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# Humility, Climate Change, and the Pursuit of Scientific Truth

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# HUMILITY, CLIMATE CHANGE, AND THE PURSUIT OF SCIENTIFIC TRUTH

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"I'm not a scientist" became quite the meme in 2014. President Barack Obama, Speaker of the House John Boehner, and countless other politicians uttered the phrase when speaking about climate science. Of course, only a few of us are scientists by profession. But we elect and appoint leaders who are not scientists even though those leaders must answer many scientific questions. Obama and Boehner studied political science and business, respectively.[1]

Only a handful of the current 535 members of Congress are scientists.[2] John Davis, a physician who served as the Speaker of the House from 1845 to 1847, was the closest that we have come to having



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1 The status of political science as a science has provoked a recent debate in Congress. *See* 159 CONG. REC. S4104 (daily ed. Mar. 20, 2013) (statement of Sen. Coburn) (proposing to eliminate National Science Foundation funding for political science projects unless they promote "national security or the economic interests of the United States"). But that is not the kind of science that I'm talking about here.

2 *See* John Allen Paulos, Opinion, *Why Don't Americans Elect Scientists?*, N.Y. TIMES: CAMPAIGN STOPS (Feb. 13, 2012), https://campaignstops.blogs.nytimes.com/2012/02/13/why-dont-americans-elect-scientists/ [https://perma.cc/4H7C-SAKF] (reporting that "[a]mong the 435 members of the House, for example, there are one physicist, one chemist, one microbiologist, six engineers and nearly two dozen representatives with medical training").

a Speaker who was a scientist.[3] Several presidents were amateur scientists, such as Thomas Jefferson and Theodore Roosevelt, while Jimmy Carter was a nuclear engineer. But again, no president majored in biology, chemistry, physics, or similar sciences. And predictably, all members of the Supreme Court are trained in law, not science. We should not be surprised, then, when our political leaders exclaim "I am not a scientist" to explain why they are unable to answer a question or to justify their consultation with scientific experts.[4]

The unifying premise of such remarks is that the speaker does not have personal expertise. Usually, that is not a problem because there is no real controversy about what science reveals. But when science engages with politically controversial topics, non-scientists are often asked what they "believe"—not what they "know"—in a manner reminiscent of discussions about claims of religious truths. The recurring question "Do you believe in climate change?" suggests that the answer depends on whether one believes in science as a source of truth—or not. While Representative Boehner suggested he was unqualified to debate the nature of climate change, President Obama viewed the "I'm not a scientist" refrain as a cop-out. He lamented that "today's Congress . . . is full of folks who stubbornly and automatically reject the scientific evidence about climate change," yet he respected their willingness "to say what they actually think."[5] By contrast, he criticized those who "duck the question" by protesting "'I'm not a scientist.'"[6] "What that really means is," said the President, "'I know that manmade climate change really is happening, but if I admit it, I'll be run out of town by a radical fringe that thinks climate science is a liberal plot, so I'm not going to admit it.'"[7] Obama then explained how he approached his lack of scientific credentials. "I'm not a scientist either, but we've got some really good ones at NASA. I do

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3 *See DAVIS, John Wesley: 1799–1859*, BIOGRAPHICAL DIRECTORY OF THE U.S. CONG., https://bioguideretro.congress.gov/Home/MemberDetails?memIndex=D000120 [https://perma.cc/PA3C-BRSZ]. Davis graduated from the Baltimore Medical College in 1821 and then moved to practice medicine in Indiana. *Id.* He declined to run for reelection to the House after his sole term as Speaker. Instead, he accepted President Polk's appointment as Commissioner to China and then President Pierce's appointment as Governor of Oregon Territory. *Id.*

4 *Cf.* Adrian Vermeule, *Should We Have Lay Justices?*, 59 STAN. L. REV. 1569, 1570 (2007) (noting that "there is no constitutional or statutory rule that requires" Supreme Court Justices to be accredited lawyers).

5 President Barack Obama, Remarks by the President at University of California-Irvine Commencement Ceremony (June 14, 2014) (transcript available at https://obamawhitehouse.archives.gov/the-press-office/2014/06/14/remarks-president-university-california-irvine-commencement-ceremony [https://perma.cc/JG7Z-VS33]).

6 *Id.*

7 *Id.*

know that the overwhelming majority of scientists who work on climate change, including some who once disputed the data, have put that debate to rest."[8]

The transition from the Obama Administration to the Trump Administration confirmed that science has become one of the most contested parts of environmental law. President Trump's opponents accuse him of indifference or hostility toward scientific reasoning. President Trump's supporters complain that EPA relied on flawed and biased science during the Obama Administration. These contrasting views were displayed during a January 2017 congressional hearing on "Making EPA Great Again." One witness asserted that "our country's future, and indeed all of humanity's future, becomes dangerously compromised" unless we are able to cultivate more "reverence for evidence in our policy making."[9] Another witness countered that scientific experts "have become nothing more than rubberstamps who approve all of the EPA's regulations."[10] A few weeks later, the confirmation hearing for EPA Administrator Scott Pruitt was even more contentious. Pruitt acknowledged the existence of climate change, but when Senator Bernie Sanders pressed him to acknowledge that human activity is causing climate change, Pruitt demurred. The perceived "war on science" provoked the April 2017 "March for Science," but predictably, those marching for science incited a

8 *Id.* Obama made similar criticisms in another speech before the League of Conservation Voters. *See* President Barack Obama, Remarks by the President at League of Conservation Voters Capital Dinner (June 25, 2014) (transcript available at https://obamawhitehouse.archives.gov/the-press-office/2014/06/25/remarks-president-league-conservation-voters-capital-dinner [https://perma.cc/Q2G6-N8HL]). Numerous pundits echoed Obama's criticism. *See, e.g.*, Ben Cosman, *Jon Stewart Analyzes the Republican Strategy of 'I'm Not a Scientist,'* THE WIRE (June 5, 2014), https://www.theatlantic.com/culture/archive/2014/06/jon-stewart-analyzes-the-republican-strategy-of-im-not-a-scientist/372210/ [https://perma.cc/923C-LM6T]; Jonathan Chait, *Why Do Republicans Always Say 'I'm Not a Scientist'?*, INTELLIGENCER (May 30, 2014), https://nymag.com/intelligencer/2014/05/why-republicans-always-say-im-not-a-scientist.html [https://perma.cc/GUE5-79WR]; Steve Benen, *Florida's Rick Scott: 'I'm Not a Scientist,'* MSNBC (May 27, 2014), https://www.msnbc.com/rachel-maddow-show/floridas-rick-scott-im-not-scientist-msna337106 [https://perma.cc/G9U8-NHHB].

9 *Hearing Before the H. Comm. on Sci., Space & Tech.*, 115th Cong. (2017) (written testimony of Rush Holt, Chief Executive Officer, American Association for the Advancement of Science, Executive Publisher, *Science*) (available at https://science.house.gov/imo/media/doc/Rush%20Holt%20Testimony.pdf).

10 *"Making EPA Great Again": Hearing Before the H. Comm. on Sci., Space & Tech.*, 115th Cong. 4 (2017) (statement of Rep. Lamar S. Smith, Chairman, H. Comm. on Sci., Space & Tech.) [hereinafter Making EPA Great Again].

pushback accusing them of having "culturally appropriated science to push a purely political agenda."[11]

This Essay begins with the understanding that environmental law could not exist without science. The tolerable amount of pollution, the proximity of a species to extinction, and the threats presented by climate change are just some of the questions that environmental law depends on science to answer. Often environmental law insists that science alone is relevant to a particular regulatory action, such as an air pollution standard or an endangered species listing. It is not surprising, therefore, that many disputes about environmental law are really disputes about science.

Science, however, does not always yield the information that environmental law needs or that interested parties want. Disputes over the status of the pika illustrate this predicament. The pika is a small mammal that lives in rock piles in very high elevations in the Rocky Mountains.[12] Pikas are also a favorite of my daughter's, so we sought them out during a visit to Rocky Mountain National Park. Watching them scurry across the rocks, one would never know that "the pika is toast."[13] That is how leading environmental law scholar J.B. Ruhl began his seminal article on the evolving application of the Endangered Species Act (ESA) to wildlife whose existence is endangered by climate change.[14] Pikas were thought to be especially vulnerable to climate change because they live only at high elevations with chilly weather.[15] But we have since learned that pikas may be more adaptable to a warming climate than scientists once believed. The federal government thus concluded in 2010 that the pika is not in danger of extinction within the meaning of the ESA.[16]

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11 Alex Berezow, *March for Science: How Democracy Kills Expertise*, AM. COUNCIL ON SCI. & HEALTH (Mar. 20, 2017), https://www.acsh.org/news/2017/03/20/march-science-how-democracy-kills-expertise-11026 [https://perma.cc/HL4G-RAJZ].

12 J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. REV. 1, 2–3 (2008).

13 *Id.* at 2.

14 *Id.*

15 *See id.* at 3–4.

16 Endangered and Threatened Wildlife and Plants; 12-month Finding on a Petition to List the American Pika as Threatened or Endangered, Part II, 75 Fed. Reg. 6438 (Feb. 9, 2010) (to be codified at 50 C.F.R. pt. 17). *But see* Ruhl, *supra* note 12, at 4–5.

*A pika posing for me in Rocky Mountain National Park*

The ESA, like many other environmental laws, asks a purely scientific question: "Is the pika in danger of going extinct?"[17] If it is, the pika gets listed and protected by the law. If the pika is not in danger of going extinct, it remains legally unprotected from any activities that would cause it harm. The ESA demands that science—and science alone—answer the question of whether the pika is an endangered species eligible for the protection of the law. Only then, if the pika is found to be endangered, does the ESA broaden its view and incorporate other values, including economic ones, into decisions about how to rescue the species.[18] Yet even that single inquiry ("Is the pika in danger of going extinct?") illustrates many of the challenges that confront the application of science to environmental law. First, environmental law presumes there is an objectively *true* answer to the scientific question. Second, the science that informs environmental law is subject to *uncertainty*. Third, environmental law must confront the fact that scientific teaching is sometimes subject to *unbelief*.

17 *See* J. B. Ruhl, *The Battle over Endangered Species Act Methodology*, 34 ENV'T L. 555, 573 (2004).

18 *See* Ruhl, *supra* note 12, at 27, 37 (describing the ESA's science provisions).

My argument is that the virtue of humility provides a needed framework for addressing each of these challenges. Christian teaching—particularly evangelical thinking—may seem like a strange place to turn to engage environmental law's reliance on science. Yes, those at the forefront of the scientific revolution were Christian adherents who perceived science as a means of understanding more about the world that God created. But the Christian roots of modern science weakened over the course of several centuries. Evangelicals became wary of scientific claims that they regarded as contrary to biblical teaching, such as Darwin's theory of evolution. There is a notable diversity of opinion among evangelicals with respect to the precise relationship between biblical teaching about creation and scientific teaching about evolution, but it remains true that evangelicals are more cautious in approaching evolutionary science than are other segments of the public.

That caution also affects attitudes toward the scientific basis for environmental law. Some in the evangelical community see scientists and environmentalists as hostile to Christianity. These concerns are fueled by recent studies indicating that scientists are more secular than the general population. For their part, many scientists worry that religious teachings are antithetical to the project of environmental law. "If you don't believe in the evolutionary sciences," claims Chip Ward, "chances are you also don't heed or trust the ecological sciences that underlie environmental law and policy."[19] Of course, there are many scientists who seek to integrate their religious beliefs and their scientific expertise. And there are observers who question the use of science in environmental policy without claiming any religious commitment. Nonetheless, the basis for Christian belief is generally regarded as distinct and profoundly different from the basis for belief in the claims of science.

And yet, Christianity and science struggle with the same fundamental challenges: learning the truth and communicating it to others. The experience of Christians in engaging those challenges equips them to make sense of environmental science and environmental law. Let's now examine how Christian teaching and the virtue of humility can inform the scientific challenges confronted by environmental law. Truth exists, and we should seek it, even as we recognize that certain human impulses cause affirmative attempts to

19 Chip Ward, *Bush's Holy War on Nature*, TOMDISPATCH (Sept. 15, 2005), https://tomdispatch.com/chip-ward-bush-s-holy-war-on-nature/ [https://perma.cc/H6UN-YQTT]; *see also Public Praises Science; Scientists Fault Public, Media*, PEW RESEARCH CENTER (July 9, 2009), https://www.pewresearch.org/politics/2009/07/09/public-praises-science-scientists-fault-public-media/ [https://perma.cc/5M8U-2YFW] [hereinafter Pew Poll].

obscure scientific truth. Uncertainty exists, and when we confront a world in which scientific evidence narrows the range of possibilities but leaves policymakers without certain guidance, we should employ a trial-and-error strategy for the incremental collection of additional knowledge. Finally, unbelief exists, and we must accept that it will persist even as we strive to address the sometimes legitimate concerns of those who decline to believe the prevailing scientific lessons.

## TRUTH

"What is humility," a nineteenth century writer proclaimed, "but heartfelt love of, and practical conformity to truth . . . ?"[20] Every year the editors of the Oxford dictionaries select a word of the year. Their choice in 2016 was "post-truth."[21] They defined the adjective as "relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief."[22] The term gained currency in political debate, especially with the rise of Donald Trump.

The dismissal of truth is related to "the death of expertise," which is the title of Tom Nichols's recent book.[23] Nichols worries that people no longer care about truth.[24] Indeed, they actively dismiss it. "The United States," he contends, "is now a country obsessed with the worship of its own ignorance."[25] As truth recedes, we resent those experts who cling to a special claim on correctness. Of course, Americans have always had an anti-intellectual side. Alexis de Tocqueville observed in 1835 that "each American appeals only to the individual effort of his own understanding," thus destroying "the disposition for trusting the authority of any man whatsoever."[26] Historically, evangelicals have been particularly guilty of anti-intellectualism.[27] But hostility to truth has become a badge of honor across our public discourse—and especially on social media. The resulting death of expertise, writes Nichols, "is fundamentally a

20 HENRY EDWARDS, THE NATURE, GROUNDS, AND CLAIMS OF CHRISTIAN HUMILITY 11 (London, H.G. Clarke & Co. 1845).

21 *See Word of the Year 2016*, OXFORDLANGUAGES, https://en.oxforddictionaries.com/word-of-the-year/word-of-the-year-2016 [https://perma.cc/P4DD-GFBN].

22 *Id.*

23 TOM NICHOLS, THE DEATH OF EXPERTISE: THE CAMPAIGN AGAINST ESTABLISHED KNOWLEDGE AND WHY IT MATTERS (2017).

24 *See id.* at ix–x.

25 *Id.* at ix.

26 2 ALEXIS DE TOCQUEVILLE, DEMOCRACY IN AMERICA 2–3 (Francis Bowen ed., Henry Reeve trans., Cambridge, Sever & Francis 4th ed. 1864).

27 *See* MARK NOLL, THE SCANDAL OF THE EVANGELICAL MIND (1994).

rejection of science and dispassionate rationality, which are the foundations of modern civilization."[28]

There is a vast philosophical literature that explores the nature of truth and whether it even exists. Christianity and science both insist that there is such a thing as objective truth. Jesus declared that "I am the way, and the *truth*, and the life"[29] and that "the truth will set you free."[30] In a certain sense, the heart of the Christian message is that truth is worth pursuing. Science too insists that there is a such a thing as truth. The earth moves around the sun, or the sun moves around the earth; both cannot be true. Science suggests that you can answer precise questions about human interactions with the natural environment. How much pollution in the air or the water can we tolerate before we get sick? What are the harms that may result from climate change? Will an endangered plant survive in a new habitat? And yet the scientific method encourages a kind of humility as we try to answer such questions. Trial-and-error, replication, peer review, and other practices of modern scientific research seek to ensure that our scientific conclusions are truthful. The epistemic humility associated with the advancement of science acknowledges that we may not be able to discover the answer to every question that environmental law asks.

Claims of scientific truth require three responses from environmental law. First, we must acknowledge that truth exists. Second, we must actively pursue the truth. And third, we must not reject the truth. I'll consider each response in turn.

*Acknowledging the truth.* Some strains of science actually cut against the idea of objective truth. "Post-normal science" is the term that philosophers of science use to call on science to give normative weight to its decisions. This view questions the traditional premise that science is disinterested and value neutral. Instead, post-normal science encourages tilting the scales toward a particular outcome. The leading proponent of post-normal science, Jerry Ravetz, sees "[t]he preservation of safety" as "a new function for science" because science itself "has produced new threats, some potentially catastrophic and others insidious."[31]

Such science feeds the suspicion that environmental science is simply another type of political advocacy for one's desired environmental policy. It feeds the distrust of environmental science.

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28 NICHOLS, *supra* note 23, at 5.

29 *John* 14:6 (emphasis added).

30 *John* 8:32.

31 Jerry Ravetz, *The Post-Normal Science of Safety*, *in* SCIENCE AND CITIZENS: GLOBALIZATION & THE CHALLENGE OF ENGAGEMENT 43, 43–44 (Melissa Leach, Ian Scoones & Brian Wynne eds., 2005).

Environmental law itself has declined to embrace post-normal science. Environmental statutes are careful to identify the questions that science is supposed to answer. Moreover, the process of environmental regulation provides numerous opportunities to examine the scientific truth of relevant scientific claims. Christian teaching reinforces that emphasis by insisting that truth claims be examined to discern their veracity and to ensure that the human tendency to conflate one's own views with truth does not seep into environmental law.[32]

*Pursuing the truth.* Truth does not simply emerge for environmental law; we must find it. So, for example, how many fish are there in the sea? "[C]ounting fish is a lot like counting trees, except that fish swim and consume each other."[33] Fisheries are managed under the Magnuson Stevens Act (MSA), a federal law intended to maintain sustainable populations of fish.[34] The MSA requires a specific factual determination of how many fish can be caught without jeopardizing the stock's ability to replenish itself.[35] Unsurprisingly, it is difficult to identify that number of fish. The butterfish, for example, lives off the Atlantic coast and "has a very short lifespan (1–3 years), high natural mortality, highly uncertain and variable survey indices, and exceedingly variable catch estimates."[36] The difficulty in measuring the status of the butterfish means that

> [i]t is possible even in 10 years we will still not have an assessment that provides much reliable information about the condition and productivity of the butterfish stock. If we did have such an assessment, it would be out of date upon completion because most of the butterfish that were alive then will be dead before final review of the assessment, and even less would be alive by the time that information worked its way through the specification process.[37]

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32 E. Calvin Beisner, The Competing World Views of Environmentalism and Christianity 7 (Nov. 10, 2020) (unpublished manuscript) (available at http://www.cornwallalliance.org/docs/THECOM~1.PDF); MARK A. NOLL, JESUS CHRIST AND THE LIFE OF THE MIND 80–82 (2011).

33 *Implementation of the Magnuson-Stevens Fisher Conservation and Management Act: Hearing Before the S. Subcomm. on Oceans, Atmosphere, Fisheries, & Coast Guard of the Comm. on Com., Sci. & Transp.*, 112th Cong. 7 (2011) (statement of Hon. Olympia J. Snowe, U.S. Sen. from Maine).

34 *See id.* at 1 (statement of Hon. Mark Begich, U.S. Sen. from Alaska).

35 *Id.* at 12–16 (statement of Eric C. Schwaab, Assistant Administrator, National Marine Fisheries Service, National Oceanic and Atmospheric Administration).

36 *NOAA's Fishery Science: Is the Lack of Basic Science Costing Jobs?: Oversight Hearing Before the Subcomm. on Fisheries, Wildlife, Oceans & Insular Affairs of the H. Comm. on Nat. Res.*, 112th Cong. 85 (2011) [hereinafter 2011 House Hearing] (statement of Gregory DiDomencio, Executive Director, Garden State Seafood Association, Cape May, New Jersey).

37 *Id.*

Learning the scientific truth about butterfish is difficult, but that is what the MSA requires.

The MSA establishes procedures for counting the fish in the sea as well as the other factors that determine the sustainable level of fishing. The National Marine Fisheries Service (NMFS) employs peer reviewers of its scientific determinations, but one report cited in a recent congressional hearing complained that those reviewers "usually lack local knowledge of data, stocks, fishery management context, and the basis for past advice."[38] Another witness accused those responsible for implementing the MSA of relying on "[a] hodgepodge of information that perhaps may add up to an informed guess."[39]

An informed guess is not good enough. It is not good enough for environmentalists trying to protect fish, but neither is it good enough for the fishing industry. Environmentalists often demand better science in the service of strengthening environmental law, but this is an example in which the regulated industry desires better science, too. Fishing interests say, in essence, "if we knew the truth, we might be able to fish more." For this reason, they promote "cooperative research," an approach founded on the premise that government-funded scientists are not the only source of valuable scientific information. The participants in cooperative research programs include industry groups, non-governmental organizations (NGOs), universities, state agencies, and fishermen themselves. A National Academies of Science study sees

> great scientific potential in cooperation between scientists and fishermen. Fishermen bring field experience, practical knowledge, and platforms for collection of data. Scientists bring experimental design, the scientific method, and data synthesis. By bringing together the knowledge and skills of these two groups, the quality, quantity, and relevance of research may be greatly improved.[40]

Additionally, such cooperation helps to overcome what the National Academy of Sciences study described as the "[p]erception of [a]rrogance."[41] That perception arises because of the contrasting "cultural milieu" of fishermen and scientists. "When a fisherman says that 'scientists are arrogant' or when a scientist feels that fishermen are 'aloof and uninterested,' it may be that cultural differences are getting

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38 MICHAEL SISSENWINE & BRIAN ROTHSCHILD, BUILDING CAPACITY OF THE NMFS SCIENCE ENTERPRISE 22 (2011), https://www.st.nmfs.noaa.gov/Assets/science_program/07_sciencerept.pdf.

39 2011 House Hearing, s*upra* note 36, at 69 (statement of Jefferson Angers, President, Center for Coastal Conservation).

40 NATIONAL RESEARCH COUNCIL, COOPERATIVE RESEARCH IN THE NATIONAL MARINE FISHERIES SERVICE 10 (2004).

41 *Id.* at 91.

in the way."[42] By working together in cooperative research programs, fishermen and scientists can gain a better appreciation for the ways that each other acquires knowledge about fisheries. Cooperative research, in other words, is humility in action.

*Denying the truth.* In his letter to early Christians in Rome, the apostle Paul warned of "those who are self-seeking and who reject the truth"[43] and of those "who exchanged the truth about God for a lie."[44] One sees echoes of these charges in numerous episodes that have occurred throughout environmental history. The Ethyl Corporation denied that adding lead to gasoline caused any health problems. Auto manufacturers denied that cars were responsible for the worsening air pollution in Los Angeles during the 1940s and 1950s. Pesticide manufacturers denied that DDT was the cause of the silent spring that Rachel Carson observed.

The Bush Administration faced repeated criticism for allegedly rejecting scientific truth. Books appeared with titles such as *The Republican War on Science* and *Undermining Science: Suppression and Distortion in the Bush Administration.* The Union of Concerned Scientists (UCS) published several reports with the same theme, and Congress held hearings to investigate "science under siege."[45] The examples cited to justify these charges included the administration's exaggeration of the viability of endangered Florida panthers (ostensibly to accommodate more development in southern Florida); its understatements about the impact of timber harvesting on forest health; and its denial of the threat presented by climate change. The alleged tactics included political officials ordering scientists to alter technical information in scientific documents or public reports, selective use of data or edits to change the meaning of scientific findings to better serve a desired policy outcome, and the refusal to release unwanted scientific information.[46] There were often plausible justifications for any particular action, but it was difficult not to see a pattern of agency discomfort with the release of scientific information contradicting that agency's preferred policies.[47]

Complaints regarding government manipulation of environmental science persisted during the Obama Administration.

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42 *Id.*

43 *Romans* 1:25.

44 *Romans* 2:8.

45 *See Science Under Siege: Scientific Integrity at the Environmental Protection Agency: Hearing Before the Subcomm. on Oversight & Investigations of the H. Comm. on Energy & Commerce,* 110th Cong. (2008).

46 *Id.* at 48 (statement of Francesca Grifo, Ph.D., Senior Scientist, Director, Science Integrity Program, Union of Concerned Scientists).

47 *Id.* at 48–50.

Environmentalists objected to the science used by the Fish and Wildlife Service (FWS) to justify the removal of wolves from the endangered species list[48] and to shrink the habitat of the endangered American burying beetle near the path of the proposed Keystone XL pipeline.[49] When a Department of the Interior press release exaggerated the benefit to salmon of the removal of dams along the Klamath River, an outside report deemed it simply a case of "false precision," not intentional falsification.[50] And opponents of tougher environmental regulation routinely contended that EPA's scientific determinations exaggerated the scientific truth.

All of that was before Donald Trump, who has a strained relationship with the truth in contexts far beyond environmental policy. Six months into Trump's presidency, the Union of Concerned Scientists accused his administration of showing "a blatant disregard for scientific facts and evidence" and of "appointing officials with a track record of misrepresenting scientific information."[51] Others charged the administration with eliminating inconvenient truths from agency websites, reassigning troublesome agency employees, and seeking to invent scientific debates where none exist.

The charges against private entities that obscure climate science are even more severe. "For more than two decades," Rhode Island's Senator Sheldon Whitehouse proclaimed in 2012, "the climate denial movement has been well-organized and funded by the fossil fuel

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48 Phil Taylor, *WOLVES: FWS Failed to Use "Best Available Science" in Delisting—Review Panel*, E&E NEWS PM (Feb. 7, 2014), https://plus.lexis.com/document?crid=b81545e7-ec79-48b3-8d23-1a8efbe345b5&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A5BP0-TKH1-F066-G11K-00000-00&pdsourcegroupingtype=&pdcontentcomponentid=302445&pdmfid=1530671&pdisurlapi=true [https://perma.cc/L4WD-VK2A].

49 Emily Yehle, *INTERIOR: How Shoddy Science Almost Led One Agency to Use Flawed Map in Keystone XL Review*, GREENWIRE (Aug. 8, 2013), https://plus.lexis.com/document?crid=8066d5f7-7a97-4197-a902-4dd012b8be46&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A5990-06N1-JBSK-R2HF-00000-00&pdsourcegroupingtype=&pdcontentcomponentid=8322&pdmfid=1530671&pdisurlapi=true [https://perma.cc/2LX2-RVG3].

50 Emily Yehle, *INTERIOR: Press Releases on Dam Removal Suffered From "'False Precision,'" Not Inaccuracy—Expert Panel*, GREENWIRE (Mar. 27, 2013), https://plus.lexis.com/document?crid=3a982990-f5ec-43a2-9f2f-ad065052a193&pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A588K-CYF1-DY7N-F17R-00000-00&pdsourcegroupingtype=&pdcontentcomponentid=8322&pdmfid=1530671&pdisurlapi=true [https://perma.cc/J9XQ-TT9A].

51 JACOB CARTER ET AL., SIDELINING SCIENCE SINCE DAY ONE: HOW THE TRUMP ADMINISTRATION HAS HARMED PUBLIC HEALTH AND SAFETY IN ITS FIRST SIX MONTHS 1–2 (2017).

industry and conservative ideologues and foundations. The mission of these paid-for deniers is to 'manufacture uncertainty,' to manufacture doubt so the polluters can keep on polluting."[52] Again, popular books with titles such as *The Inquisition of Climate Science* and *Global Warming and Political Intimidation* join environmental activists and political leaders in decrying the corporate effort to discredit the scientific consensus regarding climate change. They blame the popular confusion surrounding climate change science on affirmative efforts to mislead the public by way of research designed to reach a foreordained conclusion. They point also to efforts to discredit individual climate scientists[53] and to create "independent" organizations that are in fact dedicated to promoting a false scientific message.[54]

The impulse to shade inconvenient truths is understandable given the automatic operation of environmental regulations. Several environmental laws impose stringent regulation immediately upon specified determinations, such as the amount of an air pollutant that harms human health or the point at which a species is endangered with extinction. If you are told that the law is settled about what triggers the protection of a species, or about how much pollution we're willing to tolerate, or when land must be designated as wilderness, then the language of science becomes essential. The inexorable connection between scientific truth and government regulation ensures that potentially regulated parties will oppose the former to avoid the latter. At the same time, it is equally problematic for advocates of environmental regulation to portray scientific truth as the mere means to an end. When a Canadian environment minister stated that it didn't matter "if the science is all phony" because the specter of climate change afforded "the greatest chance to bring about justice and equality in the world," she unwittingly offered support for the fear that post-normal science doesn't really care about truth at all.[55]

Christianity insists that we have nothing to fear from the truth. Christian teaching and scientific understanding share the desire to identify the truth, and they insist that the discovery of truth is worthy of continuous effort. What the church once feared, it should (and

52 158 CONG. REC. S7427 (daily ed. Dec. 5, 2012) (statement of Sen. Whitehouse).

53 RAYMOND S. BRADLEY, GLOBAL WARMING AND POLITICAL INTIMIDATION: HOW POLITICIANS CRACKED DOWN ON SCIENTISTS AS THE EARTH HEATED UP 3 (2011).

54 158 CONG. REC. S7428 (daily ed. Dec. 5, 2012) (statement of Sen. Whitehouse).

55 ROBERT ZUBRIN, MERCHANTS OF DESPAIR: RADICAL ENVIRONMENTALISTS, CRIMINAL PSEUDO-SCIENTISTS, AND THE FATAL CULT OF ANTIHUMANISM 219 (2012) (quoting reporting by Terence Corcoran, *Global Warming: The Real Agenda* NAT'L POST (Dec. 26, 1998), http://junksciencearchive.com/dec98/corcoran.html [https://perma.cc/46YN-BTQB]).

often does) now embrace. Environmental science should continue to do the same.

## UNCERTAINTY

The scientific truth about the environment is often hard to learn even when we actively seek it. Is the pika in danger of extinction or not? Is the continued catching of butterfish sustainable or not? The problem, as explained by the Supreme Court, is that "arguably, there are no certainties in science." [56] We are unraveling many of the complexities of the world, but because there is so much we cannot explain, humility demands us to acknowledge the limits of our understanding. That is a familiar problem for Christian teaching, which reminds us that we can never know everything about the world because we are not God.

Much environmental science is predictive, and few if any predictions about the future are guaranteed to be correct. Pollution control regulations often rely on computer models of the future, and those models are a frequent source of legal disputes. Climate change models are especially controversial because of the great number of variables and the lengthy timeframes involved. Wetlands restoration, wildlife preservation, and forest management all depend on scientific judgments about the interplay of new and existing factors within ecosystems that are already extraordinarily dynamic even in the absence of human intervention. And scientific uncertainty is always increasing because science is "never finished," for today's knowledge is inevitably supplemented or replaced by what science learns in the future.[57]

Thus environmental law needs to grapple with scientific uncertainty. Again, Christian teaching can be helpful in accommodating this idea of scientific uncertainty because religious believers are particularly familiar with the need to act without the kind of definitive, empirical evidence that people expect and that the law sometimes demands. That is not to say that there isn't evidence for the Christian faith or for other religious beliefs, but rather that the evidence is often of a different sort or defies standards of proof.

We see a related phenomenon in environmental disputes when the law requires a decision to be made, yet the relevant scientific evidence is equivocal. Consider ozone. So-called ground level ozone is created by the chemical reaction of sunlight with emissions from

56 Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579, 590 (1993).

57 *See* NAOMI ORESKES & ERIK M. CONWAY, MERCHANTS OF DOUBT: HOW A HANDFUL OF SCIENTISTS OBSCURED THE TRUTH ON ISSUES FROM TOBACCO SMOKE TO GLOBAL WARMING 76 (2010).

factories, cars, and other sources. Breathing too much ozone can cause chest pain, worsen asthma, and reduce lung function. The Clean Air Act (CAA) combats such pollution by directing EPA to establish national ambient air quality standards (NAAQS) that are based on the amount of ozone that can exist in the atmosphere without harming public health and include a margin of safety that accounts for uncertainty.

Scientists have been studying the effects of ozone for decades, and while they have learned a great deal, they still cannot say with precision how much ozone is "safe" and how much is harmful. Here are some possible numbers:

| **Ozone concentrations in the atmosphere (parts per billion)** | **Source of data** |
|---|---|
| 120 | 1979 EPA standard |
| 80 | 1971 & 1997 EPA standard |
| 75 | Bush EPA 2008 proposed standard |
| 70 | Obama EPA proposed standard |
| 50 | Evidence of some health effects |
| 15–35 | Background levels |

The ozone standard was once set as high as 120 parts per billion (ppb), in the beginning of 1979. The lowest standard would be 35 ppb, the background level of natural ozone in the atmosphere. Given current understandings, the correct standard is likely somewhere between 50 and 80 ppb. Do we want 75 ppb, which is what the Bush Administration purposed in 2008, much to the chagrin of the environmental community? Do we choose 60, 65, or 70 ppb? That is the range proposed by the Clean Air Scientific Advisory Committee (CASAC), the scientific body established by the CAA to work with EPA. CASAC concluded that there is a window between 60 and 70 ppb that is the appropriate number. But CASAC acknowledged that even at 50 ppb you can see some health effects.

The administrative and judicial battle over the proper ozone standard raged throughout the Obama Administration into the Trump Administration. In April 2017, a federal court granted EPA's request to defer the litigation challenging the standard. As the D.C. Circuit

explained, "EPA finds itself in a situation reminiscent of *Goldilocks and the Three Bears* . . . . But unlike Goldilocks, this court cannot demand that EPA get things 'just right.'"[58] There is not a definitive scientific answer to the question of what the "just right" ozone standard is. Science can narrow the range of possibilities. It can tell us that to try to establish a level of ozone in the atmosphere of 20 ppb is silly, if not impossible, given that 20 ppb is below the background level. And science can tell us that a standard as high as 200 ppb is going to have some dire consequences. But a more exact identification of the point at which ozone becomes harmful is beyond the capacity of our current scientific understanding.[59]

Examples abound of environmental law requiring action in the face of scientific uncertainty. The CAA's regulation of mercury emissions provoked a similar debate about the relevant scientific evidence, including a debate between competing camps of evangelicals. EPA is required to decide whether or not to issue water pollution permits within a set timeframe, even if the science regarding a facility's pollution remains uncertain. A federal court of appeals, addressing such a circumstance, wrote that "[i]n almost every case, more data can be collected, models further calibrated to match real world conditions; the hope or anticipation that better science will materialize is always present, to some degree, in the context of science-based agency decisionmaking."[60]

The ESA context is especially rife with scientific uncertainty. The threshold question of whether or not a species is in danger of extinction is notoriously difficult to answer. Besides the pika described at the beginning of this chapter, the problem is illustrated by the Queen Charlotte goshawk, which the FWS declined to list based on scientific evidence that was admittedly flawed and inconclusive.[61] A court upheld that decision because that evidence was the best available.[62] By contrast, the FWS listed the White Bluffs bladderpod—a plant that lives only in southern Washington—even though the agency admitted that "[b]ecause of its recent discovery and limited

58 Mississippi v. EPA, 723 F.3d 246, 260 (D.C. Cir. 2013).

59 *See id.*; *Timeline of Ozone National Ambient Air Quality Standards (NAAQS)*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ground-level-ozone-pollution/timeline-ozone-national-ambient-air-quality-standards-naaqs_[https://perma.cc/ML5C-S4SG].

60 Upper Blackstone Water Pollution Abatement Dist. v. EPA, 690 F.3d 9, 23 (1st Cir. 2012), *cert. denied*, 569 U.S. 972 (2013).

61 *See* Sw. Ctr. for Biological Diversity v. Norton, No. 98-934, 2002 WL 1733618, at *6, *9 (D.D.C. 2002).

62 *Id.* at *13; Julie Lurman Joly, Joel Reynolds & Martin Robards, *Recognizing When the "Best Scientific Data Available" Isn't*, 29 STAN. ENV'T. L.J. 247, 251–52 (2010).

range, little is known of the [plant's] life-history requirements."[63] When questioned about the listing at a congressional hearing, the head of the FWS admitted, "[s]cience doesn't provide us with an answer, it is not black and white."[64] The problem of scientific uncertainly persists once a species is listed. Litigation over conflicting evidence about the status of polar bears—with environmentalists insisting that polar bears are in danger of extinction and the state of Alaska objecting that polar bears are thriving—illustrates what Eric Biber describes as the "tremendous uncertainty" surrounding the question of "whether a particular decision will lead to the extinction of a species."[65]

Christian teaching is comfortable with such uncertainty because it acknowledges that there are some things that we are not yet, if ever, capable of understanding. Christianity embraces mystery. As one writer put it:

> Mystery acknowledges that, while we cannot know absolutely everything about, say, a particular ecosystem, there is nothing to stop us from knowing *more* about it, infinitely so. Mystery recognizes the provisional nature of our explanations and the inexhaustibility of our investigations. The world will always be more than what we know. Mystery is being grasped by something larger than ourselves, ever compelling us to stretch, rather than limit, the horizons of our awareness. Under the rubric of wonder, mystery has its place alongside understanding."[66]

Such statements are eloquent, but useless for law because law doesn't do mystery well. Law requires numbers and rules and standards that can guide our conduct and are capable of being judged. And so when the law tries to address uncertainty, it needs something outside of science to decide how to proceed.

Environmental law employs several responses to scientific uncertainty. One possibility is to hold at bay the coercive power of the law until the requisite scientific knowledge can be obtained. This

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63 Endangered and Threatened Wildlife and Plants; Threatened Status for *Eriogonum codium* (Umtanum Desert Buckwheat) and *Physaria douglasii* subsp. *tuplashensis* (White Bluffs Bladderpod), 78 Fed. Reg. 23,984, 23,988 (Apr. 23, 2013) (to be codified at 50 C.F.R. pt. 17).

64 *Transparency and Sound Science Gone Extinct? The Impacts of the Obama Administration's Closed-Door Settlements on Endangered Species and People: Oversight Hearing Before the H. Comm. on Nat. Res.*, 113th Cong. 38 (2013) [hereinafter Endangered Species Hearing] (statement of FWS Director Dan Ashe).

65 Safari Club Int'l v. Salazar (*In re* Polar Bear Endangered Species Act Listing & Section 4(d) Rule Litig.), 709 F.3d 1, 6–7 (D.C. Cir. 2013); Eric Biber, *Which Science? Whose Science? How Scientific Disciplines Can Shape Environmental Law*, 79 U. CHI. L. REV. 471, 485 (2012).

66 WILLIAM P. BROWN, THE SEVEN PILLARS OF CREATION: THE BIBLE, SCIENCE, AND THE ECOLOGY OF WONDER 5 (2010).

strategy is favored by those who hope to postpone any regulation but opposed by those who fear that *perfect* science could thus become the enemy of *good* science. Another choice is to defer to the scientists to simply make the best available choice even though we recognize that they do not have a complete understanding of the problem and that any decision they make is thus by definition beyond their expertise. That is what the court did in the ozone case. "Reasonable people might disagree with EPA's interpretations of the scientific evidence," the D.C. Circuit explained, "but any such disagreements must come from those who are qualified to evaluate the science, not us."[67]

A related approach is to simply accept the best scientific evidence that is available. That is what the ESA requires. Such an approach eschews any obligation to conduct additional research to close in on the ultimate scientific truth. The best available scientific evidence standard also demands that someone judge what is the best evidence in the face of scientific uncertainty, and again, courts defer to agency decisions about what constitutes the best scientific evidence. In other words, the decision of what constitutes the best scientific evidence is itself "scientific in nature and accordingly deserves deference."[68] The consequence of this approach is that federal judges must shy away from exercising their own scientific judgment. As the Ninth Circuit has emphasized, the best scientific data available "does not mean 'the best scientific data possible.'"[69] In another scientific dispute, the same court observed that "[t]he fact that the FWS chose one flawed model over another flawed model is the kind of judgment to which we must defer."[70]

The most debated approach is the precautionary principle, which is the legal manifestation of the maxim "better safe than sorry." According to the precautionary principle, the law should act to protect against a possible environmental harm even if causation remains unclear and it is unknown whether harm will ever actually materialize. There are as many as twenty distinct formulations of the principle's requirements, ranging from weaker forms that reject the absence of

67 Mississippi v. EPA, 723 F.3d 246, 257 (D.C. Cir. 2013).

68 Native Vill. of Chickaloon v. Nat'l Marine Fisheries Serv., 947 F. Supp. 2d 1031, 1067 (D. Alaska. 2013) (quoting Oregon Nat. Desert Ass'n v. Tidwell, 716 F. Supp. 2d 982, 996 (D. Or. 2010)).

69 San Luis & Delta-Mendota Water Auth. v. Jewell, 747 F.3d 581, 602 (9th Cir. 2014) (emphasis omitted) (quoting Building Indus. Ass'n v. Norton, 247 F.3d 1241, 1246 (D.C. Cir. 2001)).

70 *Id.* at 620.

decisive evidence as a basis for failing to regulate, to stronger forms that mandate a margin of safety in every decision.[71]

The precautionary principle is popular in Europe and in international environmental agreements, but it has faced withering criticism in the United States. Harvard law professor (and former Obama Administration regulatory official) Cass Sunstein deplores the precautionary principle as "literally incoherent" because "[t]here are risks on all sides of social situations. It is therefore paralyzing; it forbids the very steps that it requires."[72] In response, Douglas Kysar defends the precautionary principle as grounded in humility and "reflect[ing] a prior determination by the political community to pursue environmental sustainability."[73] Under this view, the precautionary principle represents a normative commitment to a particular type of environment.

I am most persuaded by a Christian approach, overlooked in the abundant literature discussing the precautionary principle. Baylor environmental scientist Susan Power Bratton sees wisdom as the key. Bratton has examined the precautionary principle from the perspective of the wisdom literature contained in the biblical books of Proverbs and Job. Wisdom, explains Bratton, recognizes the limits of our knowledge of nature and our ability to control it.[74] Wisdom is not the exclusive possession of experts, but rather can be gained by those who have the greatest experience.[75] Bratton faults the precautionary principle as "inflexible and absolute in approaching human decision-making that is informed by multiple factors."[76] The better path, she contends, is to act carefully, rather than seeking to prevent action. "Biblical wisdom assumes that humans learn by trial and error," she explains, whereas the precautionary principle "discourages testing technologies and actions whose results may not be completely predictable."[77] She uses the example of fisheries management to illustrate how expert officials overruled traditional indigenous ecological learning during the early twentieth century, only to later learn that the native wisdom was correct after all. Bratton concludes:

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71 J.B. Ruhl, *The Battle over Endangered Species Act Methodology*, 34 ENV'T L. 555, 576–99 (2004) (outlining the three possible responses to scientific uncertainty).

72 CASS R. SUNSTEIN, LAWS OF FEAR: BEYOND THE PRECAUTIONARY PRINCIPLE 4 (2005).

73 DOUGLAS A. KYSAR, REGULATING FROM NOWHERE: ENVIRONMENTAL LAW AND THE SEARCH FOR OBJECTIVITY 240, 250 (2010) (emphasis omitted).

74 *See* Susan Power Bratton, *The Precautionary Principle and the Book of Proverbs: Toward an Ethic of Ecological Prudence in Ocean Management*, 7 WORLDVIEWS: GLOB. RELIGIONS, CULTURE, & ECOLOGY 253, 263 (2003).

75 *Id.* at 270.

76 *Id.* at 257.

77 *Id.* at 256, 267.

> The [precautionary principle] bases decision-making on a single principle, and explicitly avoids process. Wisdom utilises balanced pairs of admonitions, and explicitly encourages process . . . . Public or Congressional demands for answers can push mandated science into dangerously premature recommendations concerning policy, or force it to expected outcomes. The scribes who compiled Proverbs would shake their heads—mandated science is too speedy and too pre-directed to respond to Wisdom.[78]

Bratton, in other words, insists that there is more to confronting scientific uncertainty than being safe instead of being sorry.

I would combine Bratton's approach with the "learning by doing" suggestion offered by Holly Doremus. "Given uncertainty," writes Doremus, "we know that any regulatory decision might be wrong. We should, therefore, seek to increase our knowledge over time and be prepared to revisit decisions as justified by new information."[79] But, she adds, "the decision to act does not end the opportunity for caution."[80] She offers the example of sitting in a room when the lights go out: caution alone would counsel remaining motionless, but careful movement through the room could solve the problem, even if it causes stumbles along the way.[81] Doremus thus offers several suggestions for helping administrative agencies, Congress, and courts to overcome the barriers to learning by doing, while stressing that "[b]y far the most important contribution legislatures can make to learning while doing . . . is to support it through stable and sufficient funding sources."[82] Which is to say that a primary means for eliminating scientific uncertainty is to pursue scientific truth.

## UNBELIEF

The search for scientific truth sometimes yields unbelief. Nowhere is this more obvious than in the American debate over climate change. "I don't believe it," President Trump remarked—twice—when asked about the dire consequences predicted by a leading federal climate change report.[83] Oklahoma's James Inhofe, soon after becoming the chair of the Senate Environment and Public Works

78 *Id.* at 270.

79 Holly Doremus, *Precaution, Science, and Learning While Doing in Natural Resource Management*, 82 WASH. L. REV. 547, 553 (2007).

80 *Id.* at 554.

81 *Id.*

82 *Id.* at 572.

83 President Donald J. Trump, Remarks by President Trump Before Marine One Departure (Nov. 26, 2018) (transcript available at https://trumpwhitehouse.archives.gov/briefings-statements/remarks-president-trump-marine-one-departure-26/ [https://perma.cc/6E4A-LZHP]).

Committee in 2003, concluded a speech to his Senate colleagues by asserting "that manmade global warming is the greatest hoax ever perpetrated on the American people."[84] Inhofe built on that claim by writing a book entitled *The Greatest Hoax* in which he explained that he "came to that conclusion only after engaging in a lengthy, rigorous oversight process over the course of a few years; it was the most thorough investigation of the science by any senator."[85] Likewise, the conservative evangelical Cornwall Alliance faulted "global warming alarmism" for exaggerating the role of greenhouse gas emissions on climate change, and then seeking "to intimidate or demonize scientific skeptics rather than welcoming their work as of the very essence of scientific inquiry: putting hypotheses to the test rather than blindly embracing them."[86]

Inhofe, Trump, and the Cornwall Alliance have plenty of company. Polling consistently shows that a sizeable portion of the American public doubts that the climate is changing or that human actions have anything to do with it. Yale's "Global Warming's Six Americas" studies show that opinions about climate change range from those who are convinced it is a dire problem, to those who are worried but not sure, to those who are actively skeptical of what scientists say. All sides exaggerate how many people agree with them.[87]

The Christian tradition and the biblical writings are familiar with unbelief. In the parable of the sower, Jesus preached that some people will reject his message immediately, some will hear it but become distracted, and some hear his message and believe it.[88] Similarly, after the apostle Paul spoke to the people of Athens, "some of them sneered, but others said, 'We want to hear you again on this subject.'"[89] The Bible advises Christians to expect a variety of responses to their claims of religious truth.

For their part, environmentalists wonder why people do not believe the claims of environmental science. They assume that people

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84 149 CONG. REC. 19,443 (2003) (statement of Sen. James Inhofe).

85 JAMES INHOFE, THE GREATEST HOAX: HOW THE GLOBAL WARMING CONSPIRACY THREATENS YOUR FUTURE 20 (2012).

86 CORNWALL ALLIANCE, A RENEWED CALL TO TRUTH, PRUDENCE, AND PROTECTION OF THE POOR: AN EVANGELICAL EXAMINATION OF THE THEOLOGY, SCIENCE, AND ECONOMICS OF GLOBAL WARMING 2 (2009), http://www.cornwallalliance.org/docs/a-renewed-call-to-truth-prudence-and-protection-of-the-poor.pdf; *see also* Nathan Rott, *EPA Head Scott Pruitt Doubts Basic Consensus on Climate Change*, NPR (Mar. 9, 2017, 4:34 PM), http://www.npr.org/2017/03/09/519499975/epa-head-scott-pruitt-doubts-basic-consensus-on-climate-change [https://perma.cc/4X2L-8TKU].

87 ANTHONY LEISEROWITZ ET AL., GLOBAL WARMING'S SIX AMERICAS IN MARCH 2012 AND NOVEMBER 2011, at 6 (2012).

88 *Luke* 8:11–15.

89 *Acts* 17:32.

are ignorant, deceived, or willfully wrong. There is abundant evidence to support each of those explanations in certain circumstances, but each assumes that the problem lies with the hearers of the scientific message rather than the speakers of the message or the message itself. That is why another explanation is often overlooked. Many people refuse to believe the claims of environmental science, especially climate change science, because they have made a thoughtful determination that the message or the messengers are not trustworthy. These four distinct reasons for scientific unbelief suggest a similar variety of responses that are so far missing from most environmental debates.

*Ignorance.* Scientific unbelief is commonly attributed to ignorance, especially as Americans become more scientifically illiterate. So education is the first instinct for scientists and for environmental policymakers: we just need to teach people. Indeed, education about the threat of pollution, the loss of familiar wildlife and open spaces, and the other environmental impacts of unchecked development inspired the popular consensus that resulted in the iconic environmental statutes of the 1970s. When it became clear that there was a scientific consensus on climate change, many environmental activists simply tried to get more information out.

The problem is that education has not always worked. A 2014 "Six Americas" study found that "a growing number of Americans have said that they have all the information they need to form a firm opinion about global warming," and yet opinion concerning climate change remains divided.[90] We suffer from confirmation bias, which leads us to filter information in a manner that affirms what we already believe and discards the rest. There is even evidence that climate change education produces a backlash that makes some people *less* inclined to believe its scientific claims. Of course, education has helped many people learn the nuances of climate change, pollution, biodiversity, and other issues of concern to environmental law. But President Trump and Senator Inhofe are not the only ones who have been stubbornly resistant to education.

*Deception & willful refusal.* The second and third explanations for scientific unbelief share a common conviction that people wrongly reject the truth, either because they have been deceived by others or because they have simply chosen to disbelieve the science. Recall the extensive efforts of past and current polluters to deny the reality of their pollution, as I discussed above with respect to the importance of

90 ANTHONY LEISEROWITZ ET AL., CLIMATE CHANGE IN THE AMERICAN MIND: AMERICANS' GLOBAL WARMING BELIEFS AND ATTITUDES IN NOVEMBER 2013, at 5–6, 21 (2014).

truth in environmental law. There is an active effort to try to confuse people, and there is an eagerness to disbelieve, when scientific evidence could result in unwanted environmental regulations.

Such efforts work because we want them to work. There is increasing evidence, from a variety of disciplines, that one's willingness to accept factual claims is colored by ideology, political preferences, and world view. Douglas Kysar observes that "a growing number of neuroscientists, psychologists, and legal scholars have adopted the view that utilitarianism, deontology, and other normative ethical systems are best understood not as philosophical theories to guide behavior, but as ex-post accounts that seek to depict biologically determined cognitive processes as having flowed from autonomously selected philosophical theories."[91] Kysar's Yale colleague Dan Kahan has written extensively about "cultural cognition," by which one's worldview affects agreement with factual claims on everything from climate change to gun control to date rape.[92]

The research of Jonathan Haidt, a social psychologist at the New York University Stern School of Business, is especially instructive in showing how people tend to let their predispositions color their view of the facts. Haidt's conclusion, based on an eclectic and exhaustive range of psychological studies, is that people work to mold their understanding of the facts to the intuitive moral beliefs that they already possess. Our moral beliefs determine our understanding of the facts, rather than the facts determining our moral beliefs. That is why, to cite one of his examples, women who drink lots of coffee found the most flaws in a (fictitious) scientific study that purported to posit a link between caffeine and breast cancer.[93] Haidt thus emphasizes that our understanding of morality "*binds and blinds.*"[94]

Christian teaching offers an explanation for the phenomenon Haidt describes. As Mark Noll explains, "humans persistently abandon their capacity for finding the truth in favor of abuses that spring from idolatrous self-interest."[95] Christian teaching expects that some people are not going to believe even when the truth is clearly explained to them.

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91 KYSAR, *supra* note 73, at 36.

92 *See* Dan M. Kahan, *Culture, Cognition, and Consent: Who Perceives What, and Why, in Acquaintance-Rape Cases*, 158 U. PA. L. REV. 729, 732, 735 (2010); Dan M. Kahan, *The Secret Ambition of Deterrence*, 113 HARV. L. REV. 413, 451–61 (1999); Dan M. Kahan, *Cognitive Bias and the Constitution*, 88 CHI.-KENT L. Rev. 367, 376, 406 (2013).

93 JONATHAN HAIDT, THE RIGHTEOUS MIND: WHY GOOD PEOPLE ARE DIVIDED BY POLITICS AND RELIGION 84 (2012).

94 *Id.* at xv.

95 NOLL, *supra* note 32, at 82.

If "idolatrous self-interest" is the root cause of disbelief, the default response of education is of limited utility. The idealized view of scientific understanding presumes that the presentation of accurate information and reasoned arguments will persuade people of the correct position. Hence Al Gore's ode to the power of reason: "Faith in the power of reason—the belief that free citizens can govern themselves wisely and fairly by resorting to logical debate on the basis of the best evidence available, instead of raw power—was and remains the central premise of American democracy."[96] Gore worried that the ability of religious claims to trump scientific evidence is "[b]linding the [f]aithful."[97] But it is not just religious believers who can be blind to reasoned arguments. Haidt's research found that people reach conclusions based on their moral intuitions, not the power of reason. "We do moral reasoning not to reconstruct the actual reasons why *we ourselves* came to a judgment; we reason to find the best possible reasons why *somebody else ought to join us* in our judgment."[98] Haidt noticed that additional education about a controversial topic actually *increased* disagreement because people were better equipped to marshal arguments for their initial position. Haidt condemned the "rationalist delusion" of "worshipping reason and distrusting the passions," because "when a group of people make something sacred, the members of the cult lose the ability to think clearly about it."[99] In sum, "[a]nyone who values truth should stop worshipping reason."[100]

The remedy for unbelief caused by deception or willful refusal, then, is to expose the effects of self-interest. The environmental community has been careful to highlight the financial, political, and other interests that appear to motivate the refusal to accept scientific truth. But environmentalists cannot fully succeed until they have earned the trust of those they seek to persuade.

*Trust.* The fourth explanation for scientific unbelief is the most ignored, so it will require some effort to unpack. Disbelief is often the result of distrust. Some people find contested scientific claims to be untrustworthy. Andy Crouch, a popular Christian writer, says that "[a]ll science is a matter of trust" because "[t]he tools, methods, and mathematical skills scientists acquire over the years of training are beyond the reach of the rest of us, even of scientists in different fields."[101] Lacking years of scientific training, I cannot say anything

96 AL GORE, THE ASSAULT ON REASON 2 (2007).

97 *Id.* at 45.

98 HAIDT, *supra* note 93, at 44.

99 *Id.* at 28.

100 *Id.* at 89.

101 Andy Crouch, *Environmental Wager: Why Evangelicals Are—but Shouldn't Be—Cool Toward Global Warming*, CHRISTIANITY TODAY, Aug. 2005, at 66.

about climate change models, species extinction patterns, or air pollutant dispersal from my personal expertise. Those of us who are not scientists have to decide which scientific claims to trust. Ideally, we would read the appropriate scientific papers and reach our own conclusions. But most scientific studies are just as inaccessible as religious literature can be for non-believers. Instead, most non-scientists—which is to say, most people—form their opinions about environmental science based on summaries contained in popular books and articles, blogs, websites, or casual conversations. Given the abundance of such sources and the various conclusions they reach, it is obvious why beliefs about environmental science are so diverse.[102]

And so we need to decide which voices and claims to trust. A growing body of recent popular and scholarly literature has emphasized the importance of trust. Popular author Rachel Botsman has described trust as "the glue that holds society together," "society's most precious and fragile asset," and "fundamental to almost every action, relationship and transaction." [103] Yet many fear that trust is collapsing even as we recognize its importance. Distrust featured in both the election of Donald Trump and the vote in favor of Brexit.[104] That does not mean, however, that trust is vanishing. A better description is that trust is *shifting*. As Botsman describes it, the Trump and Brexit elections resulted "from one of the biggest *trust shifts* in history: from the monolithic to the individualized. Trust and influence now lie more with 'the people'—families, friends, classmates, colleagues, even strangers—than with top-down elites, experts and authorities."[105]

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102 *See, e.g.*, Transcript of Oral Argument at 23, Massachusetts v. EPA, 549 U.S. 497 (2007) (No. 05-1120); *see also See* MIKE HULME, WHY WE DISAGREE ABOUT CLIMATE CHANGE 223 (2009).

103 RACHEL BOTSMAN, WHO CAN YOU TRUST? HOW TECHNOLOGY BROUGHT US TOGETHER AND WHY IT MIGHT DRIVE US APART 6, 256, 10 (2017).

104 *See id.* at 48 ("The fact that the [2016 presidential] election was even a contest came down to trust."); *id.* at 49 (quoting Michael Moore, *5 Reasons Why Trump Will Win*, MICHAEL MOORE, https://michaelmoore.com/trumpwillwin/ [https://perma.cc/38CY-VWPH] (noting that Michael Moore blogged 12 months before the election that Hillary "is hugely unpopular—nearly 70 per cent of all voters think she is untrustworthy and dishonest"); MATTHEW D'ANCONA, POST TRUTH: THE NEW WAR ON TRUTH AND HOW TO FIGHT BACK 36 (2017) (explaining that Brexit "tapped into a seam of distrust that was essential to Leave's victory; a growing suspicion that traditional sources of authority and information were unreliable, self-interested or even downright fraudulent").

105 BOTSMAN, *supra* note 103, at 5; *see also id.* at 7 (asserting "a theory, a bold claim" that "we are the start of the third, biggest trust revolution in the history of humankind"); *id.* at 8 (noting that trust "used to flow upwards to referees and regulators, to authorities and experts, to watchdogs and gatekeepers" but it "is now flowing horizontally, in some instances to our fellow human beings and, in other cases, to programs and bots.").

We are now willing to trust things that our ancestors never even dreamed about. We trust that planes won't crash to the ground, the flammable gasoline sloshing in our cars won't explode, and the skyscrapers in which we work will continue to stand. We trust strangers to share their home with us (via Airbnb), to give us a ride (via Uber), or to match us on dates (via Tinder).[106]

But mostly, we trust people like us. "People are more likely to describe 'a person like me' as the most credible source of information. A friend or, say, a Facebook friend, is now viewed as twice as credible as a government leader."[107] We are engaged in "homophily"—literally, the love of self, the scientific term for our tendency to associate with people like ourselves. We learn from our friends more than from institutions such as network television or the local newspaper.

Meanwhile, trust in the dissimilar or the unfamiliar is plummeting. Driverless cars are struggling to gain trust among those who fear the loss of control when driving. A good friend of mine travels with her own cleaning supplies because she distrusts the cleanliness of hotel rooms. Most dramatically, trust in elite institutions "is eroding at an alarming rate." According to recent Gallup polls, while 62% of Americans trust other Americans a "great deal" or a "fair amount," trust in federal agencies (52%) and politicians lags behind.[108]

Botsman sees three "somewhat overlapping" reasons for the growing distrust of elite institutions. The first is the "inequality of accountability, which means that "certain people are being punished for wrongdoing while others get a leave pass."[109] Many observers trace the decline in institutional trust to the financial meltdown that occurred in 2007 and 2008, when millions of people lost their jobs, homes, and savings, yet few of the corporate leaders suffered the consequences.[110] The "twilight of elites and authority" offers a second reason for distrust as "the digital age is flattening hierarchies and eroding faith in experts and the rich and powerful."[111] As British leader Michael Gove stated during the Brexit debate, "I think the

106 *Id.* at 7.

107 *Id.* at 47.

108 *Trust in Government*, GALLUP, https://news.gallup.com/poll/5392/trust-government.aspx [https://perma.cc/6JRN-N93D].

109 BOTSMAN, *supra* note 103, at 42.

110 *See* Warren J. von Eschenbach, *Trust as a Public Virtue*, *in* VIRTUES IN THE PUBLIC SPHERE: CITIZENSHIP, CIVIC FRIENDSHIP AND DUTY 140 (James Arthur ed., 2019) (citing Felix Roth, *The Effect of the Financial Crisis on Systemic Trust*, 44 INTERECONOMICS 203 (2009); Eric M. Uslaner, *Trust and the Economic Crisis of 2008*, 13 CORP. REPUTATION REV. 110 (2010); Paola Sapienza & Luigi Zingales, *A Trust Crisis*, 12 INT'L REV. FIN. 123 (2012); GEOFFREY HOSKING, TRUST: A HISTORY (2014)).

111 BOTSMAN, *supra* note 103, at 42.

people in this country have had enough of experts."[112] A third reason for institutional distrust results from our "segregated echo chambers."[113] As President Obama warned in his farewell speech, we

> retreat into our own bubbles, whether in our neighborhoods or on college campuses, or places of worship, or especially our social media feeds, surrounded by people who look like us and share the same political outlook and never challenge our assumptions . . . . And increasingly, we become so secure in our bubbles that we start accepting only information, whether it's true or not, that fits our opinions, instead of basing our opinions on the evidence that is out there."[114]

Nonetheless, there are good reasons to trust the scientific claims that we hear. Science relies on rigorous empirical methods and distinguishes between true and false claims about the world around us, and the scientific enterprise has accumulated an impressive record that generates widespread trust. The National Research Council has observed that "science can be a counterweight to self-interestedness in politics and thereby ensure that policy reflects the public interest,"[115] a view that fits nicely with Christian teaching about the distorting influence of sin. Indeed, most people trust most scientists. But few people trust *all* scientists. Why? Specifically, why is distrust of environmental science so common, especially in the context of climate change? Once again, Rachel Botsman can help us answer this question. Botsman identifies the three traits of trustworthiness as competence, reliability, and honesty.[116] Let's examine each of these traits—especially the last.

Competence. Some people distrust environmental science because scientists are fallible. There are numerous historical examples of scientists making environmental claims that were later proven wrong. Activists who oppose increased environmental regulation seize on these episodes. Richard Land, the head of the Ethics and Religious Liberty Commission of the Southern Baptist Convention, referred to

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112 *Id.* at 49.

113 *Id.* at 42.

114 President Barak Obama, Farewell Address (Jan. 10, 2017) (transcript available at https://obamawhitehouse.archives.gov/farewell [https://perma.cc/2Q98-AQLW]); *see also* Warren von Eschenbach, *Western Societies Can't Ignore the 'Crisis of Trust' We're Experiencing*, AM. MAG. (Feb. 20, 2019), https://www.americamagazine.org/politics-society/2019/02/20/western-societies-cant-ignore-crisis-trust-were-experiencing [https://perma.cc/A3KP-CA37] (warning that "'fake news' reinforces particularized trust, or the view that we can or should trust only those with whom we identify or have kinship. Those who are unfamiliar or different than us are not to be trusted, and neither are those information sources that allegedly advocate for worldviews opposed to our own.").

115 NAT'L RSCH. COUNCIL, USING SCIENCE AS EVIDENCE IN PUBLIC POLICY 13 (2012).

116 BOTSMAN, *supra* note 103, at 123.

"the loss of credibility . . . in my constituency over some of the wild projections of the doomsayers among the environmentalists."[117] Testifying before Congress, evangelical David Barton cited 1960's predictions of a "population bomb," exaggerated worries about DDT, fear about aerosols in the 1970s, and past warnings of a coming ice age.[118] Barton concluded that Christians "tend to be more comfortable with theological teachings that have endured millennia but not with science that often reverses its claims on the same issue."[119]

Of course, humility reminds us that no one is always right. Barton's testimony elides the fact that the church is often wrong, too.[120] In fact, Barton's own publisher withdrew one of his books because of questions about its veracity.[121] From the perspective of Christian teaching, this should come as no surprise, because the Bible repeatedly teaches that people are fallible. Whether through deception, self-serving sinfulness, or simply the limits of human capacity, we get things wrong. That is true whether we are acting as religious adherents, as scientists, as policymakers, or in any other capacity. We need to be more humble in our claims about what we know and in our respect for what others claim to know. Christian teaching about humility provides a continual reminder of our fallibility.

Reliability. Scientists employ elaborate procedures to confirm the reliability of their findings. In a 2017 congressional hearing on climate science, Representative Lamar Smith questioned whether climate scientists had followed those procedures:

> Far too often, alarmist theories on climate science originate with scientists who operate outside of the principles of the scientific method. The scientific method is a simple process that has been used for centuries. It involves identifying a question, developing a hypothesis, constructing an experiment, and analyzing the results. If the results do not align with the original hypothesis, the hypothesis must be reexamined. The scientific method welcomes critiques so theories can be refined, and it avoids speculation about

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117 Richard Land, Commentary, *in* CREATION AT RISK? RELIGION, SCIENCE, AND ENVIRONMENTALISM 65 (Michael Cromartie ed., 1995).

118 *An Examination of the Views of Religious Organizations Regarding Global Warming: Hearing before S. Comm. on Env't and Pub. Works*, 110th Cong. 206–208 (2007) (statement of David Barton, author and historian) (citing mistaken scientific claims regarding fetal tissue research, overpopulation, DDT, and aerosols).

119 *Id.* at 209; *see also id.* at 195 (statement of Reverend Dr. James Tonkowich, President, Institute on Religion and Democracy) (asserting that "[s]cientific consensus has been wrong before and it will be wrong again").

120 *See, e.g.*, NOLL, *supra* note 32, at 101.

121 *See* Jeffrey A. Trachtenberg, *Publisher Pulls Book on Thomas Jefferson*, WALL ST. J. (Aug. 10, 2012), https://www.wsj.com/articles/SB10000872396390443404004577581423889936052 [https://perma.cc/GF69-4KN4].

> distant events for which there is no hard proof. Alarmist predictions amount to nothing more than wild guesses. The ability to predict far into the future is impossible. Anyone stating what the climate will be in 500 years or even at the end of the century is not credible. All too often, scientists ignore the basic tenants (sic) of science in order to justify their claims.[122]

Smith concluded that "[o]nly when scientists follow the scientific method can policymakers be confident that they are making the right decisions. Until then, the debate should continue."[123] Later in the hearing, a scientist who questioned the scientific consensus agreed that "the traditional scientific method has not been consistently followed in today's pronouncements about climate change made by so-called official panels."[124]

Honesty. Consumers of science are not without justification in noting that some of the predictions of yesteryear have proven unreliable. But even beyond reliability, perhaps the essential criterion for trustworthiness is honesty. "Honesty is about integrity and intentions," Botsman explains. "What do they gain by lying or telling the truth?"[125] That is why the Climategate scandal was so damning. In 2009, leaked emails revealed that scientists at the University of East Anglia and at institutions in the U.S. were deriding and trying to suppress the publication of their critics' work.[126] The publications at issue would not have undermined the vast majority of the scientific work related to climate change, which is why one climate change researcher not involved in the scandal advised that it would not "affect public opinion at all."[127] But in the U.S., beliefs about climate change

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122 *Climate Science: Assumptions, Policy Implications, and the Scientific Method: Hearing before the H. Comm. on Sci., Space, & Tech.*, 115th Cong. 4 (2017) [hereinafter 2017 House Hearing] (statement by Rep. Lamar S. Smith, Chairman, Comm. on Sci., Space, & Tech.).

123 *Id.* at 5.

124 *Id.* at 35 (testimony of Dr. John Christy, Professor and Director, Earth System Science Center, University of Alabama at Huntsville; State Climatologist, Alabama); *see also id.* at 36 ("In my view, the dispassionate analysis of scientific results on which policy decisions are based was sidetracked by those in control of the IPCC documents. This problem is pervasive in climate science. Grand compilations such as the IPCC, the National Climate Assessment, pronouncements from scientific societies, who never do any scientific work on the problem, by the way, for their results and even EPA's endangerment finding are on the whole written by those who are not scientifically dispassionate, and as such, the traditional method of science was circumvented, in my opinion.").

125 BOTSMAN, *supra* note 103, at 123.

126 Lauren Morello, *Stolen E-mails Sharpen a Brawl Between Climate Scientists and Skeptics*, N.Y. TIMES (Nov. 24, 2009), www.nytimes.com/cwire/2009/11/24/24climatewire-stolen-e-mails-sharpen-a-brawl-between-clima-19517.html [https://perma.cc/UUF5-CKGM] (quoting Anthony Leiserowitz, director of the Yale Project on Climate Change, predicting the negligible impact of the scandal).

127 *Id.*

fell off a cliff. Climategate damaged the environmental cause precisely because it fed into the narrative that scientists are trying to push people toward their preferred policy outcome rather than objectively providing information. As one scientist, Judith Curry, told the House Science Committee:

> Prior to 2010, I felt that supporting the IPCC consensus on human-caused climate change was the responsible thing to do. That all changed for me in November 2009 following the leaked Climategate emails that illustrated the sausage making and even bullying that went into building that consensus. I came to the growing realizing that I had fallen into the trap of groupthink in supporting the IPCC consensus.[128]

Curry went on to conduct "an independent assessment of topics in climate science that had the most relevance to policy. I concluded that the high confidence of the IPCC's conclusions were not justified and that there were substantial uncertainties in our understanding of how the climate system works."[129]

Honesty is further undermined when one tries to suppress contrary opinions. At the same House Committee hearing, Curry and other witnesses complained of such treatment by the "other side." Leading climate scientist Michael Mann testified:

> I think the attacks against scientists by individuals, groups, many of them allied with fossil fuel interests and fossil fuel front groups, are aimed at several goals. One of them is to silence climate scientists. If you get attacked every time you publish an article that demonstrates the reality and threat of human-caused climate change, if that causes you to become subject to Congressional inquiries and Freedom of Information Act requests, obviously that's very stifling, and I think the intention is to cause scientists to retreat. I also think that the intention of these very public attacks on climate scientists . . . is meant to send a chilling signal to the entire research community that if you too publish and speak about the threat of human-caused climate change, we're going to come after you too.[130]

Judith Curry remarked that she had suffered from the same treatment even though she proclaimed the opposite scientific view:

> As a result of my analyses that challenge the IPCC consensus, I have been publicly called a serial climate disinformer, anti-science, and

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128 2017 House Hearing, *supra* note 122, at 19 (testimony of Dr. Judith Curry, President, Climate Forecast Applications Network; Professor Emeritus, Georgia Institute of Technology).

129 *Id.*

130 *Id.* at 98 (testimony of Dr. Michael Mann, Distinguished Professor of Atmospheric Science and Director, Earth System Science Center (ESSC), The Pennsylvania State University).

> a denier by a prominent climate scientist. I've been publicly called a denier by a U.S. Senator. My motives have been questioned by a U.S. Congressman in a letter sent to the president of Georgia Tech. While there is much noise in the media and blogosphere and professional advocacy groups, I'm mostly concerned about the behavior of other scientists. A scientist's job is to continually challenge their own biases and ask how could I be wrong? Scientists who demonize their opponents are behaving in a way that is antithetical to the scientific process. These are the tactics of enforcing a premature theory for political purpose.[131]

And Professor Roger Pielke added that "the investigation of individual researchers is not an appropriate role for Congress and is unlikely to contribute positively to the upholding of scientific integrity. A bipartisan truce ending such investigations of individual researchers should start immediately."[132]

Honesty is further undermined by bias. Trust depends on the actual absence of bias as well as the *appearance* of the absence of bias. Both actual and apparent bias may be caused by ideological commitments or financial incentives. Even those making scientific arguments can be blinded by their own agendas. Everything that Jonathan Haidt, Dan Kahan, and Christian teaching say about how our ideological predispositions distort our understanding of the truth applies to the proponents of environmental science as well to climate skeptics. In response to a question about climate change, Haidt explained that

> the left is now embracing this as their sacred issue, which guarantees that there will be frequent exaggerations and minor—I don't want to call it fudging of data—but there will be frequent mini-scandals. Because it's a moral crusade, the left is going to have difficulty thinking clearly about what to do.[133]

That is especially problematic for environmental science because "[i]n the political sphere, the credibility of scientific knowledge is tied to cultural perceptions about its political neutrality and objectivity, which are crucial social resources for building consensus in ideologically

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131 *Id.* at 19 (testimony of Dr. Judith Curry, President, Climate Forecast Applications Network; Professor Emeritus, Georgia Institute of Technology).

132 *Id.* at 72 (Testimony of Dr. Roger Pielke Jr., Professor, Environmental Studies Department, University of Colorado).

133 Holman W. Jenkins, Jr., *Johnathan Haidt: He Knows Why We Fight*, WALL ST. J. (June 29, 2012), https://online.wsj.com/article/SB10001424052702303830204577446512522582648.html [https://perma.cc/NW9B-XVDT]; *see also* RICHARD J. LAZARUS, THE MAKING OF ENVIRONMENTAL LAW (2004).

polarized policy arenas."[134] The realization that scientists alternately speak from their technical expertise and from their own normative values confuses the message for those seeking to understand scientific truth. Then skepticism about scientific claims becomes more common as the policy implications increase.

Moreover, the "political neutrality and objectivity" of environmental scientists has been called into question by political conservatives. A 2009 Pew Research Center poll found that Democrats outnumber Republicans among scientists nine-to-one.[135] Scientists are far more approving of government regulation and far more critical of private businesses than the public at large.[136] Commenting on those findings, *Slate*'s Daniel Sarewitz noted that one possible explanation is that Democrats are more likely to accept scientific truth, while Republicans "are dominated by scientifically illiterate yahoos and corporate shills willing to sacrifice the planet for short-term economic and political gain."[137] But Sarewitz offered another explanation, too:

> Or could it be that disagreements over climate change are essentially political—and that science is just carried along for the ride? For 20 years, evidence about global warming has been directly and explicitly linked to a set of policy responses demanding international governance regimes, large-scale social engineering, and the redistribution of wealth. These are the sort of things that most Democrats welcome, and most Republicans hate. No wonder the Republicans are suspicious of the science.
>
> Think about it: The results of climate science, delivered by scientists who are overwhelmingly Democratic, are used over a period of decades to advance a political agenda that happens to align precisely with the ideological preferences of Democrats.[138]

Jonathan Haidt addressed these kinds of issues in his first foray into legal scholarship. Writing in the *Alabama Law Review* in 2013, Haidt examined "the rationalist delusion in ethics," which he defined as "[t]he belief in a reliable faculty of reasoning, capable of operating effectively and impartially even when self-interest, reputational concerns, and intergroup conflict pull toward a particular

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134 Gordon Gauchat, *Politicization of Science in the Public Sphere: A Study of Public Trust in the United States, 1974 to 2010*, 77 AM. SOCIO. REV. 167, 168 (2012).

135 *See* Pew Poll, *supra* note 19.

136 *Id.*

137 Daniel Sarewitz, *More Scientists in This Country Are Democrats. That's a Problem.*, SLATE (Dec. 8, 2010), https://slate.com/technology/2010/12/most-scientists-in-this-country-are-democrats-that-s-a-problem.html [https://perma.cc/8VCA-D365] (reporting the results of the Pew poll showing that 55% of U.S. scientists are Democrats, 6% are Republicans, and the balance are either independent or do not know their political affiliation).

138 *Id.*

conclusion."[139] He noted that his earlier work had produced "a mountain of evidence demonstrating the deficiencies of human reasoning," and he concluded that "to have faith in a reliable faculty of reasoning, in this day and age, is structurally rather similar to having faith in God."[140] He noted that "[t]here is a long history of classic experiments in social psychology showing the general tendency for one person's judgment to influence others—quite apart from any reasons given," which is explained by the confirmation bias: the tendency to try to prove one's initial intuition rather than objectively evaluating both sides of a proposition.[141] Haidt described the confirmation bias as "among the most important psychological ideas that can be taught in a law school," for it should counsel caution, for example, regarding the hunches of police investigators about guilt or innocence.[142] And confirmation bias is exacerbated by conflicts of interest, which Haidt finds

> so powerful because we are so good at lying to ourselves. We reach the conclusion we are motivated (or paid) to reach, and then ask ourselves: Did I make an objectively defendable decision? It's so easy to confirm that hypothesis that we all end up convinced that we were not influenced by extraneous motives.[143]

Haidt connected these psychological insights to the dangers of a liberal scientific orthodoxy in an article that he co-authored with three other social psychologists in 2014. That article responded to evidence that the imbalance between liberal social psychologists and everyone else (including moderates, conservatives, and libertarians) was similar to the nine-to-one ratio for scientists generally.[144] The authors concluded that "[t]his lack of political diversity can undermine the validity of social psychological science via mechanisms such as the embedding of liberal values into research questions and methods, steering researchers away from important but politically unpalatable research topics, and producing conclusions that mischaracterize liberals and conservatives alike."[145] That lack of diversity is of special concern "primarily in areas related to the political concerns of the left—areas such as race, gender, stereotyping, environmentalism, power, and inequality—as well as in areas where conservatives

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139 Jonathan Haidt, *Moral Psychology and the Law: How Intuitions Drive Reasoning, Judgment, and the Search for Evidence*, 64 ALA. L. REV. 867, 867 (2013).

140 *Id.* at 867–68.

141 *Id.* at 872–73.

142 *Id.* at 873.

143 *Id.* at 877–78.

144 *See* José L. Duarte et al., *Political Diversity Will Improve Social Psychological Science*, 38 BEHAV. & BRAIN SCI. 1, 3 (2015).

145 *Id.* at 1.

themselves are studied, such as in moral and political psychology."[146] The fear is that "left unchecked, an academic field can become a cohesive moral community, creating a shared reality that subsequently blinds its members to morally or ideologically undesirable hypotheses and unanswered but important scientific questions."[147] Thus peer review, which is one of the most important methods for checking the accuracy of scientific research, "likely offers much less protection against error when the community of peers is politically homogeneous."[148]

Scientists face accusations of financial interest as well as ideological bias. Just as scientists funded by fossil fuel companies or the Koch brothers face attacks about their trustworthiness, those who question climate change science insist that the elite academic scientific community is to blame for scaring people in an effort get more research funding or academic prestige.[149] The Utah state legislature thus debated a resolution referring to the "gravy train" pursued by climate scientists.[150] A farming official told a congressional panel that "scientists, environmental organizations, and peer review panels all have economic incentives for ESA listings and have strayed from fact-driven science to become biodiversity conservation advocates."[151] Texas Representative Ted Poe told his House colleagues that Al Gore "may be the world's first carbon billionaire. He makes money preaching fear in the name of global warming."[152] Or as one climate change skeptic argues,

> Does anyone seriously think that a young researcher is going to get that kind of funding by going to federal agencies with a proposal that global warming's amount and effects have been dramatically overblown (as they have)? The mere proposal threatens to derail everyone else's gravy train. It won't get funded, and the researcher soon won't be paid.[153]

The notion that climate scientists get rich from their advocacy of climate change has provoked numerous rebuttals, but these rebuttals are likely to fail because the mere perception that a scientist gains from

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146 *Id.* at 2.

147 *Id.* at 4.

148 *Id.* at 8.

149 *See, e.g.*, JAMES LAWRENCE POWELL, THE INQUISITION OF CLIMATE SCIENCE 152–55 (2011).

150 *See* H.J.R. 12, 2010 Gen. Sess. (Utah 2010).

151 Endangered Species Hearing, *supra* note 64, at 24 (statement of Kent D. McMullen, Chairman, Franklin County Natural Resources Advisory Committee).

152 155 CONG. REC. 29907 (2009) (statement of Rep. Poe).

153 Patrick Michaels, *The Threat to the Scientific Method*, TOWNHALL (July 24, 2014, 5:28 PM), https://townhall.com/columnists/patrickmichaels/2014/07/21/the-threat-to-the-scientific-method-n1864397) [https://perma.cc/5NJQ-DDRE].

a particular outcome clouds the popular acceptance of his or her research.

Even the desire for professional standing calls into question the objectivity of contested scientific claims. Questioning climate science is a treacherous career move for any scientist who hopes to gain tenure or a leadership position within the academy. "I hope there are no climate change deniers in the Department of Interior," Secretary of the Interior Sally Jewel told her assembled employees shortly after she took office.[154] She soon walked back that statement in the face of cries of "scientific cleansing" and charges that she was leading an Obama Administration effort "to silence any internal critics,"[155] but the message lingered that professional advancement within the department depends on one's beliefs about climate change.

Trust in environmental science, in short, is threatened both by the manufactured research conducted by business interests who oppose greater environmental regulation and by the subtler biases of the nearly monolithic views of scientists who favor more stringent environmental regulation. Liberals don't trust scientific studies that are generated by the Trump Administration, funded by corporate interests, or stray from a scientific consensus demonstrating the need for governmental regulation. Conservatives don't trust climate scientists who are overwhelmingly liberal and Democratic, who obtain lucrative grants to support their work, who ostracize their peers if they reach the "wrong" conclusion, or who seem to suppress contrary viewpoints (as in Climategate).

To be clear, I am not saying that climate scientists are not telling the truth. Far from it: I am persuaded by the scientific consensus regarding climate change. What I am saying is that truth is necessary but not sufficient for trust. Appearances matter.

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154 Laura Petersen, *Interior: Secretary Wants 'No Climate Change Deniers' in Her Department*, E&E NEWS PM (July 31, 2013), https://plus.lexis.com/document?pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A5978-6YT1-JCR4-S17R-00000-00&pdsourcegroupingtype=&pdcontentcomponentid=302445&pdisurlapi=true&pdmfid=1530671&crid=569b1d48-cff4-400f-ad5d-a52f638c63bc [https://perma.cc/NG5D-PYLE].

155 Laura Petersen, *Climate: Skeptics Blast Jewell's Comments As "Scientific Cleansing,"* GREENWIRE (Aug. 1, 2013), https://plus.lexis.com/document?pddocfullpath=%2Fshared%2Fdocument%2Fnews%2Furn%3AcontentItem%3A597G-6031-DY7N-F1WW-00000-00&pdsourcegroupingtype=&pdcontentcomponentid=8322&pdisurlapi=true&pdmfid=1530671&crid=c0e977ad-140e-4766-8203-bc753e03e054 [https://perma.cc/HZ9H-FYSC].

## REBUILDING TRUST

Perhaps the most obvious way to earn trust is to become trustworthy. Recall that Botsman identifies the three traits of trustworthiness as competence, reliability, and honesty.[156] Competence is the easy one. The vast majority of us do not possess any expertise in environmental science, and we rely on the proxies of education, affiliations, and accomplishments to identify those who are expert. Likewise, there are numerous ways of achieving reliability. Rebecca Bratspies has identified "the three core components of regulatory trust" as "expertise, stewardship, and transparency."[157] Transparency is especially important for establishing reliability, and thus trust. Dr. Mann told the House Science Committee that "asking for a scientist's source of funding to me is fair game, and I'm more than—always more than happy to provide details about where my funding comes from. I think any scientist should be willing to do that, and Congress has a right to know that information as well."[158]

Besides a transparent process, the scientific information that informs that process must be transparent, too. Early in the Trump Administration, the House passed two bills designed to establish greater trust in the scientific basis for environmental regulation. Supporters repeatedly characterized the bills as necessary to overcome the problem of distrust. They objected to EPA's issuance of "extensive regulations without ever showing the science to back up their claims to justify these regulations," and instead saying, "[t]rust us, we have got good science backing up our claims."[159] Or, as another member quipped, "[t]he days of 'trust-me science' are over."[160]

The first bill, dubbed HONEST, would require that regulatory actions be based on publicly available science that is susceptible of replication.[161] But opponents worry that its stringent scientific disclosure requirements would inhibit *all* regulation because EPA does not control much of the research on which it relies. Indeed, they contend that the real purpose of the bill is to stop EPA and other agencies from regulating regardless of whether they rely on good science or bad.[162] The HONEST bill thus presents a dilemma. The primary argument against it is that it is anti-regulation because we

156 BOTSMAN, *supra* note 103, at 123.

157 Rebecca M. Bratspies, *Regulatory Trust*, 51 ARIZ. L. REV. 575, 578 (2009).

158 2017 House Hearing, *supra* note 122, at 99 (testimony of Dr. Michael Mann, Professor of Atmospheric Science and Director, Earth System Science Center (ESSC), The Pennsylvania State University).

159 163 CONG. REC. H2538 (daily ed. Mar. 29, 2017) (statement of Mr. Babin).

160 *Id.* at H2536 (statement of Mr. Smith).

161 *Id.* at H2536.

162 *Id.* at H2357 (statement of Ms. Bernice Johnson).

cannot, or will not, pay the costs necessary to fund open, transparent, and reproducible science. If environmental regulation depends on scientific procedures that we cannot afford, then we end up with less environmental regulation. Thus the claim that HONEST is actually a dishonest attack on environmental regulation itself. But that argument invites a related counter argument. Why should we impose environmental regulation based on science that we admit is unreliable? Unreliable, that is, because we are unwilling to pay to ensure that the science supporting the regulation is reliable. The assumption is that environmental regulation must proceed whether or not it is based on the best science. This claim that environmental regulation is so important that we must impose it regardless of the scientific basis for it is the exact opposite of the claim that we should not adopt such regulation even if we have a sound scientific justification.

The steps suggested by Bratspies and others could cultivate the reliability that is needed to gain trust. But trust also requires honesty, and honesty demands both the absence of bias and the absence of the appearance of bias. Jonathan Haidt emphasizes that "it's so important to have intellectual and ideological diversity within any group or institution whose goal is to find truth (such as an intelligence agency or a community of scientists) or to produce good public policy (such as a legislature or advisory board)."[163] As Roger Pielke told the House Science Committee, the "processes for assessing the state of scientific knowledge on subjects of relevance . . . work best when they are populated by a diversity of experts including those who may hold minority or even unpopular perspectives."[164] Such ideological diversity can help overcome individual biases by raising questions and identifying evidence that would otherwise be overlooked, even unconsciously, by those who share a desired outcome.

The second bill passed by the House during the early days of Trump Administration addresses this concern. It would modify the composition of the Science Advisory Board (SAB), which emerged from 1978 legislation that directed EPA to establish an official body of scientific advisors to consult when promulgating regulation.[165] The complaint against the current system is that "in recent years, SAB experts have become nothing more than rubberstamps who approve all of the EPA's regulations. The EPA routinely stacks this board with friendly scientists who receive millions of dollars in grants from the federal government. The conflict of interest here is clear."[166] So the

163 HAIDT, *supra* note 93, at 90.

164 2017 House Hearing, *supra* note 122, at 72 (testimony of Dr. Roger Pielke Jr., Professor, Environmental Studies Department, University of Colorado).

165 163 CONG. REC. H2564–65 (daily ed. Mar. 30, 2017).

166 Making EPA Great Again, *supra* note 10.

new bill would require EPA to ensure a broader scientific and geographic representation, while simultaneously allowing industry and private scientists to serve on the SAB so long as they disclose their interests but barring scientists who have received grants from EPA.[167] That approach, say opponents, is "turning the term 'conflict of interest' on its head by excluding scientists who have done the most relevant research on the topic being considered by the Board."[168] The bill's supporters are incredulous, though, that SAB members "have taken public and even political positions on issues they are advising about," citing the example of "a lead reviewer of the EPA's hydraulic fracking study [who] published an anti-fracking article titled, 'Regulate, Baby, Regulate.'"[169]

That bill became stuck in the Senate, so EPA Administrator Scott Pruitt decided to take matters into his own hands. In October 2017, Pruitt issued a directive on "Strengthening and Improving Membership on EPA Federal Advisory Committees."[170] He acknowledged EPA's need to rely on independent, expert advice from the "most qualified, knowledgeable, and experienced candidates," and to achieve that goal, he sought to strengthen the independence, diversity, and breadth of participation.[171] Pruitt cited four principles to be heeded when selecting members to serve on the committees charged with providing scientific advice to the agency: independence; state, local, and tribal participation; geographic diversity; and fresh perspectives.[172] The latter three principles are relatively uncontroversial; they aim to incorporate a broad and changing range of scientific perspectives by including more scientists from all levels of government, by preventing the committee from representing only a few parts of the country, and by limiting the terms of committee members. The only dissent from that aspect of Pruitt's directive was voiced by Delaware Senator Tom Carper, who insisted that "EPA research grants and advisory roles should be awarded to the most qualified and most capable candidates. Period."[173]

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167 163 CONG. REC. H2564–65 (daily ed. Mar. 30, 2017).

168 *Id.* at H2566 (statement of Ms. Eddie Bernice Johnson).

169 *Id.* at H2566 (statement of Mr. Lucas).

170 Memorandum from E. Scott Pruitt, Env't Prot. Agency Adm'r (Oct. 31, 2017).

171 *Id.*

172 *Id.*

173 Press Release, U.S. Sen. Comm. on Env't & Pub. Works (Oct. 31, 2017) (available at https://www.epw.senate.gov/public/index.cfm/press-releases-democratic?ID=53208CF9-9250-4390-86D0-1350B6BA6506 [https://perma.cc/BXN9-EADQ]. "If balance was really at the heart of this, I would think that the new rules would apply to both EPA and industry funding." Email from Joe Árvai, Professor, U. of Michigan, to John Nagle, Professor, Notre Dame L. Sch. (on file with author). Dr. Árvai's term on the Science Advisory Board just ended.

The principle of independence has been acceptable in theory but contested in practice. Per Pruitt's directive, "Members shall be independent from EPA, which shall include a requirement that no member of an EPA federal advisory committee be currently in receipt of EPA grants, either as a principal investigator or co-investigator, or in a position that otherwise would reap substantial direct benefit from an EPA grant."[174] Pruitt explained the rule as analogous to the biblical story of Joshua, who told the Israelite people that

> if it is evil in your eyes to serve the LORD, choose this day whom you will serve, whether the gods your fathers served in the region beyond the River, or the gods of the Amorites in whose land you dwell. But as for me and my house, we will serve the LORD.[175]

Pruitt described his directive as

> sort of like the Joshua principle—that as it relates to grants from this agency, you are going to have to choose either service on the committee to provide counsel to us in an independent fashion or choose the grant. But you can't do both. That's the fair and great thing to do.[176]

His critics saw it differently. "Disqualifying the very people who know the most about a subject from serving as advisors makes no sense," objected one scientific spokesman.[177] Others complained that the top scientists who win the competition for EPA grants are precisely the experts who should advise the agency, and in any event, committee members were already subject to conflict-of-interest rules.[178] Ironically, Pruitt himself faced charges of bias for allegedly seeking to dictate the composition of the committees, and especially for his failure to similarly disqualify industry scientists from serving on the committees that review the scientific evidence that could result in their regulation (or not).[179]

The controversy about Pruitt's directive is more about trust than it is about science. Those who protest that the advisory committees should only be about science make a good point, but they miss another one. We do not collect scientific evidence by popular vote; we

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174 Pruitt, *supra* note 170.

175 *Joshua* 24:15.

176 Zahra Hirji, *Citing the Bible, The EPA Just Changed Its Rules for Science Advisers*, BUZZFEED NEWS, https://www.buzzfeednews.com/article/zahrahirji/epa-pruitt-new-science-advisors [https://perma.cc/Z4LE-P52C] (last updated Nov. 1, 2017).

177 *Id.*

178 *Id.*

179 Press Release, Earth Inst., Columbia Environmental Law Clinic Challenges EPA's Scott Pruitt on Behalf of Scientists (Dec. 21, 2017), https://news.climate.columbia.edu/2017/12/21/columbia-environmental-law-clinic-challenges-removal-epa-science-advisers/ [https://perma.cc/FH7Y-RNBX].

recognize that such evidence is best obtained by those possessing the relevant scientific expertise. But when we seek to integrate that scientific evidence into environmental policy, then we need to ensure that the scientists are trustworthy in the eyes of the policymakers. Industry scientists are not worthy of trust from the perspective of many observers, and Pruitt's failure to exclude them is either an unfortunate oversight or a deliberate attempt to stack the committees in favor of a particular view—precisely what the directive purports to be against. If the goal really is to obtain greater trust—as it should be—then it is fair to be concerned about allowing the same individuals to compete for funding from EPA while simultaneously advising EPA. Sharon Jacobs claims that

> the insinuation that receiving a grant from the EPA renders an advisory board member impartial is misleading. The EPA estimates that in the past three years, members of its Science Advisory Board, Clean Air Scientific Advisory Committee, and Board of Scientific Counselors received a combined total of more than $77 million in direct EPA grant funding.[180]

For many observers, especially those who are already suspicious of EPA, that seems like a substantial financial incentive in what EPA is doing. "But that figure, by itself, proves nothing," Jacobs responds. "The EPA already employs a conflicts screening process. According to one former member of EPA's Scientific Advisory Board, advisory commission members are given a conflict of interest form to fill out for each separate issue discussed. If a conflict is identified, the member is immediately recused."[181] Alas, that is the approach that Pruitt and his congressional supporters reject. For them, a conflict of interest exists if one is simultaneously getting grant money from EPA and serving on a committee advising EPA. Whether or not the scientist is actually biased is not the point. The arrangement gives rise to an appearance of bias.

Election law provides a helpful comparison. The Supreme Court has held that the "appearance" of corruption provides a sufficient justification—indeed, a compelling state interest—for campaign finance regulations that implicate the freedom of speech protected by the first amendment.[182] According to the Court, "the impact of the appearance of corruption stemming from public awareness of the opportunities for abuse inherent in a regime of large individual financial contributions" was "[o]f almost equal concern as the danger

180 Sharon B. Jacobs, *Advising the EPA: The Insidious Undoing of Expert Government*, HARV. L. REV. BLOG (Dec. 6, 2017), https://blog.harvardlawreview.org/advising-the-epa-the-insidious-undoing-of-expert-government/ [https://perma.cc/Y4FP-2M8P].

181 *Id.*

182 Buckley v. Valeo, 424 U.S. 1, 27 (1976).

of actual *quid pro quo* arrangements."[183] Those quid pro quo arrangements are already prohibited by bribery laws, so if that was our only concern, then campaign finance laws would be unnecessary. Instead, even if a politician is not biased as a result of a campaign contribution or expenditure, we also worry that the politician will appear to be biased. And the appearance of a biased decisionmaker is of concern for elected officials and advisory committee members alike.

## HUMILITY

Trust is in short supply when we are overly certain of our own perspective. Thus I would add humility as a final factor that is needed to establish trust. Humility is the beginning of trust, for it emphasizes a willingness to acknowledge both the limits of one's own knowledge and the knowledge possessed by others. Humility is necessary for the one who is to be trusted, for an exaggeration of one's knowledge quickly leads to a lack of trustworthiness. Humility is necessary for the one who trusts—who is "not a scientist," but who needs to understand science—because one's admitted lack of knowledge necessitates reliance on someone else who possesses that knowledge. Tom Nichols, lamenting the death of expertise, exhorts readers "to approach expert advice with a certain combination of skepticism and humility."[184] He expands on how we should read: "Be humble. That is, at least begin by assuming that the people writing the story, whatever their shortcomings, know more about the subject than you do."[185] By contrast, "[i]f you approach any story in the media, or any source of information already assuming you know as much as anyone else on the subject, the entire exercise of following the news is going to be a waste of your time."[186]

Perhaps the best expression of a humble approach appears in what I regard as the best book written about climate change: Mike Hulme's *Why We Disagree about Climate Change*.[187] Hulme is a scientist at the University of East Anglia who has been heavily involved in efforts to understand and encourage a response to climate change for twenty-five years. Hulme agrees that "[t]here is an increasing appreciation, both among scientists and among the public, of the contingent factors of personal belief, cultural context and institutional arrangements, which influence the way scientific knowledge is established."[188] He

183 *Id.*
184 NICHOLS, *supra* note 23, at 207.
185 *Id.* at 167.
186 *Id.*
187 MIKE HULME, WHY WE DISAGREE ABOUT CLIMATE CHANGE (2009).
188 *Id.* at 82.

thus favors a pluralism that encourages different ways of knowing the world, and a polycentrism that encourages a multiplicity of distinct sources of scientific information.[189] Hulme concludes that science will always be incomplete and uncertain and speak with a conditional voice, so "uncertainty and humility should always be essential features of any public policy debate which involves science."[190]

We are much more accustomed to thinking about uncertainty than about humility when we try to reconcile environmental science and environmental law. But humility is sorely needed to help us address truth, uncertainty, unbelief, and the appropriate role of science. Humility encourages the recognition of what we know and what we do not know, what others know and what they do not know, and what the law can and cannot accomplish. A more humble approach to environmental science may thus help strike the elusive balance between the frequently exaggerated claims about both science and law made by partisans in environmental debates.

189 *Id.* at 74, 81.
190 *Id.* at 106.