

reports

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new
format!



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from the executive director

Dear NCSE members,

Welcome to the brand-new *Reports of the National Center for Science Education*! I am excited about its new look, but even more excited about the news it contains. All of us here at NCSE want you—our members and supporters—to know more about exactly what we do to defend the integrity of our nation’s science classrooms. The visual summary opposite is a snapshot of the accomplishments that you made possible in 2015 (*NCSE by the Numbers*, p. 3).

A lot of those accomplishments involved climate change education. In this issue, Peter Buckland interviews Michael Mann, the Pennsylvania State University climatologist (and member of NCSE’s Advisory Council) who has been at the center of many of the storms over climate change. “Everyone who cares about science and wants to preserve its role in public discourse has to recognize that there is a war going on right now,” Mann urges (*Willing to Fight*, p. 4).

Also in this issue, you’ll hear from Minda Berbeco about our new NCSEteach network, which already has more than 4,000 teacher members. Our goal is to provide every science teacher the tools and support they need to teach evolution and climate change honestly, accurately, and completely—and for them to know that NCSE has their backs if they get in trouble for it (*A Challenge Accepted*, p. 10). Speaking of new endeavors, Emily Schoerning writes about the very first NCSE Science Booster Club in Iowa City, Iowa, which has already attracted more than 450 community members (*Building Grassroots Support for Science*, p. 12).

Rounding out our inaugural “new” *RNCSE* issue is a map of science education news, a new advice column about how to deal with science denial, news about NCSE members, the best of NCSE’s blog, a book review, and more.

The new quarterly *RNCSE* will provide an opportunity for staff and guest writers from around the world to communicate directly with you. It is a testimony to the creative and organizational genius of editor Stephanie Keep, who managed to draw out the best from all of NCSE’s rambunctious staff to create a publication that we’re all very proud of. I hope that you enjoy reading it as much as we enjoyed developing it, and we welcome your feedback.

As much as we hope you enjoy its contents, we also hope the new *RNCSE* inspires a sense of urgency, and even anger, about the ongoing threats to science education that continue to make NCSE’s work so important. NCSE needs your support to help the hundreds of thousands of children around the country who are not taught what they deserve to be taught: the best science without obfuscation or apology.

We at NCSE are dedicated to making sure that the number of classrooms touched by denial and doubt declines. We know we can do it with your help.

Gratefully,

Ann Reid is the executive director of NCSE. reid@ncse.com



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ncse

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by the numbers

As 2015 drew to a close, the NCSE staff submitted facts and figures that together, could give our members and supporters a taste of our accomplishments. Here are a few—but by no means all—of the submissions, accurate as of December 1, 2015.




25 ...soon to be 150

teacher-scientist matches in the Scientists in the Classroom pilot




4,000

teachers enrolled in NCSEteach (covering all 50 states!)



600 ...soon to be 3,000

students benefitting from the Scientists in the Classroom pilot




1

groundbreaking national climate education survey conducted




1,593,729

NCSE web page views



17

times Glenn blogged about the Scopes trial.



506

blog posts at ncse.com/blog



12

times Stephanie has been dismayed by evolution coverage in the media



1,396

@NCSE tweets




45,833

new facebook fans



100,186

YouTube channel views



3

teacher grants funded by Iowa City SBC



463 members

2,100 people attending events

Iowa City Science Booster Club



120

volunteer hours contributed to Iowa City SBC

WILLING TO FIGHT: MIKE MANN ON CLIMATE ACTION AND EDUCATION

by Peter Buckland

In November 2009, the climate research community was hit by a hurricane: a cache of thousands of personal e-mails was released, with passages wrenched out of context to make climate science seem petty, insular, and unscientific. At Penn State, where I was in my second year as a Ph.D. student, “Climategate” got ugly fast, because Penn State’s own Michael E. Mann was at the heart of the manufactured controversy. Since then, Mann has continued to be the “bullseye” of attacks launched by the fossil fuel industry and other “merchants of doubt.” In the summer of 2015, I sat down with Mann, and our sweeping conversation covered everything from Carl Sagan to the roles of public education teachers. What follows are a few excerpts, edited for clarity.

Peter Buckland: Over the last fifteen or twenty years, you have gone from being just some guy doing statistical representations and computer models of climate data to being a public spokesman for climate science in particular and science in general. How have you grown over that time and who has shaped you?

Michael Mann: I majored in physics and applied math and I went on to get a Ph.D. for work on the physics of climate. Not in my wildest dreams or imagination did I think that I’d find myself part of a fractious public debate. But the historic temperature change curve that my partners and I published in 1998—“the hockey stick”—came under immediate attack. Those looking to discredit it were part of a somewhat cynical effort to claim that by doing so, they could discredit the entire case for climate change. As if the consensus rested on one paper.

I realized that I had to make a decision: Was I going to retreat from that debate and into my lab and just double down and focus on the science and eschew any role in the larger debate? Or would I embrace it even though that’s not what I signed up for?

I decided to embrace it. If my science is going to be used as a proxy for the validity of the science of climate change, then I’m willing to fight. It’s a worthy battle. In my view, until the public fully understands the science, I

cannot remain on the sidelines.

PB: There’s this element of politics creeping into science. It’s there so much in issues of societal importance. You had a piece in *The New York Times*, “If You See Something, Say Something” [in the January 17, 2014, issue]. How do you think science teachers can or should navigate that social tension?

MM: One of the critical things we have to appreciate is that science is not done in a vacuum; it is done by human beings. We try too hard sometimes to pretend that science exists in this sphere that is external to our humanity.

PB: As if facts are free-floating things separate from our values.

MM: Right. And our critics will use that to say, “We can’t trust these scientists because their values are embedded in how they do their science.”

PB: And then they will do the same thing.

MM: [Laughs] Exactly. I think we have to be honest that that’s true. It should be true. It would be odd if the way that we viewed the discipline of science wasn’t in some way reflective of the way the way we view all matters as human beings. We study science not just for science’s sake, but because it matters in many ways and can inform everything from worldview to economic policy.

PB: Should that come into the classroom somehow?

MM: Sure. We should recognize that every human pursuit is going to be influenced by our values. Removing



©Tom Cogill

Mann posing with one set of the tree ring samples that provided proxy measurement of ancient temperatures.

yourself from preconceptions and thinking in novel ways often leads to scientific breakthroughs.

PB: Let's talk a bit more about education. Climate science has a lot of "doom and gloom" potential. How can K-12 educators impart optimism to their students? Make it so that they don't walk away thinking that the die is cast and that the problem is just way too big to do anything about?

MM: This is always a potential pitfall. When we communicate about climate change to the public, we must convey the urgency of action without implying futility. The fact is that some bad things have happened already, and more bad things are likely to happen in the future even in a best-case scenario. But some good things are happening too. We're seeing remarkable progress when it comes to renewable energy and the transition away from a fossil fuel economy, for example. There is still time to avert catastrophic and irreversible climate change impacts. The only obstacle is political will.

PB: One approach that some educators take to avoid too much pessimism or controversy is to teach "both sides" of the climate "debate." It is true, of course, that nothing in science is ever proven and students need to learn critical thinking skills, but is this practice appropriate?

MM: Absolutely not. I don't think any teacher would teach the "Earth Is Flat" half of the "Earth Geometry" debate, right? Nor should they expose their students to similarly egregious science denialism when it comes to climate change.

PB: You aren't a K-12 teacher, but you do teach a first-year seminar for undergraduate students on climate change. How do you approach your course?

MM: Technically, the course is about climate change, but there's only one skill I want them to come away with: critical appraisal of sources of information. The internet is a Wild West frontier we all must navigate critically by learning to evaluate information.

So I'll give my students a claim to research, such as the global cooling claim [that people predicted global cooling in the 1970s]. It's one of the great canards. I'll have them Google that and they will come up with all kinds of stuff. I don't penalize my students for the opinions they

express. The metric I apply is whether they are applying the tools of critical assessment and reasoning. Did they ask the important questions: Who is this source? Who is funding that source? Are there conflicts of interest? Does the source have a perspective or an agenda?

PB: Is this baloney detection à la Carl Sagan?

MM: Absolutely. No question.

PB: Readers of this publication and people who work with the National Center for Science Education are going to wonder what you think they should do?

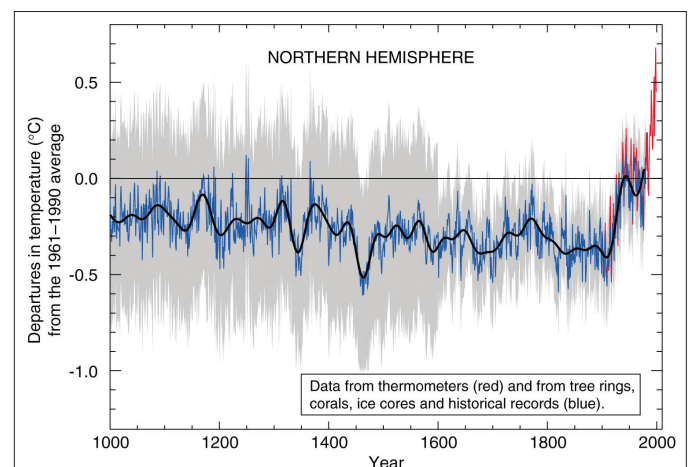
MM: Well, NCSE supporters comprise a pretty biased sample. They already love science. But loving science isn't enough. Everyone who cares about science and wants to preserve its role in public discourse has to recognize that there is a war going on right now. We are under assault by the forces of ignorance and special interests that want to discredit science when it turns out to be inconvenient to their agenda.

We have to show some courage here. We have to recognize that there's a really concerted effort to stop us. Without an equal and opposite push in the other direction it's lost. It's laws of physics.

PB: Social physics in this case.

MM: Yes, but still applicable. The path of least resistance. The squeaky wheel. Whatever you want to call it. Unfortunately there's a lot of power and a lot of money on the other side. But there are a lot more people on our side. Our interests are the interests of human civilization. Not the narrow and short-

THEY HAVE ONE
THING: MONEY.
WE HAVE
EVERYTHING ELSE.
THAT MATTERS.
IT MEANS
SOMETHING.



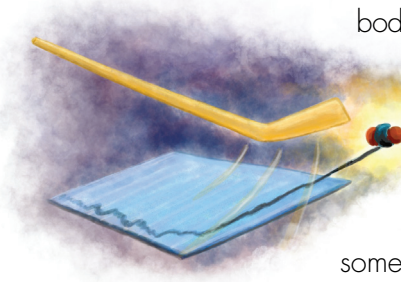
The infamous "hockey stick" graph.

Credit: Climate Change 2001: The Scientific Basis, ed. J. T. Houghton et al., Cambridge: Cambridge University Press, 2001.

term vested interests of those who profit from this. The numbers and moral authority are on our side. They have one thing: money. We have everything else. That matters. It means something.

Everybody from schoolteachers to church leaders and ordinary citizens expressing their views at town halls or in letters to the editor, there are so many different ways to share your views.

We have the ultimate weapon on our side. Scientific truth. It may take time to win out, but it ultimately it will prevail. Unfortunately, we don't have time to waste. It was okay that it took plate tectonics many decades to prevail over the erroneous prevailing scientific paradigm. No-



body died or suffered as a result. With climate change, however, the urgency is great. With each passing year of inaction, we commit to greater tragedy and suffering.

In the end, my belief is that self-preservation will prevail. I often quote an adage sometimes attributed to Edmund Burke. "The only thing necessary for the triumph of evil is for good men to do nothing." Good men and women. Everybody can play some role.

Peter Buckland works on academic programming for Penn State's Sustainability Institute. His love of art, science, and the quandary of living in the Anthropocene occupies his first book of poetry, *Heartwood*. pd118@psu.edu



PLACE & TIME

Canyon Ministries



Canyon Ministries' popular "A Different View" tours tell tourists how the Grand Canyon was formed by Noah's Flood 4,300 years ago. This van is parked at Powell Point, a popular overlook on the South Rim.

While mainstream geologists argue that Grand Canyon formed over tens of millions of years by erosion and other natural processes, a growing number of creationist museums and publications use Grand Canyon to promote young-Earth creationism. Young-Earth organizations offer tours of Grand Canyon that offer explanations and interpretations not based in science, but based upon the belief that the canyon is evidence of the global flood that God used to kill everyone except Noah and his family 4,300 years ago. The most famous of these is Canyon Ministries, an organization founded by Tom Vail and based in Parks, Arizona.

Tom Vail first rafted through Grand Canyon in 1980, and served as a boatman for the next fifteen years. In 1994, after a conversion experi-

ence, Vail came to believe that geologists' evidence for Grand Canyon's old age "never really made complete sense." In 1995, he began offering "Christ-centered rafting trips" through Grand Canyon that interpret the canyon as evidence of God's "judgment by water of a world broken by the sin of men." Vail founded Canyon Ministries in 1996, and has been using Grand Canyon to make money, attack science, and promote young-Earth creationism ever since.

In 2003, Vail edited the 104-page *Grand Canyon: A Different View*, a beautifully illustrated, "one-of-a-kind exploration of the Grand Canyon" consisting of essays from twenty-three prominent young-Earth creationists, including Duane Gish, Ken Ham, Steve Austin, Henry Morris and John Morris, and Kurt Wise. Although it contradicts every geology-based exhibit in Grand Canyon National Park, Vail's book was approved in 2003 by the National Park Service (NPS) for sale in Grand Canyon National Park and on the park's website despite protests from many prominent individuals, including of the superintendent of the park itself, Joe Alston, and the presidents of seven scientific societies. One park

geologist noted that selling Vail's book in Grand Canyon National Park was equivalent to Yellowstone National Park selling a book titled *Geysers of Old Faithful: Nostrils of Satan*.

Grand Canyon: A Different View emphasizes views of Grand Canyon from the Colorado River. Because relatively few people who visit Grand Canyon National Park raft through Grand Canyon or hike to the river, Vail and others subsequently produced *Your Guide to the Grand Canyon: A Different Perspective* in 2008 for people wanting young-Earth interpretations of Grand Canyon from the rims of the canyon. Similar books are available for Zion and Bryce National Parks, and others are planned.

Today, Canyon Ministries is a thriving business at Grand Canyon National Park. Vail's books continue to be sold at Grand Canyon, including at the National Geographic Visitor Center store.

Randy Moore is the HT Morse-Alumni Distinguished Professor of Biology at the University of Minnesota. moores@umn.edu





M. Kim Johnson



The physicist and science education activist **Marshall Berman** died on October 25, 2015, at the age of 76, according to a November 8, 2015, obituary from the Coalition for Excellence in Science and Math Education (CESE) in New Mexico. Passionate about the quality of science education, Berman served for four years on the state board of education and was a leader in the state's science education organizations, including the New Mexico Academy of Science, New Mexicans for Science and Reason, and CESE.

Berman became involved in the fight against creationism in 1996, when the state board of education voted to

remove references to evolution and the age of the Earth from the state's science standards. After lobbying, education, and legislative efforts all failed, Berman won election to the board, and convinced his new colleagues to restore evolution and the age of the Earth to the standards. Berman's efforts in New Mexico were recognized by NCSE with a Friend of Darwin award in 1999. Berman was instrumental in rebuffing subsequent efforts to compromise the scientific integrity of the standards and to pass anti-evolution bills in the state legislature. His motivation was not hard to discern: creationism, in Berman's view, was a threat to "all of science and society," as he explained in a 2005 column published in the American Physical Society's newsletter.

In 2006, he told *Stanford Medicine Magazine*, "It's hard for me to imagine a bigger threat that all of us face. It's time to take action. Get involved in politics and take a stand for science."

Berman was born on June 16, 1939, in Detroit, Michigan. He earned his B.S. in physics from the University of Michigan and his Ph.D. in nuclear physics from Wayne State University. He spent his professional career at Sandia National Laboratories in Albuquerque, New Mexico, where he worked for thirty-two years on nuclear reactor safety, managing a variety of defense research projects. He also served as the executive director of the U.S. Council of Competitiveness's Innovation Initiative. —GLENN BRANCH

WHAT WE'RE UP AGAINST

Avoiding "the E-Word"

Utah is revising its state science standards, which form the basis of statewide tests, textbook selection, and local districts' curriculum. Recently under consideration were the middle school standards. There was a lot to like in the draft, including coverage of the nature of science, deep time, and even climate change (no mean feat in this conservative state).

Unfortunately, there was also something missing. While evolutionary concepts are covered, the phrase "change in species over time" was clumsily substituted for "evolution."

THIS IS WHAT WE'RE UP AGAINST.

Words have power. No teacher should feel discouraged from forthrightly naming the unifying prin-

ciple of biology. As the Utah state board of education itself recognizes, evolution "is a major unifying concept in science."

Your support enabled us to successfully rally concerned Utahns and encourage Utah policymakers, in the name of clarity and good science, to restore the word "evolution" to the standards.

—JOSH ROSENAU



UPDATES

ncse.com/updates

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

ALABAMA

When the Alabama board of education voted to approve a new set of science standards on September 10, 2015, in which evolution was described as “substantiated with much direct and indirect evidence,” the question arose: what will become of the evolution disclaimer in Alabama’s textbooks? According to *Newsweek*, “The state superintendent and state board of education ... will ... evaluate whether or not the insert will survive as-is in the new books, or whether it will be altered.”

CONNECTICUT

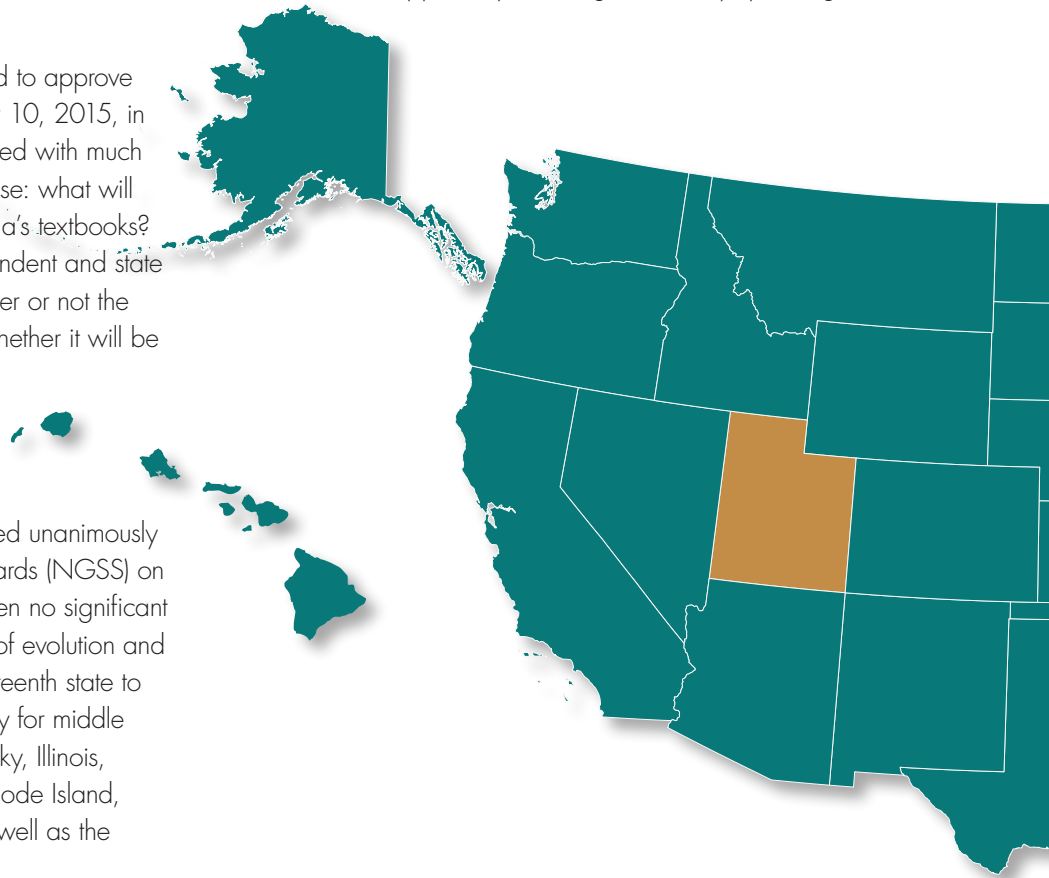
The Connecticut state board of education voted unanimously to adopt the Next Generation Science Standards (NGSS) on November 4, 2015. There seems to have been no significant public controversy over the NGSS’s inclusion of evolution and climate change. Connecticut becomes the sixteenth state to adopt the NGSS, joining Arkansas (so far only for middle school), California, Delaware, Kansas, Kentucky, Illinois, Maryland, Nevada, New Jersey, Oregon, Rhode Island, Vermont, Washington, and West Virginia, as well as the District of Columbia.

FLORIDA, DELTONA

A handout on evolution entitled “Not just a theory” disseminated to eighth-grade science students caused a parent to complain. In particular, the parent took exception to the accusation that people characterizing evolution as “just a theory” are trying to mislead their audience. The principal responded to the parent’s complaint by saying that the handout was intended “to address current science standards for differentiating scientific theory and scientific law” but apologizing for the objectionable sentences and promising that the handout would not be used in the future.

FLORIDA, PENSACOLA

The flamboyant young-earth creationist Kent Hovind of Creation Science Evangelism is free. In 2006, he was convicted of fifty-eight federal charges, and in 2007, he was sentenced to serve ten years in federal prison. While in prison, he was charged with mail fraud and related charges and with criminal contempt; he was found guilty on the criminal contempt charge in 2015 but the verdict was overturned and the charges dismissed without prejudice. Hovind is apparently returning to his busy speaking schedule.



LOUISIANA, BOSSIER PARISH

In September 2015, the ACLU warned the Bossier Parish School Board about a pattern of religious proselytization at Airline High School—which includes attacks on evolution education. “Some Airline teachers are teaching creationism as science,” Zack Kopplin reported in *Slate*, and one student told him that one teacher “got in trouble last year for teaching evolution as a fact” and another “didn’t want to teach evolution because she was scared.” E-mails reveal that the Bible is used to “debunk” evolution.

MAINE

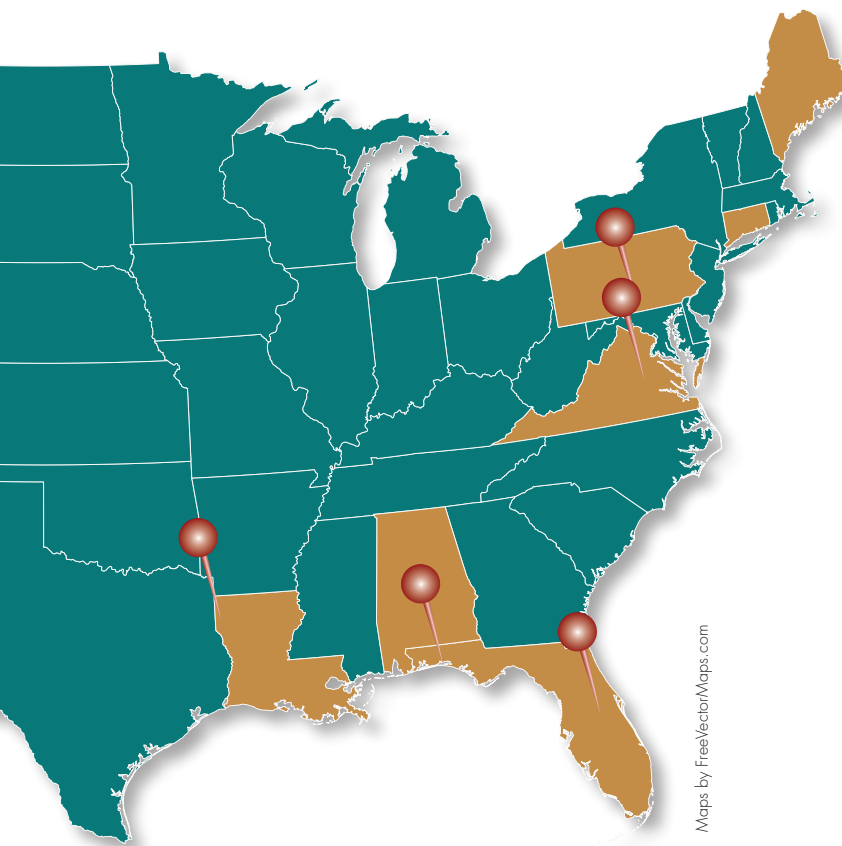
There was a flurry of excitement when the governor of Maine, Paul LePage, appointed Bill Beardsley as the acting state education commissioner, owing to Beardsley's saying in 2010 that he supported teaching creationism in the state's public schools. But after his appointment, Beardsley reversed his position. The *Portland Press Herald* reported, "he said he doesn't believe schools should teach creationism in science classes, and that he will not put forward any effort to change Maine's current science standards to include creationism."

UTAH

Coverage of a proposed new set of middle school science standards for Utah misleadingly suggested that climate change denial was included at the sixth-grade level, while the use of "change in species over time" for "evolution" and the omission of natural selection in the seventh-grade standards was unmentioned. In a blog post (republished by the *Washington Post*), NCSE's Minda Berbeco set the record straight, and NCSE alerted its Utah members to submit their comments to the state board of education.

VIRGINIA, GREENE COUNTY

The new at-large member of the Greene County School Board expressed support for teaching creationism in the public schools during a public forum, according to the *Greene County Record*. Disavowing the Big Bang, Harry Daniel said, "I believe if we're going to teach one aspect of it, the other ought to be taught." His opponent, Larry Morris, said, "I am a pastor, so I spend my life teaching creation." Daniel defeated Morris with 52% of the vote in the November 2015 election.



PENNSYLVANIA, DOVER

As the tenth anniversary of *Kitzmiller v. Dover*, the case establishing the unconstitutionality of teaching "intelligent design" creationism in the public schools, approached, Pennsylvanians were treated to multiple reminiscences of the historic trial in the *York Daily Record* and the *York Dispatch*. In addition, Eugenie C. Scott and Kenneth Miller made presentations at York College followed by a panel discussion in Harrisburg with Richard Katskee, Nick Matzke, Kevin Padian, Christy Rehm, and Eric Rothschild, sponsored by the ACLU of Pennsylvania.



AUSTRALIA, WESTERN AUSTRALIA

Andrew Hastie, a Liberal candidate for the Canning seat (south of Perth) in the Australian House of Representatives, was plagued before the election by questions about evolution and creationism, because his father, the theologian Peter Hastie, is a young-earth creationist associated with Creation Ministries International. Hastie expressed his belief in God but otherwise refused to engage with the questions, describing them as irrelevant to the voters, according to *The Guardian*. He won the hotly contested by-election in September 2015.



A Challenge Accepted

NCSE has been working for the past thirty years to defend the teaching of science in public schools, specifically evolution and, more recently, climate change. Yet every time I go to a teacher conference or meet with a group of educators, I still hear the question, “What is NCSE again?” This is a big problem. If teachers don’t know about NCSE or our history, how will they ever know that they can reach out to us for help?

I brought this challenge to our new executive director, Ann Reid, when she first took the reins of NCSE early in 2014. She agreed with my assessment that getting more K–12 teachers into our network was imperative, since only when we could hear directly from teachers themselves about the challenges they faced could we begin to understand how to best support them. The result of these discussions was the 2015 launch of NCSEteach—NCSE’s first-ever program dedicated entirely to educators. Through NCSEteach, we hope to reach every classroom in the country, providing access to our staff and resources, a way for teachers to learn and support one another, and a ready source of help when challenges arise.

Building a teacher-led network

In planning NCSEteach, we were adamant that it should be the teachers themselves, not us, deciding the agenda. So in the spring of 2015, we sent teachers a survey to find out what they wanted—and it turned out that they wanted a lot! They wanted access to more resources; they wanted greater community support; they wanted to know about professional development opportunities to get better training on evolution and climate change science; and, most interesting, they wanted access to scientists. Based on this feedback, we established a monthly newsletter for teachers with resources and professional development opportunities. We also started the Scientists in the Classroom program, to connect classrooms with early career scientists (see sidebar), and a Science Booster Club program, now piloting in Iowa (see page 12). To round

it all off, we’ve started to gear more of our outreach, blogging, and professional development to the needs of educators.

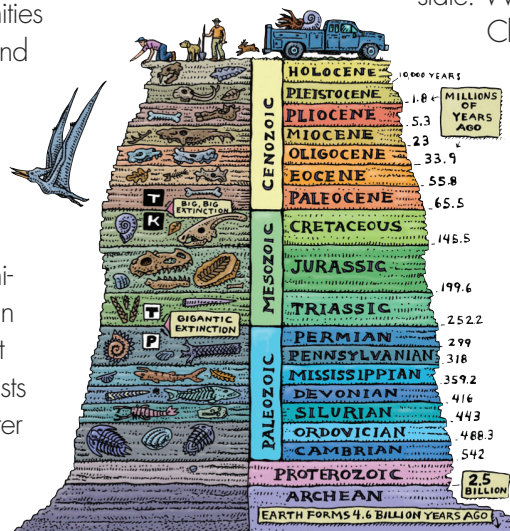
Fostering two-way communication

To our delight, as we’ve started connecting more with teachers, they’ve started sharing more with us. We’ve heard from teachers who were forced out of positions or felt it necessary to leave because of backlash to their teaching evolution and not “intelligent design.” We’ve heard from teachers who tell us other teachers are teaching creationism in their schools. And we’ve heard from teachers with worries about their knowledge or ability to teach science effectively.

So this increased outreach to teachers has allowed teachers not only to know about NCSE, but also to feel comfortable sharing their concerns with us. In some cases, we have been able to discuss these challenges—and share the successes—with other teachers via our blog. As we help to shine a light on the challenges science teachers face, more and more of them are learning that we are there to help them, and trusting us to assist them in the least disruptive and most thoughtful way possible.

Just getting started

The work is far from over, of course. NCSEteach’s enrollment went from 400 teachers to 4,000 teachers in one year, but we want to triple that next year. We want to be on the radar of thousands of science teachers in each state. We want them to know about our Scientist in the Classroom programs and our Science Booster Clubs, and most importantly, to know that we are just a phone call or quick e-mail away, ready to help and support them. We’re off to a good start, but this coming year will be a real test to see how far we can build this teacher network, connect with educators, and make sure they know we’re ready to defend and support them as we work together to teach the science.



Minda Berbeco is a programs and policy director for NCSE. berbeco@ncse.com



Sowing the Seeds of Change with NCSE Interns

When I started NCSE's internship program a few years ago, I had very specific rules: no stuffing envelopes, no making copies, and no getting coffee (or dry cleaning for that matter)! Many non-profits take advantage of the free labor provided by interns, but what I wanted was something much bigger and better: for young scientists and students to come to understand the significant challenges to the integrity of science education.

The NCSE interns worked hard, and got a lot out of their experiences. Some have been able to discuss their work in their senior theses; others have gotten an academic publication or conference experience out of it. These are good things, undoubtedly—but it isn't money. Yes, experience is worth a lot, but for NCSE to attract the best possible interns, it would take money, which was not available—that is, until last summer.

After writing about our internship program for *RNCSE* last year, a pair of NCSE donors, Stephen and Katherine Jenkins, offered to fund our first-ever paid internship program. Thanks to matching funds from another NCSE donor, we were able to bring in two paid summer interns (one full-time and one part-time) in the summer of 2015. When I'd advertised for unpaid interns in the past, I'd get one or two applicants. This time? We had over a hundred applicants for the positions. After a long deliberation, I finally settled on two recent graduates: Kate Heffernan and Nikita Daryani.

And what did these interns do? Oh, not much—they just helped launch our new teacher network, NCSEteach, and its affiliated Scientist in the Classroom program. They developed our social media campaign, conducted teacher outreach, reviewed resources, researched scientific and policy papers, wrote for our blog, and joined me at meetings and on professional calls. All the while, they were learning important skills such as using database management tools and newsletter programs, Google Apps, and social media technologies—not bad résumé fodder. It was therefore no surprise to me that Daryani was hired from NCSE into a permanent position in the field. Since, I wasn't ready to lose both my right and left hands, I tried to convince Heffernan to stay through the spring to help launch our Scientist in the Classroom program—luckily for me, she agreed.

We were very fortunate to have these amazing interns this past summer, and we are keen to bring in more this

coming summer. The Jenkinses have again offered to supply the seed funds for the program, but to run the program again, we'll need matching funds. If you are interested in helping bring interns to NCSE to work with our staff this summer, please consider donating this winter to our internship program. E-mail me for details.

— MINDA BERBEKO

Scientists in the Classroom



Photo courtesy Bertha Vazquez.

University of Miami scientist Eleanor Middlemas teaching Bertha Vazquez's middle school students about how atmospheric observations are made at the Miami International Airport.

This fall, NCSEteach piloted a new program to get early career scientists who specialize in evolution or climate change into classrooms across the country. By connecting scientists with local classrooms, we hoped to increase the trust and collaboration between the scientific and teaching communities. The pilot included twenty-five teacher and scientist pairs, who were encouraged to connect throughout the semester via social media before meeting in person towards the end of the semester for in-class activities.

To call the pilot a success would be a huge understatement. Through the fall pilot, we connected over six hundred students with scientists across the country. The teachers and scientists were so excited to work together that they went beyond the bounds of the program. This spring, we will be rolling out the program in earnest, and hope to reach more than three thousand students. We have no doubt that our expectations will continue to be shattered in the best possible ways.

—KATE HEFFERNAN



news from the booster clubs

Building Grassroots Support for Science

Wouldn't it be great if there were an easy way to bring your community together around science education? We're working on it!

All too often, NCSE is consulted for help when the teaching of evolution or climate change is endangered due to community pressure. We are hoping to pre-empt the need by helping to effect change at the grassroots level with the Science Booster Club project. Science Booster Clubs (SBCs) have three goals: to energize, organize, and connect people who love science; to provide fun, locally-oriented science programming; and (most importantly) to raise money for local science teachers.

Getting off the ground

Our pre-pilot club, SBC-Iowa City, has hit the ground running in Iowa. We started there in April 2015, and in six months have seen our pre-pilot club grow to include more than 450 members. As of late fall, we have partnered with local institutions, individuals, and non-profits to provide hands-on, community-based education about climate change to more than 2,100 people in the Iowa City, Iowa area. The enthusiasm and support of the community has been really impressive. Local individuals and businesses have contributed dozens of volunteer hours and hundreds of dollars to science education in their community. People who attend SBC events are not shy about expressing their excitement for the SBC-brand of fun, casual science education in their communities—they also aren't shy about asking for more of our programming!

One success story: At a fall community science event on climate change, we found that people felt free to ask questions where they might otherwise worry about looking uninformed. This gave us the opportunity to explain basic concepts like the greenhouse effect, carbon emissions, and the impact of



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"Zombies" teaching evolution at the Creepy Campus Crawl, Iowa City.



© Emily Schoering

Iowa City SBC members gathered for a nature hike with botanist Ray Tallent.

sea level rise to hundreds of adults who were otherwise largely uninformed regarding climate change issues. We find that most people are interested to learn about these topics, that they engage with the material, and that they often want to learn more.

Beyond enthusiasm

While it's great to see such enthusiasm, we know that attending an event is different from being part of a consistent, positive, pro-science presence, and from organizing around threats to science education. Our feeling is, however, that if socially contentious science topics like evolution and climate change are frequently encountered in a friendly community context, they become normal and non-threatening—which of course they should be! If people see other members of their community enjoying themselves at public science events, they might be encouraged to speak up at the next school board meeting, or to offer words of encouragement to a teacher embarking on an evolution or climate science unit.

As a researcher, I know that nothing inspires support like data. Accordingly, NCSE has partnered with the University of Iowa to run this project as a research study. As we expand into three new pilot sites this fall, we will be surveying booster club participants to see whether and if so how these clubs change science literacy and people's impressions of socially relevant science topics at the local level, and impact people's involvement in and engagement with their communities. Our hope is that the data will serve as proof of concept, and provide the evidence we need to get SBCs started all over the country—and the timing couldn't be more perfect.

New standards present an opportunity

Science, technology, engineering, and mathematics (STEM) education in states across America is changing as states adopt the Next Generation Science Standards (NGSS) or look to them as a model for standards revisions. For many teachers, these new standards call for a very different approach to science education, with more hands-on activities and incorporation of scientific practices in the classroom. This is a good direction for science education, but without support, successful implementation will be a huge challenge. Additional funding and professional development opportunities are critical to the successful implementation of content-heavy, practice-based standards, but many of the states that have adopted NGSS have not adopted measures that would give teachers additional funding or professional development to help them implement the standards.

This is not only an especially important time for science education in America—it is also an opportunity. We need to be supporting our science teachers as they work to provide students with the best education they can. Surveys have shown that most science teachers do not feel strong community support for their work. We think that Science Booster Clubs can change that. Our research and outreach work has also shown something many of us already know: science teachers really need some cash—even for the most basic materials. Clearly, we've got a long way to go. How can we hope to get the concepts we care about covered accurately and in depth if teachers can't even get supplies they need to teach the basics?

There is a bright side. Our work so far indicates that people really want to come together around science and support local science education. This is great news for teachers as we expand the project, and we think it's also great news for communities. An informed community is a community that is empowered to make scientifically sound choices. A community that supports local science teachers is making a real investment in education.

Are you interested in starting a Science Booster Club in your community? Get in touch!

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



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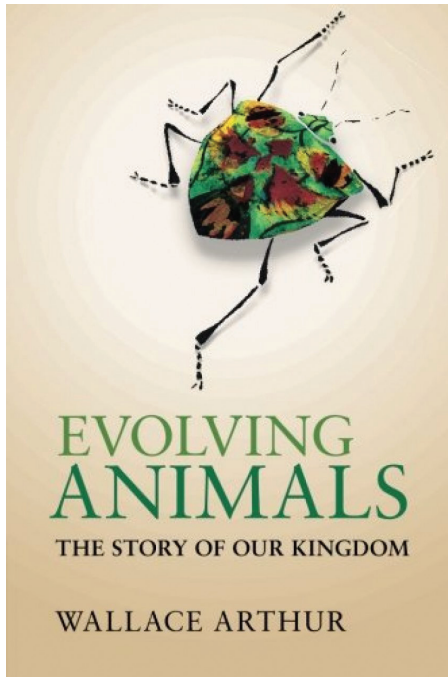
*Dear NCSE,
I am a middle school teacher in a very conservative community and am worried about having to teach climate change once the Next Generation Science Standards are adopted in our state. Would it help to teach both sides about the causes of global warming?*

*Signed,
Teaching about Climate, Tentatively*

Dear TaCT,
Even if you think that it might help to assuage community concerns, teaching “both sides” isn’t a pedagogically responsible approach when one side consists of upward of 97% of the relevant scientific experts. You wouldn’t teach “both sides” when it came to the layout of the solar system, even if there were avid geocentrists in your community, would you? The Next Generation Science Standards reflect the scientific consensus, and performance expectation MS-ESS3–5 specifically calls for emphasizing “the major role that human activities play in causing the rise in global temperatures.” This unequivocal statement provides you with a defense should you personally encounter any pushback for teaching anthropogenic climate change: after all, it wasn’t you who decided to adopt the standards, but your state. In terms of a teaching strategy, we recommend starting your discussion of climate change with the basic science, emphasizing the converging independent lines of evidence, and later discuss policy implications neutrally and objectively. Do that and you should be on safe ground.

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

THE RNCSE REVIEW



Evolving Animals: The Story of Our Kingdom

author: Wallace Arthur
publisher: Cambridge University
Press, 2014

Reading Wallace Arthur's *Evolving Animals: The Story of Our Kingdom* is like having a long lunch with an avuncular university don. Arthur is in fact Professor Emeritus of Zoology at the National University of Ireland Galway, and his writing style is very much like a lunchtime chat centering on his academic expertise. The book's voice is conversational and accessible to readers of many stripes, and Arthur winds a path through a tangle of topics and taxa that at first blush seems neither predictable nor systematic. His thoughts reflect the idiosyncrasies and speculations of an experienced scholar who is not afraid to project beyond the evidence or to redefine

the conventions of his field as it suits his own thinking. Arthur's writing is also, to me, unmistakably British. He cites the work of many of his UK colleagues as if recounting a conversation with old school chums rather than presenting an abstract of a scientific article. He also has a certain authoritative teaching style that requires the reader to trust the author's expertise as much as the evidence he provides, so that we essentially play Dr. Watson to Arthur's Sherlock Holmes of zoology. The effect is a book that is enjoyable by and comprehensible to a wide variety of readers, but also a book where the reader must carefully judge the author's more speculative claims, perhaps without the support of a deep scientific knowledge of the subject.

Arthur's topic is the animal kingdom, including much more than the birds, mammals, and other vertebrates that most of us picture when we think of animals, but also all invertebrates, including our distant marine relatives, like sponges and jellyfish, and the far more numerous insects with which we share the terrestrial world. Though he discusses all of the most familiar groups, as well as some unfamiliar phyla, Arthur has no intention of providing an exhaustive review of animal life; in fact, he directs the reader to appropriate textbooks for such a survey. His real goal is to outline the

latest science concerning the evolution of our kingdom. He covers a wide variety of topics—the relationships among the major lineages, patterns in the fossil record, major transitions (such as the invasion of the land), important patterns and processes of development and embryology, adaptation and its “scale”-dependence (a topic of interest to him discussed in multiple chapters), and the inevitable discussion of human evolution. He does so,

however, largely by describing a wide variety of recent studies by scientists across the globe, so even long-studied problems are treated in the light of cutting-edge work. That is not to say that Arthur ignores the history of the study of animal evolution. On the contrary, Arthur's discussion of the historical development of various

concepts often highlights the specific contributions of important (and often British) early figures in the history of evolutionary thought, like R. A. Fisher and J. B. S. Haldane. Arthur's writing is generally engaging, and even with all of his zigging and zagging through the maze of topics, it is not too difficult for the reader to avoid becoming lost in the narrative.

Hanging in there with Uncle Wallace is not always a smooth ride. While Arthur generally sticks to the evidence and reports past and present research, there are times when he deploys his intellectual privilege

*“...a tangle
of topics
and taxa that
at first blush
seems neither
predictable nor
systematic.”*

to move the narrative forward past a question to which the research does not provide him with a satisfactory answer. He is not above redefining a familiar term, as he does with “adaptation,” defining it to be “environment-specific,” and removing traits like vertebrate jaws from this category. (He instead labels jaws as “design improvements.”) This struck me as an unnecessary modification of an important term. Occasionally, Arthur will make claims beyond the evidence he discusses, such as choosing or preferring one side of a debate based on some rationale of his own. One final quibble is that the illustrations are without color, generally sketchy, and too often not adding to understanding the topic at hand.

Overall, the merits of *Evolving Animals* outweigh its flaws. Even in those instances when Arthur’s claims left me skeptical, I often came away with interesting questions to ponder. *Evolving Animals* is not meant to be a textbook, much less a scientific treatise, but for readers with a recreational interest in animal evolution, it is an engaging and accessible introduction to the most recent research on Kingdom Animalia.

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Kalliopei Monoyios, www.kalliopeimonoyios.com

BEST OF THE BLOG

ncse.com/blog



On NCSE’s blog, The Science League of America, we cover not only the latest in science, science education, and science denial, but also history, philosophy, and even humor. With new posts every day, there’s always something new. Here’s just a taste of posts from 2015.

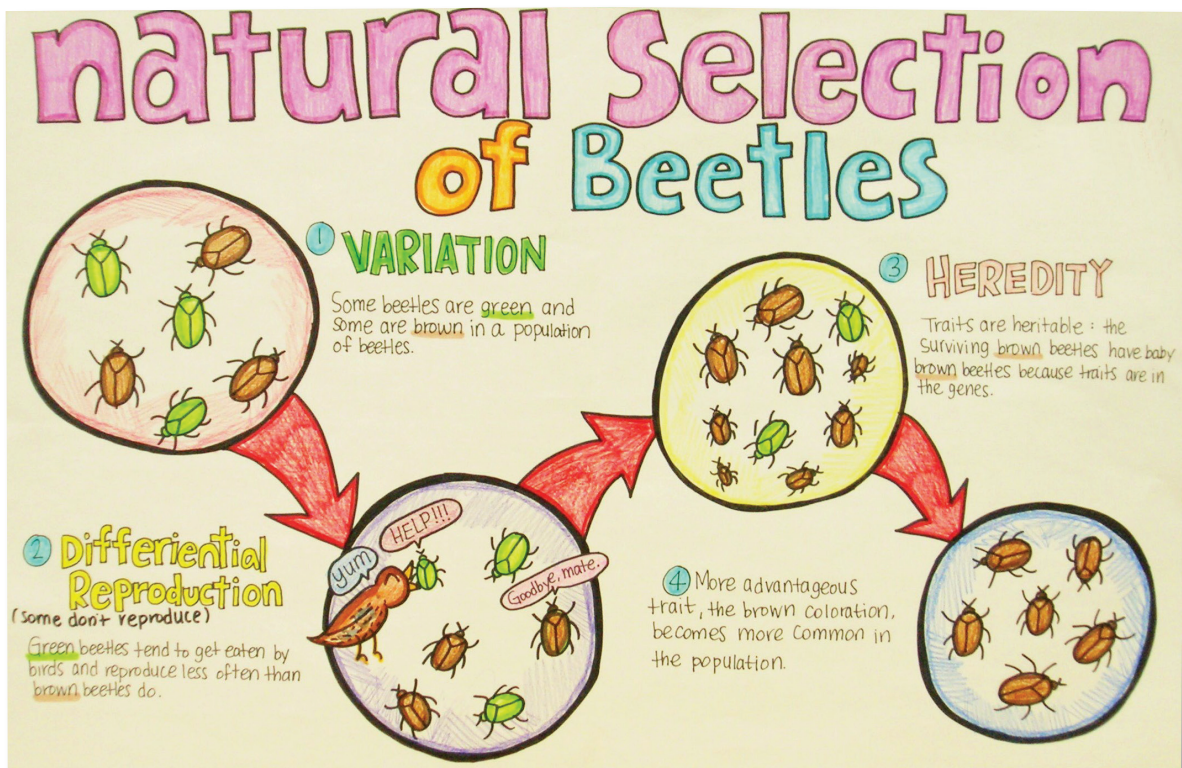
- **Bacon Whoopee!** Ann Reid talks turkey about bacon and other processed meat that may kill you. Or not. [<http://bit.ly/1kGDY3J>]
- **Evolution, the Environment, and Religion:** Josh Rosenau created a super-informative graphic. [<http://bit.ly/1GijRke>]
- **Science Denial in Utah?** Minda Berbeco reports. [<http://bit.ly/1RIMdav>]
- Steve Newton on **A Textbook Example of How to Do Science.** [<http://bit.ly/1MSmDBL>]
- Stephanie Keep (cave)-dives deep to explore **Homo naledi: Another Awesome Twig on the Human Family Tree.** [<http://bit.ly/1HX81JZ>].
- **Creationists Targeting Teachers?** Oh yes. Minda Berbeco’s tales from National Education Association. [<http://bit.ly/1SBkc4J>]
- **Defending the Alabama Textbook Disclaimer with a Convenient...** what? Glenn Branch knows. [<http://bit.ly/20HxpPq>]
- In **Girls**, Emily Schoerning takes umbrage at a sexist marketing campaign. [<http://bit.ly/210oSHq>]
- Emily Schoerning discusses **The Emotional Roots of Science Denial.** [<http://bit.ly/1j6sipV>]
- **Why Are Teachers Voting With Their Feet?** Steve Newton on the brutal teacher shortage facing American schools. [<http://bit.ly/1LkvJzV>]
- Facts vs. frenzy: Ann Reid says **Let’s All Take a Deep Breath About Pandemics.** [<http://bit.ly/1Q7esb>]
- **Hypotheses, Theories, and Laws. Oh My!** Stephanie Keep digs into misconceptions at the heart of the nature of science. [<http://bit.ly/1H7s10b>]
- In **Textbooks of Doubt**, educator K. C. Busch explores whether science textbooks are distorting climate change. [<http://bit.ly/1PxYj6Y>]
- **All Along the (Climate) Watchtower: Will God Save the World from Climate Change?** Robert Luhn hopes *somebody* will save the day. [<http://bit.ly/1X5O4r5>]

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This year, an estimated **484,000** students will be taught **creationism** in their **public** high school biology classes.

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