

# Defending Science Education: Climate as a Second Front for Biologists

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**S**adly, there was nothing about Arizona's Senate Bill 1213, introduced in January 2013, that seemed unusual. Claiming that "the teaching of some scientific subjects, including biological evolution, the chemical origins of life, global warming, and human cloning can cause controversy," the bill would have permitted teachers in the state's public schools to discuss "the scientific strengths and scientific weaknesses" of such theories—and, moreover, would have prohibited local and state administrators from interfering.

The bill represents the third wave of antievolutionist strategy. With the strategies of banning the teaching of evolution and of requiring the teaching of biblical creationism, creation science, or intelligent design no longer feasible, belittling evolution as "controversial" became the preferred strategy within the first decade of the millennium (Branch et al. 2010). In the last decade, over 50 such bills have appeared in state legislatures around the country, passing in Louisiana in 2008 and Tennessee in 2012.

What turned out to be unusual about the Arizona bill, though, was its primary sponsor's motivation: What she regarded as an imbalance in the presentation of climate change in the state's public schools. "I just happen to think that if a person believes that this is not man caused or that man only contributes so much, then they should be able to stand before their class and discuss it," she told the *Arizona Star*. Senate Bill 1213 died in committee, without receiving a hearing, but it was the tip of a menacing iceberg.

It is now routine for evolution and climate change to be targeted together

in attacks on science education in the United States. The 2012 law enacted in Tennessee explicitly refers to both; the 2008 law enacted in Louisiana originally referred to both. In 2013 alone, of the nine antiscience bills introduced in seven states, five of them mentioned global warming: Colorado's House Bill 13-1089, Kansas's House Bill 2306, Montana's House Bill 183, and Oklahoma's House Bill 1674, in addition to Arizona's Senate Bill 1213.

The statehouse isn't the only place where evolution and climate change education are imperiled. In 2009, the Texas State Board of Education amended the state's science education standards in a way that would degrade the treatment of both evolution and climate change in science classrooms and in the textbooks used in the state. Moreover, because Texas is the largest market for textbooks in the United States, publishers typically harmonize their textbooks with its standards. What happens in Texas doesn't stay in Texas.

The new Next Generation Science Standards treat evolution as a core idea of the life sciences and global climate change as part of a core idea of the Earth and space sciences. As a result, they are encountering resistance. The chair of the Kentucky Senate Education Committee complained that there is "no factual evidence" of speciation—"to suppose that it happens is counter to the beliefs of many Kentuckians"—and that there are "several stubborn facts" contradicting the consensus on global change reflected in the Next Generation Science Standards.

Even in the absence of organized opposition to the teaching of evolution, the situation in K–12 classrooms

is famously dire. A rigorous national study of public high school biology teachers conducted in 2007 revealed that a quarter of them were presenting creationism in the classroom, with nearly half of that quarter presenting it as scientifically credible. Less than a quarter of the teachers responding indicated that evolution served as the unifying theme for their biology courses (Berkman et al. 2008).

Although the data are not as rigorous, it seems likely that the situation is comparably dire in the case of climate science. According to a 2011 National Earth Science Teachers Association survey of 555 K–12 teachers who teach climate change, 36 percent were influenced, directly or indirectly, to teach "both sides" of the issue, with 5 percent required to do so (Johnson and Holzer 2011)—although, as surveys of the literature have repeatedly shown, the level of consensus among relevant scientists on climate change is around 97 percent (Cook et al. 2013).

## A call to arms

Since even before the Scopes trial in 1925, biologists have been commendably resisting the danger posed by creationism to the integrity of science education: testifying in court cases and before state legislatures, boards of education, and local school boards; writing articles and books expounding evolution and debunking creationism; engaging in outreach through their universities and professional societies; speaking at local events and ranting on blogs. It is time for biologists to help resist the danger posed by climate change denial, too.

Scientists are in broad agreement about the occurrence, causes, and consequences of climate change; climate

change deniers are wrong to claim otherwise; and science teachers therefore have a responsibility to help their students understand climate change, the evidence for climate change, and the fact that the scientific community agrees that the evidence is convincing. As with evolution, it is important to defend the teaching of climate science simply because it is sound science that students have a need—and a right—to understand.

But if further reasons seem necessary, consider that climate change denial affects the way in which biology is learned and taught, studied and applied. After all, climate science is biologically relevant, playing a role in biological disciplines ranging from agriculture to zoology. A public that lacks climate literacy is a public that lacks biological literacy, and it is only with the existence of a biologically literate public that biology can thrive. Climate change denial is a systematic attack on scientific literacy.

The experience of biologists in combating creationism will stand them in good stead. True, creationism is driven largely by religious conservatism, whereas climate change denial is driven largely by political conservatism (McCright and Dunlap 2011). There is overlap: the National Center for Science Education's analysis of data from a 2009 survey conducted by the Pew Research Center for the People and the Press reveals a significant association ( $\chi^2(2) = 54.49$ ,  $p = 1.5 \times 10^{-12}$ ), with those who reject evolution twice as likely to reject climate change, as well. But there is not identity.

Yet the basic rhetorical strategies of creationists and climate change deniers are the same. Contending that the science is shaky, conjectural, teetering on the verge of collapse, just a theory, controversial; alleging that the science is driven by radical ideological motivations and leads to undesirable social

consequences; and insisting that it is only fair to acknowledge the supposed scientific controversy: These are the three pillars of science denial, recognizable in creationism and climate change denial alike (Branch et al. 2010).

What can biologists do to help? First, they can prepare, by understanding the basics of climate science. They don't have to become climatologists, but they should appreciate the scientific consensus on the occurrence, causes, and consequences of climate change and the converging lines of evidence for it. In addition, they should learn the motivations and arguments of climate change deniers and should be aware of the likely battlegrounds over climate education, from the local classroom to the state legislature.

Second, biologists can support climate education. Part of doing so involves modeling the behaviors themselves: Biologists at the college and university level can readily emphasize the relevance of climate science to biology in their own teaching. But it is also important to support climate education in formal and informal venues locally and, through their professional societies, nationally. Unlike evolution, climate science is not yet comfortably enconced in the K–12 educational system; there is a lot of work to do before it is.

And third, biologists can take action when there is a local controversy over climate education, working to resolve the controversy cordially but without compromising on the quality of science education. As with evolution education, science alone isn't enough to resolve such controversies, but by joining in broad coalitions to defend the integrity of science education, biologists can help explain the consensus of the scientific community on climate change and emphasize the scientific methodology on which the consensus is founded.

When the chair of the Texas State Board of Education, Don McLeroy, urged his colleagues to degrade the treatment of evolution and climate change in the state science standards in 2009, his rallying cry, notoriously, was "Someone has to stand up to these experts!" Not all biologists are experts on climate change, just as not all biologists are experts on evolution. But on the teaching of climate change no less than on the teaching of evolution, the biological community's voice deserves to be heard. Experts, in short, have to stand up to the likes of McLeroy.

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