

reports

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A Brief ... History of The Last 10 Years at NCSE

EducationWeek.

SCIENCE DIVISION

Dry Facts, Debate, Despair: How Not to Teach Climate Change

By Ann Reid — September 23, 2019 | 5 min read



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HOW CLIMATE CHANGE IS TAUGHT IN AMERICA'S PUBLIC SCHOOLS

March 30, 2020

How the science community is working to combat COVID-19

NCSE Executive Director Ann Reid, formerly a research biologist who helped sequence the 1918 flu virus, explains how scientists are working together to understand and combat the novel coronavirus.



SCIENTIFIC AMERICAN

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Evolution Education in the U.S. Is Getting Better

The percentage of public school bio teachers who present it as the broad consensus view among scientists—without presenting the creationist “alternative”—has increased markedly since 2007

BY STEVEN BRONKHORST AND ANN REID

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Dear NCSE Supporters,

It is a great pleasure to introduce myself and share my first RNCSE greeting with you, NCSE's most loyal supporters. As a former classroom teacher, recent science teacher educator, and lifelong advocate of science education, it is an honor to bring my passion for accurate, honest, and complete science education to the helm of the National Center for Science Education. The support you provide NCSE helps to ensure that students across this nation learn science accurately and are given the opportunity to engage with evidence.

Taking the reins of an organization as critical to science education as NCSE is no small undertaking. Over the past few months, Ann Reid and I worked closely to ensure that the leadership transition would be smooth as we enter 2024, because there is much to do! In October, we worked with staff to develop the plans and budget for the coming year. With challenges to accurate science education continuing and likely to arise in multiple states across the country, it was critical to ensure that not a moment was wasted. By the end of November, we were able to work as a team in all planning and outreach to the NCSE community so that by my official start date in December, we were able to move forward swiftly and without pause. Ann Reid has been a tremendous mentor and guide to me throughout this process and will continue to be an asset to the organization as we move into the future. NCSE has been in her capable hands for the past 10 years (see her look back on page 3) and she will continue to be a respected and welcome friend to our organization.

As we look forward, I am confident in predicting that 2024, like 2023, will be a year of growth and focus. We will continue to be on the front lines, catalyzing action whenever challenges to science education arise, whether as part of textbook adoptions, standards revision, curriculum and instruction, or legislation. We will be pursuing our active research program on what classroom science educators think and teach about evolution, climate change, and the nature of science. We will also be looking to explore new avenues to reach teachers across the United States, with a specific focus on developing relationships and networks in those states where there is the most resistance to teaching evolution and climate science. In fact, we plan to bring three new members to the board of directors who represent those parts of the country, increasing the voice of our organization within regions where engagement is most critical. I look forward to sharing more about them following their confirmation in February 2024!

Finally, I want to share a sincere thank you to each of you for being a part of this journey. Without your encouragement, work on the ground, and ongoing support of our mission, none of what we do would be possible. I look forward to getting to know you all and to work together with you to ensure the accurate teaching of science in our schools so that one day all students will be able to engage with the evidence!



Amanda L. Townley

is the executive director of NCSE.
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A Brief and Far from Comprehensive History of The Last 10 Years at NCSE



Ann Reid

When I arrived at NCSE in early 2014, the board, staff, and founding executive director, Genie Scott, all recognized that the landscape was changing. After stupendous legal victories, culminating in the resounding pro-science decision in [Kitzmiller v. Dover](#) in 2005, the fever over challenging evolution in schools seemed to be breaking as it was becoming clear that teaching creationism or any of its variants in public schools would not survive court challenges. Soon after, the [Next Generation Science Standards](#), which included a thorough treatment of evolution, were moving towards adoption in state after state. Perhaps the nation was on the right track on that score.

Meanwhile, in 2012, NCSE had added climate change to its mission, having seen the topic suffer the same kinds of indirect attacks in state legislation (of the “teach both sides” or “teach critical thinking” variety) that had previously targeted evolution. But head-on challenges in classrooms or districts to climate change education were rare and, in any event, it was clear that if the challenges were to become more direct, we would need a new strategy—an argument based on the separation of church and state would not apply.

All this is to say that NCSE was in the midst of some soul-searching when I arrived. How, exactly, might NCSE expand beyond its hugely successful strategy of reacting when threats to science education arose? The organization’s

go-to metaphor was that it was the nation’s firehouse—ready to spring into action whenever efforts to interfere with science education flared up. But what should the new metaphor be? Clearing the brush so that fewer fires started? Fire-proofing communities? Equipping teachers and parents with extinguishers?

It turns out that what was needed was not a new metaphor, but a new collection of metaphors. NCSE remains the nation’s science education firehouse, always on the lookout for efforts to interfere with science education and consistently successful at blocking them. We have also evolved into one of the few organizations, perhaps the only organization, that deeply explores what is actually going on in classrooms when it comes to the teaching of evolution and climate change. And we have devoted immense effort into figuring out how to support teachers who, for any number of reasons, are not providing their students with the evolution and climate change education they deserve.

There are a lot of stories I could tell and so many people to thank for the great work they did at NCSE over the last 10 years (they’re all listed in the accompanying sidebar, p. 5), but I’m going to focus on just one major storyline: NCSE’s increased focus on helping teachers do a better job teaching evolution and climate change.

The first step in this process was the deployment in 2014–2015 of the first-ever nationally representative survey of climate change teaching practices. The survey results revealed that lots of middle and high school science teachers were covering climate change, but many of them—about half—were sending their students “[mixed messages](#)” about the degree of acceptance of anthropogenic climate change among scientists. Indeed, a shocking four in 10 teachers correctly chose the response that more than 80–100% of scientists accept anthropogenic climate change, a clear sign that the fossil fuel industry’s efforts to sow doubt about the scientific consensus had been quite successful. Given that most teachers reported having very little formal exposure to climate science during college



Ann Reid with past and present members of the NCSE Board of Directors at an event marking the organization’s 40th anniversary.

or in subsequent professional development, their vulnerability to propaganda was understandable, but troubling.

The survey's snapshot of climate change teaching practices was strikingly similar to those of an [earlier survey of evolution teaching practices](#) that showed that only about one-third of high school biology teachers were covering evolution consistently with the current scientific understanding while about half were avoiding, equivocating, or otherwise depriving their students of a straightforward education about evolution.

In both cases, only a small minority of teachers reported actively misleading their students about the reality of climate change or evolution, and most of these would never register as a blip on NCSE's radar. But the recognition that so many teachers were covering these topics poorly or not at all was pivotal for NCSE and has informed our approach to our mission for the last 10 years. Perhaps, we realized, we need to be concerned not only with active interference but also with misleading approaches to these topics (intentional or not).

How might we reach these teachers? This turns out to be a remarkably difficult challenge. The decentralization of the U.S. educational system makes it practically impossible to mandate uniform treatment of any subject. The federal government has minimal authority to impose requirements on local school systems. Each state sets its own science standards and teacher licensing requirements. Decisions about textbooks, curriculum, and professional development opportunities are often left to individual districts, individual schools, and even individual teachers.

To be sure, that is not entirely a bad thing. I think we'd all agree that we would not want each new federal administration to be able to suddenly upend how science,

or anything else, is taught at every school in the country. But for NCSE, decentralization meant that we had to find creative ways to reach the teachers we most wanted to help.

The first step was to start a newsletter, [NCSETeach](#), and begin working to build awareness of NCSE among the teaching community. Within a year, the newsletter had accumulated 6,000 teacher subscribers. Next, we recruited about 30 experienced teachers, whom we dubbed [Teacher Ambassadors](#), to help us develop sample activities and classroom best practices. Our long-term plan was for these teacher leaders to bring NCSE's resources to their local communities through professional development, as we suspected that successfully changing teaching practices would require personal contact. For topics as socially contentious as evolution and climate change, trusting the messenger would be essential.

As we worked with these teachers, a coherent philosophy began to emerge, centered on three interlocking concepts: direct engagement with scientific evidence; resolution of common misconceptions; and implementation of a no-conflict approach.

A key realization was that many students do not enter the classroom as blank slates when it comes to the topics of evolution and climate change. Well, to be fair, students never walk into the science classroom as blank slates—they have been imbued by nature and nurture with plenty of ideas, right or wrong, about how things work. But climate change and evolution are special in that many of the ideas that students have about them come from how these topics are talked about in their communities or presented in the media. Unlike their ideas about the periodic table or photosynthesis, students' misconceptions about evolution and climate change may have been instilled as part of their very identities.

And that is why, as we honed our approach to helping teachers cover these topics effectively, we decided that we should choose the most common and stubborn misconceptions that students might have about evolution and climate change, develop activities that directly address those misconceptions, and base those activities on authentic



Ann Reid at a community science outreach event.



Some of NCSE's staff during a hike in the California redwoods.

scientific evidence that students could engage with directly. In so doing, the students' misconceptions would be resolved organically. The teacher would act as a guide, modeling scientific thinking and processes, rather than as a judge, directly confronting and correcting students' initial beliefs.

These concepts have guided our work for the last several years. When the pandemic delayed our initial outreach in the summer of 2020, we used the next two years to deepen our resources, building [comprehensive lesson sets](#) that systematically address misconceptions, incorporate pedagogical best practices, and work seamlessly with the Next Generation Science Standards.

The pandemic also stimulated a further expansion of our mission. NCSE has always recognized that many misconceptions about evolution and climate change are grounded in a fundamental misunderstanding of how science works. We knew that many teachers who cover evolution and climate change successfully in places where misconceptions are rife swear by beginning the school year with a deep dive into the nature of science—a scaffold that they work from when they begin to discuss evolution and climate change.

Understanding how science works is essential to navigating our complex world. But the pandemic shone a bright light on the degree to which most American adults, much less students, were simply not equipped to handle the flood of COVID-19 news, from the origin of the virus, to mortality rates, to the efficacy of masks and vaccines, to risk assessment. Many—perhaps most—people felt unable to evaluate all this information for themselves. And that, of course, left many people at the mercy of authority figures they thought they could trust, but who often were misinformed, or worse, deliberately spreading misinformation.

And so, during the pandemic, we put our downtime to good use: developing a third set of lessons on the nature of science, and writing a near-weekly [“Coronavirus Teachable Moment”](#) column to help teachers answer the questions about the pandemic their students were bringing to the classroom.

When the pandemic receded, we hit the ground running. We expanded our teacher team, and began working with our Teacher Ambassadors to prepare them to introduce our new lesson sets in their local communities.

And that's where we are now: working hard to figure out how to reach as many science teachers as possible with a comprehensive set of resources and approaches to

measurably improve how evolution, climate change, and the nature of science are taught. Our Supporting Teachers program is now NCSE's largest.

It couldn't possibly be a better time for someone like Amanda L. Townley to take over the leadership of NCSE. Expert in effective teaching practices, deeply connected to the science teaching community, and gifted with rare cultural sensitivity through her upbringing in a conservative religious community, NCSE's new executive director is uniquely qualified to take our teacher outreach efforts to new levels. I can't wait to see what comes next.

It should go without saying that I cannot claim sole credit for NCSE's successes; our progress is due to a wonderful group of dedicated, smart, and generous-spirited colleagues, beginning with Genie Scott who welcomed, mentored, and encouraged me.

And of course, a loyal and deeply engaged board has inspired and supported me all along the way.

But here's the heart of the matter: there follows a list of NCSE's employees during my time as Executive Director. I want to give a heartfelt thanks to each and every one because without them, the organization would not have been able to do the important work of defending and supporting accurate science education (and would not have been such a great place to work!).

Claire Adrian-Tucci
David C. Almandsmith
Lin Andrews
Minda R. Berbeco
Glenn Branch
Astrid Broertjes
Kate Carter
Ashley Collins
Emma Doctors
Stuart Fogg
Heather Grimes
Charles Hargrove
Cari Herndon
Peter Hess
Brad Hoge

Nina L. Hollenberg
Rae Holzman
Deb Janes
Wendy Johnson
Stephanie Keep
Robert Luhn
Mark McCaffrey
Eric Meikle
Nia Mitchell
Steve Newton
Paul Oh
Josh Rosenau
Emily Schoerning
Blake Touchet





Amanda L. Townley became Executive Director of NCSE in December 2023. She is an award-winning researcher and advocate specializing in science teacher education, evolution education research, and science literacy-focused public outreach. Prior to joining NCSE, she was Associate Professor of Middle Grades and Secondary Science Education at Georgia Southern University in Savannah, Georgia. Her research centered on the intersections between science and society, specifically the acceptance and rejection of evolution and climate change, misconceptions and misuse of the nature of science in anti-science movements, and the impact of the perceived conflicts between scientific understandings and culture on science literacy. Townley is a deeply engaged advocate of science for all and “hands-on, minds-on” science teaching and learning, supporting the accurate and comprehensive teaching of science across levels of study.

Paul Oh: You’ve had numerous connections with NCSE over the years. What kind of influence have those connections had on you and your work?

Amanda L. Townley: I found NCSE as a teacher, when I was emerging from my own experiences with evolution teaching and learning. That first connection let me know I was not alone and there were others out there working to ensure that students didn’t go through the same struggles I underwent in biology class. Later, as I pursued my education, I wrote a number of articles and had other opportunities to work with Glenn Branch and later you, Paul, to speak out for sound science in my own communities and my state.

These early encounters lit a fire for me: I realized that I needed to speak up, and that fueled my desire to focus on evolution education in my research. Many years later, I was not only advocating for science education as needed in my home state but also publishing my own work on evolution teaching and learning as well as developing new approaches to evolution instruction and outreach. It was that shift that brought me deeper into the workings of NCSE, when the very first Teacher Ambassador group came to Savannah to begin their work. It was also at that time that Ann Reid and I presented on climate and evolution misconceptions to the American Association for the Advancement of Science. So much of my history

is woven into the last decade of NCSE’s history that I feel that I am coming home!

PO: I’ve heard you discuss your upbringing in a ministry-focused household and how that has helped shape your beliefs about evolution education and science education in general. Can you say more about this?

AT: Oh, there is a whole book worth of information on that history, including an [article](#) I wrote for NCSE for Darwin Day several years ago. A very abridged version: I was brought up in a deeply devout family in a community and culture where all things are called back to church. At the same time, I grew up on a farm with amazing strong Southern women who encouraged me to explore, question, and stand up for others. All those things intersected when I was in the classroom of a teacher who was against evolution and refused to teach the subject. After reading more about this topic seen as “controversial” in my community, I realized that it related directly to my experiences and observations on the farm—I couldn’t understand why it was such an issue. When I brought the discussion home, though, I came to recognize that the reaction was rooted in fear and misunderstanding, of both evolution as a subject and science as a field. Over many years of research, self-exploration, formal education, and conversations with my family, community members, church groups, and the public,

NCSE'S NEW EXECUTIVE DIRECTOR AMANDA L. TOWNLEY PROFILED IN *SCIENCE*

Amanda L. Townley was [profiled](#) by *Science* (November 24, 2023) in advance of her becoming NCSE's new executive director. Townley became NCSE's third executive director on December 4, 2023, succeeding Ann Reid.

The profile recounted Townley's own journey. "I grew up in a young Earth creationism home, with a worldview that was based in evangelical Christianity and a literal translation of the Bible," she told *Science*. After learning about evolution and having challenging conversations with her community, she found herself "on a path toward evolutionary biology and science education."

"Our goal is for all students in the United States to have the opportunity to engage with the scientific evidence [for evolution and climate change]," Townley emphasized toward the end of the profile. "And the sky's the limit."

I realized that stories like mine had to be shared to let others from similar backgrounds learn how to navigate difficult passages where their faith and what they learn about science seem to be at odds. This also lets people know that learning science and being scientifically minded is for everyone!

PO: I can understand, then, why your research has centered on societal acceptance or rejection of evolution and climate change as well as misconceptions and misuse of the nature of science in anti-science movements. How do you think these research topics have prepared you to help fulfill NCSE's mission?

AT: My work for the last 15 years has focused on three main areas. The first is traditional academic research, expanding what we know about the teaching and learning of those subjects, both quantitatively and descriptively. The second is outreach: getting that information translated into public spaces, such as churches, community groups, and even social media platforms. The third is what's called research-to-practice: taking what we discovered about teaching and learning, connecting it with educational and public needs, and then developing teaching approaches or materials accordingly. I find it encouraging that in the three arenas in which NCSE operates, the same focuses are apparent: Investigating Science Education—research; Catalyzing Action—public outreach; and Teacher Support—research into practice.

PO: What else would you like our supporters to know about you and your work?

AT: I would like them to know how passionate I am about changing science education for the better—allowing students around the country to learn science in a way that is accurate, robust, and that inspires curiosity. Teachers play a key role, of course. I use the terms "scientist teachers" and "hands-on, minds-on" science a great deal when talking about teaching evolution, climate change, and the nature of science. To help to transform science education, teachers must be empowered to be more than passive givers of information. They should be the inspiration of curiosity and a model of scientific inquiry for their students. They should be "scientist teachers": scientists in their own right, who guide students through investigating phenomena, making observations, and reaching conclusions on the basis of evidence. Teaching in this way is what I call a "hands on, minds on" approach in which students engage with the evidence as a scientist would! In light of my passion for improving science education,

I can't think of anything more exciting than spearheading NCSE's efforts to bring these ideas to classrooms across the country.

PO: Finally, what are you most looking forward to in your new role as executive director?

AT: As a teacher and academic, my research, outreach, and teacher work represented just a portion of the roles and responsibilities I balanced. Since those are the things I am most passionate about, I always desired to do more than what time was afforded. In my new role with NCSE, these are now the primary focus of my position and I can dedicate myself wholly to the mission of improving science education. I also get to put my high energy level into empowering, motivating, and encouraging our staff, partners, and donors. I love to engage with others who are passionate, or even just cautiously curious, about science, especially evolution and climate change, so I look forward to opportunities to connect.

Paul Oh is NCSE's Director of Communications. oh@ncse.ngo



UPDATES

Are there threats to effective science education near you? Do you have a story of success or cause for celebration to share? E-mail any member of staff or info@ncse.ngo.

CALIFORNIA, CULVER CITY

The California Center for Climate Change Education was established in April 2023 at West Los Angeles College in the Los Angeles Community College District, with the aim of developing “educational resources to assist students and faculty of the state’s public elementary, secondary, and postsecondary systems by providing fact-based education about climate change and its direct relation to equity and environmental justice issues.” The center is receiving \$5 million in initial funding from the state with a further \$1.3 million from the federal government. The idea of the center was broached in 2022’s Assembly Bill 1913, sponsored by Isaac G. Bryan (D–District 54). The bill passed the Assembly but died in a Senate committee; the funding for the center seems to have been included in a successful budget bill, however.

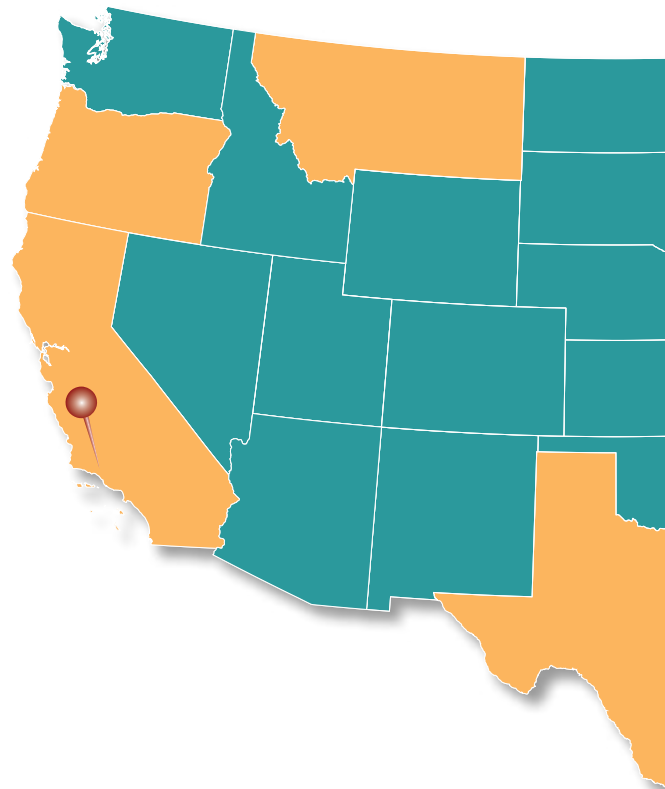
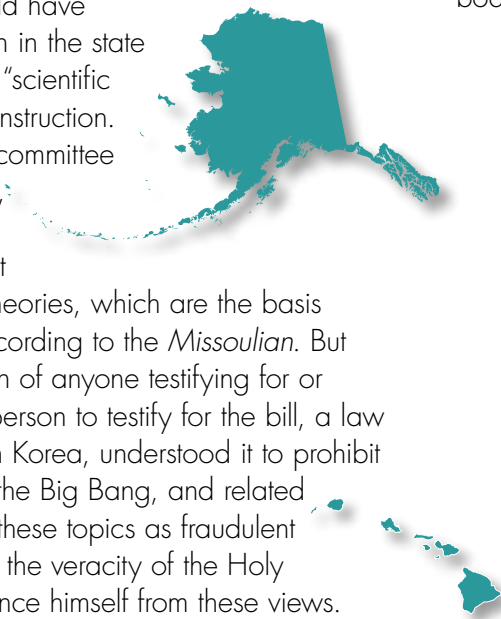
MONTANA

Senate Bill 235, introduced in January 2023 by Daniel Emrich (R–District 11), would have crippled science education in the state by excluding anything but “scientific fact” from curriculum and instruction. When the bill received a committee hearing in February 2023, Emrich “said that he didn’t think the bill would prohibit the teaching of scientific theories, which are the basis of explaining science,” according to the *Missoulian*. But that was not the impression of anyone testifying for or against the bill. The only person to testify for the bill, a law professor working in South Korea, understood it to prohibit the teaching of evolution, the Big Bang, and related topics; he also described these topics as fraudulent and aimed at impeaching the veracity of the Holy Bible. Emrich did not distance himself from these views. Among the bill’s opponents were students, teachers, and representatives of the Blackfeet Tribe, School Administrators for Montana, Coalition of Advocates for Montana Public Schools, the Board of Public Education, North East Rural Schools, the Montana Federation of Public Employees, Montana Conservation Voters, and Montana Audubon. Rob Jensen, a retired Montana science teacher, told the committee that the bill was “the most extreme anti-science legislation I’ve ever seen in this

country,” making the 1925 trial of John Scopes for violating a Tennessee ban on teaching human evolution “look like a period of [e]nlightenment,” according to the *Daily Montanan*. The bill was roundly criticized not only for its prospective effect on Montana science education but also for its apparent conflict with the state constitution, which vests supervision of schools in the Board of Public Education and in local school districts. A legal analysis attached to the bill expressed the same concern. Subsequently, the committee (including Emrich) voted unanimously to table the bill.

TEXAS

When the Texas state legislature adjourned sine die on May 29, 2023, a pair of identical bills that would have harmed science education, House Bill 1804 and Senate Bill 2089, died in committee. If enacted, the bills would have amended the state education code to require that instructional material adopted by the state board of education “present a scientific theory in an



objective educational manner that: (i) clearly distinguishes the theory from fact; and (ii) includes evidence for both the scientific strengths and scientific weaknesses of the theory.”

Clause (i) appears to reflect a common misconception about facts and theories. “In scientific terms, ‘theory’ does not mean ‘guess’ or ‘hunch’ as it does in everyday usage,” as the National Academy of Science explained in its publication *Science and Creationism*, second edition (1999). “Scientific theories are explanations of natural phenomena built up logically from testable observations and hypotheses. Biological evolution is the best scientific explanation we have for the enormous range of observations about the living world. ... [S]cientists can also use [“fact”] to mean something that has been tested or observed so many times that there is no longer a compelling reason to keep testing or looking for examples. The occurrence of evolution in this sense is a fact.”

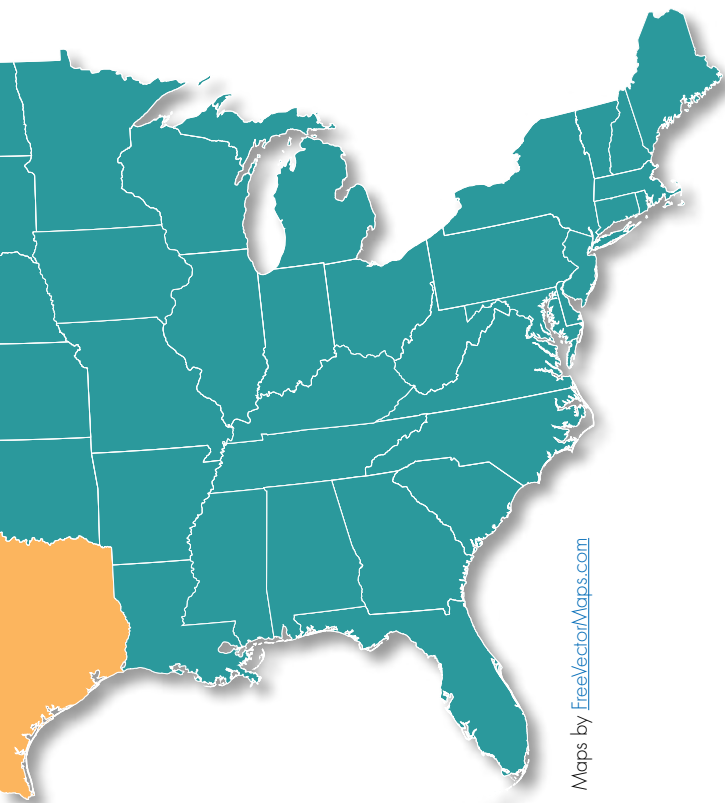
Clause (ii) betrays the intention of the bills. As *The New York Times* editorialized of the phrase “scientific strengths and scientific weaknesses” in 2008, “This is code for

teaching creationism.” Employed by proponents of “creation science” and “intelligent design” alike, the phrase appears in antievolution laws enacted in Louisiana in 2008 and Tennessee in 2012. In 2017, Texas’s House Bill 1485 would ostensibly have provided Texas science teachers with the academic freedom to teach “the scientific strengths and scientific weaknesses” of scientific theories discussed in the state science standards; after receiving a public hearing, during which a member of the state board of education testified that the bill would allow the teaching of creationism, the bill died in committee, as NCSE previously reported.

House Bill 1804 was sponsored by Terri Leo-Wilson (R–District 23), who previously served three terms on the state board of education (as Terri Leo) where she continually sought to undermine the treatment of evolution in the state science standards and in textbooks submitted for state adoption; Senate Bill 2089 was sponsored by Brandon Creighton (R–District 4). Both bills received committee hearings, during which public comment was heard and amendments were proposed, but neither bill came to a committee vote.

OREGON

Oregon’s Senate Bill 854, which, if enacted, would have required local school districts to establish and periodically update a climate change instructional program for K–12 students under the supervision of the state department of education, died in committee when the legislature adjourned sine die on June 25, 2023. The bill received a hearing in the Senate Committee on Education on March 9, 2023, where it received support from the Oregon Education Association, Portland Public Schools, and the Oregon Sierra Club, among others. The committee did not take a vote. Senate Bill 854 was introduced by James I. Manning Jr. (D–District 7) and Deb Patterson (D–District 10) at the request of Oregon Educators for Climate Education, which describes itself as “a statewide group of educators working toward Oregon legislation that would integrate and infuse PK–12 climate change education across all core subject areas.”



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The second edition of *Humans: An Introduction to Four-Field Anthropology* (Routledge, 2023), by **Alice B. Kehoe**

and **Andrew J. Petto** (a former member of NCSE's board of directors and a former editor of *RNCSE*), was published. The publisher writes:

Humans is a concise, jargon-free introduction to four-field anthropology. This book outlines and breaks down a complex discipline to identify some of the most important and relevant questions in anthropology. It provides students with an understanding of the unity of the human species, the adaptation of societies to their environments (physical and political), and an appreciation of the power of socialization into a culture.

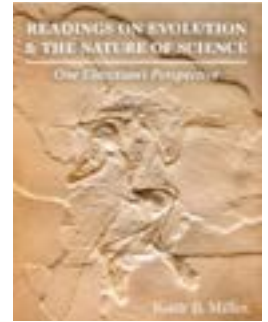
The authors ensure that the book takes a balanced approach to all four fields, covering topics such as cultural relativism, humans as a biological species, primates, communicating, economics, and religion. Pedagogical features include a study guide and notes for instructors. This second edition is fully updated with brand new material on evolution, genetics, and archaeology to reflect the latest research and recent changes in the field.



NCSE is pleased to congratulate **Michael E. Mann**, a member of NCSE's board of directors, on being awarded the Humanist of the Year award for 2023 by the American Humanist Association. In his acceptance speech (published in the summer 2023 issue of *The Humanist*), he warned, "Truth has

never been more fragile. Nor has our planet. It is up to all of us to defend both before it is truly too late."

Readings on Evolution & the Nature of Science: One Christian's Perspective (Masthof Press, 2022), by **Keith B. Miller**, Research Assistant Professor of Geology at Kansas State University, was published. According to the publisher:



This book is a collection of articles and essays that address a wide range of topics related to evolution and the history of life. They are presented from the perspective of a Christian geologist and paleontologist, and seek a robust integration of evolutionary science and the Christian faith. Evolutionary science raises a number of important questions in relation to scriptures testimony about the character and creative work of God. Among the topics addressed are the nature and limitations of science, common misconceptions of evolution, the fossil record, human evolution and the image of God, God's role in an evolving creation, and the problem of evil.



NCSE is pleased to congratulate **Ben Santer** for his selection by Climate One as the recipient of the Stephen H. Schneider Award for Outstanding Climate Communication for 2023. A member of NCSE's board of directors, Santer retired from Lawrence Livermore National Laboratory in 2021 and is now a

Fowler Distinguished Scholar in Residence at Woods Hole Oceanographic Institution and a Visiting Researcher at UCLA's Joint Institute for Regional Earth System Science & Engineering. His previous honors include a MacArthur Fellowship in 1998, election to the National Academy of Sciences in 2011, and Sigma Xi's William Procter Prize for Scientific Achievement in 2019.

—GLENN BRANCH

NCSE Climate Change Lesson Sets Win Endorsement from CLEAN, Identified as High-Quality Materials



If you've looked recently at our [climate change lesson sets](#), you might have noticed something new: a Selected-by-CLEAN badge on each.

Since mid-October 2023, the [Selected-by-CLEAN badge](#) issued by the [Climate Literacy and Energy Awareness Network](#) has identified all five of our climate change lesson sets as being aligned with both the Next Generation Science Standards and the Climate Literacy Essential Principles and Energy Awareness Principles. We are incredibly proud of this achievement. This badge not only attests to the quality of our lesson sets, but also allows teachers to find these valuable resources more easily. Following the conferral of the badges, the National Oceanic and Atmospheric Administration, which funds CLEAN in part, highlighted our lesson sets on its social media channels, bringing them to the attention of even more teachers nationwide.

Materials that CLEAN includes in its portal undergo a rigorous, independent review involving scientists and teachers. Only high-quality materials are chosen for inclusion, and even then often only after revisions in the light of CLEAN's feedback. In the case of our lesson set [Back to the Future: Climate Edition](#), NCSE used the feedback received to strengthen the lesson set, for example, by including a technology-free version of an activity where students look for patterns in

tree rings to determine whether tree rings are reliable climate proxies. This updated version is now available.

NCSE AND CLEAN'S HISTORICAL PARTNERSHIP

CLEAN is led by the Cooperative Institute for Research in Environmental Science (CIRES) at the University of Colorado Boulder and the Science Education Resource Center (SERC) at Carleton College. (SERC's founding director Cathryn A. Manduca is a [2023 Friend of the Planet](#) recipient.) Although the CLEAN portal was originally launched in 2010 as a project of the National Science Digital Library, it has been housed at [climate.gov](#) since 2012. CLEAN not only serves as a resource bank for the CLEAN Collection of Climate and Energy Science resources, all of which have been reviewed by a panel of scientists and teachers, but also provides guidance in the best practices to teach climate and energy science. Moreover, CLEAN maintains the CLEAN Network, a community of professionals committed to improving climate and energy literacy, which has been virtually meeting each week since 2008. The CLEAN Network now includes over 800 members (and you, too, can [join](#)).

NCSE has been involved with CLEAN since the beginning of our Supporting Teachers program. Director of Teacher Support Lin Andrews and I have been attending weekly CLEAN meetings

since we began at NCSE (in 2019 and 2021, respectively).

Looking to the future, we hope to develop our partnership with CLEAN even further. In November 2023, CLEAN hosted the first meeting of its Accelerating Climate Capacity, Engagement, and Leadership Summit (ACCELS), for which NCSE is leading a working group. The ACCELS working group that NCSE is heading is investigating what it would take to put together a flexible inventory of climate change education concepts that would be accessible to any teacher. We have also collaborated with CLEAN on the development of a professional learning experience for teachers that blends our solutions-forward climate change lesson set [Climate Super Solutions](#) with strategies to support climate mental health in students and teachers.

Students need to learn not only how to resolve their misconceptions about climate change in science class but also how to cope with the mis- and disinformation they encounter outside of the classroom. We at NCSE are committed to ensuring that science educators have the resources to guide their students accordingly. As we continue to grow our network of teachers who utilize our lesson sets and engage in our community of practice, valued partners such as CLEAN will help to accomplish this goal even more effectively.

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Cartoons, Jokes, and Lies: Kids at Risk from Climate Change Denial

Cartoons and jokes and lies: that's the recipe for climate change denial aimed at kids, sometimes kids as young as six years old, judging from recent campaigns from conservative outfits like the [CO2 Coalition](#), Mike Huckabee's [EverBright Kids](#), and [PragerU](#). It's not a new recipe, either: the same cookbook was employed, less blatantly but more pervasively, over the last two decades by a state government agency funded by voluntary contributions from the fossil fuel industry.

With a yearly budget in the tens of millions of dollars, the [Oklahoma Energy Resources Board](#) produces classroom materials with such kid-friendly characters as Petro Pete and the fourth-rate Bill Nye impersonator who hosts "[Lab Time with Leo](#)." The supposed virtues of fossil fuels are front and center, as in "[Petro Pete's Big Bad Dream](#)," written for elementary school students. The contribution of fossil fuel consumption to climate change is nowhere to be seen.

Whatever its source, it's dismaying that such propaganda is aimed at so young an audience. That's not only because these students will then have to unlearn the lies and distortions at a later stage in their science education. It's also because their elementary teachers, who should be trustworthy sources of information about science for these students, typically lack the preparation and the resources to counter misinformation and disinformation about climate change.

A 2018 national survey [found](#) that only one in three elementary school teachers felt very well prepared to teach science; only one in five felt very well prepared to teach earth science. With regard to climate change in particular, a 2022 survey commissioned by the North American Association for Environmental Education [discovered](#) that elementary teachers were the least confident educators when it came to teaching climate change.

By the same token, such teachers feel a dearth of reliable educational resources on climate change. Fully 40 percent of elementary teachers in the NAAEE survey reported that they lacked resources to teach effectively about climate change, with a further 25 percent reporting that such resources were available only some of the time. One



elementary teacher commented, "I would need something at a level that my students would understand."

Fortunately, there's reason for hope. The main source of guidance for teachers is their state science standards, which specify the skills and abilities students are expected to acquire in the course of their education. Climate change is

adequately [represented](#) at the middle and high school level in the bulk of these standards, and although it isn't usually explicit, the conceptual framework for a later understanding of climate change is erected at the elementary level.

As a result, elementary teachers are increasingly expected to have more knowledge about climate change and how to teach it effectively. In consequence, a handful of states have budgeted to provide professional development on climate change for their teachers, while publishers are beginning to revise their textbooks to comply with standards improved to include more content relevant to climate change at the elementary material.

Expect the purveyors of climate change denial to redouble their efforts as climate change education becomes more prevalent across the country—and don't expect elementary students to be spared. After PragerU's videos received the imprimatur of Florida's department of education, it was [reported](#) that its CEO "wants to ensure schools frame climate science as a debate" with the goal of reaching children "when they are at their most impressionable."

But no fewer than 80 percent of Americans agree that it is important for elementary as well as secondary school students to learn about climate change, [according](#) to a 2023 national survey. That's not surprising: today's students are going to be spending the rest of their lives coping with the challenges of climate change. The work of preparing them to do so begins in the elementary school classroom, and their teachers need to be equipped with the necessary ingredients.

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THE RNCSE REVIEW

The primary goal of most popular books on evolution is to walk the reader through a logical, reasonable, engaging, and evidence-based explanation of the diversification of living things. Especially given the social controversies surrounding evolution, it is easy for such books to be, or come across as, combative, thus backfiring with a segment of the very audience they are hoping to convince. In [Exploring Life through Evolution](#), Louisiana State University evolutionary biologist Prosanta Chakrabarty seeks to meet those with doubts about evolution where they are, as if inviting them to a conversation. The easy-to-read and bite-sized chapters coupled with his unpretentious and playful tone and his attention to topical issues involving evolution allow him to accomplish this objective through most of the book—but it sometimes comes at a cost.

The book begins with “A Personal Prologue,” four short chapters describing Chakrabarty’s own experience learning about evolution while also explaining what science is and how it works. Chakrabarty is at his best here. I was engaged by his empathetic writing style, which he probably honed during his years of teaching college evolutionary biology in the Deep South. Chakrabarty adroitly explains that skepticism is an essential component of the scientific process, but invites the reader to extend him “a bit of trust” as he describes how we have come to our current understanding of evolution.

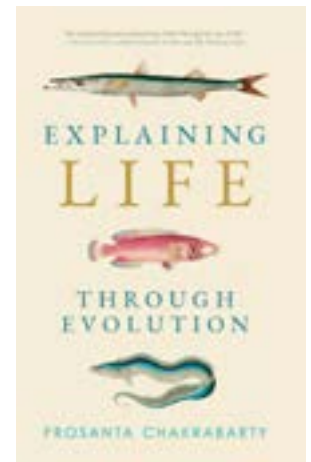
Parts II and III, “The Evolution Revolution” and “Questions and Misconceptions,” make up the bulk of the book. These parts provide the understanding of evolution that Chakrabarty hopes to instill in his readers. The order of these two sections is effective: first present the audience with the facts behind the phenomena and only then tackle the most common misunderstandings about and misdirected challenges to evolution.

Explaining Life Through Evolution

author: Prosanta Chakrabarty

publisher: MIT Press

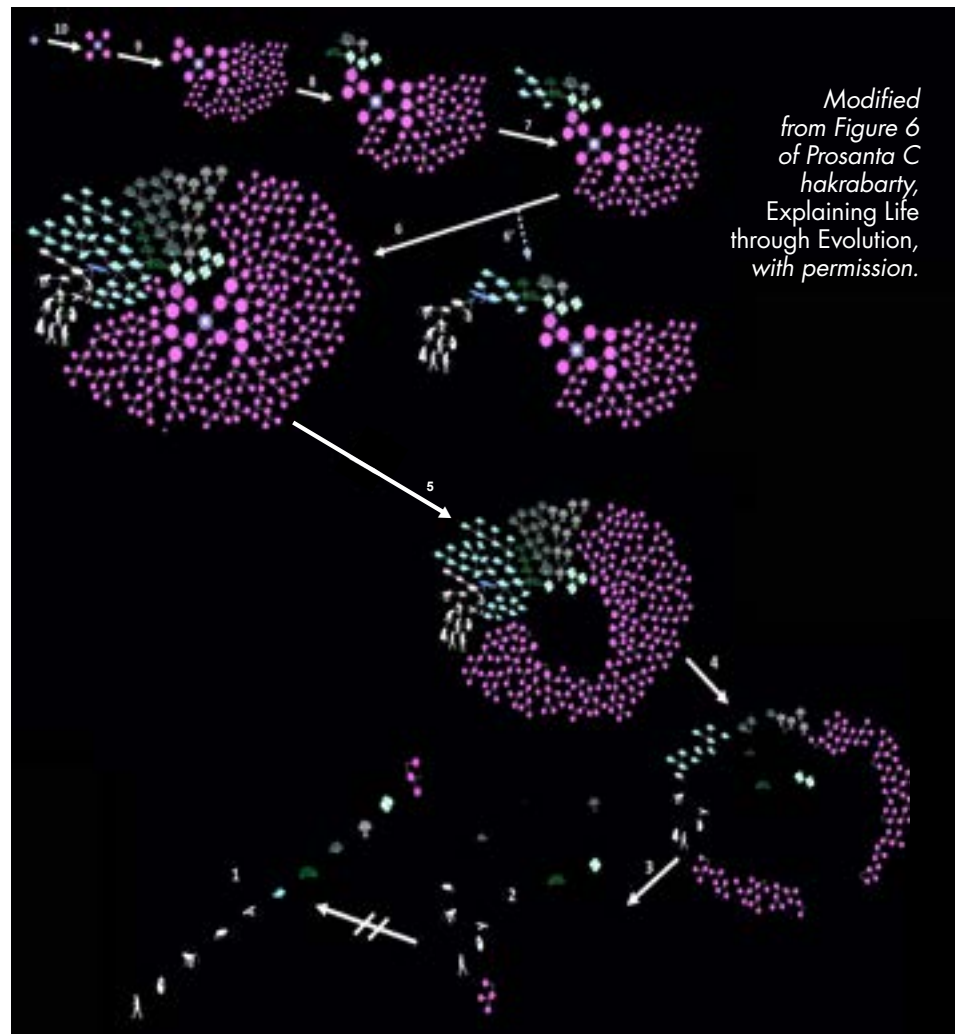
reviewed by: Paul K. Strode



I was impressed with Part II’s different approaches to explaining how evolution works, including myriad ways to depict the tree of life, complete with color versions that I suspect come directly from teaching materials he has developed and refined over the years. I particularly liked Figure 6 and its exploding firework design with little drawings that represent the evolution of the major groups of organisms. These bursts of adaptation

and speciation are a clever visualization I had not seen before. Also noteworthy is a chapter consisting of a clever and non-confrontational illustrated story of Darwin and Wallace’s independent discovery of natural selection, which charmed my art-major daughter, home from college for Thanksgiving.

But Chakrabarty’s attempts at simplicity sometimes backfire. My daughter, with



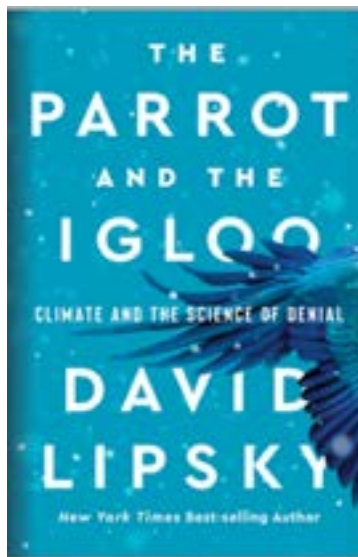
Modified from Figure 6 of Prosanta Chakrabarty, *Explaining Life through Evolution*, with permission.

The Parrot and the Igloo: Climate and the Science of Denial

author: David Lipsky

publisher: W. W. Norton

reviewed by: John Mashey



The award-winning journalist and author David Lipsky has written a readable, compelling book about climate science and its deniers, *The Parrot and the Igloo*. The quirky title was a mystery to me until the penultimate chapter, when it finally made sense. His foray into the climate wars is lively and accessible, but built atop meticulous research. It is a good first book for people who want to learn about the climate wars and its key combatants on both sides, with references to highly credible sources for further reading

But I would also recommend it even for topic experts, as Lipsky has unearthed many obscure facts that help better understand the people involved. In my case, I have helped sell supercomputers to climate modelers, am a member of the American Geophysical Union and have attended its meetings, studied climate

science for two decades, and know personally quite a few of the climate scientists included in his book. Yet I still learned new information about the history.

Likewise, I have studied organized climate denial for 15 years. I am quite familiar with most of the deniers covered in the book and have researched and written often about them, in a few cases resulting in personal attacks. Still, in reading the book, I often encountered fascinating new-to-me details about these characters. Extensive endnotes, not printed in the book but available online, add even more value to Lipsky's investigation.

The book's 50 chapters have amusing titles that make sense upon reading the chapters. They are organized into three parts and an epilogue, where the book's title finally gets explained.

only a year of biology in high school and a semester in college, complained that a chapter on the history of life misleadingly talked about microbes as learning and inventing. Here and elsewhere, Chakrabarty unnecessarily and misleadingly ascribes agency where none exists. Similarly, when he writes "so many of our body parts evolved for use in water" (page 28) and "Tiktaalik and other early lobe-finned fishes evolved thicker fin bones for fighting gravity" (page 104), he seems to fall into the trap of teleology, failing to recognize, much less to challenge, the common misconception that evolution is goal-oriented, with new traits arising in order to promote survival and reproduction, or even speciation.

The book ends with "Why Understanding Evolution Matters": five short chapters plus a fictitious and somewhat unbelievable barstool conversation between the author and a creationist. While I was hoping for a strong finish addressing important topical

Chakrabarty has made a noble attempt at perhaps the most difficult task a scientist faces: explaining evolution to the skeptical non-scientist.

issues to which evolution is relevant, like gene editing, natural history, genealogy versus ancestry, and sex versus gender, I quickly lost interest—and patience.

For example, the "Evolution in the Anthropocene" chapter starts with a spirited indictment of dog breeding (Chakrabarty calls it "forced incest"; I agree) but then quickly transitions to a surprising rant about the dangers of the new CRISPR-Cas9 gene editing technology. Here Chakrabarty even goes as far as to speculate that the release of disease-resistant mosquitoes

could end up sterilizing people, a claim that is more cable news click-bait than responsible science journalism. Worse, it's counterproductive: his overstated warnings about the technology might be taken as a reason to distrust science and scientists. For many, learning about one potential harmful use of science is all they need to decide to disregard decades' worth of scientific research.

Overall Chakrabarty has made a noble attempt at perhaps the most difficult task a scientist faces: explaining evolution to the skeptical non-scientist. However, he falls into the classic traps of oversimplifying to the point of reinforcing the very misconceptions he hopes to correct and overemphasizing topical issues to the point of losing track of the project.

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The first part of the book, “Inventors” (49 pages), tells brief stories of the key figures in the creation of electrical power grids: Samuel Morse (electricity on wires), Thomas Edison (wires under streets for lights), Nikola Tesla (alternating current), and George Westinghouse (commercial alternating current for electric power distribution). I was initially surprised by Lipsky’s way of beginning his book, but it makes sense in context, since most of the world’s grids are powered by fossil fuels, something that must change in order to mitigate the effects of climate change.

The second part of the book, “Scientists” (141 pages), offers a brief history of climate science’s development during the 19th and 20th centuries, for which *The Discovery of Global Warming* (revised edition 2008), by Spencer R. Weart (a recipient of NCSE’s Friend of the Planet award) is a classic reference with more details. Lipsky covers the struggles of late-20th-century scientists to communicate clear warnings about climate change in the face of indifference, political pushback, and early denial tactics.

The third and longest part of the book, “Deniers” (209 pages), goes into depth on organized climate denial, starting with the precedent tactics used by the tobacco industry, and later direct efforts

with key climate change deniers such as Frederick Seitz, Fred Singer, and Steve Milloy. Science threatened profits for both Big Tobacco and the fossil fuel industry, so they funded individuals, front groups, and think tanks to create doubts and attack scientists. The deniers run the gamut from scientists (only rarely climate scientists) to those with no credible science background.

I had known Singer had connections to Sun Myung Moon’s controversial Unification Church, but I was surprised to learn how pervasive they were or that Seitz was equally involved. Lipsky writes:

But Frederick Seitz served on the advisory board of eight Moon conventions. He’s right there in the program: as chairman, vice-chairman. And S. Fred Singer—who would sacrifice a lot for a good pre-paid air ticket—hit up ten church conferences. As vice chairman, as speaker. It remains among the enduring Reverend Moon achievements. Matchmaking: bringing the two men together. The first time the two denial grandfathers appeared side-by-side in a magazine story. *Nature* reported the Freds as “luminaries of the organizing committee at the 1983 event.

That’s the start for these two names that would enter history together.” (p. 268)

In the epilogue (70 pages), Lipsky concludes by describing the 21st-century travails of climate scientists, such as the 2009 theft and cherry-picked release of selected emails from the Climatic Research Unit at the University of East Anglia—also known as Climategate—and Steve McIntyre’s dogged and unfounded criticism of Michael E. Mann and the hockey stick study, as well as harassment of many scientists with Freedom of Information Act requests designed mostly to waste people’s time.

Lipsky explains, “The story this book tells is about the people who made our world; then the people who realized there might be a problem; then the people who lied about that problem” (p. xiii). He tells the story in a compelling, informative, and illuminating way. I liked this book very much.

John Mashey is a semi-retired computer scientist and an advisory committee member for the University of California San Francisco’s Center for Tobacco Control Research and Education. His favorite avocation has become investigation and reporting on climate denial, especially as connected with the tobacco industry. mash@heymash.com



WHAT WE’RE UP AGAINST

Creationists Who Can’t Be Bothered to Cite the Original



Lynn Margulis

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Wikimedia Commons

According to the anonymous author of the short essay “Can Creationists Accept Evolution?” (posted by the young-earth creationist ministry Answers in Genesis on February 17, 2023), “The late evolutionist Lynn Margulis said, generally, of the field of evolutionary biology, ‘It’s wrong like phrenology is wrong. Every major tenet of it is wrong.’” Ignore the fact that Margulis’s first name was Lynn. The article cites, not Margulis, but a 2017 paper published in *Biology & Philosophy*. That paper cites, not Margulis, but a popular 1994 book, Kevin Kelly’s *Out of Control*.

That book, finally, attributes the quoted sentences to Margulis, although the final word is italicized. But it also describes Margulis as among a number of scientists who “do not reject Darwin’s contribution; they simply want to move beyond it.” Nothing in Kelly’s book, or in Margulis’s own writings, suggests that she thought, as the essay alleges, that there is no good evidence for evolution.

—GLENN BRANCH

THANK YOU, ANN REID!

NCSE Executive Director, 2014–2023



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