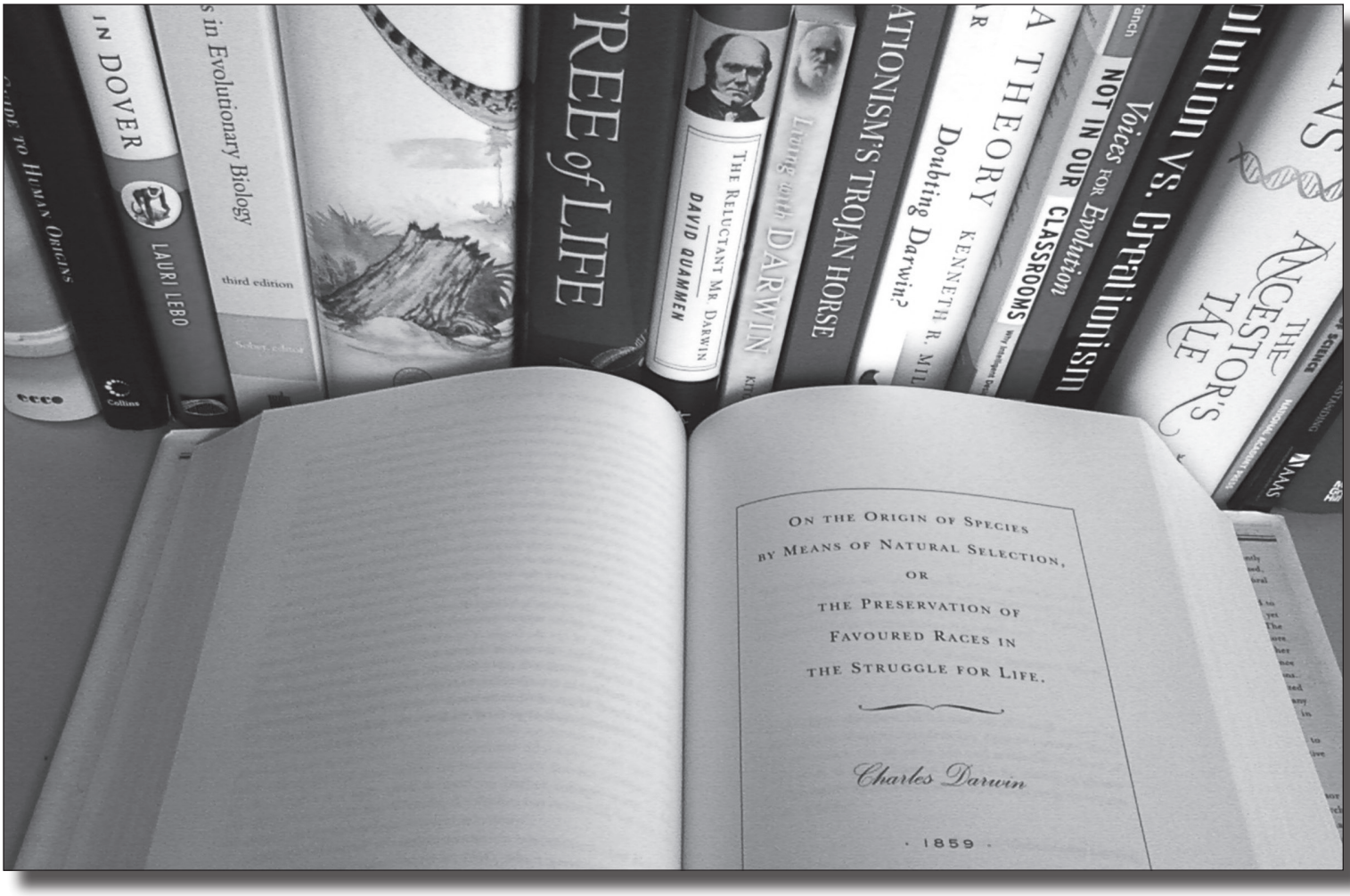
REPORTS OF THE NATIONAL CENTER FOR SCIENCE EDUCATION

DEFENDING THE TEACHING OF EVOLUTION AND CLIMATE SCIENCE

Volume 32, Number 3 May – June, 2012



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NCSENEWS News from the Membership *Glenn Branch*

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

Michael D Barton spoke on "Charles Darwin: Myth vs history" on April 4, 2012, in the Old Library Auditorium at the Oregon Health & Science University Library in Portland. On his blog The Dispersal of Darwin (http://thedispersalofdarwin.wordpress.com/), Barton explained that the talk addressed "both what I think are unintentionally created myths (events or characteristics that find their way into popular history, science textbooks, etc.) and those that are indeed intentional, and meant to sme[a]r the reputation of a historical character (mainly, creationist misuse of history)." The slides for his talk are available at http://www.slideshare.net/darwinsbulldog/charles-darwin-myth-vs-history.

Robert L Carneiro of the American Museum of Natural History, **Jonathan B Losos** of Harvard University, and **Maureen L Stanton** of the University of California, Davis, were among the 220 new members of the American Academy of Arts and Sciences announced on April 17, 2012. "Election to the Academy is both an honor for extraordinary accomplishment and a call to serve," said the academy's president Leslie C Berlowitz in a press release. "We look forward to drawing on the knowledge and expertise of these distinguished men and women to advance solutions to the pressing policy challenges of the day." The press release added, "Since its founding in 1780, the Academy has elected leading 'thinkers and doers' from each generation, including George Washington and Benjamin Franklin in the 18th century, Daniel Webster and Ralph Waldo Emerson in the 19th, and Albert Einstein and Winston Churchill in the 20th. The current membership includes more than 250 Nobel laureates and more than 60 Pulitzer Prize winners."

Nina G Jablonski was named as a recipient of a 2012 fellowship from the John Simon Guggenheim Memorial Foundation. The fellowship will support her studies of the dynamics of Vitamin D status in human populations. According to the foundation, only 181 fellows were selected from among over three thousand applicants. Jablonski is Distinguished Professor of Anthropology at the Pennsylvania State University and the author of *Skin: A Natural History* (Berkeley [CA]: University of California Press, 2006).

Dave Koerner, Associate Professor of Astronomy at Northern Arizona University, was featured in the *Arizona Daily Sun* (2012 Mar 31) as a scientific voice in opposition to a young-earth creationist who gave a church-sponsored talk at Northern Arizona University. Koerner told the newspaper,

> In general it's a free country and you can believe really nutty things if you want to. Why not? … Where I have a problem is if you are trying to compel a lot of people or teach them things that contradict the scientific results in our culture. ... There's a lot of students and young people who could have promising careers in technical professions. As long as scientists are demonized to them and [they are] lied [to] about it, it puts a roadblock in their way.

Koener should know, as the *Daily Sun* noted. Raised as a young-earth creationist, reading Whitcomb and Morris's *The Genesis Flood*, "actually helped turn him against a literal account of creation because it was so hard to believe."

NCSE congratulates **Michael E Mann** on receiving the European Geoscience Union's Hans Oeschger Medal for 2012, in honor of "his significant contributions to understanding decadal-centennial scale climate change over the last two millennia and for pioneering techniques to synthesize patterns and northern hemispheric time series of past climate using proxy data reconstructions." The citation explains, "Mann deserves the award on the basis of his important contributions to the understanding of climate change over the last two millennia but also for pioneering statistical techniques for isolating climate signals in noisy data," adding,

> Mann's climate reconstruction of the last 1000 years is popularly known as the "Hockey Stick" and gave tremendous impetus to the study of historical climate change, even though some questions remains about the magnitude of these past changes. By doing so, he had to face escalating political and personal attacks. ... Mann exemplifies the courage that Oeschger hoped scientists should have, another reason for him to deserve the Oeschger Medal."

Mann is Professor of Meteorology at the Pennsylvania State University and the author of *The Hockey Stick and the Climate Wars* (New York: Columbia University Press, 2012).

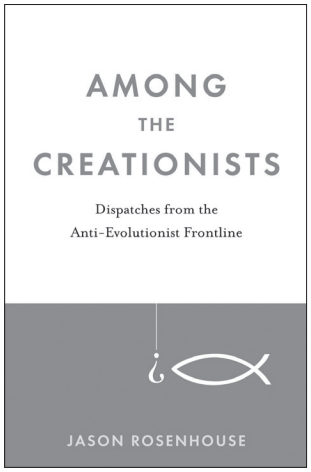
"Science and religion—Building bridges, dismantling misconceptions," a special half-day symposium held on March 31, 2012, at the 86th meeting of the AAAS Southwest and Rocky Mountain Division (SWARM) in Tulsa, Oklahoma, featured a number of members of NCSE. **Doren Recker**, Associate Professor of Philosophy at Oklahoma State University, spoke on "Good fences make good neighbors (and vice versa): Nature, method, and science in the creation/evolution debates"; **Stanley A Rice**, Associate Professor of Biology at Southeastern Oklahoma University, spoke on "God and natural selection" (wearing a Darwin-style bowler and burgundy scarf while doing so); and **Matt Lovern**, Associate

Glenn Branch is NCSE's deputy director.

Professor of Biology at Oklahoma State University, spoke on "Teaching evolution without apology in a human physiology course." A press release from AAAS released April 4, 2012 (available from http://www.aaas.org/news/releases/2012/0404swarm_science_religion.shtml), discussed the proceeds in detail. Among the highlights:

- Lovern reported on his "informal survey of attitudes on evolution among his students in 2008. Among 134 respondents, over half said that it was incompatible with their religious beliefs or that it wrongly casts humans as descendants of apes." In his teaching, he said, "I really, really hit that science and religion do not necessarily conflict... There doesn't have to be a conflict—the majority of faiths accept scientific progress, and evolution specifically."
- Recker explained, "This isn't a fight between science and religion. It's between science and a particular religious view that all religions do not hold." Recker characterized the scientific approach to dispute as settling a bet. "Testing is the key," he said. If one side can't prove its assertion—if it can't win the bet—then "we're back to value beliefs—and it's not clear how we settle the bet."
- Rice argued, "Proponents of intelligent design insist that the complexity of the human genome and the physical bodies that the genes encode had to be designed by an intelligent creator. What they do not discuss is that a lot of the apparent design in the human genome confers affliction rather than benefit. That is, the intelligent designer, if there is one, has no discernible purpose, and is as likely to afflict as to bless the human race."

Jason Rosenhouse's *Among the Creationists: Dispatches from the Anti-Evolutionist Front Line* (New York: Oxford University Press, 2012) was published. The publisher writes,



> Why do so many Americans reject the modern theory of evolution? Seeking answers, mathematician Jason Rosenhouse became a regular attendee at creationist conferences and other gatherings. After ten years of attending events like the giant Creation Mega-Conference in Lynchburg, Virginia, and visiting sites like the Creation Museum in Petersburg, Kentucky, and after hundreds of mostly friendly conversations with creationists of varying stripes, he has emerged with a story to tell, a story that goes well beyond the usual stereotypes of Bible-thumping fanatics railing against coldly rational scientists. Through anecdotes, personal reflections, and scientific and philosophical discussion, Rosenhouse presents a more down-to-earth picture of modern creationism and the people who espouse it. He also tells the story of his own nonbeliever's attempt to understand a major aspect of American religion. Forced to wrestle with his views about religion and science, Rosenhouse found himself drawn into a new world of ideas previously unknown to him, arriving at a sharper understanding of the reality of science versus religion disputes, and how these debates look to those beyond the ivory tower.

A lifetime member of NCSE, Rosenhouse is Associate Professor of Mathematics at James Madison University.

John Vacher organized and facilitated an adult religious education course on creationism in the public schools for the Unitarian Universalist Congregation of Atlanta. The course ran for three ninety-minute sessions between March 28 and April 11, 2012. Session 1 focused on science, with **Sarah L Pallas** of the Neuroscience Institute and the Department of Biology at Georgia State University; session 2 focused on court cases and legislation, with Michael Manely, the attorney who represented the plaintiffs in the Cobb County, Georgia, textbook sticker case; session 3 focused on theology, with Graham Walker of Mercer University's McAfee School of Theology. The course was well received by the more than thirty attendees. Vacher would be happy to discuss his experiences with fellow NCSE members thinking about organizing a similar course; get in touch with him c/o the NCSE office.

Charles M Wynn Sr was in Oregon for Darwin Day in February 2012, where he gave three public lectures about the continuing conflict between scientific understandings and religious beliefs and the dangerous effects of scriptural literalism. His talk, entitled "And God said, 'Let there be evolution!': Reconciling the Book of Genesis, the Qur'an and the Theory of Evolution," was delivered at Willamette University in Salem, Portland State University in Portland, and First Congregational United Church of Christ in Salem. They were co-sponsored by the Center for Religion, Law, and Democracy at Willamette University, the Physics Department of Portland State University, the Center for Inquiry, Portland, and Oregonians for Science and Reason. Professor of Chemistry at Eastern Connecticut State University, Wynn is the coeditor, with Arthur W Wiggins, of *And God Said, "Let There Be Evolution"* ([Somerville (ME)]: All Things That Matter Press, 2011), which features essays on the compatibility of evolution and faith from **Howard Van Till** (representing a Christian perspective), **TO Shanavas** (representing an Islamic perspective), and David E Kay (representing a Jewish perspective).

from THE STAFF

A sampling of what we at NCSE headquarters have been doing to defend the teaching of evolution in the public schools—and beyond.

GLENN BRANCH writes: Working at NCSE, I think that I probably answer as many recondite, recherché, and downright ridiculous questions as anybody, so I usually don't bother seeking for extra opportunities to do so. But in late March 2012, I saw a blog post with the intriguing headline "One of our caricatures is missing!" The post continued:

> Help! Can you identify a missing Darwin caricature? All we know is that it was called "The Young Darwinian" and was drawn by the American comic illustrator Thomas Francis Beard. A copy was sent to Darwin in 1872 by his friend Asa Gray but Darwin didn't keep it.

And while that might not have impelled me to commit any time or energy, the fact that it was posted by Alison Pearn of the Darwin Correspondence Project did.

Thomas Henry Huxley once told Darwin, "You are the cheeriest letter-writer I know." Cheery perhaps; diligent certainly. Even by the standards of Victorian England, when letter-writing flourished thanks to burgeoning literacy and the Penny Post, Darwin was a tireless correspondent. As David Quammen writes in *The Reluctant Mr Darwin*:

> Self-sequestered inside both his home and his sense of frail health, he became very dependent on written correspondence and very disciplined in his use of it. He wrote letters for friendship, letters for business, letters for love (to his "dear old Titty" or his "dear Mammy," as he variously called Emma, when they were apart), letters for good deeds and scientific politicking, letters asking parental advice and (later, with his sons away) giving it, letters for the sheer joy of prattle, and most of all, letters seeking scientific information. He peppered friends, acquaintances, and strangers with questions, requests for data, little assignments of experimentation that they might perform for him if, ahem, it wasn't too much trouble.

It is estimated that over his life there were more than 15 000 letters to and from Darwin. (It's unnerving to think what he might have done with e-mail or Twitter at his disposal.)

Founded in 1974 by Frederick Burkhardt, the Darwin Correspondence Project is engaged in the task of locating, researching, and publishing all of the extant Darwin correspondence. It's been described as the greatest editorial project in the history of science and one of the major international scholarly projects of the past half-century. The Project is publishing Darwin's letters in chronological order—volume 19, covering the year 1871, is the latest volume in print—and also steadily adding to its website (http://www.darwinproject.ac.uk/), which contains complete transcripts of all known letters Darwin wrote and received up to the year 1868.

Wanting to help, and having a few moments to spare, I thought a little about Pearn's request for assistance in identifying the caricature. In her post, she indicated what luck the Project had so far:

> We think it was probably drawn in 1871 or 1872 in response to Darwin's book Descent of Man. Beard was a prolific artist who worked for a number of US magazines and newspapers, including *Phunny Phellow, Wild Oats, Budget of Fun, Jolly Joker, Comic Monthly,* and *Harper's Weekly.*

Well, I thought, if it were as easy as using Google to search for "Thomas Francis Beard AND Darwin" or "Beard AND 'The Young Darwinian'", then the Project would already have found it. So perhaps Gray made a trivial mistake in his letter to Darwin: maybe the caricature was entitled "Darwin as a Youth," say, or maybe the artist was a different Beard. In fact, Gray's letter, as quoted by Pearn, referred only to "Beard," and although Thomas Francis Beard was identified as the artist in Frederick Burkhardt and Sydney Smith's *A Calendar of the Correspondence of Charles Darwin*, perhaps that was a misidentification, too.

That turned out to be the right approach. A few searches with Google for "Beard AND Darwin*"—where the asterisk indicates that any word beginning with "Darwin" is acceptable—swiftly revealed that William Holbrook Beard, the uncle of Thomas Francis Beard, painted "The Youthful Darwin Expounding His Theories," a photograph of which was exhibited at the Century Club in New York in 1871, and prints of which were published by the American Photoplate Printing Company in the same year. Beard was famous for his scenes of animals satirizing human behavior: prints of his painting of "The Bulls and Bears in the Market" (1879), showing the titular animals running amok in Wall Street, are still available. And he was interested in, if skeptical of, evolution, too: his 1891 "Discovery of Adam," for example, shows a group of clothed and civilized monkeys bewildered at their discovery that their ancestor, Adam, was in fact a tortoise.

Now armed with a name and title, I was able to discover that the original "The Youthful Darwin" is now in the possession of the American Museum of Natural History, having been acquired—I don't know when—by its longtime head Henry Fairfield Osborn. But I couldn't find a picture of "The Youthful Darwin" at the AMNH website or anywhere else on-line, and although I found

a few sources—a catalog of a Beard exhibit in a New York gallery; a review of the same exhibit; a magazine article about Beard—that were likely to describe it in detail, none of them was on-line, either. And desirous though I was to help, I wasn't really willing to make a special trip to a large enough library to be able to find those sources. So the identification was, if plausible, still not quite conclusive.

I e-mailed Pearn with my findings, and she agreed with my suggestion that Gray might well have been talking about "The Youthful Darwin." I was gratified to see, a few weeks later, a follow-up post by her announcing "we found the right image just in time to include it in the next volume of the *Correspondence of Charles Darwin* (vol. 20) which is about to go to press" and thanking me as well as NCSE member Michael Barton, who also worked on the mystery. Accompanying her post was a small image, provided by the AMNH, of "The Youthful Darwin" (Figure 1), showing, as Pearn writes, "a young humanoid with a nicely vestigial tail, showing a pair of sceptical (and slightly amused) older apes a series of organisms from a fish to an amphibian."

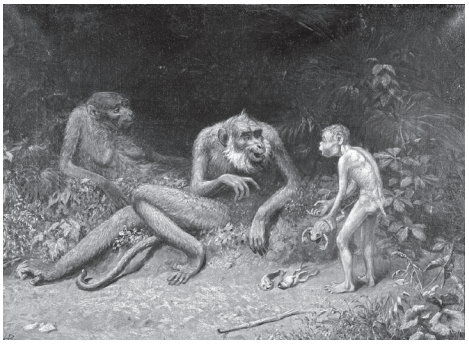


Figure 1. William Holbrook Beard, "The Youthful Darwin Expounding His Theories." Image #3021, American Museum of Natural History Library.

This wasn't the most important, or the most extensive, bit of research ever conducted at NCSE, of course. (On both counts, that honor would probably go to the archival work that Nick Matzke and Jessica Moran did in 2004 and 2005, helping to establish the creationist roots of *Of Pandas and People* and leading to the verdict in *Kitzmiller v Dover*.) But it was a pleasure and a privilege for me to be able to contribute, if only in a small way, to such a worthy scholarly endeavor as the Darwin Correspondence Project!

Eugenie C Scott writes: Did you know that CO_2 is actually a cooling gas, rather than a cause of global warming?

Neither did I. But appearing in my e-mail inbox the other day was a long essay by an enthusiastic proponent of that idea. This climate change denialist was circulating his "research" and encouraging people to read it for insight into why the standard view of CO_2 was incorrect—and hence, global warming was not occurring.

Such a discovery would come as a big surprise to the vast majority of climate scientists, of course. But my correspondent had already anticipated that response. Scientists, it was claimed, are closed-minded about new ideas, and need to break free of the shackles of the "so-called scientific consensus".

No surprise there. A common debating point of those who reject either evolution or climate change is to denigrate the "so-called scientific consensus" on these two issues, and present scientists as dogmatic and closed-minded. "Mavericks" producing seemingly endless list of reasons to doubt evolution or global warming "could be right".

And yes, they could be. Anyone who knows how science works knows that this is true. On the other hand, we also know that the probability that the core ideas of science are wrong is extremely low. Think of the content of science as being composed of three concentric circles (Figure 2). The innermost of the

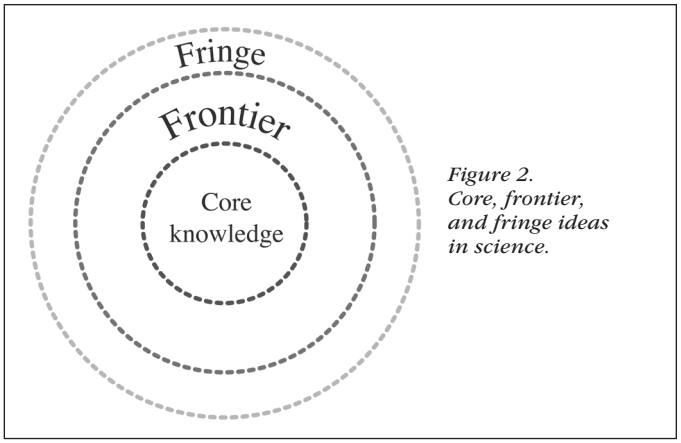


Figure 2. Core, frontier, and fringe ideas in science.

three concentric circles consists of the core ideas of science: well-established principles and concepts that are well-tested, and which have proved to be fruitful for stimulating new scientific discovery. That living things descended with modification from common ancestors (biological evolution) is one of these core ideas. That CO_2 is a greenhouse gas is another core idea of science.

Moving outward from the core ideas of science, we find the frontier ideas of science. These are based upon the core ideas, but tend to be the ideas that are being actively tested by scientists and which you will read about in scientific journals or hear about at scientific conferences. There is often a great deal of debate surrounding the scientific frontier. This is the normal way that science operates: the debate over and confrontation of ideas helps to refine our explanations and increase our knowledge of how the natural world works.

The outermost ring consists of the fringe ideas of science. These ideas and concepts are ones that professional scientists are spending little time on, largely because they violate in some way the core principles of science. If you look on the Internet, you will find many investment opportunities for "free energy". You will also find that physicists tend not to invest in such companies: this is because the various contraptions

NCSE & me

Susan Epperson in the Grand Canyon
Photograph: Jon Epperson

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

Susan Epperson was at the center of the legal case establishing the unconstitutionality of Scopes-era bans on the teaching of evolution. Raised and educated in Arkansas, where she received her undergraduate degree in biology from the College of the Ozarks (now the University of the Ozarks), she returned to the state after earning her master's degree in zoology at the University of Illinois to teach biology in Little Rock in 1964. As she explains in the interview, she agreed to serve as a plaintiff in a lawsuit challenging a state law forbidding the teaching of human evolution. Epperson now teaches preparatory chemistry and non-majors biology at the University of Colorado at Colorado Springs. She is a recipient of NCSE's Friend of Darwin award, which she received in November 2008, commemorating the fortieth anniversary of the Supreme Court's decision in *Epperson v Arkansas*.

How did you originally become involved in defending the teaching of evolution?

That would go back to 1965. My home state of Arkansas had a law, dating from 1928, which prohibited teaching or adopting textbooks that taught "the doctrine or theory that mankind ascended or descended from a lower order of animal." I was teaching tenth-grade biology at Little Rock Central High School and we had updated our textbook for the 1965–1966 school year. It contained a chapter entitled "The history of man," which dealt with humans' evolutionary past, and thus was breaking this 1928 law. The Arkansas Education Association decided that it was high time to challenge the constitutionality of the law. A biology teacher who would be threatened by the law was needed. So I ended up being the plaintiff.

The AEA approach was different from that in the Scopes case. Scopes was arrested for teaching evolution (whether he actually did or not!) and thus was a defendant. We brought suit to challenge the Arkansas law and asked the court's protection of teachers (me, in

claimed to generate free energy violate the laws of thermodynamics—core ideas of science. Very, very infrequently a fringe idea is proposed, is tested, and begins to be confirmed as a frontier idea, and if good enough, wins its way to the core ideas. Continental drift is the classic example of this (see p 8). But most fringe ideas, if they are tested, are spun off pretty quickly back to the fringe, rather than penetrating deeper into the frontier.

As it happens, the recent e-mail proposing that CO_2 has cooling effects was reviewed by climate scientists, but rather quickly rejected (one friend commented privately that he "felt dumber for reading this"). The proposition could be right, but for it to be right, very basic science would have to be wrong. What's the probability of that? Very low.

I'm reminded of the joke about the little boy seeing the pile of manure in Grandpa's barnyard. He grabs a shovel and begins shoveling like mad.

"Sonny, what're you doing?" asks Grandpa.

"There's a pony in there somewhere," replies the boy.

Well, I know a lot of scientists who receive unsolicited propositions suggesting quite grand revisions of science (my friend Joe Levine titles his file of such correspondence "theory of everything"). NCSE's bathroom wall, where

Figure 3. Is there a pony here? Photograph: Sten Porse (Wikimedia).

we put the "good" email, has a number of them.

When you're proposing ideas that violate basic principles of science, the burden of proof is very high. If you say that water is composed of oxygen, hydrogen, and *something else*, propose away, but the burden of proof is not on scientists to disprove you—it's on *you* to clearly demonstrate why the basic understandings of nature, the core ideas of science, are wrong.

So go ahead and shovel, mavericks. There might be a pony in there somewhere (Figure 3). But it's up to you to convince us.

the specific case) who would teach evolution and could be fired and fined as a result. We also asked the court to find the law unconstitutional and void.

The case was handled superbly by the AEA lawyer, Eugene Warren. He was an excellent lawyer and I had complete confidence in him. One of my concerns, early on, was the handling of publicity, since I knew this was a controversial topic for many folks. Warren and the AEA executive secretary, Forrest Rozzell, did all they could to avoid any "circus-like" publicity, for which I was and am grateful!

We had a trial in Chancery Court in Little Rock on April 1, 1966. The Arkansas Attorney General, Bruce Bennett, lined up some pastors to testify about the untruth of evolution and its conflict with the Bible. Warren objected to any introduction of faith testimony, just sticking with the constitutionality of the law and its wording. His objections were sustained by the judge, and so, at the end of the day, the attorney general had no more case.

Sometime in May, the Chancery Court judge decided in our favor and declared the law unconstitutional! This was, of course, a momentary victory. His decision was appealed to the Arkansas Supreme Court by Bennett. More than a year later, in June 1967, the Arkansas Supreme Court reversed the opinion and this opened the door for Warren to appeal to the US Supreme Court, whose Chief Justice at the time was Earl Warren. They heard our case, still argued by Eugene Warren, in October 1968. In November 1968, the Supreme Court decided unanimously in our favor, declaring the Arkansas law unconstitutional.

The majority opinion was written by Justice Abe Fortas. Three justices concurred with the decision.

This was a happy victory, but I knew that it would not be the end of the controversy over teaching evolution. I think that as long as people see this subject at a threat to their religious faith, battles will continue.

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

Obviously, this Supreme Court case. I am always gratified when I hear that the decision in our case is quoted in other related cases. Judge John Jones's opinion in *Kitzmiller v Dover Area School Board* referred to our case several times. I recommend reading that opinion. If a court opinion can be entertaining, this one is.

In addition to the importance of the 1968 case itself, I also am grateful for the opportunities to give talks to biology teachers and other groups about it.

It is important to convey the idea that there is not any conflict between science and faith. I am a Christian and see no conflict, so I take the opportunity to try to reassure people that believing evolution does not destroy one's faith. This may be a completely unattainable goal, but I like to try.

How did you originally become involved with NCSE?

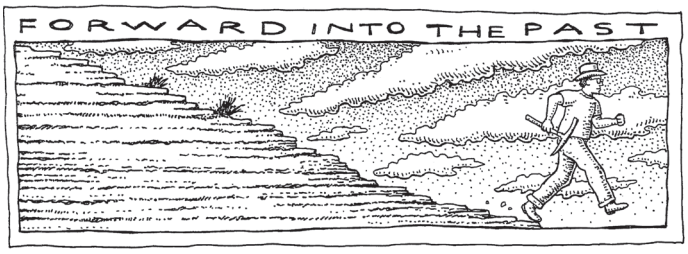
I first heard of NCSE in 1998, when I was asked by Randy Moore to speak at the convention of the National Association of Biology Teachers. At that convention, I met Eugenie C Scott and became aware of NCSE's efforts to maintain the integrity of science education.

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

I am certainly proud of NCSE's behind-the-scenes work on the *Kitzmiller* trial in Pennsylvania. I also appreciate NCSE's work to keep good science standards in Kansas and good biology textbooks in Texas. There are many other places where NCSE has supported teachers in their efforts to teach good science. I have taken part in workshops for Colorado science teachers at the University of Colorado in Boulder. One year it was my privilege to collaborate with Judge Jones of the Dover case, and another year Eugenie Scott and I were members of a panel. This is just a small sampling of the many ways NCSE is helping science teachers to deal with this sometimes intimidating subject.

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

My personal experience with NCSE members and staff has been going on the rafting trip through the Grand Canyon. I feel very privileged to have done this four times! What an experience to have geologists along explaining some of the story of the canyon, and then to share it all with fellow science teachers and people with a passion for science. I do not know if you could find another rafting group where everyone gets excited about a small fossil, or a huge stromatolite rock, or just the strata in that amazing place! Some of us were delighted during the 2010 trip to find hundreds of planaria clinging to the bottoms of small rocks in one of the side streams that empties into the Colorado River. Just about every beginning biology class includes study of these small flatworms, so we could all relate! Another enjoyable part of those rafting trips is the opportunity to sit around after supper and hear the stories of different people as they have taught evolution and sometimes experienced opposition. It was very helpful just to share ideas and methods with fellow teachers. Experiencing the canyon with fellow scientists is a wonderful and memorable experience!



Alfred Wegener (1880–1930)

Randy Moore

Alfred Lothar Wegener was born in Berlin on November 1, 1880. He earned a PhD from the University of Berlin in astronomy in 1904, but was most interested in meteorology. By 1905, Wegener was working at the Royal Prussian Aeronautical Observatory, where he pioneered the use of kites and balloons to collect meteorological data. After returning to Germany in 1909 from an expedition to Greenland, Wegener taught astronomy and meteorology at the University of Marburg.

During World War I, Wegener was drafted into the army and injured in combat. While recuperating, he remembered an article that reported identical fossils being found on opposite sides of the Atlantic Ocean. This discovery, combined with the observation that the continents were shaped like jigsaw puzzle pieces that could be fit together into a single unit, prompted Wegener to wonder if the continents have moved across the face of the earth. (This was not an entirely new proposal. Austrian geologist Eduard Suess, using paleobotanical evidence, had suggested that the continents of the southern hemisphere were at one time joined to form Gondwanaland.)

At the 1912 meeting of the Geological Association in Frankfurt, Wegener tentatively outlined his theory of continental drift. His proposal was met by reactions ranging from polite skepticism to outright hostility. Wegener's concept of continental drift did not receive a warm reception, partly because Wegener could not provide a convincing explanation for continental movement. Wegener won some converts to his view, but during his relatively short life, he did not see widespread acceptance of his proposal. Undeterred, he scoured the literature and discovered much supporting evidence, including strata of rock shared between eastern North America and Scotland, fossils indicating the presence of different climates than what is currently found in that locale (for example, fossils of tropical plants in the Arctic), and coal bands that match when the continents are brought together. In *The Origin of Continents and Oceans* (1915), Wegener noted that the edges of the continents fit together precisely, and proposed that a supercontinent, Pangaea (Greek for "all earth"), existed approximately 300 million years ago.

By the 1950s, growing evidence indicated that Wegener was correct about continental movement. Analyses of the sea floor documented the existence of mid-ocean ridges where volcanoes form crust that spreads outward from the ridge. These findings were integrated in the 1960s to form the now well-supported theory of plate tectonics, in which plates are moved by convection in the underlying asthenosphere within which the plates are embedded or "float". Wegener's original proposal, although incorrect in its details, remains a remarkable example of how seemingly unrelated sets of observations make sense when interpreted relative to the great age and changing nature of the planet.

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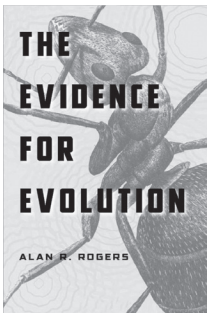
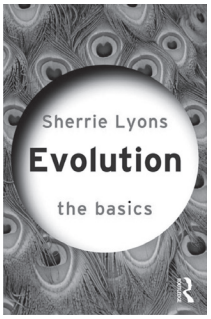
Randy Moore is the HT-Moore–Alumni Distinguished Professor of Biology at the University of Minnesota. His latest book, coauthored with Sehoya Cotner, is Arguing for Evolution: An Encyclopedia for Understanding Science *(Santa Barbara [CA]: Greenwood, 2011). People & Places of Evolution is his regular column in* RNCSE.

Summary of *RNCSE* 2012;32(3):1.1–1.3; the full text is available from http://reports.ncse.com/index.php/rncse/article/view/134/153



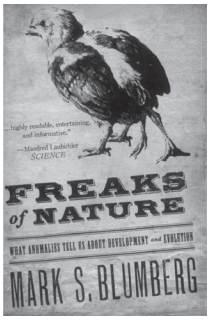
The Evidence for Evolution by Alan R Rogers (Chicago: University of Chicago Press, 2011; 120 pages). Describing it as a "fresh and splendid little book," reviewer **Warren D Allmon** praises *The Evidence for Evolution* for focusing on the evidence for evolution, explaining, "By far the best feature of this book … is its focus on precisely why such indirect evidence actually favors evolution over its alternatives. The answer is hardly novel, but it is strangely missing (or at least dramatically deemphasized) in virtually all presentations of the topic: *the most abundant evidence for evolution is that the characters of organisms are not scattered randomly, but rather are arranged in such a pattern that implies a hierarchical, branching tree*."

Summary of *RNCSE* 2012;32(3):2.1–2.3; the full text is available from: reports.ncse.com/index.php/rncse/article/view/122/142



Evolution: The Basics by Sherrie Lyons (New York: Routledge, 2011; 200 pages). "With only seven chapters and 177 pages of text, *Evolution: The Basics* is true to its title, offering an abbreviated and basic introduction to evolutionary thought," writes reviewer **Daniel J Fairbanks**. "This book's greatest strength is its first three chapters: a rapid and simple historical narrative recounting key events in the foundation of evolutionary theory from pre-Darwinian times through the modern synthesis of the 1940s." Unfortunately, Fairbanks adds, "this book suffers from an excessive number of scientific errors, ranging from simple oversights to serious misstatements. These errors cluster in chapters 4 through 6, and most, but not all, are misconceptions about molecular evolution." Genomics and bioinformatics are also neglected.

Summary of *RNCSE* 2012;32(3):3.1–3.3; the full text is available from: reports.ncse.com/index.php/rncse/article/view/123/129

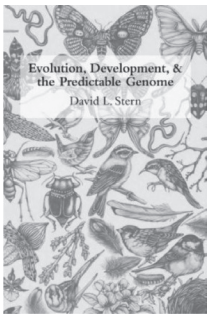


Freaks of Nature: What Anomalies Tell Us about Development and Evolution by Mark S Blumberg (New York: Oxford University Press, 2009; 352 pages). The purpose of *Freaks of Nature*, writes reviewer **Paul R Gross**, is "to present insights from evolutionary developmental biology … The insights offered derive from a putatively new understanding of the real significance of monsters, said to have been unrecognized, or—worse—ignored, after the triumph of the modern synthesis so-called of genetics with comparative morphology and paleontology, under the driving force of successful Darwinian selection theory." While appreciating Blumberg's "enthusiasm, documentation, and fascinating details," Gross regards his main claims on behalf of evo-devo and of the significance of "freaks of nature" as either uncontroversial or unproven.

Summary of *RNCSE* 2012;32(3):4.1–4.3; the full text is available from: reports.ncse.com/index.php/rncse/article/view/128/157

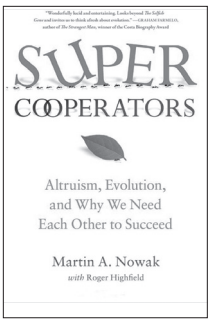
Spider Silk: Evolution and 400 Million Years of Spinning, Waiting, Snagging, and Mating by Leslie Brunetta and Catherine L Craig (New Haven [CT]: Yale University Press, 2010; 248 pages). Reviewer **Joe Lapp** writes, "*Spider Silk* is written for the layperson. It requires no advanced knowledge of spiders, biology, or evolution. It strives to provide all the background a reader might need. It goes out of its way to explain basic ideas in evolution and to address a few misunderstandings that laypeople often have about evolution." Especially admired were two complementary themes: "that the story of the evolution of spiders is the story of the evolution of spider silk … [and] that small changes in a spider's silk genes can correspond to dramatic changes in a spider's phenotype."

Summary of *RNCSE* 2012;32(3):5.1–5.3; the full text is available from: reports.ncse.com/index.php/rncse/article/view/129/144



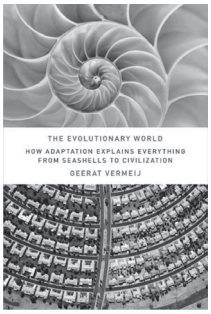
Evolution, Development, and the Predictable Genome by David L Stern (Greenwood Village [CO]: Roberts & Company, 2011; 288 pages). "In *Evolution, Development, and the Predictable Genome*, David L Stern highlights recent path-breaking work in evolutionary developmental biology and experimental evolution, and makes the case for integrating population genetics and developmental biology," writes reviewer **David Leaf**. Describing the book as "a superb compendium of recent key work in evolutionary developmental biology," Leaf adds, "Although *Evolution, Development, and the Predictable Genome* is not written as an exposé of the follies of 'intelligent design,' readers familiar with the anti-evolutionary fallacies of ID will find a rich assortment of examples to counter the foolhardy claims of Jonathan Wells, Michael Behe, and their colleagues."

Summary of *RNCSE* 2012;32(3):6.1–6.3; the full text is available from: reports.ncse.com/index.php/rncse/article/view/130/132



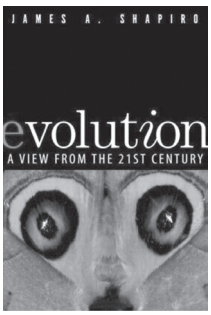
SuperCooperators: Altruism, Evolution, and Why We Need Each Other to Succeed by Martin A Nowak with Roger Highfield (New York: Free Press, 2011; 330 pages). Reviewer **EG Leigh Jr** describes *SuperCooperators* as "a must for evolution teachers": "It emphasizes human cooperation more than the wonders of nature, but in today's world, that emphasis may make it a more effective teaching tool. Moreover, its message on cooperation's essential role in evolution and human affairs is right on target." Praising it for sounding "like an autobiographical fireside chat, in which Nowak celebrates his mentors … who helped him learn to shape mathematical questions about when cooperation evolves," Leigh faults it mildly for its occasional lack of clarity and for its deprecation of kin selection.

Summary of *RNCSE* 2012;32(3):7.1–7.3; the full text is available from: reports.ncse.com/index.php/rncse/article/view/133/154



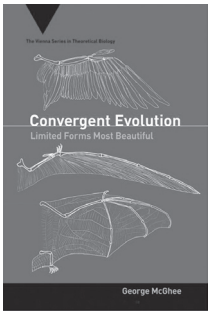
The Evolutionary World: How Adaptation Explains Everything from Seashells to Civilization by Geerat Vermeij (New York: Thomas Dunne Books, 2010; 336 pages). Reviewer **Joseph S Levine** writes that *The Evolutionary World* is filled "with delights for the mind ranging from astute observations of morphological minutiae to intriguing hypotheses and syntheses—all selected to show how an evolutionary perspective can yield 'an emotionally satisfying, aesthetically pleasing, and deeply meaningful worldview in which the human condition is bathed in a new light.' The book is a joy to read, both for its often lyrical prose, and for its provocative hypotheses." Especially welcome were the vignettes from Vermeij's own life and career, which "inform his theses without dominating the exposition."

Summary of *RNCSE* 2012;32(3):8.1–8.3; the full text is available from: reports.ncse.com/index.php/rncse/article/view/124/134



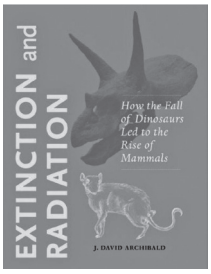
Evolution: A View from the 21st Century by James A Shapiro (Upper Saddle River [NJ]: FT Press Science, 2011; 253 pages). "The main theme," writes reviewer **Laurence A Moran**, "is that discoveries in molecular biology and genomics have caused us to rethink our understanding of evolution in the 21st century." Moran faults Shapiro for failing to provide adequate historical context, for caricaturing the positions he attacks, and for misunderstanding the Central Dogma of Molecular Biology. Unimpressed with Shapiro's scientific claims, Moran concludes, "This book is highly critical of old-fashioned evolutionary theory (neo-Darwinism) using many of the same silly arguments promoted by the Fellows of the Discovery Institute's Center for Science and Culture. Those fellows are dead wrong and so is Shapiro."

Summary of *RNCSE* 2012;32(3):9.1–9.4; the full text is available from: reports.ncse.com/index.php/rncse/article/view/125/135



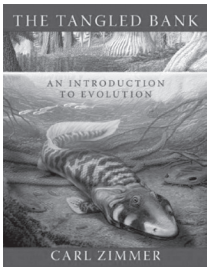
Convergent Evolution: Limited Forms Most Beautiful by George R McGhee (Cambridge [MA]: MIT Press, 2011; 321 pages). Reviewer **Kevin Padian** praises *Convergent Evolution* as "a great compendium of information (there are dozens of tables in the book laying out examples of functional and ecological convergence in a huge range of animals, plants, ecosystems, and molecules)" and as "well written and a really stimulating read for graduates and undergraduates alike," adding, "A whole lot of term papers will find inspiration in this book." Padian noted, "I found some points that perplexed me in the treatments of critters with which I have at least a slight familiarity," but explained, "most merely involve a particular choice of words or an angle from which to view the problem."

Summary of *RNCSE* 2012;32(3):10.1–10.4; the full text is available from: reports.ncse.com/index.php/rncse/article/view/131/136



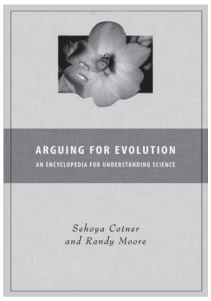
Extinction and Radiation: How the Fall of Dinosaurs Led to the Rise of Mammals by J David Archibald (Baltimore [MD]: The Johns Hopkins University Press, 2011; 120 pages). In *Extinction and Radiation*, according to reviewer **P David Polly**, it is argued that "the patterns of extinction and survival through the Late Cretaceous and early Paleogene differed among groups of organisms, some of which died off prior to the collision and some of which were unaffected. These patterns thus cannot be entirely explained by a sudden impact. The asteroid impact was more of a coincidence than a trigger." Polly praises Archibald's careful and detailed review of the "strengths, weaknesses, and limitations" of the contending explanations as "a highly recommendable example of the scientific process."

Summary of *RNCSE* 2012;32(3):11.1–11.4; the full text is available from: reports.ncse.com/index.php/rncse/article/view/132/158



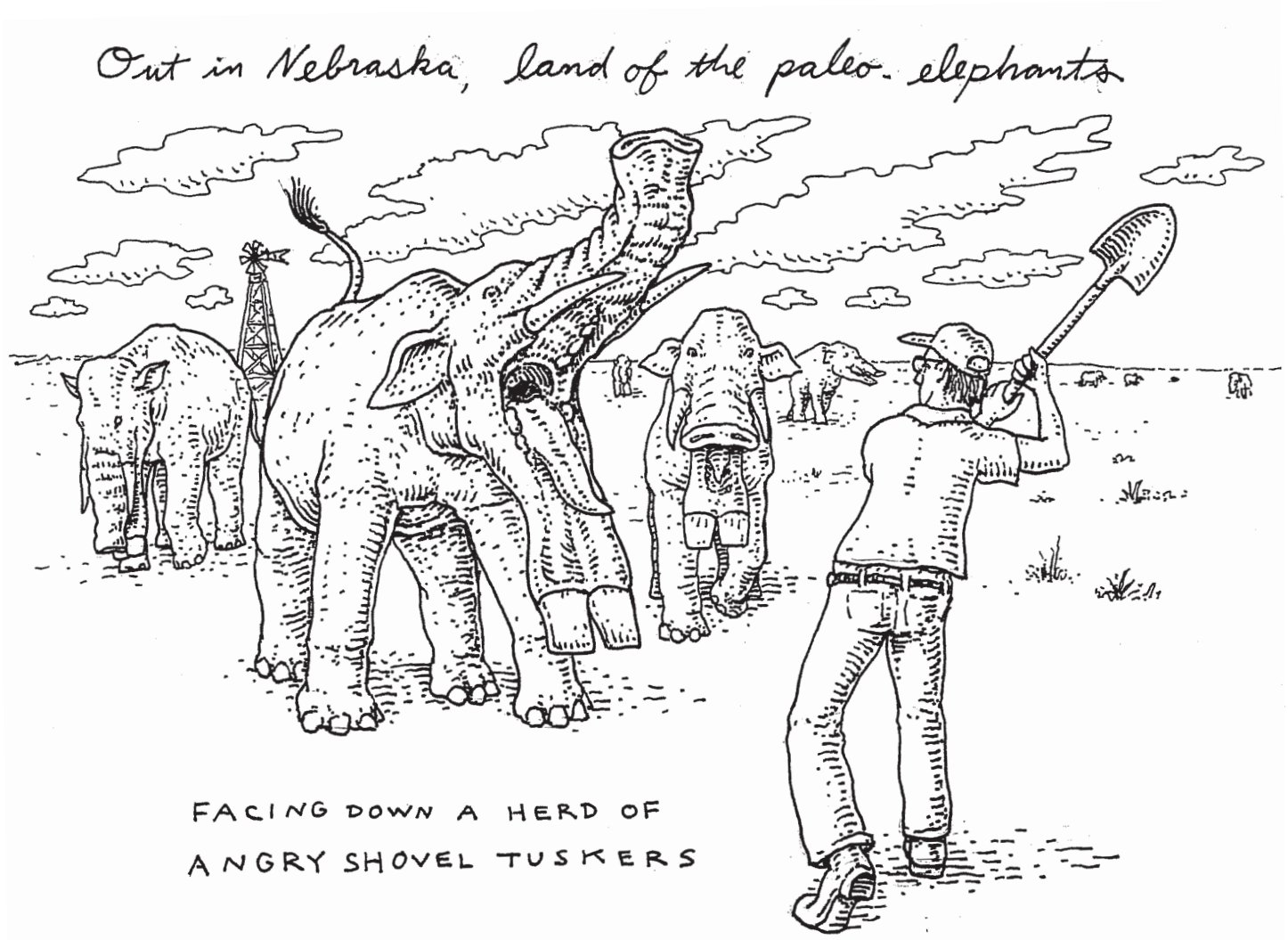
The Tangled Bank: An Introduction to Evolution by Carl Zimmer (Greenwood Village [CO]: Roberts and Company, 2010; 394 pages). Reviewer **Steve Rissing** describes the writing of *The Tangled Bank* as "clear, concise, and very user-friendly," its science as "remarkably current and complete" and its art as "fantastic [and] surprisingly ample and effectively colorful." Mildly regretting the lack of attention to Alfred Russel Wallace and to kin selection, as well as a confusing system of references, Rissing was overall enthusiastic about the book, writing that it "should appeal to most people motivated to understand more about evolution, whether because course readings are required or because they just want to understand more about the organizing principle of biology."

Summary of *RNCSE* 2012;32(3):12.1–12.3; the full text is available from: reports.ncse.com/index.php/rncse/article/view/126/138



Arguing for Evolution: An Encyclopedia for Understanding Science by Sehoya Cotner and Randy Moore (Santa Barbara [CA]: ABC-Clio, 2011; 318 pages). "*Arguing for Evolution* is the latest addition to an increasing number of books written to provide a view of contemporary evolutionary biology for the educated layperson … organized around chapters covering the scientific status of evolution, the age of the earth, fossils, biogeography, molecular and anatomical evidence of evolution, behavior, coevolution, and human evolution," explains reviewer **Erik Scully**. Noting a few errors of fact and omission, Scully hopes "the book will be successful enough to justify another edition where examples can be updated or replaced with new research that further supports and illustrates our knowledge of the evolutionary process."

Summary of *RNCSE* 2012;32(3):13.1–13.3; the full text is available from: reports.ncse.com/index.php/rncse/article/view/97/145



REPORTS OF THE NATIONAL CENTER FOR SCIENCE EDUCATION

VOL 32, NR 3, MAY - JUN, 2012

ISSN 1064-2358

Eugenie C Scott, *Publisher*
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PO Box 9477
Berkeley CA 94709-0477
(510) 601-7203
fax: (510) 601-7204
e-mail: info@ncse.com
http://www.ncse.com

Cover photo by David Almandsmith, NCSE

Page 7 and 11 artwork © Ray Troll
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RNCSE is published 6 times a year.

Address editorial correspondence to the editor. Style guidelines can be found at http://reports.ncse.com
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