support ground operations. At the pilot site in Iowa, with the help of many dedicated volunteers, every dollar expended on outreach enabled us to reach about ten new people. Some events cost a little more and some cost a little less, but in general, it takes a hundred dollars to engage one thousand people, face to face, on climate change or evolution. That's a great investment.



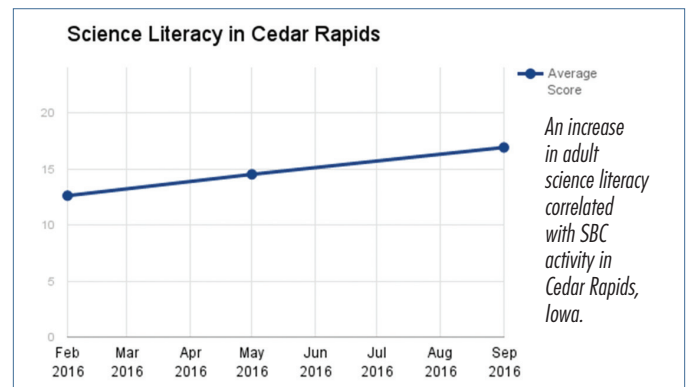
Kids and adults engaged in evolution outreach. Photo: George Malanson

Outreach with Impact

From the beginning, we've wanted the Science Booster Club program to be more than a good time. Our goal is to test and evaluate ways to affect societal attitudes towards and knowledge of science. Evaluation requires data, and the data we have collected so far are providing evidence that our investment is paying off. Initial analysis suggests that community scientific literacy improves in areas where Science Booster Clubs are active.

The Science Booster Club program is run as a research project, so we regularly survey participants and bystanders at our events. Since the beginning of 2016, we've been using a survey at some of our larger events to measure science literacy on a 24-point scale. The survey asks questions such as "Does the Earth go around the Sun, or does the Sun go around the Earth?" and "Is all radioactivity manmade, or does some occur naturally?" You might think that these questions are rather basic—and they are—but they are standard questions used in survey research on scientific literacy.

What do the data show? Just look at the results of our survey work in Cedar Rapids, Iowa:



Mean scientific literacy scores in Cedar Rapids have risen from 13 to 17 in just seven months of data collection. That's a rise of about 30%, and the difference is statistically significant ($p = 0.03$). We're starting to see similar upward trends in the other communities where we work. I hope to show you more data in our next issue, but even just these early results are very exciting.

Spotlight on Interns

The Science Booster Club project would not be possible without its interns. Here we hear from two of our hard-working Iowa City SBC interns, University of Iowa Ph.D. student Joe Jalinsky and undergraduate Jorge Moreno.



Joe Jalinsky Before interning with NCSE, my career energy had been spent almost entirely on research. The experiences I have gained after I began working with NCSE have reinforced the idea that science

is becoming less and less an insular endeavor: how the public understands and relates to science can have lasting impacts on education and policy. I have enjoyed using my research and educational background to find creative ways to remedy many commonly held misconceptions about how we as scientists know what we know and how

we know it. Because of this, I have realized that there is ample opportunity and need for Ph.D.s outside of strictly research-focused careers.



Jorge Moreno As an undergraduate trying to figure out what direction in life I want to take, I have found my experience with NCSE to be very helpful. I have learned that a scientist's

job description should include being an effective communicator. I firmly believe that the general public should have the chance to learn science, and that as scientists it is our job to teach them. NCSE has influenced how I view public outreach, and taught me that teaching science is of great importance. I want to pursue a Ph.D. in biology, and continue to teach not only the next generation of students but also all the people I may encounter along the way.

Moving the Needle on Science Literacy

Adult science literacy is a tough nut to crack. Researchers have been using surveys to assess public science literacy for almost fifty years. While there's been improvement in the public understanding of some areas, including probability and DNA, understanding of concepts related to geologic time—crucial to climate change as well as evolution—has not improved.

We are constantly learning more about our world through the application of scientific methods, but that doesn't mean it's easy for people to access this knowledge. Most adults don't get many science learning opportunities in their daily lives. The awesome hands-on programming of the Science Booster Clubs provides more of these chances, and, clearly, it's having an impact. We can make a difference in our communities. Adult scientific literacy isn't impossible to improve and it doesn't cost millions of dollars to do it, either. It does, however, take dedication, respect, and a sense of fun—the key hallmarks of the Science Booster Club project.

Taking Action

Many of us are dismayed and angry about the direction that our country may be taking and its implication for science education. For some of us, it will be tempting to express that anger by lashing out; for others of us, dismay may tempt us to retreat into isolation. But in these

divided times, it's more important than ever to reach out to people, to give them opportunities to appreciate the importance of science.

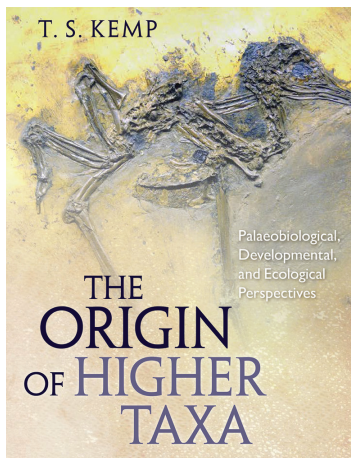
The Science Booster Club activities have been extensively tested in politically and religiously conservative areas. Our unique approach has allowed us to bring scientifically valid information on climate change and evolution into places where access to this type of information is limited at best. Recently, the National Resources Defense Council blog onEarth (November 15, 2016) featured a piece that praised our approach. "[I]t's comforting," Jeff Turrentine wrote, "to know that there are folks down on the ground who know that patience, respect, good faith, and actual science are what's going to win the war in the long run—one mind at a time."

We know that aggressive, condescending, or debate-style approaches to these topics do not move the needle on adult literacy. And we know that the no-conflict approach does.

So please. Join us. Let's not go out there and fight. Let's go out there and win. You can donate directly to the Booster Club project at <https://ncse.com/donatebooster>.

Emily Schoerning is the NCSE Director of Community Organizing and Research. schoerning@ncse.com





THE RNCSE REVIEW

The Origin of Higher Taxa: Palaeobiological, Developmental, and Ecological Perspectives

author: **T. S. Kemp**

publisher: **Oxford University Press and University of Chicago Press, 2016**

reviewed by: **Kevin Padian**

In typical classes that discuss evolution in high school and college, the most neglected topic is what for better or worse can be called “the origin of higher taxa”—namely, how do new major groups of organisms get started, and what major functional and ecological innovations are associated with these origins? There are two primary reasons that the topic is neglected. First, until recent decades we lacked critical information on the origin of major groups, which phylogenetic, paleontological, and developmental genetic evidence has greatly improved. And second, the fact is that only a minority of evolutionary biologists work on large-scale changes in evolution; most focus on population biology and genetics, and some on speciation. Until a few years ago not a single major American textbook had a chapter dedicated to macroevolutionary principles and processes.

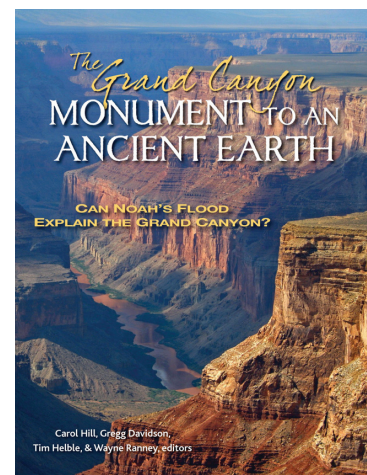
Thus, Tom Kemp’s new book is especially welcome, because he approaches the whole problem of major origins with such a sweeping compass. It won’t please everyone, but it’s brilliantly conceived and executed. Kemp’s driving question is simply this: how should we think about the

origins of major taxa and their adaptations? He compares three standard approaches: the atomistic model, which treats organisms simply as bags of characters, each selected differently; the modular model, which divides the organism into structural and functional units that evolve independently; and the correlated progression model, which regards changes in all systems as steplike and coordinated. Kemp prefers the third, and provides good evidence from a variety of examples for why it’s productive to conceive of macroevolutionary problems in this way.

Kemp situates his approach in developmental and ecological contexts, and this is critical for getting at the root of the problem. Sure, some phylogeneticists confine their analyses to cladograms and lists of synapomorphies, without a separately tested hypothesis of functional and physiological change. And some strictly quantitative macroevolutionists may prefer to plot diversity in stratigraphic ranges and let the patterns dictate the questions about the data. But on the whole, most readers should appreciate Kemp’s well-researched, thoughtful approach. As C. H. Waddington said, “[t]he whole real

guts of evolution—which is, how you get horses and tigers, and things—is outside the [mathematical] theory [of neo-Darwinism].” But only macroevolutionary evidence will convince many people that evolution really has occurred.

Kevin Padian is Professor of Integrative Biology and Curator in the Museum of Paleontology, University of California, Berkeley. He is a past president of NCSE’s board of directors. kpadian@berkeley.edu



The Grand Canyon, Monument to an Ancient Earth: Can Noah’s Flood Explain the Grand Canyon?

editors: **Carol Hill, Gregg Davidson, Tim Helble, Wayne Ranney**

publisher: **Kregel Publications, 2016**

reviewed by: **Steven Newton**

The *Grand Canyon, Monument to an Ancient Earth* is a concise, well-written guide not only to the scientific understanding of Grand Canyon but also to creationist attempts to undermine



© Paula Spence

that understanding. As the book observes, there are long-lived and ongoing young-earth creationist endeavors to appropriate Grand Canyon as a showcase for supposed “evidences” of Noah’s Flood. One particular creationist ministry even goes so far as to run rafting trips down the Colorado River to present a creationist perspective on Grand Canyon. (See the winter 2016 issue of *RNCSE* for Randy Moore’s report on this organization.)

Flood geology is thus a main target of *The Grand Canyon, Monument to an Ancient Earth*, which explains the evidence behind standard geologic interpretations of Grand Canyon and contrasts these interpretations with the implausible claims of Flood geologists. The book also discusses Flood geology’s use of the Bible, suggesting alternative interpretations of the relevant biblical passages and emphasizing that the literal interpretation of Noah’s flood is not something to which all people of faith adhere. Flood geologists will gnash their teeth.

The book commendably uses very clear diagrams and photographs to explain its major points. Profuse illustrations should make this book quite understandable even for readers with no prior geologic knowledge.

Another strength of this book is not revealed until the end, where biographies of the contributors explain that many of the authors come from a religious background and have published widely in defense of science. Ralph F. Stearley, for example, the author of chapter 13, is also the co-author, with Davis A. Young, of *The Bible, Rocks and Time* (2008), which explains and defends the scientific approach to geochronology to a Christian readership. This Nixon-goes-to-China authenticity adds to the effectiveness of a book that, on the merits of its writing and illustrations alone, is a valuable contribution.

Steven Newton is a Programs and Policy Director at NCSE; he also teaches geology at the College of Marin. newton@ncse.com



Dear NCSE,
I’m a science teacher in Texas, and I recently saw an article suggesting that the state board of education would be considering whether to remove creationist/anti-evolution language from the state science standards. What is this article referring to? I read and reread the standards and don’t see anything that looks like a requirement to teach creationism.

Signed,
Confused in Corpus Christi

Dear C³,

The good news is that there isn’t a standard in the current TEKS (Texas Essential Knowledge and Skills) that blatantly calls for students to explain creationism or compare it to evolutionary explanations for the diversity of life. The bad news is that there are standards that reflect creationist themes. The problematic standards are subtle and easy to miss—unless you’re looking for them. For example, TEKS (7)(G) reads, “analyze and evaluate scientific explanations concerning the complexity of the cell.” It might seem innocent enough; after all, understanding cell structures is important in biology. But this particular TEKS is in the section on evolutionary theory, which is odd, isn’t it? In fact, this is intended to invite discussion of the “intelligent design” concept of irreducible complexity, often advanced in connection with the bacterial flagellum. Pretty sneaky, right? There are three other TEKS ((3A), (7B), (9D)) that similarly reflect creationist themes. A good summary of them can be found in the 2012 Texas Freedom Network publication “Recommendations for Dealing with Pedagogical and Scientific Problems” (<http://tfn.org>; search for “recommendations”). It’s a good idea to read it through so you can develop a more sensitive and critical filter for evaluating future standards and materials. And here’s hoping that the board will make the right decision on these standards!

—STEPHANIE KEEP

Have a question? Write to us at askncse@ncse.com.

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