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PEDDLING IGNORANCE: A NEW FALSITY STANDARD FOR SCIENTIFIC KNOWLEDGE FRAUD CASES

Wes E. Henricksen*

I. INTRODUCTION

“An ideal system of law would draw its postulates
and its legislative justification from science.”¹

JUSTICE OLIVER WENDELL HOLMES
June 25, 1895

The tobacco industry spent half a century telling the public and policymakers the science was unclear on the link between smoking and cancer.² That was a lie. And it worked. The result was that, for decades, many Americans believed no one was sure whether smoking caused cancer, even though the smoking-cancer link was scientific fact. To date, more than twenty million Americans have died from lung cancer and other illnesses resulting from firsthand and secondhand tobacco smoke.³

* Assistant Professor of Law, Barry University School of Law. Many thanks to Professor Andrea Freeman, whose advice and guidance greatly improved this Article. Thanks to Professors Nancy Chi Cantalupo and Benjamin P. Edwards for their insight and input. Thanks to Dean Leticia Diaz and Barry University School of Law for their support for this Article, and to the participants at the 2017 Barry Law Faculty Workshop and at the 2017 University of Kentucky College of Law Developing Ideas Conference for their helpful questions and feedback. Special thanks to Patricia Blotzer for research and editorial assistance, and to Jamy Barreau and Brently Mohler for research assistance.

¹ Oliver Wendell Holmes, *Learning and Science*, Harvard University (June 25, 1895).

² The tobacco industry’s campaign to cast doubt on the scientific link between smoking and cancer is well-documented. *See, e.g.*, PHILIP J. HILTS, *SMOKE SCREEN: THE TRUTH BEHIND THE TOBACCO INDUSTRY COVER UP* (1996) (outlining the history of attempts by the tobacco industry to escape regulation); RICHARD KLUGER, *ASHES TO ASHES: AMERICA’S HUNDRED-YEAR CIGARETTE WAR, THE PUBLIC HEALTH, AND THE UNABASHED TRIUMPH OF PHILIP MORRIS* (1996) (outlining the history of attempts by the tobacco industry to escape regulation); Robert N. Proctor, *Golden Holocaust: Origins of the Cigarette Catastrophe and the Case for Abolition* (University of California Press 2012). The Tobacco industry’s scientific misrepresentations have also become well-known in popular culture. *See, e.g.*, *Thank You for Smoking* (Fox Searchlight Pictures 2006); Naomi Oreskes and Erik M. Conway, *Merchants of Doubt* (Bloomsbury Press 2010). One now-famous tobacco industry memorandum from 1969 stated the industry’s goal explicitly: “Doubt is our product.” Rahul Kanakia, *Tobacco companies obstructed science, history professor says*, STAN. U. NEWS SERV. (Apr. 6, 2016), <http://news.stanford.edu/pr/2007/pr-proctor-021407.html>.

³ *See* U.S. DEP’T OF HEALTH AND HUMAN SERV.: TOBACCO FACTS AND FIGURES, <https://betobaccofree.hhs.gov/about-tobacco/facts-figures/> (last visited Sept. 3, 2017) (noting that “[m]ore than 20 million Americans have died because of smoking since 1964, including approximately 2.5 million deaths due to exposure to secondhand smoke”). As Stanford professor Robert Proctor points out, “It’s still the leading cause of death. It still kills over 400,000 Americans per year. It’s still two jumbo jets crashing every day.” Michael Mechanic, *The Book Big Tobacco*

What the tobacco industry figured out, and profited from, was that lies pertaining to scientific knowledge⁴ are uniquely difficult to disprove. Numerous companies in a wide variety of other industries also figured this out. Asbestos, leaded gasoline and other lead-laced goods, fracking-produced oil and gas, soft drinks, sugar, artificial sweeteners, trans-fats, Bendectin, DES and Thalidomide, Agent Orange, formaldehyde, DDT, aerosols, and cancer-causing baby powder are some of the harmful products companies peddled to the public by manipulating or withholding damaging scientific information about them. Here is how the scheme works: there is a product that is both profitable and destructive, and the companies selling the product tell the public “the science is unsettled,” when in fact the science is clear enough to know it poses a danger and greater regulation is needed.⁵

Doesn't Want You to Read, MOTHER JONES (Apr. 6, 2016), <http://www.motherjones.com/politics/2012/05/tobacco-book-golden-holocaust-robert-proctor>.

Worldwide, the number is even more grim; it is estimated one hundred million people were killed by tobacco in the Twentieth Century, and that as many as one billion are expected to die from tobacco in this century. THE TOBACCO ATLAS: SMOKING'S DEATH TOLL, <http://www.tobaccoatlas.org/topic/smokings-death-toll/> (last visited Sept. 3, 2017).

⁴ To qualify as “scientific knowledge,” an assertion must be derived by scientific methods and supported by adequate validation. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 590 (1993). See also *Scientific Knowledge*, BLACK'S LAW DICTIONARY (10th ed. 2014) (“Four primary factors are used to determine whether [an assertion] amounts to scientific knowledge: (1) whether it has been tested; (2) whether it has been subjected to peer review and publication; (3) the known or potential rate of error; and (4) the degree of acceptance within the scientific community.”).

⁵ Schemes involving misrepresentation of scientific knowledge are not limited to private companies motivated by profit. There have been numerous recent examples of such conduct carried out by individuals and groups motivated primarily by ideology, politics, or religion. These include claims made by the anti-vaccination movement (see, e.g., Amanda Z. Naprawa, *Don't Give Your Kid That Shot!: The Public Health Threat Posed by Anti-Vaccine Speech and Why Such Speech Is Not Guaranteed Full Protection Under the First Amendment*, 11 CARDOZO PUB. L. POL'Y & ETHICS J. 473, 474-75 (2013)); numerous laws—some signed into law, some only proposed—regarding the teaching of scientifically unsupported doctrines on evolution, climate change, physics, geology, and astronomy (see, e.g., Wendy F. Hanakahi, *Evolution-Creationism Debate: Evaluating the Constitutionality of Teaching Intelligent Design in Public School Classrooms*, 25 U. HAW. L. REV. 9 (2002)); several laws that contradict scientific consensus on abortion (see, e.g., Joelle Anne Moreno, *Extralegal Supreme Court Policy-Making*, 24 WM. & MARY BILL RTS. J. 451, 462 (2015)); a diverse range of scientifically unsupported laws aimed at the LGBT community, including ones pertaining to bathroom access, marriage equality, military service, and employment discrimination (see, e.g., Judith E. Koons, *Pulse: Finding Meaning in A Massacre Through Gay Latinx Intersectional Justice*, 19 SCHOLAR: ST. MARY'S L. REV. & SOC. JUST. 1, 33 (2017)); several scientifically unsupported laws and funding cuts aimed at curtailing stem cell research (see, e.g., Amy Miller, *The Effect of Federal Funding Restrictions for Embryonic Stem Cell Research on Colleges and Universities: The Need for Caution When Ethical Objections to Research Are Raised*, 41 J.C. & U.L. 147, 148-49 (2015)); and a steady stream of climate change denial by public figures, advocacy organizations, public and private companies, and certain media outlets.

A victim of such a scheme may bring a fraud claim against the wrongdoer.⁶ But fraud cases of this type—where the alleged misrepresentation pertains to scientific knowledge—present significant (and often insurmountable) challenges to plaintiffs in proving the falsity element.⁷ If a tobacco company says the science is unsettled on the link between smoking tobacco and cancer, how can the plaintiff prove that that statement is false? The scientific knowledge on any particular topic is always, technically-speaking, unsettled. That is the nature of science. It is not an encyclopedic body of knowledge. “Instead, it represents a *process* for proposing and refining theoretical explanations about the world that are subject to further testing and refinement.”⁸

Moreover, proving the falsity of the tobacco company’s claim, or any claim pertaining to scientific knowledge, is further complicated by the myriad misconceptions people have about science (like how the scientific method works, what a “theory” really is, and the lack of absolute objectivity and certainty in scientific research results) and the many biases that warp people’s interpretations of scientific assertions (like prejudices based on religious, social, political, or other personal convictions, as well as financial conflicts of interest). Because of these obstacles, industry defendants in such cases have a major advantage. The defendant need only raise doubt about the scientific idea, something relatively easy to do, while the plaintiff is tasked with proving the idea—e.g., the link between smoking and cancer—with certainty, something extraordinarily difficult to do. Not surprisingly, the tobacco litigation cases,⁹ asbestos litigation cases,¹⁰

⁶ As used in this Article, the term “fraud” encompasses common law fraud, misrepresentation, deceit, securities fraud, mail fraud, wire fraud, truth in lending laws, truth in advertising laws, and any other fraud or fraud-like claim or defense, state or federal, civil or criminal, which has as one of its elements that the wrongdoer made a false representation. *See, e.g.,* West v. JPMorgan Chase Bank, N.A., 154 Cal. Rptr. 3s 285, 295 (2013) (California common law fraud); GEICO Gen. Ins. Co. v. Hoy, 136 So. 3d 647, 651 (Fla. Dist. Ct. App. 2013) (Florida common law fraud); Girozentrale v. Tilton, 48 N.Y.S.3d 98, 105 (N.Y. App. Div. 2017) (New York common law fraud); Zaidi v. Shah, 502 S.W.3d 434, 441 (Tex. App. 2016) (Texas common law fraud); CAL. CORP. CODE § 25401 (West 2016) (California securities fraud); FLA. STAT. § 517.301 (2016) (Florida securities fraud); N.Y. GEN. BUS. LAW §§ 352, 353 (McKinney 2016) (New York securities fraud); TEX. REV. CIV. STAT. ANN. § 581-33 (West 2016) (Texas securities fraud); 18 U.S.C.A. § 1341 (federal mail fraud); 18 U.S.C.A. § 1343 (federal wire fraud); SEC Rule 10b-5, 17 C.F.R. § 240.10b-5 (2017) (federal securities fraud). For a more complete list of fraud and fraud-like claims this Article’s proposed standard is intended to apply to, please see Appendix I. *See also* *Fraud*, BLACK’S LAW DICTIONARY (10th ed. 2014) (defining fraud as “[a] knowing misrepresentation or knowing concealment of a material fact made to induce another to act to his or her detriment,” and specifying that it is usually a tort, but in some cases may be a crime).

⁷ Falsity is a required element of most kinds of fraud claims. *See supra* note 6.

⁸ *Daubert*, 509 U.S. at 590 (emphasis in original).

⁹ *See* James A. Henderson, Jr. & Aaron D. Twerski, *Reaching Equilibrium in Tobacco Litigation*, 62 S.C. L. REV. 67, 70-75 (2010); *see also* ORESKES & CONWAY, *MERCHANTS OF DOUBT*, 14, 24, 33.

¹⁰ *See, e.g.,* Lester Brickman, *On the Theory Class’s Theories of Asbestos Litigation: The Disconnect Between Scholarship and Reality*, 31 PEPP. L. REV. 33 (2003) (giving a brief overview of asbestos litigation); Paul Brodeur, *Outrageous Misconduct* (1985); Elise Gelinas, *Asbestos*

and others¹¹ demonstrate a long history of injured plaintiffs denied compensation for their injuries because of the difficulties of holding industry defendants liable.

Last year, yet another alleged scientific knowledge fraud scheme¹² came to light. Attorneys general from twenty states launched a “massive” investigation into whether Exxon Mobil Corp. (“Exxon”),¹³ the world’s largest oil company,¹⁴ misled investors and the public about climate change over the past four decades.¹⁵ The potential charges include securities fraud, common law fraud, and violations of racketeering, consumer protection, truth in advertising, public health, and shareholder

Fraud Should Lead to Fairness: Why Congress Should Enact the Fairness in Asbestos Injury Resolution Act, 69 MD. L. REV. 162 (2003) (discussing history of asbestos litigation); see also *Bragg v. Owens-Corning Fiberglas Corporation*, 734 A.2d 643 (D.C. 1999) (recounting the history of asbestos use and litigation); *In re Joint Eastern & Southern Districts Asbestos Litigation*, 129 B.R. 710, 735 (E. & S.D.N.Y.1991) (recounting a detailed history of asbestos use), *vacated*, 982 F.2d 721 (2d Cir.1992), *modified on rehearing*, 993 F.2d 7 (2d Cir.1993); *Jackson v. Johns-Manville Sales Corp.*, 750 F. 2d 1314 (5th Cir. 1985); Special Project, *An Analysis of the Legal, Social, and Political Issues Raised by Asbestos Litigation, Part I*, 36 VAND. L. REV. 573 (1983).

¹¹ Regarding the scientific consensus on the tobacco-cancer link, see David G. Owen, *Inherent Product Hazards*, 93 KY. L.J. 377, 392–393 (2004); Alan L. Calnan, *Distributive and Corrective Justice Issues in Contemporary Tobacco Litigation*, 27 SW. U. L. REV. 577, 672 (1998); Robert L. Rabin, *A Sociolegal History of Tobacco Tort Litigation*, 44 STAN. L. REV. 853, 856 (1992); see Richard Doll and A. Bradford Hill, *A Study of the Aetiology of Carcinoma of the Lung*, 2 BRIT. MED. J. 1271 (1952), available at <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2022425/pdf/brmedj03472-0009.pdf> (June 9, 2015); Wynder and Evarts A. Graham, *Tobacco Smoking as a Possible Etiologic Factor in Bronchiogenic Carcinoma: A Study of Six Hundred and Eighty-Four Proved Cases*, 143 J. AM. MED. ASS'N 329 (1950). Regarding the Reader's Digest article and its effect, see Ray Norr, *Cancer by the Carton*, READER'S DIG., Dec. 1952, at 7-8, available at <https://www.industrydocumentslibrary.ucsf.edu/tobacco/docs/#id=nyyp0092> (last visited Oct. 7, 2017); RICHARD KLUGER, *ASHES TO ASHES* 152 (1996).

¹² This article refers to these kinds of fraud schemes, where the alleged misrepresentation pertains to scientific knowledge, as “scientific knowledge fraud.” Consistent with the definition of fraud set forth in note 6, such schemes may correspond to one or more of the many species of fraud and fraud-like claims available to plaintiffs, such as common law fraud, criminal and civil securities fraud, and consumer protection fraud, to name a few.

¹³ Prior to 1998, the company was called the Exxon Corporation. In 1998, the Exxon Corporation and Mobil Oil Corporation signed a \$73.7 billion merger agreement forming a new company called Exxon Mobil Corp., the largest oil company and the third largest company in the world. Allen R. Myerson & Agis Salpukas, *Exxon and Mobil Announce \$80 Billion Deal to Create World's Largest Company*, N.Y. TIMES (Dec. 3, 1998), http://www.nytimes.com/learning/teachers/featured_articles/19981203thursday.html?mcubz=0. For brevity and simplicity, I will refer to the company throughout—both pre- and post-merger—as “Exxon.”

¹⁴ Lauren Gensler, *The World's Largest Oil and Gas Companies 2016: Exxon is Still King*, FORBES (May 26, 2016), <https://www.forbes.com/sites/laurengensler/2016/05/26/global-2000-worlds-largest-oil-and-gas-companies/#7d8e87d228b6>.

¹⁵ See Ivan Penn, *California to Investigate Whether Exxon Mobil Lied About Climate-Change Risks*, L.A. TIMES (Jan. 20, 2016), <http://www.latimes.com/business/la-fi-exxon-global-warming-20160120-story.html>; John Schwartz, *Exxon Mobil Fraud Inquiry Said to Focus More on Future Than Past*, N.Y. TIMES (Aug. 19, 2016), <https://www.nytimes.com/2016/08/20/science/exxon-mobil-fraud-inquiry-said-to-focus-more-on-future-than-past.html>.

protection laws.¹⁶ Investigators allege Exxon knew that CO₂ emissions from fossil fuels were causing global temperatures to rise, but that it covered up this fact for decades by telling the public the science was not yet clear.¹⁷

To date, at least five lawsuits have been filed where the issue of Exxon's alleged climate science fraud is being actively litigated.¹⁸ More are sure to come.

Courts will be required to determine whether Exxon made one or more false representations to the public, to shareholders, to government regulators, or to policymakers when it maintained that the science on anthropogenic climate change was unsettled while its own scientists acknowledged it was real. But this issue has much broader implications, as well, far beyond climate change science disputes. The plethora of scientific knowledge fraud cases in the past few decades,¹⁹ along with our

¹⁶ See Penn, *supra* note 15.

¹⁷ See Penn, *supra* note 15; Schwartz, *supra* note 15.

¹⁸ See Complaint, *Ramirez v. Exxon Mobil Corp.*, No. 16-CV-03111 (N.D. Tex. 2016) (class action alleging federal securities fraud claims under §§ 10(b) and 20(a) of the Securities Exchange Act of 1934 and SEC Rule 10b-5 promulgated thereunder); Declaration of Support, *Attia v. Exxon Mobil Corp.*, No. 16-CV-03484 (S.D. Tex. 2017) (amended complaint filed Feb. 7, 2017) (class action alleging claims under Section 502 of the Employee Retirement Income Security Act, 29 U.S.C.A. § 1132); Declaration, *Exxon Mobil Corp. v. Schneiderman*, No. 17-CV-2301, (S.D.N.Y. 2016) (transferred from N.D. Texas, No. 16-CV-00469 – N.D. Texas on March 30, 2017) (action for declaratory relief); *New York v. PriceWaterhouseCoopers, LLP*, No. 451962/16 (N.Y. App. Div. 2016) (New York Attorney General subpoenas compelling Exxon to produce documents pertaining to climate change); *Exxon Mobil Corp. v. Off. of Att'y Gen.*, No. 1684CV01888, (Mass. Supp. 2016) (action filed by Exxon in response to subpoenas issued by Massachusetts Attorney General). Other parties have filed non-fraud-based claims against Exxon for its role in climate change and sea level rise. See, e.g., Complaint, *Cty. of Marin v. Chevron Corp.*, No. CIV 1702586 (Cal. App. Dep't Super. Ct. 2017) (alleging nuisance, failure to warn, negligence, and trespass claims); Complaint, *Cty. of San Mateo v. Chevron Corp.*, No. 17 CIV 03222 (Ca. Sup. Ct. 2017) (alleging nuisance, failure to warn, negligence, and trespass claims); Complaint, *City of Imperial Beach v. Chevron Corp.*, No. C17-01227 (Cal. App. Dep't Super. Ct. 2017) (alleging nuisance, failure to warn, negligence, and trespass claims).

¹⁹ Asbestos, leaded gasoline and other lead-laced goods, fracking-produced oil and gas, soft drinks, sugar, artificial sweeteners, trans-fats, Bendectin, DES and Thalidomide, Agent Orange, formaldehyde, DDT, chlorofluorocarbon-containing aerosols, and cancer-causing baby powder are some of the products companies peddled to the public using false scientific data. For leaded gasoline, see C. Boyden Gray & Andrew R. Varcoe, *Octane, Clean Air, and Renewable Fuels: A Modest Step Toward Energy Independence*, 10 TEX. REV. L. & POL. 9, 15-26 (2005). For lead paint, see *infra* note 193, at 35. For fracking-produced oil and gas, see generally Vanessa Klass, *What's the Big Fracking Deal?*, 42 W. ST. L. REV. 159 (2015). For soft drinks, see generally Priscilla Norwood Harris, *Undoing the Damage of the Dew*, 9 APPALACHIAN J.L. 53, 53 (2009). For sugar, see Nadia B. Ahmad, *The International Sugar Trade and Sustainable Development: Curtailing the Sugar Rush*, 39 N.C. J. INT'L L. & COM. REG. 675 (2014) (giving an overview of the international sugar trade); see Elizabeth Herman, *Sugar Industry Secretly Paid for Favorable Harvard Research*, STAT NEWS (Sep. 12, 2016), <https://www.statnews.com/2016/09/12/sugar-industry-harvard-research/> (reporting that the sugar industry secretly paid for favorable Harvard research); Camila Domonoske, *50 Years Ago, Sugar Industry Quietly Paid Scientists to Point Blame At Fat*, NPR (Sep. 13, 2016), <http://www.npr.org/sections/thetwo-way/2016/09/13/493739074/50-years-ago-sugar-industry-quietly-paid-scientists-to-point-blame-at-fat> (reporting that “[i]n the 1960s, the sugar industry funded research that downplayed the risks of sugar and highlighted the hazards of

society's ever-growing dependence on science, engineering, and technology,²⁰ demonstrates that this issue will become more important in the coming years. It needs to be addressed now. This Article posits the falsity standard that applies to typical fraud actions is inadequate in scientific knowledge fraud cases, and it is therefore necessary to put in place a new falsity standard.²¹

Although several authors have explored the ways greenhouse gas emitters like Exxon might be held liable for climate change under tort law, the literature on this topic has, to date, focused primarily on nuisance.²² It was not

fat"). For artificial sweeteners, see Jason Iuliano, *Killing Us Sweetly: How to Take Industry Out of the FDA*, 6 J. FOOD L. & POL'Y 31, 46-68 (2010). For trans-fats, see Ross Williams, *Safe but Not Wholesome: The Troubling State of Trans Fat Regulation*, 3 J. FOOD L. & POL'Y 39, 46-51 (2007). For Bendectin, see *infra* note 190, at 34. For DES, see *infra* note 191, at 34. For Thalidomide, see Anita Bernstein, *Formed by Thalidomide: Mass Torts As A False Cure for Toxic Exposure*, 97 COLUM. L. REV. 2153, 2156-57 (1997). For Agent Orange, see *infra* note 192, at 35. For formaldehyde, see Tobias J. Gillett, *Lessons from Nutritional Labeling on the 20th Anniversary of the Nlea: Applying the History of Food Labeling to the Future of Household Chemical Labeling*, 37 WASH. U. J.L. & POL'Y 267, 318-21 (2011). For DDT, see Shawn Kolitch, *The Environmental and Public Health Impacts of U.S. Patent Law: Making the Case for Incorporating A Precautionary Principle*, 36 ENVTL. L. 221, 230-32 (2006). For chlorofluorocarbon-containing aerosols, see Orval E. Nangle, *Stratospheric Ozone: United States Regulation of Chlorofluorocarbons*, 16 B.C. ENVTL. AFF. L. REV. 531, 532-39 (1989). For cancer-causing baby powder, see Diane M. Zhang, *J&J Hide Dangers of Talc Powder for Decades*, TRIAL 58 (June 2016).

²⁰ See, e.g., Alan I. Marcus & Amy Sue Bix, *The Future is Now: Science and Technology Policy in America Since 1950*, 6 J. HIGH TECH. L. 1 (2006-2007) (noting that World War II was "the starting point of America's realization that continued dominance in the international scene depends upon scientific and technological supremacy"); Stephen Breyer, *The Interdependence of Science and Law*, 82 JUDICATURE 24, 26 (1998) (noting that "the law itself increasingly needs access to sound science. . . . as society becomes more dependent for its well being upon scientifically complex technology, we find that this technology increasingly underlies legal issues of importance to all of us"); Jesse Lee, Barack Obama, Speech at the National Academy of Sciences (April 27, 2009), <https://obamawhitehouse.archives.gov/blog/2009/04/27/necessity-science> ("Science is more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been before.").

²¹ There are numerous species of fraud of which falsity is a required element, see *supra* note 7, but this Article pertains to any such fraud claim, regardless of species, where the alleged misrepresentation pertains to scientific knowledge.

²² See, e.g., Randall S. Abate, *Public Nuisance Suits for the Climate Justice Movement: The Right Thing and the Right Time*, 85 WASH. L. REV. 197 (2010); Randall S. Abate, *Automobile Emissions and Climate Change Impacts: Employing Public Nuisance Doctrine as Part of a "Global Warming Solution" in California*, 40 CONN. L. REV. 591 (2008); Myles Allen et al., *Scientific Challenges in the Attribution of Harm to Human Influence on Climate*, 155 U. PA. L. REV. 1353 (2007); Myles R. Allen & Richard Lord, *The Blame Game: Who Will Pay for the Damaging Consequences of Climate Change?*, 432 NATURE 551 (2004); Blake R. Bertagna, Comment, "Standing" Up for the Environment: The Ability of Plaintiffs to Establish Legal Standing to Redress Injuries Caused by Global Warming, 2006 BYU L. REV. 415 (2006); Erin Casper Borissov, Note, *Global Warming: A Questionable Use of the Political Question Doctrine*, 41 IND. L. REV. 415 (2008); Maxine Burkett, *Litigating Climate Change Adaptation: Theory, Practice, and Corrective (Climate) Justice*, 42 ENVTL. L. REP. NEWS & ANALYSIS 11144 (2012); Maxine Burkett, *Climate Justice and the Elusive Climate Tort*, 121 YALE L.J. Online 115 (2011); Nigel Cooney, Note, *Without a Leg to Stand on: The Merger of Article III Standing and Merits in Environmental Cases*, 23 WASH. U. J.L. & POL'Y 175 (2007); David A. Dana, *The Mismatch Between Public Nuisance Law and Global Warming*, 18

until the current investigation of Exxon was made public that authors began to discuss how scientific misrepresentations might be addressed under fraud law.²³

SUP. CT. ECON. REV. 9 (2010); James R. Drabick, Note, "Private" Public Nuisance and Climate Change: Working Within, and Around, the Special Injury Rule, 16 FORDHAM ENVTL. L. REV. 503 (2005); Richard A. Epstein, *Beware of Prods and Pleas: A Defense of the Conventional Views on Tort and Administrative Law in the Context of Global Warming*, 121 YALE L.J. Online 317 (2011); James Flynn, *Climate of Confusion: Climate Change Litigation in the Wake of American Electric Power v. Connecticut*, 29 GA. ST. U. L. REV. 823 (2013); Daniel J. Grimm, Note, *Global Warming and Market Share Liability: A Proposed Model for Allocating Tort Damages Among CO₂ Producers*, 32 COLUM. J. ENVTL. L. 209 (2007); David A. Grossman, *Warming Up to a Not-So-Radical Idea: Tort-Based Climate Change Litigation*, 28 COLUM. J. ENVTL. L. 1 (2003); Benjamin P. Harper, Note, *Climate Change Litigation: The Federal Common Law of Interstate Nuisance and Federalism Concerns*, 40 GA. L. REV. 661 (2006); Shi-Ling Hsu, *A Realistic Evaluation of Climate Change Litigation Through the Lens of a Hypothetical Lawsuit*, 79 U. COLO. L. REV. 701 (2008); David Hunter & James Salzman, *Negligence in the Air: The Duty of Care in Climate Change Litigation*, 155 U. PA. L. REV. 1741 (2007); Douglas A. Kysar, *What Climate Change Can Do About Tort Law*, 41 ENVTL. L. 1 (2011); Shawn M. LaTourette, Note, *Global Climate Change: A Political Question?*, 40 RUTGERS L.J. 219 (2008); Timothy D. Lytton, *Using Tort Litigation to Enhance Regulatory Policy Making: Evaluating Climate-Change Litigation in Light of Lessons from Gun-Industry and Clergy-Sexual-Abuse Lawsuits*, 86 TEX. L. REV. 1837 (2008); Kirk B. Maag, Note, *Climate Change Litigation: Drawing Lines to Avoid Strict, Joint, and Several Liability*, 98 GEO. L.J. 185 (2009); Bradford C. Mank, *Standing and Future Generations: Does Massachusetts v. EPA Open Standing for Generations to Come?*, 34 COLUM. J. ENVTL. L. 1 (2009); Bradford C. Mank, *Standing and Global Warming: Is Injury to All Injury to None?*, 35 ENVTL. L. 1 (2005); James R. May, *Climate Change, Constitutional Consignment, and the Political Question Doctrine*, 85 DENV. U. L. REV. 919 (2008); Thomas W. Merrill, *Global Warming as a Public Nuisance*, 30 COLUM. J. ENVTL. L. 293 (2005); Christopher L. Muehlberger, Comment, *One Man's Conjecture is Another Man's Concrete: Applying the "Injury-in-Fact" Standing Requirement to Global Warming*, 76 UMKC L. REV. 177 (2007); Sarah Olinger, Comment, *Filling the Void in an Otherwise Occupied Field: Using Federal Common Law to Regulate Carbon Dioxide in the Absence of a Preemptive Statute*, 24 PACE ENVTL. L. REV. 237 (2007); Matthew F. Pawa, *Global Warming: The Ultimate Public Nuisance*, 39 ENVTL. L. REP. 10230 (2009); Matthew F. Pawa & Benjamin A. Krass, *Global Warming as a Public Nuisance: Connecticut v. American Electric Power*, 16 FORDHAM ENVTL. L. REV. 407 (2005); Eduardo M. Peñalver, *Acts of God or Toxic Torts? Applying Tort Principles to the Problem of Climate Change*, 38 NAT. RESOURCES J. 563 (1998); Christopher R. Reeves, *Climate Change on Trial: Making the Case for Causation*, 32 AM. J. TRIAL ADVOC. 495 (2009); Joseph M. Stancati, Note, *Victims of Climate Change and Their Standing to Sue: Why the Northern District of California Got it Right*, 38 CASE W. RES. J. INT'L L. 687 (2006–2007); Amelia Thorpe, *Tort-Based Climate Change Litigation and the Political Question Doctrine*, 24 J. LAND USE & ENVTL. L. 79 (2008); Jonathan Zasloff, *The Judicial Carbon Tax: Reconstructing Public Nuisance and Climate Change*, 55 UCLA L. REV. 1827 (2008). At least two lawsuits have also addressed this topic. See generally *American Elec. Power Co., Inc. v. Connecticut*, 564 U.S. 410 (2011) (a lawsuit by eight states, New York City, and three land trusts against electric power corporations that owned and operated fossil-fuel-fired power plants in twenty states, seeking abatement of defendants' ongoing contributions to public nuisance of global warming); *Native Village of Kivalina v. ExxonMobil Corp.*, 663 F. Supp. 2d 863, 877–80 (N.D. Cal. 2009) (a lawsuit by an Eskimo village and a city against oil, energy and utility companies for federal common law nuisance, based on emission of greenhouses gases that contributed to global warming, which caused erosion of Arctic sea ice).

²³ See John C. Coffee, Jr., *On Thin Ice: Climate Change, Exxon, NYAG and the Martin Act*, N.Y. L.J. (Nov. 19, 2015), <http://clsbluesky.law.columbia.edu/2015/11/23/on-thin-ice-climate-change-exxon-the-nyag-and-the-martin-act/>; Ashley Poon, *An Examination of New York's Martin Act as a*

However, no author has, to date, provided a satisfactory solution to how a scientific knowledge fraud claimant might establish falsity, a significant hurdle in such cases. This Article fills a gap in the legal literature by giving courts a falsity standard to apply in scientific knowledge fraud cases. The Article does not, however, comprehensively address how the standard should be implemented and applied in specific types of fraud cases. This practical component of the standard will need to be addressed by future scholarship. Once the proposed standard is implemented, and once the other questions this Article leaves unanswered are satisfactorily addressed,²⁴ the standard proposed herein should both (1) encourage judges and juries to focus on and adhere to accurate scientific principles, and (2) help courts more accurately determine the truthfulness or falsity of any statement or omission pertaining to scientific knowledge.

This Article proceeds as follows. Part II summarizes the allegations against Exxon, including how the consensus on climate change science developed over time and what Exxon represented to the public and to its shareholders regarding that science. Part III describes the significant challenges plaintiffs face in trying to establish the falsity of a representation regarding scientific knowledge. Part IV discusses the longstanding policy of protecting and promoting accurate science. Part V proposes a new falsity standard for courts to apply in scientific knowledge fraud cases, and applies the new standard to the Exxon matter.

II. THE INVESTIGATION OF EXXON MOBIL CORP.

“The CO₂ problem . . . is the most important manmade weather problem that we have to contend with.”

EXXON CORP. INTEROFFICE MEMORANDUM
October 31, 1977

“Victory will be achieved when average citizens ‘understand’ (recognize) uncertainties in climate science, [when] recognition of uncertainties becomes part of the ‘conventional wisdom.’”²⁵

Tool to Combat Climate Change, 44 B.C. ENVTL. AFF. L. REV. 115, 130-31 (2017); Chris Erickson, *Climate Change Regulation Through Litigation: New York's Investigation of Exxonmobil Under the Martin Act*, GEO. ENVTL. L. REV. ONLINE 1 (2017), [https://1.next.westlaw.com/Document/I3e848324ffd411e698dc8b09b4f043e0/View/FullText.html?transitionType=SearchItem&contextData=\(sc.Search\)](https://1.next.westlaw.com/Document/I3e848324ffd411e698dc8b09b4f043e0/View/FullText.html?transitionType=SearchItem&contextData=(sc.Search)).

²⁴ See *infra* note 255.

²⁵ *Global Climate Science Communications, Action Plan*, UNION OF CONCERNED SCIENTISTS, <https://www.documentcloud.org/documents/784572-api-global-climate-science-communications-plan.html>.

MEMORANDUM BY THE AMERICAN PETROLEUM INSTITUTE
(LOBBYING GROUP FUNDED BY EXXONMOBIL)

April 3, 1998

The year 2016 was the hottest in the 136 years that records have been kept.²⁶ Before that, 2015 was the hottest year.²⁷ And before that, 2014 was the hottest.²⁸ Indeed, the ten warmest years ever recorded have all occurred since 1998.²⁹ Even more troubling, however, is the long-term trend; averaged over all land and ocean surfaces, temperatures warmed roughly 1.53 degrees Fahrenheit (0.85 degrees Celsius) from 1880 to 2012, even before these past few record-breaking years.³⁰ The three decades from 1983 to 2012 were the warmest thirty-year period of the last 1,400 years.³¹ In short, the current warming period has been significant and abrupt, perhaps best represented by the now-famous “hockey stick graph,” showing a thousand-year period of flat temperatures and a sharp increase in temperatures beginning in about the year 1900, thus taking the shape of a hockey stick.³²

At least 97% of actively publishing climate scientists agree that the warming over the past century was “extremely likely”³³ due to human activities such as CO₂ emissions.³⁴ Most of the leading scientific organizations worldwide have issued public statements endorsing this position.³⁵ However, one of the loudest critics of mainstream climate change science over the past three decades has been the world’s largest oil company, Exxon.³⁶ Following revelations that

²⁶ *Global Temperature*, NASA: GLOBAL CLIMATE CHANGE, VITAL SIGNS OF THE PLANET, <https://climate.nasa.gov/vital-signs/global-temperature/>.

²⁷ *Id.*

²⁸ Steve Cole, Leslie McCarthy, *NASA, NOAA Find 2014 Warmest Year in Modern Record*, NASA, <https://www.nasa.gov/press/2015/january/nasa-determines-2014-warmest-year-in-modern-record>.

²⁹ *Global Temperature*, *supra* note 26.

³⁰ NCAR UCAR, ATMOSNEWS, <https://www2.ucar.edu/climate/faq/how-much-has-global-temperature-risen-last-100-years>; Intergovernmental Panel on Climate Change, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS: WORKING GROUP: CONTRIBUTION TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE: SUMMARY FOR POLICYMAKERS 3, https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WGIAR5_SPM_brochure_en.pdf.

³¹ NCAR UCAR, *supra* note 30.

³² A discussion and explanation of the hockey stick graph can be found at Richard Monastersky, *Climate Science on Trial*, CHRON. OF HIGHER EDUC. (Sept. 5, 2003), <http://www.chronicle.com/article/Climate-Science-on-Trial/34665>. Today, the conclusions the graph represent have been reinforced by dozens of reconstructions, using various statistical methods. See David Frank et al., *A noodle, hockey stick, and spaghetti plate: A perspective on high-resolution paleoclimatology*, WIRES CLIM. CHANGE 2010, 1, 507-16.

³³ “Extremely likely” means a certainty of 95% to 100%. See CLIMATE CHANGE 2014: SYNTHESIS REPORT: SUMMARY FOR POLICYMAKERS 2 n.1.

³⁴ *Scientific consensus: Earth’s climate is warming*, GLOBAL CLIMATE CHANGE: VITAL SIGNS OF THE PLANET, NASA, <http://climate.nasa.gov/scientific-consensus/>.

³⁵ *Id.*

³⁶ J. William Carpenter, *Top 5 Companies Owned by Exxon Mobile (XOM)*, INVESTOPEDIA (OCT.

Exxon, for decades, mislead shareholders and the public about climate change, several law enforcement agencies launched a “massive” investigation into the company.³⁷

The allegations against Exxon, though serious, are only allegations. The facts discussed below are taken from media reports, interviews, and relevant documents made publicly available.

A. Scientists have long recognized the link between CO₂ emissions and global warming³⁸

The basic mechanics of anthropogenic³⁹ climate change are relatively simple. Plants absorb carbon dioxide, a naturally-occurring compound, from the air, and when those plants decay or are burned, the CO₂ is released back into the atmosphere. All fuels used by humans consist of carbon compounds produced by modern or ancient plants. Accordingly, humans have, since the invention of fire, released CO₂ into the atmosphere when burning fuel for heat or cooking or any other energy-dependent activity. Throughout most of the half million years

13, 2015), <http://www.investopedia.com/articles/markets/101315/top-5-companies-owned-exxon-mobil.asp>; Neela Banerje et al., *Exxon's Own Research Confirmed Fossil Fuels' Role in Global Warming Decades Ago*, INSIDECLIMATE NEWS (Sept. 16, 2015), <http://insideclimatenews.org/news/15092015/Exxons-ownresearch-confirmed-fossil-fuels-role-in-global-warming> (describing how Exxon conducted cutting-edge climate research decades ago and then, without revealing all that it had learned, worked at the forefront of climate denial, manufacturing doubt about the scientific consensus that its own scientists had confirmed).

³⁷ Big Oil's climate change denial was not the industry's first experience with scientific knowledge fraud, nor was it the last. In the 1950s and 60s, oil companies worked to discredit scientists who pointed to a link between petroleum and smog. See Neela Banerjee, *For Oil Industry, Clean Air Fight Was Dress Rehearsal for Climate Denial*, INSIDE CLIMATE NEWS (Jun. 6, 106), <http://insideclimatenews.org/news/05062016/oil-industry-clean-air-fight-smog-los-angeles-dress-rehearsal-climate-change-denial-exxon>. Petroleum industry has also misled the public on the science pertaining to leaded gasoline and, more recently, on fracking-produced oil and gas.

³⁸ This subsection briefly addresses a broad and important topic: the development of climate change science and the emergence of scientific consensus on anthropogenic global warming. There are many articles and books on this topic, and this article does not have the space to do this topic justice. For a better and more comprehensive treatment of this topic, see INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE: FIFTH ASSESSMENT REPORT: SUMMARY FOR POLICYMAKERS, http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf; THOMAS G. FARMER & JOHN COOK, CLIMATE CHANGE SCIENCE: A MODERN SYNTHESIS: VOLUME 1 - THE PHYSICAL CLIMATE (2015); Naomi Oreskes, *The Scientific Consensus on Climate Change: How Do We Know We're Not Wrong?*, CLIMATE CHANGE: WHAT IT MEANS FOR US, OUR CHILDREN, AND OUR GRANDCHILDREN 65 (MIT PRESS 2007), <http://www.project2061.org/events/meetings/climate2010/includes/media/NotwrongClimateChange.MITPress.2007.pdf>.

³⁹ “Anthropogenic” is a term that refers to humans’ influence on nature. *Anthropogenic*, MERRIAM-WEBSTER DICTIONARY, <https://www.merriam-webster.com/dictionary/anthropogenic> (“of, relating to, or resulting from the influence of human beings on nature anthropogenic pollutants”); “Anthropogenic climate change” is the prevailing term used to describe climate change caused by humans.

humans have been on the Earth, however, our fuels consisted of wood and other plants that had grown only a few years before they were burned. The effect of this burning on the content of the atmospheric CO₂ was negligible, because it only slightly speeded up the natural decay processes that continually recycle carbon from the biosphere to the atmosphere.⁴⁰

About three hundred years ago, however, humans began using fossil fuels—like coal, petroleum, oil shales, tar sands, and natural gas—which are derived from plants buried in sediments over hundreds of millions of years. We have been increasing our use of these fuels ever since. Today, we use fossil fuels for the vast majority of our energy needs, from powering cars and airplanes to generating electricity for myriad residential and commercial purposes.⁴¹ But burning fossil fuels has greatly sped up the natural plant decay process, releasing at a rapid rate CO₂ absorbed by plants over hundreds of millions of years, thereby increasing the atmospheric CO₂.⁴² Because CO₂ is a greenhouse gas—meaning its presence in the atmosphere traps in heat like the roof of a greenhouse⁴³—increasing the CO₂ in the atmosphere increases temperatures on the Earth.⁴⁴

Simple, right? Not exactly. This brief overview glosses over the complexity of the science behind how global warming happens. There are numerous drivers of global temperatures, both natural (the sun,⁴⁵ volcanos,⁴⁶ and Earth's orbit,⁴⁷ for instance) and anthropogenic (ozone emissions,⁴⁸ methane

⁴⁰ PRESIDENT'S SCI. ADVISORY COMM., *Restoring the Quality of Our Environment*, Report of the Environmental Pollution Panel 112-13 (1965), <http://dgc.stanford.edu/labs/caldeiralab/Caldeira%20downloads/PSAC,%201965,%20Restoring%20the%20Quality%20of%20Our%20Environment.pdf>.

⁴¹ *Id.*

⁴² *Id.*

⁴³ Greenhouse gasses in the Earth's atmosphere, like water vapor, carbon dioxide, methane, nitrous oxide, and ozone, do what the roof of a greenhouse does. During the day, the sun's heat penetrates through the atmosphere, heating up Earth's surface. At night, Earth's surface cools, releasing the heat back into the atmosphere, much of it escaping out into space. But some of the heat is trapped by the greenhouse gases in the atmosphere. That is what keeps the Earth a comfortable fifty-nine degrees; without the greenhouse effect, the Earth's temperature would be approximately -18 degrees Celsius (or 0 degrees Fahrenheit), a temperature so low that all water on Earth, including the oceans, would freeze, and life as we know it would not exist. See *Climate and the Carbon Cycle: Unit Overview, Lab 3: Carbon in the Atmosphere, 3A: CO₂ – It's a Gas!*, EARTHLABS, <http://serc.carleton.edu/eslabs/carbon/3a.html> (last visited on Aug. 1, 2017).

⁴⁴ PRESIDENT'S SCI. ADVISORY COMM., *supra* note 40, at 113.

⁴⁵ *Solar Radiation and Climate Experiment*, NASA EARTH OBSERVATORY, https://earthobservatory.nasa.gov/Features/SORCE/sorce_04.php (last visited Aug. 1, 2017); *Is Current Warming Natural?*, NASA EARTH OBSERVATORY, <https://earthobservatory.nasa.gov/Features/GlobalWarming/page4.php> (last visited Aug. 1, 2017).

⁴⁶ *Is Current Warming Natural?*, *supra* note 45; *How Volcanoes Influence Climate*, UCAR CTR. FOR SCI. EDUC., <https://scied.ucar.edu/shortcontent/how-volcanoes-influence-climate> (last visited Aug. 1, 2017).

⁴⁷ *Is Current Warming Natural?*, *supra* note 45.

⁴⁸ Nadine Unger, *Transportation Pollution and Global Warming*, NASA (June 2009), https://www.giss.nasa.gov/research/briefs/unger_02/.

emissions,⁴⁹ and aerosols,⁵⁰ for instance), and warming and cooling do not necessarily coincide on all parts of the globe or in all levels of the upper and lower atmosphere.⁵¹ Moreover, human activities both heat and cool the Earth; the release of CO₂, Methane, and Nitrous Oxide into the atmosphere all have a warming effect, while the release of aerosols into the atmosphere has a slight cooling effect.⁵² But *how* each of these factors affects global temperatures and *how much* they do so are complex scientific questions.

Nevertheless, scientists have long understood the two basic components of the equation: one, CO₂ acts as a greenhouse gas in the atmosphere by stopping some of the solar radiation (heat from the sun) from radiating back out into space, warming the Earth, and two, humans' burning of fuels and, increasingly, fossil fuels, releases excess CO₂ into the atmosphere.⁵³ Indeed, scientists first posited that CO₂ emissions from burning fossil fuels might affect the Earth's climate more than a century ago.⁵⁴

During the second half of the twentieth century, the scientific community's confidence in the idea that global warming was happening, and that it was caused by human-caused factors, most notably CO₂ emissions, grew steadily.⁵⁵ By 1965, President Lyndon B. Johnson told Congress that humans have "altered the composition of the atmosphere on a global scale through . . . a steady increase in carbon dioxide from the burning of fossil fuels,"⁵⁶ and the 1979 World Climate Conference of the World Meteorological Organization concluded "it appears plausible that an increased amount of carbon dioxide in the atmosphere can contribute to a gradual warming of the lower atmosphere, especially at higher latitudes. . . . It is possible that some effects on a regional and

⁴⁹ *Overview of Greenhouse Gases*, EPA, <https://www.epa.gov/ghgemissions/overview-greenhouse-gases> (last visited Aug. 1, 2017); *Causes of Climate Change*, EPA, <https://www.epa.gov/climate-change-science/causes-climate-change> (last visited Aug. 1, 2017).

⁵⁰ *Atmospheric Aerosols: What Are They and Why Are They So Important?*, NASA (Aug. 1, 1996), <https://www.nasa.gov/centers/langley/news/factsheets/Aerosols.html>.

⁵¹ See *A Blanket Around The Earth*, NASA GLOBAL CLIMATE CHANGE, <https://climate.nasa.gov/causes/> (last visited Aug. 1, 2017).

⁵² *Atmospheric Aerosols: What are They and Why Are They So Important*, *supra* note 50.

⁵³ See *Global Warming FAQ*, UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/global_warming/science_and_impacts/science/global-warming-faq.html#.WPaHPqK1vIU (last visited Aug. 1, 2017).

⁵⁴ The American geologist, T.C. Chamberlain (in 1899), and the Swedish chemist, S. Arrhenius (in 1903) each independently proposed that CO₂ emissions from human activities might result in global warming. PRESIDENT'S SCI. ADVISORY COMM. *supra* note 40, at 114; *The Discovery of Global Warming*, AM. INST. OF PHYSICS (Jan. 2017), <http://history.aip.org/climate/co2.htm>.

⁵⁵ *The Discovery of Global Warming*, *supra* note 54; *The Keeling Curve Explained*, QUEST (Dec. 12, 2014), <https://ww2.kqed.org/quest/2014/12/12/the-keeling-curve-explained/>.

⁵⁶ Reuven S. Avi-Yonah & David M. Uhlmann, *Combating Global Climate Change: Why A Carbon Tax Is a Better Response to Global Warming Than Cap and Trade*, 28 STAN. ENVTL. L.J. 3, 15 (2009).

global scale may be detectable before the end of this century and become significant before the middle of the next century.”⁵⁷

But it was not until 1988 that a strong consensus on global warming began to emerge. That year, a “World Conference on the Changing Atmosphere: Implications for Global Security” gathered hundreds of scientists and others in Toronto.⁵⁸ They concluded that the changes in the atmosphere due to human pollution “represent a major threat to international security and are already having harmful consequences over many parts of the globe,” and declared that by 2005 the world should push its emissions some 20% below the 1988 level.⁵⁹ Also that year, the Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization and the United Nations Environmental Program in response to the growing warnings about global warming.⁶⁰ The IPCC is the world’s leading authority on climate change issues.⁶¹

The IPCC published its First Assessment report in 1990. Despite the scientific gaps, the panel warned that unrestrained emissions from burning fossil fuels would surely warm the planet in the century ahead. The conclusion, the IPCC said after intense deliberations, was “certain.” It prescribed deep reductions in greenhouse gas emissions to stave off a crisis in the coming decades.⁶²

In 1995, in the organization’s Second Assessment report, the IPCC declared that the human impact on climate was now “discernible.”⁶³ By that year the IPCC had grown to include several hundred climate scientists from around the world.⁶⁴ Its assessment was generated through a rigorous process of peer review and revision, through which all opinions and comments added to the draft by the scientists reviewing it had to either be incorporated into the draft by the author, or the author had to adequately explain why those opinions or comments

⁵⁷ Declaration of the World Climate Conference, World Meteorological Organization 2 (February 13, 1979), <http://unesdoc.unesco.org/images/0003/000376/037648eb.pdf>.

⁵⁸ Conference Statement, *The Changing Atmosphere: Implications for Global Security*, Toronto, June 27-30, 1988, World Meteorological Organization 292 (1989), cmosarchives.ca/History/ChangingAtmosphere1988e.pdf

⁵⁹ Conference Statement, *supra* note 58, at 292, 296; *see also* James E. Peterson, *Can Algae Save Civilization? A Look at Technology, Law, and Policy Regarding Iron Fertilization of the Ocean to Counteract the Greenhouse Effect*, 6 *COLO. J. INT’L ENVTL. L. & POL’Y* 61, 101-02 (1995).

⁶⁰ INTERGOVT’L PANEL ON CLIMATE CHANGE, *History*, http://www.ipcc.ch/organization/organization_history.shtml (last visited Sept. 5, 2017).

⁶¹ INTERGOVT’L PANEL ON CLIMATE CHANGE, *Organization*, <https://www.ipcc.ch/organization/organization.shtml> (last visited Sept. 5, 2017).

⁶² David Hasemyer & John H. Cushman, Jr., *Exxon Sowed Doubt About Climate Science for Decades by Stressing Uncertainty*, *INSIDE CLIMATE NEWS* (Oct. 22, 2015), <http://insideclimatenews.org/news/22102015/Exxon-Sowed-Doubt-about-Climate-Science-for-Decades-by-Stressing-Uncertainty>.

⁶³ Intergovernmental Panel on Climate Change’s Second Assessment Report, *Climate Change 1995: The Science of Climate Change*, Intergovernmental Panel on Climate Change 5 (1996), https://www.ipcc.ch/ipccreports/sar/wg_I/ipcc_sar_wg_I_full_report.pdf.

⁶⁴ INTERGOVT’L PANEL ON CLIMATE CHANGE, *supra* note 60.

did not belong in the assessment.⁶⁵ The result was a conclusion that human activities were affecting the global climate.

By 2001, the IPCC's Third Assessment Report stated that the evidence was strong and getting stronger,⁶⁶ and in 2007, the Fourth Assessment called anthropogenic global warming "unequivocal."⁶⁷ Major scientific organizations and prominent scientists around the world have repeatedly ratified the IPCC's conclusions.⁶⁸ The IPCC's most recent assessment, in 2013, found "[i]t is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century."⁶⁹

B. Exxon initially embraced objective climate science, but later launched a campaign of climate change denial⁷⁰

Researching climate change science was (and is) an integral part of Exxon's business. As the world's largest oil company,⁷¹ it had a duty to inform

⁶⁵ *Id.*

⁶⁶ See J.F.B. Mitchell et al., *Detection of Climate Change and Attribution of Causes*, CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS. CONTRIBUTION OF WORKING GROUP I TO THE THIRD ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (Houghton, J.T., Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K. Maskell, and C.A. Johnson eds., Cambridge Univ. Press 2001) ("In the light of new evidence and taking into account the remaining uncertainties, most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations. Furthermore, it is very likely that the 20th century warming has contributed significantly to the observed sea level rise, through thermal expansion of sea water and widespread loss of land ice.") (available at: <https://www.ipcc.ch/ipccreports/tar/wg1/pdf/TAR-12.PDF>).

⁶⁷ Richard B. Alley et al., INTERGOVT'L PANEL ON CLIMATE CHANGE, SUMMARY FOR POLICY MAKERS, 5 (2007), <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>.

⁶⁸ INTERGOVT'L PANEL ON CLIMATE CHANGE, *supra* note 60.

⁶⁹ Intergovernmental Panel on Climate Change's Fifth Assessment Report, ch. 10 at 869 (2013), <https://www.ipcc.ch/report/ar5/wg1/> (note that "extremely likely" equates to a 95%-100% level of certainty); see also Oreskes, *supra* note 38, at 67-68 (explaining the relevance of the IPCC's Fifth Assessment Report findings).

⁷⁰ This subsection very briefly addresses a broad and important topic: Exxon Mobil Corp.'s actions pertaining to the development of, and denial of, climate change science. There have been many articles and books on this topic, and this article does not have the space to do it justice. For a more comprehensive treatment of this topic, see, e.g., Lisa Song et al., *Exxon Confirmed Global Warming Consensus in 1982 with In-House Climate Models*, INSIDECLIMATE NEWS (Sept. 22, 2015), <http://insideclimatenews.org/news/18092015/exxon-confirmed-global-warming-consensus-in-1982-with-in-house-climate-models>; David Hasemyer & John Cushman, Jr., *Exxon: The Road Not Taken, Exxon Sowed Doubt about Climate Science for Decades by Stressing Uncertainty*, INSIDECLIMATE NEWS (Oct. 22, 2015), <http://insideclimatenews.org/news/22102015/Exxon-Sowed-Doubt-about-Climate-Science-for-Decades-by-Stressing-Uncertainty>; Neela Banerjee et al., *Exxon's Own Research Confirmed Fossil Fuels' Role in Global Warming Decades Ago*, INSIDECLIMATE NEWS (Sept. 16, 2015), <http://insideclimatenews.org/news/15092015/Exxons-own-research-confirmed-fossil-fuels-role-in-global-warming>.

⁷¹ Lauren Gensler, *The World's Largest Oil and Gas Companies 2017: Exxon Reigns Supreme, While Chevron Slips*, FORBES (May 24, 2017),

its shareholders about climate change science and how it might affect its business,⁷² and a duty to protect members of the public from foreseeable harm from Exxon-caused climate change.⁷³ Such members of the public could number in the billions given the extremely large amount of fossil fuels the company extracts, refines, and sells.⁷⁴

Not surprisingly, then, Exxon's in-house scientists were working at the forefront of climate change science as far back as the 1960s. In 1966, for instance, Exxon scientist James Black helped author a report by the National Academies of Science that stated that the rate of build-up of CO₂ in the atmosphere corresponded with the rate of production of carbon dioxide by human consumption of fossil fuels.⁷⁵ This was in line with what leading climate scientists were postulating at the time.⁷⁶

Exxon's support for objective and cutting-edge advances in climate change science continued through the 1970's.⁷⁷ Notably, in July 1977, Dr. Black, then a senior scientist in Exxon's Research & Engineering division, warned company executives of the danger of atmospheric carbon dioxide increases from the burning of fossil fuels.⁷⁸ Dr. Black reported general scientific agreement that

<https://www.forbes.com/sites/laurengensler/2017/05/24/the-worlds-largest-oil-and-gas-companies-2017-exxon-mobil-reigns-supreme-chevron-slips/#c550d2a4f87c>.

⁷² *Duties owed to individual shareholders*, 3 FLETCHER CYC. CORP. § 848 (noting that officers and directors owe fiduciary duty to individual shareholders).

⁷³ See BARRY A. LINDAHL 1 MODERN TORT LAW: LIABILITY AND LITIGATION § 5:1 (2d ed.) (noting that there is a duty to avoid causing injury to individuals and entities who might foreseeably be harmed by your actions).

⁷⁴ See *The World's 25 Biggest Oil Companies*, FORBES, <https://www.forbes.com/pictures/em45gmmg/4-exxonmobil-5-3-million-barrels-per-day/#265722f069f2> (noting Exxon produces 5.3 million barrels of oil per day, and generates \$400 billion in annual revenues and \$40 billion in annual profit); see also Brenda Ekwurzel, et al., *The rise in global atmospheric CO₂, surface temperature, and sea level from emissions traced to major carbon producers*, 144 *Climate Change* 579, 579-90 (2017) (presenting a study connecting climate change impacts to the emissions from Exxon, Chevron and other large oil, gas and cement companies and their products).

⁷⁵ Neela Banjeree et al., *Exxon Believed Deep Dive Into Climate Research Would Protect Its Business*, INSIDECLIMATE NEWS (Sept. 17, 2015), <https://insideclimatenews.org/news/16092015/exxon-believed-deep-dive-into-climate-research-would-protect-its-business>. ("Black helped draft a National Academy of Sciences report. . . . Published in 1966, it said the buildup of carbon dioxide in the atmosphere 'agrees quite well with the rate of its production by man's consumption of fossil fuels.'").

⁷⁶ *Id.*

⁷⁷ *Id.*

⁷⁸ *Id.*; see also Internal Exxon Memorandum from James Black to Vice President Exxon Research and Engineering Co. Mr. F. G. Turpin 1-2 (June 6, 1978) (available at: <https://insideclimatenews.org/sites/default/files/documents/James%20Black%201977%20Presentati%20on.pdf>) (James Black states: "What is considered the best presently available climate model for treating the Greenhouse Effect predicts that a doubling of the CO₂ concentration in the atmosphere would produce a mean temperature increase of about 2°C to 3°C over most of the earth. The model also predicts that the temperature increase near the poles may be two to three times this value. . . . A study of past climates suggests that if the earth does become warmer, more rainfall should result. But an increase as large as 2°C would probably also affect the distributional of the rainfall. . . .

the burning of fossil fuels was the most likely human cause of global climate change.⁷⁹

By 1982 there were discussions in Exxon of the scientific consensus of human-caused global warming. "Over the past several years a clear scientific consensus has emerged regarding the expected climatic effects of increased atmospheric CO₂," Cohen wrote to A.M. Natkin of Exxon Corporation's Science and Technology Office in 1982. "The consensus is that a doubling of atmospheric CO₂ from its pre-industrial revolution value would result in an average global temperature rise of $(3.0 \pm 1.5)^{\circ}\text{C}$." (Equal to $5.4 \pm 2.7^{\circ}\text{F}$). "There is unanimous agreement in the scientific community that a temperature increase of this magnitude would bring about significant changes in the earth's climate, including rainfall distribution and alterations in the biosphere."⁸⁰

Exxon's own modeling research confirmed this and the company's results were later published in at least three peer-reviewed science articles.⁸¹ "Exxon's science turned out to be spot on, and the company's early modeling projections still hold up more than 30 years later."⁸²

Up through the mid-1980s, Exxon's public statements and publicly released scientific results were in line with mainstream climate change science.⁸³ Moreover, Exxon incorporated accurate climate science into its operational planning. That is, the company integrated the then-current scientific knowledge of how CO₂ emissions were warming the Earth into its corporate business models. It did this in at least four distinct projects: synthetic fuels⁸⁴; the Natuna Gas Field⁸⁵; the shadow price of carbon⁸⁶; and Exxon's Arctic operations.⁸⁷

Present thinking holds that man has a time window of five to ten years before the need for hard decisions regarding changes in energy strategies might become critical.").

⁷⁹ See Banerjee et al., *supra* note 70 ("In the first place, there is general scientific agreement that the most likely manner in which mankind is influencing the global climate is through carbon dioxide release from the burning of fossil fuels," Black told Exxon's Management Committee in July 1977.); see also Shannon Hall, *Exxon Knew about Climate Change almost 40 years ago*, SCIENTIFIC AMERICAN (Oct. 26, 2015) (noting that James Black told Exxon management in "July 1977, 'In the first place, there is general scientific agreement that the most likely manner in which mankind is influencing the global climate is through carbon dioxide release from the burning of fossil fuels,'" and that "a year later he warned Exxon that doubling CO₂ gases in the atmosphere would increase average global temperatures by two or three degrees—a number that is consistent with the scientific consensus today.").

⁸⁰ Song et al., *supra* note 70.

⁸¹ *Id.*

⁸² *Id.*

⁸³ See generally Hasemyer & Cushman, Jr., *supra* note 70.

⁸⁴ See generally John H. Cushman, Jr., *Highlighting the Allure of Synfuels, Exxon Played Down the Climate Risks*, INSIDECLIMATE NEWS (Oct. 8, 2015), <http://insideclimatenews.org/news/08102015/highlighting-allure-synfuels-exxon-played-down-climate-risks> (for an overview of Exxon's synthetic fuel business model and how it incorporated in climate change).

⁸⁵ See generally Neela Banerjee & Lisa Song, *Exxon's Business Ambition Collided with Climate Change Under a Distant Sea*, INSIDECLIMATE NEWS (Oct. 8, 2015), <http://insideclimatenews.org/news/08102015/Exxons-Business-Ambition-Collided-with-Climate-Change-Under-a-Distant-Sea> (for an overview of Exxon's Natuna Gas Field business model and

All of that changed in 1988. That year, due in large part to Congressional testimony given by Dr. James E. Hansen of the National Aeronautics and Space Administration,⁸⁸ the public first became aware of the consensus, and urgency, shared by climate scientists.⁸⁹ Although for years there had been talk of the “greenhouse effect,” it was seen by and large as an idea some environmentalists had cooked up in a room somewhere. But Dr. Hansen’s testimony, in which he “told a Congressional committee that it was 99 percent certain that the warming trend was not a natural variation but was caused by a buildup of carbon dioxide and other artificial gases in the atmosphere,”⁹⁰ and the media coverage that followed,⁹¹ gave a clear warning: the CO₂ we are pumping into the atmosphere is already heating up the earth, and the effects of that warming could be felt in just a few decades, rather than in a few centuries as many had earlier postulated.⁹²

As a result of this new public awareness, the WMO and the UN set up the IPCC to further explore the dangers posed by global warming.⁹³ The world was taking notice. For the first time, global warming was becoming a real threat—to Exxon. If governments took the dangers of global warming seriously, which was rapidly becoming the case, they would move to regulate petroleum. Accordingly, Exxon pivoted away from the mainstream consensus on climate change and toward uncertainty.

Between the late 1980s and 2013, Exxon paid tens of millions of dollars to organizations supporting climate change denial.⁹⁴ This campaign of

how it incorporated in climate change).

⁸⁶ See H.T., *The Economist explains: Why Exxon Mobil would support a carbon tax*, THE ECONOMIST (Nov. 11, 2015) (for an overview of Exxon’s shadow price of carbon and how it incorporated in climate change).

⁸⁷ See generally Sara Jerving et al., *What Exxon knew about the Earth’s Melting Arctic*, L.A. TIMES (Oct. 9, 2015), <http://graphics.latimes.com/exxon-arctic/> (for an overview of Exxon’s Arctic operations and how it incorporated in climate change).

⁸⁸ Phillip Shabecoff, *Global Warming Has Begun, Expert Tells Senate*, N.Y. TIMES (June 24, 1988), <http://www.nytimes.com/1988/06/24/us/global-warming-has-begun-expert-tells-senate.html?pagewanted=all>.

⁸⁹ David Hasemyer & John Cushman, Jr., *Exxon, The Road Not Taken*, INSIDECLIMATE NEWS (Oct. 22, 2015), <http://insideclimatenews.org/news/22102015/Exxon-Sowed-Doubt-about-Climate-Science-for-Decades-by-Stressing-Uncertainty>.

⁹⁰ Philip Shabecoff, *Global Warming Has Begun, Expert Tells Senate*, N.Y. TIMES (June 24, 1988), <http://www.nytimes.com/1988/06/24/us/global-warming-has-begun-expert-tells-senate.html?pagewanted=all>.

⁹¹ See, e.g., *id.*

⁹² Hasemyer & Cushman, Jr., *supra* note 70.

⁹³ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, *supra* note 60.

⁹⁴ See generally *Smoke, Mirrors & Hot Air: How Exxonmobil Uses Big Tobacco’s Tactics to Manufacture Uncertainty on Climate Science*, UNION OF CONCERNED SCIENTISTS (2007), http://www.ucsusa.org/sites/default/files/legacy/assets/documents/global_warming/exxon_report.pdf; see also Greenpeace, *ExxonMobile Climate Denial Funding 1998-2014*, EXXONSECRETS.ORG, <http://www.exxonsecrets.org/html/index.php> (listing of Exxon’s climate denial funding compiled by Greenpeace International); Justin Farrell, *Network Structure and Influence of the Climate Change Counter-Movement*, NATURE (2015), [http://www.nature.com/nclimate/journal/v6/n4/full/nclimate2875.html?foxtrotcallback=true](http://www.nature.com/nclimate/journal/v6/n4/full/nclimate2875.html?foxtrotcallback=true;);

disinformation, which one journalist aptly labeled “skeptical propaganda masquerading as journalism,”⁹⁵ was a multidimensional effort that included scientists,⁹⁶ academics,⁹⁷ advertisements,⁹⁸ and lobbyists,⁹⁹ as well as industry

Hasemyer & Cushman, Jr., *supra* note 70; Chris Mooney, *Some Like It Hot*, MOTHER JONES (May 2005), <http://www.motherjones.com/environment/2005/05/some-it-hot/>; *Put a Tiger In Your Think Tank*, MOTHER JONES (May 2005), <http://www.motherjones.com/politics/2005/05/put-tiger-your-think-tank/>; Douglas Fischer, “Dark Money” Funds Climate Change Denial Effort, SCIENTIFIC AMERICAN (Dec. 23, 2013), <https://www.scientificamerican.com/article/dark-money-funds-climate-change-denial-effort/>; Jennifer B. Lee, *Exxon Backs Groups that Question Global Warming*, N.Y. TIMES (May 28, 2003), <http://www.nytimes.com/2003/05/28/business/exxon-backs-groups-that-question-global-warming.html>; PBS Newshour, *Has Exxon Mobil misled the public about its climate change research?*, YOUTUBE (Nov. 10, 2015), <https://www.youtube.com/watch?v=DD1b2uEirT0> (discussing the investigation of Exxon for climate change denial, and noting Exxon-funded climate denial groups include the American Enterprise Institute, the American Petroleum Institute, the American Legislative Exchange, and the Heartland Institute); Democracy Now!, *Climate Deniers Exposed: Top Scientist Got Funding from ExxonMobil, Koch Brothers, Big Coal*, YOUTUBE (Feb. 25, 2015), <https://www.youtube.com/watch?v=8E11v7DY4UM> (discussing how Dr. Wei-Hock Soon of the Harvard-Smithsonian Center for Astrophysics wrote scientific papers favorable to the fossil fuel industry’s climate change agenda and failed to disclose he was being paid significant amounts of money by fossil fuel industry groups, and referred to his papers and presentations supporting climate change denial agenda as “deliverables”).

⁹⁵ Mooney, *supra* note 94.

⁹⁶ See Oreskes & Conway, *supra* note 61, at 6 (“In case after case, Fred Singer, Fred Seitz, and a handful of other scientists joined forces with think tanks and private corporations to challenge scientific evidence on a host of contemporary issues. . . . [I]n later years, it came from foundations, think tanks, and the fossil fuel industry. . . . Most recently—over the course of nearly two decades and against the face of mounting evidence—they dismissed the reality of global warming.”).

⁹⁷ From 2001-2012, Dr. Wei Hock-Soon received over \$1.2 million from ExxonMobil, the American Petroleum Institute, the Charles Koch Foundation and other fossil fuel interests for his contrarian climate science research. Soon’s research methodology and conclusions have been widely criticized and discredited by his scientific peers, yet his work—funded by the fossil fuel industry—was used for years to spread doubt about the role of human-caused emissions in climate change. *Fossil Fuel Industry Climate Science Deception*, UNION OF CONCERNED SCIENTISTS (March 29, 2016), <http://www.ucsusa.org/press/2016/fossil-fuel-industry-climate-science-deception#.WD3hYVxrPuo>.

⁹⁸ Between 1990 and 2005, Exxon purchased numerous advertisements in several media outlets, including The New York Times, The Washington Post, and The Wall Street Journal. One of these, placed in Times, cast aspersions on scientists who “believe they can predict changes in climate decades from now.” Hasemyer & Cushman, Jr., *supra* note 70. Another ad, appearing in 2000 in response to the U.S. First National Assessment of Climate Change, said, “The report’s language and logic appear designed to emphasize selective results to convince people that climate change will adversely impact their lives. The report is written as a political document, not an objective summary of the underlying science.” *A Range of Opinions on Climate Change at Exxon Mobil*, N.Y. TIMES (Nov. 6, 2015), <https://www.nytimes.com/interactive/2015/11/06/science/exxon-mobil-global-warming-statements-climate-change.html>. Another ad, published in 2000 in the Times and The Wall Street Journal, was entitled “Unsettled Science” and said, “[I]t is impossible for scientists to attribute the recent small surface temperature increase to human activity.” Hasemyer & Cushman, Jr., *supra* note 70. This particular ad prompted the scientist on whose research it relied to call the ad a “shame,” and to clarify that the ad distorted his research results.

⁹⁹ For example, in 1998, Exxon helped create the Global Climate Science Team, an effort involving Randy Randol, the company’s top lobbyist, and Joe Walker, a public relations representative for

groups that ostensibly produced objective science but in reality merely worked to distort the true scientific picture.¹⁰⁰ But not all of the climate denial propaganda was outsourced. Exxon itself issued several statements during this period aimed specifically at sowing doubt about global warming and its causes, such as the advertorials it published in the *New York Times*, the *Wall Street Journal*, the *USA Today*, and elsewhere between 1990 and 2015.¹⁰¹ One such advertorial, published on March 23, 2000, was entitled “Unsettled Science,” and contained several staggeringly misleading statements on the then-scientific certainty about the link between human activities such as CO₂ emissions and Earth’s rising temperatures.¹⁰²

Exxon’s chairman and chief executive, Lee Raymond, also made a number of statements about the uncertainty of climate change science. He claimed in a speech delivered in 1996 to the Economic Club of Detroit, “Currently, the scientific evidence is inconclusive as to whether human activities are having a significant effect on the global climate.”¹⁰³ The next year, he said in a speech in Beijing, “Many people, politicians and the public alike, believe that global warming is a rock-solid certainty. But it’s not.”¹⁰⁴

That same year, 1997, Mr. Raymond told the World Petroleum Congress (WPC) that global warming was not occurring and that, even if it were, oil and gas would have nothing to do with it.¹⁰⁵ He specifically denied that the planet was warming at all. “The earth is cooler today than it was 20 years ago,” he said.¹⁰⁶

API. Hasemyer & Cushman, Jr., *supra* note 70. The American Petroleum Institute, a fossil fuel industry group funded by Exxon, is heavily involved in direct lobbying on behalf of the oil and gas industry, with lobbying expenses of \$7,790,000 in 2015 alone, and \$9,090,000 in 2014. *Annual Lobbying by American Petroleum Institute*, OPENSECRETS.ORG (Jan. 22, 2016), <https://www.opensecrets.org/lobby/clientsum.php?id=D000031493&year=2015>.

¹⁰⁰ Exxon helped found and fund numerous industry groups that proliferated a message of climate change denial to the public and to policymakers, including the American Enterprise Institute, the American Petroleum Institute, the American Legislative Exchange, and the Heartland Institute. *See, e.g., Has Exxon Mobil misled the public about its climate change research?*, PBS NEWS HOUR (Nov. 10, 2009, 6:45 PM), <http://www.pbs.org/newshour/bb/exxon-mobil-mislead-public-climate-change-research/>; *ExxonMobil climate change controversy*, WIKIPEDIA (July 13, 2017, 6:01 PM), https://en.wikipedia.org/wiki/ExxonMobil_climate_change_controversy#Funding_of_climate_change_denial.

¹⁰¹ Hasemyer & Chushman, Jr., *supra* note 70.

¹⁰² *See Unsettled Science*, N.Y. TIMES (attached hereto in Appendix II), available at <https://perma.cc/74BL-KL8A>.

¹⁰³ *Fossil Fuel Industry Climate Science Deception*, *supra* note 97.

¹⁰⁴ Hasemyer & Cushman, Jr., *supra* note 70.

¹⁰⁵ *Fossil Fuel Industry Climate Science Deception*, *supra* note 97.

¹⁰⁶ *Were our leaders bold enough to do enough about climate change soon enough?*, THE HIGHTOWER LOWDOWN (Dec. 1, 2015), <https://hightowerlowdown.org/article/lettertothefuture/>; Lee R. Raymond, *Chairman and Chief Executive Officer Exxon Corp., Energy – key to growth and a better environment for Asia-Pacific nations*, Remarks at World Petroleum Congress (Oct. 13, 1997) (transcript available at <http://assets.documentcloud.org/documents/2623262/raymond-at-china-world-petroleum-congress-1997.txt>).

Each of these statements was either patently false, or patently misleading. They were also strikingly effective; Mr. Raymond's messages were a significant influence on the United States' failure to ratify the Kyoto Protocol,¹⁰⁷ an international agreement that commits parties to it to reduce greenhouse gas emissions.¹⁰⁸ All UN member states are parties to the Kyoto Protocol except Andorra, Canada, South Sudan, and the United States.¹⁰⁹

Mr. Raymond's statements, as well as Exxon's other efforts to raise doubt, were part of an industrywide effort to protect fossil fuel companies from the threat of regulation. A 1998 internal strategy memo from the American Petroleum Institute, an industry group of leading oil producers, including Exxon, outlined the fossil fuel industry's plan to use scientists as spokespeople for the industry's view.¹¹⁰ The innocuously titled "Global Climate Science Communications Plan," written with the direct involvement of fossil fuel companies including ExxonMobil (then Exxon) and Chevron, details a plan for dealing with climate change that explicitly aimed to confuse and misinform the public. According to the memo, "victory" would be achieved for the campaign when "average citizens" and the media were convinced of "uncertainties" in climate science despite overwhelming evidence of the impact of human-caused global warming and nearly unanimous agreement about it in the scientific community.¹¹¹

By the time Exxon first disclosed to shareholders the financial risks to profitability of climate change (2007)¹¹² and first acknowledged publicly the

¹⁰⁷ See Sybille Van den Hove et al., *The oil industry and climate change: strategies and ethical dilemmas*, 2 CLIMATE POLICY 3, 3-18 (2002) (noting Exxon, together with its partners in U.S. lobby groups, was instrumental to the hindrance of US ratification of the Kyoto Protocol).

¹⁰⁸ *Kyoto Protocol*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/kyoto_protocol/items/2830.php.

¹⁰⁹ See *Status of Ratification of the Kyoto Protocol*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php.

¹¹⁰ *Fossil Fuel Industry Climate Science Deception*, *supra* note 97.

¹¹¹ *Id.* The similarities between this stated goal and the famous statement by the Tobacco industry that "doubt is our product" cannot be, and should not be, overlooked. Indeed, in May 2015, before the major allegations came to light, U.S. Senator Sheldon Whitehouse suggested that the federal prosecution of the tobacco industry might set a precedent for the oil industry, to prosecute companies such as Exxon. Senator Whitehouse laid out the playbook of Big Tobacco, which he said was being used also by the fossil fuels industry. It "looked something like this," he wrote: "(1) pay scientists to produce studies defending your product; (2) develop an intricate web of PR experts and front groups to spread doubt about the real science; (3) relentlessly attack your opponents." Sheldon Whitehouse, *The fossil-fuel industry's campaign to mislead the American people*, WASH. POST (May 29, 2015), https://www.washingtonpost.com/opinions/the-fossil-fuel-industrys-campaign-to-mislead-the-american-people/2015/05/29/04a2c448-0574-11e5-8bda-c7b4e9a8f7ac_story.html; He specifically pointed the finger at the API, a group funded by Exxon, as embodying this strategy. *Id.*

¹¹² Amy Lieberman & Susan Rust, *Big Oil braced for global warming while it fought regulations*, L.A. TIMES (Dec. 31, 2015), <http://graphics.latimes.com/oil-operations/>.

climate change risk (2014),¹¹³ the company had spent almost two decades and millions of dollars manufacturing doubt about the reality of global warming its own scientists had once confirmed.¹¹⁴ It had also lobbied vigorously to block federal and international action to control greenhouse gas emissions.¹¹⁵ These actions, and others described in the sources cited herein, serve as the basis for the current investigation into Exxon's years of climate change denial.

In September 2015, journalists exposed that Exxon's scientists knew *decades* ago that the evidence on anthropogenic global warming was substantial enough to take seriously, yet the company continued for years carrying out its campaign of climate change denial. The media pile-on was immediate.¹¹⁶ Following these revelations, more than 40 leading U.S. environmental and social justice organizations wrote to the United States Attorney General requesting a federal investigation into Exxon deceiving the public about climate change.¹¹⁷ Former Vice President Al Gore and all three Democratic primary candidates for President of the United States called for a Department of Justice investigation.¹¹⁸

In late October or early November 2015, New York Attorney General Eric Schneiderman began an investigation of Exxon to determine whether the

¹¹³ *Exxon Mobil Acknowledges Climate Change Risk - You Read That Correctly*, INVESTING.COM, (Apr. 1, 2014), <https://www.investing.com/news/stock-market-news/exxon-mobil-acknowledges-climate-change-risk---you-read-that-correctly-275168>.

¹¹⁴ See, e.g., Banerjee, *supra* notes 75 and 79, and accompanying text.

¹¹⁵ See, e.g., Hasemyer & Cushman, Jr., *supra* note 70, and accompanying text.

¹¹⁶ See, e.g., Banerjee et al., *supra* note 70; Sarah Zhang, *Exxon's Own Scientists Confirmed Climate Change—In the 70s*, WIRED (Sep. 16, 2015, 7:45 PM), <http://www.wired.com/2015/09/exxons-scientists-confirmed-climate-change-in-70s>; Bill McKibben, *What Exxon Knew About Climate Change*, THE NEW YORKER (Sep. 18, 2015), <http://www.newyorker.com/news/daily-comment/what-exxon-knew-about-climate-change>; Neela Banerjee & Ed Garvey, *Inside Exxon's Great Climate Cover-Up: From Early Climate Change Researcher to Epic Climate Denier*, DEMOCRACY NOW! (Sep. 24, 2015), http://www.democracynow.org/2015/9/24/inside_exxons_great_climate_cover_up; Michael Mann, *Exxon Doubled Down on Climate Denial and Deceit*, TRUTHOUT (Sep. 21, 2015, 6:52 PM), <http://truth-out.org/buzzflash/commentary/exxon-doubled-down-on-climate-denial-and-deceit>; Dino Grandoni et al., *How Exxon Went From Leader to Skeptic on Climate Change Research*, L.A. TIMES (Oct. 23, 2015), <http://graphics.latimes.com/exxon-research>; Emily Atkin, *Exxon's Climate Cover-Up Should Be Investigated By DOJ, Tobacco Prosecutor Says*, THINK PROGRESS (Oct. 20, 2015), <http://thinkprogress.org/climate/2015/10/20/3713761/exxon-climate-denial>.

¹¹⁷ Justin Gillis & John Schwartz, *Exxon Mobil Accused of Misleading Public on Climate Change Risks*, N.Y. TIMES (Oct. 30, 2015), https://www.nytimes.com/2015/10/31/science/exxon-mobil-accused-of-misleading-public-on-climate-change-risks.html?mcubz=0&_r=0 ("More than 40 of the nation's leading environmental and social justice groups demanded a federal investigation of Exxon Mobil on Friday, accusing the huge oil and gas company of deceiving the American public about the risks of climate change to protect its profits.").

¹¹⁸ Leslie Picker, *Gore Calls for Exxon Mobil Inquiry on Climate Change*, N.Y. TIMES (Nov. 3, 2015), <https://www.nytimes.com/2015/11/04/business/dealbook/gore-calls-for-exxon-mobil-inquiry-on-climate-change.html>; Timothy Cama, *Hillary joins calls for federal probe of Exxon climate change research*, THE HILL (Oct. 29, 2015), <http://thehill.com/policy/energy-environment/258589-clinton-joins-calls-for-federal-probe-of-exxon>.

company lied to the public about the risks of climate change or to investors about how such risks might hurt the oil business.¹¹⁹ The investigation was not revealed to the public until November 5, 2015, when NY AG Schneiderman issued a subpoena to Exxon, demanding extensive financial records, emails, and other documents.¹²⁰ The investigation, from its inception, has focused on whether statements the company made to investors, consumers, and the public about climate risks as recently as 2015 were consistent with the company's own scientific research.¹²¹ The potential charges include securities fraud, common law fraud, and violations of racketeering, consumer protection, truth in advertising, public health, and shareholder protection laws.¹²²

On March 29, 2016, NY AG Schneiderman held a news conference, accompanied by several of his counterparts from other states, where it was announced that the alliance cooperating in the investigation totaled seventeen states' attorneys general, including those from California, Vermont, Virginia, Massachusetts, Maryland, Connecticut, and the Virgin Islands.¹²³ "The First Amendment, ladies and gentlemen, does not give you the right to commit fraud," Mr. Schneiderman said.¹²⁴ "Every attorney general does work on fraud cases, and we are pursuing this as we would any other fraud matter. You have to tell the truth, you can't make misrepresentations of the kinds we've seen here." He added, "The scope of the problem we are facing, the size of the corporate entities and their alliances, the trade associations and other groups, is massive and it

¹¹⁹ Justin Gillis & Clifford Krauss, *Exxon Mobil Investigated for Possible Climate Change Lies by New York Attorney General*, N.Y. TIMES (Nov. 5, 2015), https://www.nytimes.com/2015/11/06/science/exxon-mobil-under-investigation-in-new-york-over-climate-statements.html?_r=0.

¹²⁰ *See id.*

¹²¹ *See id.*

¹²² *See* Ivan Penn, *California to investigate whether Exxon Mobil lied about climate-change risks*, L.A. TIMES (Jan. 20, 2016), <http://www.latimes.com/business/la-fi-exxon-global-warming-20160120-story.html> (U.S. Representative Ted Lieu "said he has sent letters to U.S. Atty. Gen. Loretta Lynch and the U.S. Securities and Exchange Commission calling for federal investigations of securities fraud and violations of racketeering, consumer protection, truth in advertising, public health, shareholder protection or other laws."); *see also* PBS NewsHour, *Has Exxon Mobil misled the public about its climate change research?*, YOUTUBE (Nov. 10, 2015), <https://www.youtube.com/watch?v=DDIb2uEirT0> (where AG Schneiderman states that the charges contemplated are wide-ranging, but all involve some kind of fraud that affects the public, consumers, and shareholders).

¹²³ David Hasemyer & Sabrina Shankman, *Climate Fraud Investigation of Exxon Draws Attention of 17 Attorneys General*, INSIDECLIMATE NEWS (March 30, 2016), <http://insideclimatenews.org/news/30032016/climate-change-fraud-investigation-exxon-eric-schneiderman-18-attorneys-general>. As of the writing of this Article, the investigation of Exxon is being actively carried out by the attorneys general of Massachusetts and New York, and joined or supported by the attorneys general of fifteen additional states. *See id.*

¹²⁴ *Id.*

requires a multistate effort.”¹²⁵ The Securities and Exchange Commission is also investigating Exxon.¹²⁶ Exxon has denied the allegations.¹²⁷

III. OBSTACLES FACED BY SCIENTIFIC KNOWLEDGE FRAUD PLAINTIFFS

“The saddest aspect of life right now is that science gathers knowledge faster than society gathers wisdom.”

ISAAC ASIMOV

Fraud is difficult to prove.¹²⁸ Not only do plaintiffs in such cases face heightened specific pleading requirements and standards of proof,¹²⁹ but they

¹²⁵ *Id.*

¹²⁶ Regarding the SEC investigation, see Christine Wang, *SEC investigating Exxon Mobil on climate change, accounting practices: Report*, CNBC (Sep. 20, 2016, 6:16 PM), <http://www.cnbc.com/2016/09/20/sec-investigating-exxon-mobil-on-climate-change-accounting-practices-report.html>. It should be noted that, in the SEC Rule 10b-5 context, the fraud-on-the-market theory could have important consequences in shareholder class actions of scientific knowledge fraud such as those contemplated against Exxon. “Fraud on the market” is a securities-fraud theory that “permits certain Rule 10b-5 plaintiffs to invoke a rebuttable presumption of reliance on material misrepresentations aired to the general public.” *Amgen Inc. v. Connecticut Retirement Plans & Trust Funds*, 133 S. Ct. 1184, 1192 (2013). The fraud-on-the-market presumption can be invoked via the pleadings at the class certification stage to establish that questions common to the class predominate over questions of individual reliance. *Id.* at 1193. Though the presumption is rebuttable by showing, *inter alia*, that the alleged public misrepresentations were not material, a divided Supreme Court recently held that the issue of materiality is a merits inquiry, not a commonality issue, and therefore rebuttal evidence as to the materiality of alleged fraud on the market statements is properly considered at the summary judgment or trial stage, not on class certification. *Id.* at 1199. A strong dissent argued that materiality is an essential element of the fraud on the market theory, and therefore the issue of materiality must be proved at the class certification stage in order to invoke the presumption. *Id.* at 1209, 1211 (Thomas, J., dissenting); see also Linda L. Addison, *Presumptions—Rebuttable presumptions—Effect of rebuttal evidence, “Fraud on the Market” presumption in securities class actions must be rebutted on the merits, not at certification stage*, 1 Tex. Prac. Guide Evid. § 3:60 (2016). Under the fraud on the market theory, each assertion pertaining to scientific knowledge to the general public potentially invokes the rebuttable assumption of a shareholder’s reliance on that assertion.

¹²⁷ See, e.g., Lonnie Shekhtman, *Exxon: Charges of lying about climate change are ‘preposterous’*, THE CHRISTIAN SCIENCE MONITOR (Apr. 14, 2016), <http://www.csmonitor.com/Environment/2016/0414/Exxon-Charges-of-lying-about-climate-change-are-preposterous>.

¹²⁸ As mentioned *supra* in note 6, the term “fraud,” as used in this Article and for the purposes of its proposed falsity standard, is broadly defined. However, parts of this Article, including this Section II, discuss common law fraud principles as a way of giving guidance on fraud law generally, and on the falsity standard specifically.

¹²⁹ See *Murphy v. BDO Seidman, LLP*, 113 Cal. App. 4th 687, 692 (2d Dist. 2003), *as modified without opinion on denial of reh’g*, (Dec. 24, 2003); *Presbyterian Med. Ctr. v. Budd*, 2003 PA

must also establish the defendant's *intent* to defraud,¹³⁰ an element that addresses state of mind and is notoriously difficult to demonstrate.¹³¹ The elements of common law fraud, each of which a plaintiff must establish, are: (1) a representation of fact; (2) falsity of the representation; (3) materiality of the representation; (4) the speaker's knowledge of the falsity of the representation, or reckless disregard for the truth or falsity of the representation; (5) the speaker's intent that the hearer rely upon it; (6) the hearer's ignorance of the falsity of the representation; (7) the hearer's reliance on the representation; (8) the hearer's right to rely on the representation; and (9) the hearer's consequent and proximate injury caused by reliance on the representation.¹³² All elements must typically be

Super 323, ¶ 15, 832 A.2d 1066, 1072 (2003); *see also* 37 AM. JUR. 2d Fraud and Deceit § 444.

¹³⁰ *See* Fairbanks Mobile Wash, Inc. v. Hubbell, Nos. 2007-05-062, 2007-05-068, 2009 WL 294936, ¶ 15 (Ohio Ct. App. Feb. 9, 2009); Merten v. Portland Gen. Elec. Co., 234 Or. App. 407, 416-17, 228 P.3d 623, 629 (2010), *review denied*, 348 Or. 669, 237 P.3d 824 (2010); S.E.C. v. Retail Pro, Inc., 673 F. Supp. 2d 1108, 1132 (S.D. Cal. 2009); *see also* 37 AM. JUR. 2d Fraud and Deceit § 109.

¹³¹ *See, e.g.,* In re Tutu Water Wells Contamination Litig., 78 F.Supp.2d 456, 462 (D.V.I. 1999) ("Caselaw has clearly established that, due to the difficulties inherent in proving a parties' state of mind, issues of scienter and fraudulent intent are generally questions for the trier of fact."); *see also Recovery in an Action of Deceit for Expression of Opinion*, 17 HARV. L. REV. 193, 195 (1904) ("The difficulty lies in proving one of the essential elements of the cause of action, the scienter, or fraudulent intent."); *Undo Undue Hardship: An Objective Approach to Discharging Federal Student Loans in Bankruptcy*, 38 J. LEGIS. 185, 215 (2012) ("Fraudulent misrepresentation is difficult to prove because scienter, or intent to deceive, is difficult to prove."). Even where a claimant may be able to plead and prove fraud, the claimant may face other hurdles, such as the economic loss rule. *See generally* Vincent R. Johnson, *The Boundary-Line Function of the Economic Loss Rule*, 66 WASH. & LEE L. REV. 523 (2009) (giving an overview of the economic loss rule); Benjamin P. Edwards, *Rolling Back The Economic Loss Doctrine In Securities Disputes Against Financial Intermediaries*, 20 NO. 1 PIABA BAR J. 39, 41 (2013) (noting that "[c]ourts and commentators struggle to define the doctrine and its scope," and discussing the economic loss rule in the context of securities disputes against financial intermediaries).

¹³² The elements of fraud are presented in slightly differing forms in different jurisdictions; some list five elements, others list seven, eight, or nine. But all jurisdictions include some version of each of these nine elements. *See, e.g.,* West v. JPMorgan Chase Bank, N.A., 214 Cal. App. 4th 780, 792, 154 Cal. Rptr. 3d 285, 295 (2013) (California fraud elements: "(1) the defendant made a false representation as to a past or existing material fact; (2) the defendant knew the representation was false at the time it was made; (3) in making the representation, the defendant intended to deceive the plaintiff; (4) the plaintiff justifiably relied on the representation; and (5) the plaintiff suffered resulting damages."); *Girozentrale v. Tilton*, 149 A.D.3d 152, 162, 48 N.Y.S.3d 98, 105 (N.Y. App. Div. 2017) (New York fraud elements: "Such a claim is stated when a plaintiff pleads a material misrepresentation of a fact, knowledge of its falsity, an intent to induce reliance, justifiable reliance by the plaintiff and damages flowing therefrom."); *Zaidi v. Shah*, 502 S.W.3d 434, 441 (Tex. App. 2016), *review denied* (June 9, 2017) (Texas fraud elements: "(1) the speaker made a material representation; (2) the representation was false; (3) when the representation was made, the speaker either knew it was false or made it recklessly without any knowledge of its truth and as a positive assertion; (4) the speaker intended the plaintiff to act upon the representation; (5) the plaintiff acted in reliance on the representation; and (6) the plaintiff suffered injury thereby"); *GEICO Gen. Ins. Co. v. Hoy*, 136 So. 3d 647, 651 (Fla. Dist. Ct. App. 2013) (Florida fraud elements: "1) a false statement concerning a material fact, 2) knowledge by the person making the statement that the representation is false, 3) intent by the person making the statement that the representation will

pled with heightened specificity and proven by clear and convincing evidence.¹³³ These high hurdles make fraud claims famously tough to plead, and to win. This is true not only for common law fraud, but for most kinds of fraud claims.¹³⁴

When the allegedly false representation pertains to scientific knowledge, however, plaintiffs are at an even greater disadvantage, in particular with regard to the falsity element. Scientific knowledge does not lend itself to being labeled unequivocally “true” or “false.” Accordingly, plaintiffs in scientific knowledge fraud cases¹³⁵ have, over the course of many decades, been fighting with one hand tied behind their backs. Time and again, defendants in such cases successfully argued that representations they made were not false because the science was “unclear” or “unsettled,” or that there were two valid “opinions” on the issue, when in reality the representations were clearly out of step with the scientific consensus.¹³⁶

A. Truthfulness and falsity of scientific knowledge

To satisfy the falsity element, the defendant’s representation must be false.¹³⁷ A false representation is any oral or written words, conduct, or combination of words and conduct that creates an untrue or misleading

induce another to act upon it, and 4) reliance on the representation to the injury of the other party”) (italics removed).

¹³³ See, e.g., *In re Ogden*, 314 F.3d 1190, 1198 (10th Cir. 2002); *Mayberry v. Ememessay, Inc.*, 201 F. Supp. 2d 687, 698, 198 A.L.R. Fed. 793 (W.D. Va. 2002); see also 37 C.J.S. Fraud § 12.

¹³⁴ See, e.g., André Douglas Pond Cummings, “*Ain’t No Glory in Pain*”: *How the 1994 Republican Revolution and the Private Securities Litigation Reform Act Contributed to the Collapse of the United States Capital Markets*, 83 NEB. L. REV. 979, 1007-08 (2005) (noting that, in enacting the Private Securities Litigation Reform Act, Congress “essentially require[d] ‘super heightened’ pleading for securities fraud cases while simultaneously amending numerous provisions of the securities laws to make it exceedingly more difficult for aggrieved investors to bring and/or prevail in a securities fraud lawsuit”).

¹³⁵ Scientific knowledge fraud is not currently recognized as a distinct category of fraud, but it needs to be. Like securities fraud, Medicare fraud, mortgage fraud, and insurance fraud, scientific knowledge fraud is a species of fraud that has generated significant litigation over the past several decades, see *infra* Section II.C, and has its own unique characteristics that warrant particularized treatment.

¹³⁶ With regard to tobacco plaintiffs’ inability to prevail in court on claims against tobacco companies, see *infra* notes 182, 183, 184, and 185, and the corresponding text. See generally Robert L. Rabin, *A Sociological History of the Tobacco Tort Litigation*, 44 STAN. L. REV. 853 (1992) (discussing how tobacco plaintiffs struggled for many years to obtain tort compensation for wrongful deaths and other injuries caused by smoking-related disease). With regard to asbestos plaintiffs’ similar inability to get redress for harm from asbestos, see *infra* note 189, and corresponding text; see also *infra* notes 190, 191, 192, and 193, along with the corresponding text for each.

¹³⁷ *U.S. v. Beebe*, 180 U.S. 343, 349, 21 S. Ct. 371, 45 L. Ed. 563 (1901); *Prestwood v. City of Andalusia*, 709 So. 2d 1173, 1175 (Ala. 1997); *Turner v. Milliman*, 392 S.C. 116, 124, 708 S.E.2d 766, 770 (2011); *Hennig v. Ahearn*, 230 Wis. 2d 149, 173, 601 N.W.2d 14, 25 (Wis. Ct. App. 1999); *Adams v. Gillig*, 199 N.Y. 314, 320, 92 N.E. 670 (1910); 37 AM. JUR. 2d Fraud and Deceit § 106.

impression in the mind of another.¹³⁸ But the person making the representation does not necessarily need to *know* it is untrue to satisfy the falsity element.¹³⁹ Knowledge is a different fraud element, as is the intent to mislead. Falsity, by contrast, requires only that the representation be, at the time it is made, objectively untrue or misleading.¹⁴⁰ But representations pertaining to scientific knowledge cannot generally be categorized on these terms—as “true” or “false.”

Consider, for example, three statements made by Exxon’s chairman and CEO in 1996 and 1997. That year, Mr. Raymond said:

- “Currently, the scientific evidence is inconclusive as to whether human activities are having a significant effect on the global climate”¹⁴¹;
- “Many people, politicians and the public alike, believe that global warming is a rock-solid certainty. But it’s not”¹⁴²; and
- “The earth is cooler today than it was 20 years ago.”¹⁴³

All three of these statements are grossly misleading, if not outright false. Nevertheless, each would likely fail to satisfy the falsity element. One reason is that scientific discovery is not an event, but a process.¹⁴⁴ To say, as Mr. Raymond

¹³⁸ T.A. Pelsue Co. v. Grand Enters., Inc., 782 F. Supp. 1476, 1488 (D. Colo. 1991).

¹³⁹ See Davis v. Sterne, Agee & Leach, Inc., 965 So. 2d 1076, 1091 (Ala. 2007) (“a false representation, even if made innocently or by mistake, operates as a legal fraud if it is a material fact that is acted upon with belief in its truth”); Monroe v. Mercer, 414 S.W.2d 756, 760-61 (Tex. Civ. App. Houston 1967), writ dismissed, (Oct. 4, 1967).

¹⁴⁰ Spreitzer v. Hawkeye State Bank, 779 N.W.2d 726, 735 (Iowa 2009). There are other nuances to the falsity standard this Article will not address, but which are relevant to the analysis herein, such as where the representation contains a half-truth, (see United Parcel Serv. Co. v. Rickert, 996 S.W.2d 464, 469 (Ky. 1999); Knights of Columbus Council 3152 v. KFS BD, Inc., 280 Neb. 904, 922-23, 791 N.W.2d 317, 331 (2010); American Empire Life Ins. Co. v. Long, 344 S.W.2d 513, 518 (Tex. Civ. App. Eastland 1961), writ refused n.r.e., (June 14, 1961); Farnsworth v. Feller, 256 Or. 56, 62, 471 P.2d 792, 796 (1970); see also 37 AM. JUR. 2d Fraud and Deceit § 107), where the representation is technically accurate, yet still misleading for the purposes of a fraud claim (see Grove Holding Corp. v. First Wis. Nat. Bank of Sheboygan, 12 F. Supp. 2d 885, 890 (E.D. Wis. 1998); W. PAGE KEETON ET AL., PROSSER & KEETON ON THE LAW OF TORTS § 106, at 736-37 (5th ed. 1984)), and where no false statement is made, but overall impression of representations are misleading (see Downey v. Finucane, 205 N.Y. 251, 264, 98 N.E. 391 (1912); see also 37 AM. JUR. 2d Fraud and Deceit § 106; 60A N.Y. JUR. 2d Fraud and Deceit § 121).

¹⁴¹ *Fossil Fuel Industry Climate Science Deception*, supra note 97.

¹⁴² Hasemyer & Cushman, Jr., supra note 70.

¹⁴³ *Were Our Leaders Bold Enough to do Enough About Climate Change Soon Enough?*, HIGHTOWER LOWDOWN (Dec. 1, 2015), <https://hightowerlowdown.org/article/lettertothe future/>.

¹⁴⁴ The Supreme Court acknowledged the importance of defining science in terms of its methods as

did in Statement No. 1 above, that the scientific evidence is “inconclusive” is at once technically accurate—scientific evidence on any topic is nearly always inconclusive¹⁴⁵—and also misleading. The message he conveyed to the audience with this statement—that when it comes to global warming, we just don’t know—significantly misstates the then-known science on climate change.

Statement No. 2 is equally misleading. It insinuates that climate change science can be boiled down to a simple, two-sided debate, which it cannot. The statement also sets up a strawman, a side of the “debate” purportedly claiming that global warming is a “rock-solid certainty,” which Mr. Raymond knocks down by saying, “But it’s not.” Science, as noted by the Supreme Court, does not operate on rock-solid certainties.¹⁴⁶

Statement No. 3 is the most problematic. Mr. Raymond said, “The earth is cooler today than it was 20 years ago.” The data such a statement implicates is mountainous, and can be interpreted many different ways, depending on many factors. The global climate is a complex system. Cooling in one part of the globe might coincide with warming elsewhere—this is as true on land as it is in the oceans.¹⁴⁷ The upper atmosphere might warm while the lower atmosphere cools, or vice versa.¹⁴⁸ A warm day in January does not necessarily mean warming is happening, because day-to-day observable events such as daily high or low temperatures relate to *weather*, while long-term widespread trends relate to *climate*.¹⁴⁹

Moreover, you cannot see climate change. This does not make it unique among scientific ideas; it makes it typical. Climate change happens very slowly

follows: “Science is not an encyclopedic body of knowledge about the universe. Instead, it represents a *process* for proposing and refining theoretical explanations about the world that are subject to further testing and refinement” (emphasis in original). *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 590 (1993) (quoting Brief for the American Association for the Advancement of Science and the National Academy of Sciences as Amici Curiae at 7-8).

¹⁴⁵ Professor Andre A. Moenssens noted that one of the major conflicts between law and science is lawyers would like to see science, when used in the courtroom, if not infallible, at least mostly accurate, mostly immutable, and certain. That is the very factor, according to Professor Moenssens, that, in the legal mind, makes evidence “reliable.” In the scientific community, by contrast, knowledge is forever changing. It is adapting; it sometimes reverses direction, thereby also advancing. NAT’L INST. OF JUST., National Conference on Science and the Law 89 (Apr. 15-16, 1999), <https://www.ncjrs.gov/pdffiles1/nij/179630.pdf>.

¹⁴⁶ *Daubert*, 509 U.S. at 590. (“Of course, it would be unreasonable to conclude that the subject of scientific testimony must be ‘known’ to a certainty; arguably, there are no certainties in science.”).

¹⁴⁷ Caitlyn Kennedy, *Does “global warming” mean it’s warming everywhere?*, NAT’L OCEANIC & ATMOSPHERIC ADMIN. (May 6, 2014), <https://www.climate.gov/news-features/climate-qa/does-global-warming-mean-it%E2%80%99s-warming-everywhere>.

¹⁴⁸ See *A Blanket Around the Earth*, NAT’L AERONAUTICS & SPACE ADMIN., (<https://climate.nasa.gov/causes/>) (“[Scientists] have observed a cooling in the upper atmosphere, and a warming at the surface and in the lower parts of the atmosphere. That’s because greenhouse gases are trapping heat in the lower atmosphere.”).

¹⁴⁹ See *What’s the Difference Between Weather and Climate?*, NASA (Feb. 1, 2005), https://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html (explaining the difference between weather and climate).

and over the course of many decades or centuries, or even millennia. An “abrupt” change in global temperature, for instance, may consist of an increase or decrease of one degree Fahrenheit over the course of a century or two. What relevance do two single years twenty years apart have, then? Probably not much. Year one, at the beginning of that twenty-year period, could have been unusually warm, or unusually cold; either way, it would give an incomplete and inaccurate picture. As it turns out, however, 1996 was the warmest year on record at that point by all objective measures.¹⁵⁰ This is a true scientific fact, backed up by objective data.¹⁵¹ Nevertheless, it is not difficult for scientists outside the mainstream to selectively compile data that differs from the consensus picture. Climate scientists would almost certainly be able to determine which data sets are objective and accurate and which are not, but judges, policymakers, and the public are much less well-equipped to make this kind of judgment call.

Accordingly, although statements one through three all should be deemed false for the purposes of a fraud claim, they likely would not meet the falsity standard currently in place.

B. Causation, conflicts of interest, and misconceptions about science

Each fraud element, including falsity, is generally a question for the trier of fact.¹⁵² Although there is disagreement to what extent non-expert judges and juries are competent to decide issues of scientific fact,¹⁵³ there is significant research and data to suggest “competent judgments on matters pertaining to scientific expertise can be made only by those who possess substantive expertise in the scientific domain.”¹⁵⁴ While structural changes to the court system that might help solve this epistemological problem by putting scientists in a position to make conclusions of fact and law on scientific issues have been proposed,¹⁵⁵

¹⁵⁰ 1996: Warmest Year since 1860, UN CHRONICLE (1997), <https://www.questia.com/magazine/1G1-19898016/1996-warmest-year-since-1860>.

¹⁵¹ See generally *id.*

¹⁵² See *Specialty Beverages, LLC v. Pabst Brewing Co.*, 537 F.3d 1165, 1181 (10th Cir. 2008) (“The existence of fraud, given evidence for each element, is a question of fact for the jury.”); *Murray v. D & J Motor Co.*, 958 P.2d 823, 831 (Okla.Civ.App.1998) (same); *Cortez v. Weymouth*, 235 Cal. App. 2d 140, 150, 45 Cal. Rptr. 63, 69 (Ct. App. 1965) (“Whether or not fraud exists, including the element of reliance, is ordinarily a question of fact for the fact-finding entity.”).

¹⁵³ See, e.g., DAVID L. FAIGMAN, *LEGAL ALCHEMY: THE USE AND MISUSE OF SCIENCE IN THE LAW* 64 (1999); Scott Brewer, *Scientific Expert Testimony and Intellectual Due Process*, 107 YALE L.J. 1535, 1679-80 (1997); Elizabeth Anderson, *Democracy, Public Policy, and Lay Assessments of Scientific Testimony*, 8 EPISTEME 144, 146-51 (2011); John Monahan & Laurens Walker, *Social Authority: Obtaining, Evaluating, and Establishing Social Science in Law*, 134 PENN. L. REV. 477, 508-12 (1986); James R. Dillon, *Expertise on Trial*, 19 Colum. Sci. & Tech. L. Rev. (forthcoming 2018) (manuscript at 22-33), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2956078.

¹⁵⁴ Dillon, *supra* note 153, at 61.

¹⁵⁵ See, e.g., Scott Brewer, *Scientific Expert Testimony and Intellectual Due Process*, 107 YALE L.J. 1535, 1677 (1997) (proposing a “two hat” solution to the problem of epistemic competence in

the court system today puts this decision making power in the hands of a lay trier of fact.

The plaintiff, then, is tasked with educating the trier of fact (judge or jury) not only about the entire applicable body of scientific research, methods, degree of error, and level of acceptance with regard specifically to the fraud alleged in that particular case, but also about the nature of science and scientific study itself.¹⁵⁶ This task is further complicated by, among other things, two critical issues germane to the interpretation of all scientific evidence: causation and conflict of interest.

The first issue, causation, is the task of attributing cause and effect—a basic cognitive function that normally takes little or no effort.¹⁵⁷ Fundamentally, it is an inferential process of weighing evidence and using judgment to conclude whether or not an effect is the result of some stimulus.¹⁵⁸ Human judgment is necessary even when using sophisticated statistical methods.¹⁵⁹ Though such methods can provide powerful evidence of associations between variables, they cannot prove with certainty the existence of causal relationship.¹⁶⁰

Factors often considered to determine if a causal relationship exists include predisposing factors, proximity of a stimulus to its presumed outcome,¹⁶¹ the strength of the stimulus, and the strength of the events in a causal chain.¹⁶¹ Unfortunately, jurors are in a less favorable position than scientists to make causal assessments. Scientists may delay their decision while they or others gather more data, whereas a jury must rule on causation based on existing information.¹⁶² Concepts of causation familiar to scientists will likely not resonate with juries who are asked to rule on general causation (i.e., whether a particular stimulus is known to produce a particular reaction) or specific

which legal authority and scientific expertise are held by “administrative agencies staffed with trained scientists, scientific expert magistrate judges, or even special science courts staffed by scientifically trained judges”); Dillon, *supra* note 153, at 44-50 (proposing a “social epistemological solution” whereby “scientific adjuncts” would make conclusions of law and fact of issues involving expert witness testimony).

¹⁵⁶ For an in-depth discussion on the myriad difficulties that arise when scientific expert witnesses communicate scientific principles to judges, juries, and lawyers, see generally Deborah M. Hussey Freeland, *Speaking Science to Law*, 25 GEO. INT’L ENV’T L. REV. 289 (2013); see also Pauline Newman, *Law and Science: The Testing of Justice*, 57 N.Y.U. ANN. SURV. AM. L. 419, 427 (2000) (“[W]e must recognize and accommodate the needs of science in the rule of law. The complexity of the interaction between law and science remains to be understood. As we enter this intellectual endeavor with greater urgency, the judge and the scientist must take strong steps to understand each other, the better to serve each other.”).

¹⁵⁷ JEROME P. KASSIRER & GLADYS KESSLER, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE, at xiii-xiv (3d ed. 2011); see also National Conference on Science and the Law Proceedings, NAT’L INST. OF JUST. 184-85 (1999) (discussing conceptual difficulties for juries when dealing with the issue of causation).

¹⁵⁸ KASSIRER & KESSLER, *supra* note 157, at xiv.

¹⁵⁹ *Id.*

¹⁶⁰ *Id.*

¹⁶¹ *Id.*

¹⁶² *Id.*

causation (i.e., whether a particular stimulus caused a particular consequence in a specific instance). A jury must decide the issue immediately, after considering the best available science.¹⁶³

The other issue critical to interpreting scientific evidence, conflict of interest, manifests as bias and can have a major influence on evidence, testimony, and decision-making in courtroom proceedings.¹⁶⁴ Conflicts of interest take many forms. In addition to financial conflicts of interest, there are also religious, social, political, or other personal convictions that can—and often do—cloud people’s judgment when addressing scientific topics.

One particularly telling incident was when U.S. Senator Jim Inhofe (R-Okla.), the current chair of the Environment and Public Works Committee, picked up a snowball outside the U.S. Capitol and carried it onto the Senate floor to show evidence that global warming was not happening.¹⁶⁵ If global warming is real, he reasoned, why is it so cold outside? This statement shows a staggering failure to understand the difference between climate and weather. Moreover, in Senator Inhofe’s book on climate change, entitled *The Greatest Hoax*, he assured readers that the scientists—which he refers to as “alarmists” throughout the book—can be ignored because a greater authority, God, has already spoken.¹⁶⁶

“I take my religion seriously,” Inhofe wrote. “[T]his is what a lot of alarmists forget: God is still up there, and He promised to maintain the seasons and that cold and heat would never cease as long as the earth remains.”¹⁶⁷ For those still skeptical of his climate change skepticism, Inhofe quoted from the source material, “one of my favorite Bible verses,” Genesis 8:22: “As long as the earth remains, There will be springtime and harvest, Cold and heat, winter and summer.”¹⁶⁸

Inhofe was asked about this particular piece of scripture during a radio interview when his book came out.¹⁶⁹ The passage, he said, is so conclusive that it’s simply outrageous that scientists continue to address the matter.¹⁷⁰ “The arrogance of people to think that we, human beings, would be able to change what He is doing in the climate is to me outrageous,” he said.¹⁷¹ Prejudices of this

¹⁶³ *Id.*

¹⁶⁴ *Id.*

¹⁶⁵ See, e.g., Philip Bump, *Jim Inhofe’s snowball has disproven climate change once and for all*, WASH. POST (Feb. 26, 2015), https://www.washingtonpost.com/news/the-fix/wp/2015/02/26/jim-inhofes-snowball-has-disproven-climate-change-once-and-for-all/?utm_term=.26b696d6704e; see also Ryan Grim, *Senator Who Cited Snowball In Climate Change Debate Cites Scripture to Back Himself Up*, HUFF. POST (Mar. 6, 2015), http://www.huffingtonpost.com/2015/03/06/jim-inhofe-genesis_n_6815270.html.

¹⁶⁶ Grim, *supra* note 165.

¹⁶⁷ *Id.*

¹⁶⁸ *Id.*

¹⁶⁹ *Id.*

¹⁷⁰ *Id.*

¹⁷¹ *Id.*

type, based on religious, social, political, or other personal convictions, introduce bias into many individuals'—even scientists'—interpretations of scientific data.

Having a financial relationship with a commercial entity also produces a conflict of interest, but it does not inevitably elicit bias. In science, a financial conflict of interest is often accompanied by disclosure of the relationship, leaving to the public, or in a fraud lawsuit, to the jury, the decision whether the interpretation might be tainted.¹⁷² Given the complexity of the task, however, this begs the question of whether juries should be charged with adjudicating between parties' differing interpretations of scientific evidence and data in fraud cases.¹⁷³

This is a particularly important (and troubling) question when considering the myriad widespread misconceptions about science prevalent in our society, like what science is,¹⁷⁴ how the scientific method works, what level of certainty should be read into research results, and what the words "hypothesis," "theory," and "law" mean in science.¹⁷⁵

¹⁷² See KASSIRER & KESSLER, *supra* note 157.

¹⁷³ See *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

¹⁷⁴ The Supreme Court in *Daubert* acknowledged the importance of defining science in terms of its methods as follows: "Science is not an encyclopedic body of knowledge about the universe. Instead, it represents a *process* for proposing and refining theoretical explanations about the world that are subject to further testing and refinement" (emphasis in original) (quoting Brief for the American Association for the Advancement of Science and the National Academy of Sciences as Amici Curiae at 7-8).

¹⁷⁵ In addition to these, there are many other widely held misconceptions about science. Some of the most common ones (and their corresponding realities) are: ***science is a collection of facts*** (it is actually a process through which we discover how the world works and put that knowledge into coherent frameworks); ***science is complete*** (actually, it is an ongoing process, and scientists are constantly elaborating, refining, and revising established scientific ideas based on new evidence and perspectives); ***there is a single scientific method that all scientists follow*** (in fact, the traditional scientific method model, as understood by many nonscientists, represents how scientists usually write up the results of their studies, but it is a gross oversimplification of how scientists build knowledge; the process of science is complex and involves many different people, engaged in many different activities, in many different orders); ***the process of science is purely analytic and does not involve creativity, and scientists use only inductive or deductive reasoning*** (in fact, scientific analysis often involves jumping back and forth among different modes of reasoning and creative brainstorming); ***experiments are a necessary part of the scientific process, and without an experiment a study is not rigorous or scientific*** (there are many ways to test almost any scientific idea, and experimentation is only one approach; some ideas are best tested by setting up a controlled experiment in a lab, some by making detailed observations of the natural world, and some with a combination of strategies); ***scientific ideas are absolute and unchanging*** (it's true some scientific ideas are so well established and supported by so many lines of evidence, they are unlikely to be completely overturned; however, all scientific ideas, even well-established ones, are subject to modification based on new evidence and perspectives); ***because scientific ideas are tentative and subject to change, they can't be trusted*** (the media is largely to blame for this misconception; while it's true that all scientific ideas are subject to change if warranted by the evidence, many scientific ideas, such as evolutionary theory or electricity or aircraft aerodynamics, and foundational ideas in chemistry, are supported by many lines of evidence, are extremely reliable, and are unlikely to change); ***scientists' observations directly tell them how things work (i.e., knowledge is "read off" nature, not built)*** (observation is critical in science, but scientists

Individuals and entities opposed to the mainstream scientific consensus on any particular scientific issue exploit these misconceptions to persuade others of the validity of their position. This problem is what Judge Richard Posner has referred to as “the deceitful potential of scientific rhetoric.”¹⁷⁶ Some of the most

often make inferences about what those observations mean; observations are part of a complex process that involves coming up with ideas about how the natural world works and seeing if observations back those explanations up); ***science proves ideas*** (science is based on the principle that any idea, no matter how widely accepted today, could be overturned tomorrow if the evidence warranted it; science accepts or rejects ideas based on the evidence; it does not prove or disprove them); ***science can only disprove ideas*** (in science, ideas can never be completely proved or completely disproved; science accepts or rejects ideas based on supporting and refuting evidence, and may revise those conclusions if warranted by new evidence or perspectives); ***if evidence supports a hypothesis, it is upgraded to a theory; if the theory then garners even more support, it may be upgraded to a law*** (in fact, hypotheses, theories, and laws are rather like apples, oranges, and apricots: one cannot grow into another, no matter how much fertilizer and water are offered; they are all scientific explanations that differ in breadth, not in level of support; hypotheses are explanations that are limited in scope, applying to fairly narrow range of phenomena; the term law is sometimes used to refer to an idea about how observable phenomena are related, but the term is also used in other ways within science; theories are deep explanations that apply to a broad range of phenomena and that may integrate many hypotheses and laws, and many theories, like the theory of relativity or the theory of evolution, are what scientists consider textbook science that will not likely be disproved, and are still called “theories” for historic reasons only); ***scientific ideas are judged democratically based on popularity*** (scientific ideas are judged on the basis of the evidence supporting or contradicting them; a hypothesis or theory comes to be accepted by many scientists—usually over the course of several years, or decades—once it has garnered many lines of supporting evidence and has stood up to the scrutiny of the scientific community); ***the job of a scientist is to find support for his or her hypotheses*** (in fact, science gains as much from figuring out which hypotheses are likely to be wrong as it does from figuring out which are supported by the evidence); ***scientists are judged on the basis of how many correct hypotheses they propose (i.e., good scientists are the ones who are “right” most often)*** (in science, gathering evidence to determine the accuracy of an explanation is just as important as coming up with the explanation that winds up being supported by the evidence); ***investigations that don’t reach a firm conclusion are useless and unpublishable*** (in fact, most scientific studies don’t reach “firm” conclusions; that is the nature of scientific knowledge—it is inherently tentative and could be overturned if new evidence, new interpretations, or a better explanation come along); ***scientists are completely objective in their evaluation of scientific ideas and evidence*** (scientists are people, and they have different personal beliefs and goals, and may favor different hypotheses for different reasons; individual scientists may not be completely objective, but science can overcome this hurdle through the action of the scientific community, which scrutinizes scientific work and helps balance biases); ***science is pure, and scientists work without considering the applications of their ideas*** (some scientists indeed do work without regard to the practical application of their research, but many scientists choose specific areas of research, like malaria genetics, because of the practical ramifications new knowledge in these areas might have; often, however, research performed without any aim toward potential applications later winds up being extremely useful). This list of misconceptions of science was adopted from *Understanding science: How science really works (Misconceptions about science)*, U. OF CAL. (July 19, 2017), <http://undsci.berkeley.edu/teaching/misconceptions.php>; DAVID GOODSTEIN, *HOW SCIENCE WORKS, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE* (3d ed. 2011), <https://www.nap.edu/read/13163/chapter/4> (articulating several “myths” about science and providing the corresponding “facts”).

¹⁷⁶ R. A. POSNER, *OVERCOMING LAW* 525 (Harvard Univ. Press, 1995).

common ways industry defendants seek to sway the court (or the public) to side with them—though by no means the only ways—is through misuse of scientific sounding words and ideas that do not stand for the proposition they are put forth to support,¹⁷⁷ misuse of statistics,¹⁷⁸ and utilization of hired-gun scientists to proffer evidence and, more importantly, their scientific opinion, to support a position that is out of step with mainstream science.¹⁷⁹

The actions of the tobacco, asbestos, oil, and other companies to manipulate the science pertaining to their products are well-known and well-documented. In each case, the companies funding these scientific distortions were well-compensated for their efforts by avoiding liability and government regulation for years.

C. Past scientific knowledge fraud cases

The tobacco industry serves as an instructive example of how easy it is to get away with lying about science. By the early 1950s, scientists no longer wondered *if* smoking caused cancer, but *how*.¹⁸⁰ That emerging scientific consensus, together with the publication in Reader's Digest of "Cancer by the Carton," caused the first wave of tobacco litigation cases.¹⁸¹ Yet this scientific certainty did not translate to liability for tobacco companies in court.

¹⁷⁷ See Peter W. Huber and Kenneth R. Foster, *Judging Science: Scientific Knowledge and the Federal Courts* (MIT Press 1999), at 209 (illustrating rhetorical strategies used by parties and their experts in an effort to misrepresent the available scientific knowledge).

¹⁷⁸ *Id.* at 211.

¹⁷⁹ See Oreskes & Conway, *supra* note 61, at 5-9; see also David Heath, *Meet the 'rented white coats' who defend toxic chemicals*, THE CENTER FOR PUBLIC INTEGRITY, <https://www.publicintegrity.org/2016/02/08/19223/meet-rented-white-coats-who-defend-toxic-chemicals> (discussing how corporate-funded research corrupts America's courts and regulatory agencies).

¹⁸⁰ See, ROBERT N. PROCTOR, *GOLDEN HOLOCAUST: ORIGINS OF THE CIGARETTE CATASTROPHE AND THE CASE FOR ABOLITION 13-14* (Berkeley: University of California Press, 2011) (noting that the American Cancer Society's National Board of Directors in 1954 announced "without dissent" that "the presently available evidence indicates an association between smoking, particularly cigarette smoking, and lung cancer"); see also Rabin, *supra* note 136, at 876.

¹⁸¹ Regarding the scientific consensus on the tobacco-cancer link, see David G. Owen, *Inherent Product Hazards*, 93 KY. L.J. 377, 392-93 (2004); see also Alan L. Calnan, *Distributive and Corrective Justice Issues in Contemporary Tobacco Litigation*, 27 SW. U. L. REV. 577, 672 (1998); Rabin, *supra* note 136, at 856; Richard Doll & Bradford Hill, *A Study of the Aetiology of Carcinoma of the Lung*, 2 BRIT. MED. J. 1271 (1952), <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2022425/pdf/brmedj03472-0009.pdf>; Ernest Wynder & Evarts Graham, *Tobacco Smoking as a Possible Etiologic Factor in Bronchiogenic Carcinoma*, 143 J. AM. MED. ASS'N 329 (1950). Regarding the Reader's Digest article and its effect, see Ray Norr, *Cancer by the Carton*, READER'S DIGEST, 738 (1952), <http://legacy.library.ucsf.edu/tid/bcm92f00/pdf;jsessionid=C5CC0A49197530878A5097436B723907.tobacco03>.

From the early 1950s up through the mid-1960s, the period widely considered the first phase of tobacco litigation,¹⁸² the tobacco industry did not lose or settle a single case.¹⁸³ Although the causal connection between smoking and cancer had been established by scientists, it was not firmly enough established in court for liability to be imposed on tobacco companies,¹⁸⁴ and tobacco companies successfully raised doubt about the scientific link between tobacco, on the one hand, and illness and addictiveness, on the other.¹⁸⁵

There was a similar lag between knowledge and accountability with regard to asbestos litigation. Scientists confirmed that exposure to asbestos caused cancers, including asbestosis and mesothelioma, by the mid-1950s.¹⁸⁶

¹⁸² Owen, *supra* note 181, at 392-93; *see also* Calnan, *supra* note 181, at 672; Karen E. Meade, *Breaking Through the Tobacco Industry's Smoke Screen: State Lawsuits for Reimbursement of Medical Expenses*, 17 J. LEGAL MED. 113 (1996); Alex J. Grant, *New Theories of Cigarette Liability: The Restatement (Third) of Torts and the Viability of a Design Defect Cause of Action*, 3 CORNELL J.L. & PUB. POL'Y 343, 343 (1994); James W. Henges, *Cigarettes: Defectively Designed or Just Extremely Dangerous*, 18 OKLA. CITY U. L. REV. 559, 587 (1993); Rabin, *supra* note 136, at 856; Marc Z. Edell, *Cigarette Litigation: The Second Wave*, 22 TORT & INS. L.J. 90, 92 (1986); Scott Richardson, *Attorney General's Warning: Legislation May Now Be Hazardous to Tobacco Companies' Health*, 28 AKRON L. REV. 291, 313-14 (1995).

¹⁸³ Rabin, *supra* note 136, at 861. Indeed, as late as the early 1990's, "after thirty-five years of litigation, the tobacco industry could still maintain the notable claim that it had not paid out a cent in tort awards." *Id.* at 874. Although, this longstanding success was due to a number of factors, including the industry's use of the defenses of preemption and assumption of the risk, *see* Lawrence G. Cetrulo, *Historical overview of tobacco litigation—The second phase of tobacco litigation*, 2 TOXIC TORTS LITIGATION GUIDE § 18:3 (2016) (preemption defense), as well as its refusal to settle and its ability to outspend opponents, *see* Rabin, *supra* note 136, at 874; *see also* Shital A. Patel, *The Tobacco Litigation Merry-Go-Round: Did the MSA Make it Stop?*, 8 DEPAUL J. HEALTH CARE L. 615, 621 (2005).

¹⁸⁴ Anthony J. Sebok, *Pretext, Transparency and Motive In Mass Restitution Litigation*, 57 VAND. L. REV. 2177, 2184 (2004); *see also* *Lartigue v. R. J. Reynolds Tobacco Co.*, 317 F.2d 19, 40 (5th Cir. 1963).

¹⁸⁵ The tobacco industry has, at various times, argued that the increase in the incidence of illnesses among smokers may be the result of improved ability to detect disease; that the association between smoking and illness is purely coincidental; that individuals who smoke are more prone to disease than non-smokers; that no one factor could cause so many diseases; that tobacco cannot be the cause of smoking-related illnesses because not all smokers become ill; and that all of the studies linking smoking and disease are flawed. ELIZABETH WHELAN, *A SMOKING GUN: HOW THE TOBACCO TRADE GETS AWAY WITH MURDER* 15-27 (1984); Matthew L. Myers et al., *Federal Trade Commission Staff Report on the Cigarette Advertising Investigation* 58-65 (1981), <http://legacy.library.ucsf.edu/tid/eiv99d00/pdf>. None of these arguments stands up to rigorous analysis. *See* Myers et al. at 65. Indeed, tobacco companies may have even influenced the American Law Institute, in its preparation of the Restatement of Torts, to include 'comment i' which has been used by the tobacco industry to fight products liability suits. *See generally* Elizabeth Laposata et al., *Tobacco Industry Influence on the American Law Institute's Restatement of Torts and Implications for Its Conflict of Interest Policies*, NCBI (2012), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3637975/>.

¹⁸⁶ *See* Jonathan M. Samet, *Asbestos and Causation of Non-Respiratory Cancers: Evaluation by the Institute of Medicine*, 15 J.L. & POL'Y 1117, 1119 (2007) ("In the 1950s, Sir Richard Doll provided the first epidemiological evidence linking an excess occurrence of lung cancer to asbestos

Indeed, asbestos companies themselves had become aware of the link by that time.¹⁸⁷ Nevertheless, it was not until 1975, when the Fifth Circuit's decision in *Borel v. Fibreboard Paper Products Corp.*¹⁸⁸ established strict liability against asbestos manufacturers, that courts held asbestos companies liable for the harm caused by their products.¹⁸⁹

Similar stories have played out in court with regard to the Bendectin,¹⁹⁰ diethylstilbestrol ("DES"),¹⁹¹ Agent Orange,¹⁹² and lead paint¹⁹³ industries, among others. Each of these industries' successes in court can be traced, at least in part, to their ability and willingness to raise scientific doubt. In cases where the parties must establish the existence or absence of a scientific principle, the side charged with raising doubt has an undue advantage over the side charged with establishing certainty.

exposure."), discussing Richard Doll, *Mortality from Lung Cancer in Asbestos Workers*, 12 BRIT. J. INDUST. MED. 81, 81-86 (1955).

¹⁸⁷ Confidential Internal Memorandum from C.G. Linke of Johns-Manville Corp. to J.A. McKinney (Jan. 12, 1979) (on file with the Cardozo Law Review).

¹⁸⁸ *Borel v. Fibreboard Paper Prod. Corp.*, 493 F.2d 1076, 1092 (5th Cir. 1973).

¹⁸⁹ James L. Stengel, *The Asbestos End-Game*, 62 N.Y.U. ANN. SURV. AM. L. 223, 223 (2006).

¹⁹⁰ See generally MICHAEL GREEN, *BENDECTIN AND BIRTH DEFECTS* (1996) (describing the history of Bendectin litigation); see also *BENDECTIN ON TRIAL: A STUDY OF MASS TORT LITIGATION* 213-14 (1998) (describing the history of Merrell Dow Pharmaceuticals, Inc., one of the most notable Bendectin manufacturer litigation defendants); Joseph Sanders, *From Science to Evidence: The Testimony on Causation in the Bendectin Cases*, 46 STAN. L. REV. 1 (1993).

¹⁹¹ See generally THOMAS F. CAMPION, *DES AND LITIGATION: THE FIRST TEN YEARS*, at 315 (PLI Litig. & Admin. Practice Course Handbook Series No. 344, 1988) (reciting the history of DES litigation); see also Tracey I. Batt, *Des Third-Generation Liability: A Proximate Cause*, 18 CARDOZO L. REV. 1217 (1996) (discussing second- and third-generation liability in DES litigation cases); Robb Tretter, *Stop Fishing in the Pond and Head Back to the Stream: Personal Jurisdiction in Mass Toxic Torts*, 1995 ANN. SURV. AM. L. 603 (1996) (discussing the history of DES litigation).

¹⁹² See generally *In re "Agent Orange" Prod. Liab. Litig.*, 818 F.2d 145, 148-61 (2d Cir. 1987) (discussing background and context of Agent Orange litigation, summarizes opinions by the Second Circuit as well as the entire history of the case), *cert. denied*, 108 S.Ct. 695 (1988); *In re "Agent Orange" Prod. Liab. Litig.*, 597 F.Supp. 740, 746-48 (E.D.N.Y. 1984) (commenting on the case having become a vehicle for Vietnam Veterans' larger grievances), *aff'd*, 818 F.2d 145 (2d Cir. 1987), *cert. denied*, 108 S.Ct. 695 (1988).

The Agent Orange litigation arose when Vietnam veterans sought to prove that they had been injured by exposure to the Agent Orange herbicide, which contained traces of dioxin, an extremely toxic chemical. See Note, *Agent Orange Products Liability Litigation*, 1984 A.F. L. REV. 97 (1984) (discussing chemical components and background of contractor defense). The case was heard by the District Court for the Eastern District of New York, which decided that the government contractor defense would be available, but denied defendants' motion for summary judgment. *In re "Agent Orange" Prod. Liab. Litig.*, 506 F. Supp. 762, 792-97 (E.D.N.Y. 1980).

¹⁹³ See generally Mark P. Gagliardi, *Stirring Up the Debate in Rhode Island: Should Lead Paint Manufacturers be Held Liable for the Harm Caused by Lead Paint?*, 7 ROGER WILLIAMS U. L. REV. 341 (Spring 2002) (discussing the history of lead paint litigation in the United States); see also Laura L. Gavioli, *Who Should Pay: Obstacles to Cities in Using Affirmative Litigation as a Source of Revenue*, 78 TUL. L. REV. 941 (Feb. 2004) (discussing the history of city litigation involving lead paint); LEAD INDUSTRY ASS'N, *Lead Pigment Litigation: Key Cases*, <http://www.leadlawsuits.com/caseinfo.htm> (last visited Jan. 29, 2004) (outlining the history of the New York City litigation from the perspective of the lead paint industry).

D. Current law is inadequate to address scientific knowledge fraud

Fraud claims have proven strikingly ineffective against entities alleged and, in many cases, later proven, to have made misrepresentations pertaining to scientific knowledge.¹⁹⁴ One impediment faced by plaintiffs pursuing such cases, although by no means the only impediment,¹⁹⁵ is the undue difficulty in establishing the falsity element. The falsity element under the current law is inadequate in science fraud cases.

To prevail on a fraud claim, a plaintiff must establish that the defendant made a statement that was false.¹⁹⁶ In many fraud cases, this is one of the least contentious elements—as opposed to, say, knowledge, intent, materiality, or reasonable reliance—because whether an assertion is true or false is often a relatively straightforward question. Indeed, it is so straightforward that falsity is folded into one or more other elements in dozens of jurisdictions, in court, and on jury questionnaires.¹⁹⁷

Not surprisingly, given that fraud law originated as an offshoot of contract law,¹⁹⁸ the falsity element requires that the plaintiff establish that the

¹⁹⁴ See *supra* notes 182, 183, 184, and 185, and the corresponding text with regard to tobacco litigation; see also Rabin, *supra* note 136 (discussing how tobacco plaintiffs struggled for many years to obtain tort compensation for wrongful deaths and other injuries caused by smoking-related disease). See *supra* note 10 and corresponding text with regard to asbestos litigation; see also *supra* note 190, 191, 192, and 193, along with the corresponding text for each. Cf. Eric Nielson, *The Admission of Scientific Evidence in a Post-Crawford World*, 14 MINN. J.L. SCI. & TECH. 951, 983 (2013) (noting “[t]he ineffectiveness of the courts in detecting the rare but real instances of scientific fraud or misconduct”).

¹⁹⁵ See generally *Johns-Manville Products Corp. v. Superior Court*, 612 P.2d 948 (Cal. 1980) (outright barring the pursuit of fraud claims against defendants that have misrepresented scientific knowledge pertaining to their products, and holding that workers' compensation was an employee's exclusive remedy for fraud committed by an employer, directed at the employee, which resulted in a physical injury to the employee).

¹⁹⁶ See *supra* notes 137, 138, 139, and 140, as well as the accompanying text to these footnotes.

¹⁹⁷ See, e.g., *Tyson Foods, Inc. v. Davis*, 66 S.W.3d 568, 580 (Ark. 2002) (articulating the first element of the tort of fraud in Arkansas as “a false representation of a material fact”); *West v. JPMorgan Chase Bank, N.A.*, 214 Cal. App. 4th 780, 792, 154 Cal. Rptr. 3d 285, 295 (2013) (articulating the first element of fraud in California as: “the defendant made a false representation as to a past or existing material fact”); *Girozentrale v. Tilton*, 149 A.D.3d 152, 162, 48 N.Y.S.3d 98, 105 (N.Y. App. Div. 2017) (articulating the first element of fraud in New York as: “a material misrepresentation of a fact”); *Zaidi v. Shah*, 502 S.W.3d 434, 441 (Tex. App. 2016), *review denied* (June 9, 2017) (articulating the first element of fraud in Texas as: “the speaker made a material representation”); *GEICO Gen. Ins. Co. v. Hoy*, 136 So. 3d 647, 651 (Fla. Dist. Ct. App. 2013) (articulating the first element of fraud in Florida as: “a false statement concerning a material fact”).

¹⁹⁸ The law of fraud is based on the action of deceit. WILLIAM L. PROSSER, *LAW OF TORTS* 105 (4th ed. 1971). A writ of deceit existed as early as 1201, and it lay against a defendant who misused a legal procedure to harm the plaintiff. *Id.* This writ was later superseded by an action on the case in the nature of deceit, which was the common law remedy for fraudulent and non-fraudulent misrepresentation which caused actual damage. *Id.* This action on the case remedied problems which are today considered breaches of contract and was regarded as inseparable from some

defendant's representation was not just misleading but "false" at the time of the representation.¹⁹⁹ Representations that are substantially true,²⁰⁰ or that are not "false in a material and substantial respect,"²⁰¹ will not support an action for fraud. However, half-truths calculated to deceive may, in some circumstances, satisfy the element.²⁰² Moreover, a representation can be technically accurate yet still, in some circumstances, be false for the purposes of a fraud claim.²⁰³ But even with these caveats, the determinative inquiry into the defendant's statement or statements is: true or false?

The line delineating what does and does not constitute a false representation is well-defined for some types of assertions. If a company reports quarterly earnings showing 2% growth, but it later comes to light the company during that period actually suffered a 2% loss, it is clear the statement made in the quarterly report was false. A person can simply look at the numbers and see the discrepancy. Similarly, if that same company put out a quarterly report for that period that stated boldly on the front page that the company had achieved 2% growth, but explained in fine print later in the document that the growth number includes only certain parts of the company's overall business portfolio, and that the company as a whole suffered a 2% loss, this would likewise likely be found to be false for the purposes of a fraud claim. Even if what is stated is technically true, it may satisfy the falsity element if it produces a false impression in the mind of the other party.²⁰⁴

contractual relation. *Id.* Indeed, deceit was not considered a separate tort until *Pasley v. Freeman*, 100 Eng. Rep. 450 (1789). That case, like many early deceit cases, involved a misrepresentation that induced the plaintiff to part with money, property, or land. *Id.* The specific misrepresentation in *Pasley* was the defendant's representing himself to be creditworthy, and thereby accepting a loan from the plaintiff, when he knew himself to be uncreditworthy. *Id.*

¹⁹⁹ *Tom Hughes Marine, Inc. v. American Honda Motor Co., Inc.*, 219 F.3d 321 (4th Cir. 2000).

²⁰⁰ *First Nat. Bank v. Level Club*, 254 A.D. 255, 4 N.Y.S.2d 734 (1st Dep't 1938), *judgment aff'd*, 282 N.Y. 577, 24 N.E.2d 991 (1939).

²⁰¹ *Pedone v. Title Guarantee & Trust Co.*, 280 N.Y. 153, 19 N.E.2d 1000 (1939).

²⁰² *United Parcel Serv. Co. v. Rickert*, 996 S.W.2d 464 (Ky. 1999); *Knights of Columbus Council 3152 v. KFS BD, Inc.*, 280 Neb. 904, 791 N.W.2d 317 (2010); *American Empire Life Ins. Co. v. Long*, 344 S.W.2d 513 (Tex. Civ. App. Eastland 1961), *writ refused n.r.e.*, (June 14, 1961). A representation stating the truth so far as it goes but which the maker knows or believes to be materially misleading because of his or her failure to state additional or qualifying matter is a fraudulent misrepresentation. RESTATEMENT (SECOND) OF TORTS § 529 (1977).

²⁰³ See, e.g., *Grove Holding Corp. v. First Wis. Nat. Bank of Sheboygan*, 12 F. Supp. 2d 885, 890 (E.D. Wis. 1998) (holding that a representation can be technically accurate, yet still misleading, for purposes of negligent and intentional misrepresentation claims); *KEETON ET AL.*, *supra* note 140, at 736-37 ("[M]isrepresentation may be found in statements which are literally true, but create a false impression in the mind of the hearer").

²⁰⁴ Moreover, it is immaterial that no specific statement in a quarterly report or a prospectus is false if the general impression conveyed by it is false. *McClellan v. Tobin*, 219 Ind. 563, 39 N.E.2d 772 (1942). If by a number of statements one intentionally gives a false impression and induces another to act upon it, it is nevertheless false, even though, if each statement is taken by itself, there may be difficulty in showing that any specific statement is untrue. *Downey v. Finucane*, 205 N.Y. 251, 98 N.E. 391 (1912).

But again, the line drawn here is between *true*, on the one hand, and *false*, on the other—i.e., that statement must have either made a truthful impression or a false impression in the mind of the other party. This true-false dichotomy is ill-equipped to handle assertions pertaining to scientific knowledge.

Courts have not been given the necessary tools to resolve “the knotty problem of the demarcation between science and pseudoscience”²⁰⁵ with regard to science fraud claims. The Supreme Court did, however, give courts guidance on this “knotty problem” in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*²⁰⁶ in the context of admissibility of expert witness testimony.²⁰⁷ There, the Court “undertook to enable every federal judge to solve that problem in deciding the admissibility of each scientific expert witness in every case that arises.”²⁰⁸ This gatekeeping role, under which trial judges are charged with assuring that scientific expert testimony truly proceeds from scientific knowledge, presents a helpful starting point for how to best equip judges and juries to determine the falsity of a statement pertaining to scientific knowledge.

But *Daubert* is only a starting point; it sets out an *evidentiary* rule. By contrast, the problem faced by courts and plaintiffs in scientific knowledge fraud cases is materially different. It is not an evidentiary question but one pertaining directly to the standard applied to determine whether the fraud elements are met.

Statements such as those by Exxon’s then-President, Lee Raymond, discussed in Section II.0,²⁰⁹ misstate the then-known scientific knowledge yet

²⁰⁵ GOODSTEIN, *supra* note 175, at 52.

²⁰⁶ *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

²⁰⁷ The facts, holding, and reasoning of the Supreme Court’s *Daubert* decision are discussed at greater length in Section III. For a more comprehensive analysis of the *Daubert* decision, and of its “far-reaching effects,” see generally David L. Faigman, *The Daubert Revolution and the Birth of Modernity: Managing Scientific Evidence in the Age of Science*, 46 U.C. DAVIS L. REV. 893 (2013). The effectiveness of the formal doctrinal test put forth in *Daubert* is questionable. See, e.g., Sophia I. Gatowski et al., *Asking the Gatekeepers: A National Survey of Judges on Judging Expert Evidence in a Post-Daubert World*, 25 L. & HUM. BEH. 433, 443 (2001) (presenting empirical evidence and conclusions drawn from a survey of 400 state court judges’ opinions about the *Daubert* criteria, their utility as decision-making guidelines, the level to which judges understand their scientific meaning, and how they might apply them when evaluating the admissibility of expert evidence); Dillon, *supra* note 153, at 23-27 (discussing studies on judges’ ability to apply the *Daubert* test reliably, which, taken together, support the conclusion judges generally cannot apply the test with a level of competence necessary to satisfy intellectual due process).

²⁰⁸ GOODSTEIN, *supra* note 175.

²⁰⁹ *Fossil Fuel Industry Climate Science Deception*, *supra* note 97; David Hasemyer & John H. Cushman, Jr., *Collaborating with the Bush-Cheney White House, Exxon turned ordinary scientific uncertainties into weapons of mass confusion*, INSIDECLIMATE NEWS (Oct. 22, 2015), <https://insideclimatenews.org/news/22102015/Exxon-Sowed-Doubt-about-Climate-Science-for-Decades-by-Stressing-Uncertainty>; Jim Hightower, *Were our leaders bold enough to do enough about climate change soon enough?*, HIGHTOWER HIGHTOWER LOW DOWN (Dec. 1, 2015), <https://hightowerlowdown.org/article/lettertothe future/>. Those statements were:

•“Currently, the scientific evidence is inconclusive as to whether human activities are having a significant effect on the global climate”;

•“Many people, politicians and the public alike, believe that global warming is a rock-solid

would likely not be found false under the current fraud-falsity standard. A different standard must be applied in such cases to remedy this inequity. It is important to note, however, that aside from the legal reasons it would be prudent to adopt and apply a different standard in such cases, doing so would also further the well-established public policy in favor of objective, accurate science.

IV. THE POLICY FAVORING VALID SCIENCE

“Science is more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been before.”

PRESIDENT BARACK OBAMA
April 27, 2009

We rely heavily on science. But we can only rely on it to the extent it is objective and accurate. Yet some groups and individuals have, in recent history and up to the present day, pushed an agenda that eschews objective science and instead bases policies and decisions on subjective individual beliefs. This is not only antithetical to progress and detrimental to the economy, it is at odds with the democratic ideals upon which our country was founded.²¹⁰ Neil DeGrasse Tyson warned: “If you cherry-pick scientific truths to serve cultural, economic, religious or political objectives, you undermine the foundations of an informed democracy.”²¹¹

Science distinguishes itself by its power to probe and understand the behavior of nature on a level that allows us to predict with accuracy, if not control, the outcomes of events in the natural world. The scientific method can be summarized in one sentence: “Do whatever it takes to avoid fooling yourself into thinking something is true that is not, or that something is not true that is.”²¹² By following this principle, scientists have greatly enhanced our health, wealth and

certainty. But it’s not”; and

•“The earth is cooler today than it was 20 years ago.”

See, respectively, *Fossil Fuel Industry Climate Science*, *supra* note 97; Hasemyer & Cushman, Jr., *supra* note 70; *Were our leaders bold enough to do enough about climate change soon enough?*, THE HIGHTOWER LOWDOWN (Dec. 1, 2015), <https://hightowerlowdown.org/article/lettertothe future/>.

²¹⁰ See Johnathan Foley, *The War on Facts Is a War on Democracy*, BILL MOYER (Jan. 30, 2017), <http://billmoyers.com/story/war-facts-war-democracy/> (“Scientists aren’t—and shouldn’t be!—worried about which political party is in power. It rarely mattered: There has always been a long tradition of bipartisan support for science and a fact-based world view. . . . Wise leaders of both parties have always recognized the value of independent science to our democracy.”).

²¹¹ Neil deGrasse Tyson, *What Science Is—and How and Why It Works*, HUFF. POST (Nov. 18, 2015), http://www.huffingtonpost.com/neil-degrasse-tyson/what-science-is-and-how-and-why-it-works_b_8595642.html.

²¹² *Id.*

security, which is greater today for more people on Earth than at any other time in human history.²¹³

Science does this by discovering objective truths. These are not established by any seated authority, nor by any single research paper. Although science is always technically provisional,²¹⁴ once an objective truth is established by scientific methods, it will not later be found to be false.²¹⁵ As DeGrasse Tyson wryly noted, “We will not be revisiting the question of whether Earth is round; whether the sun is hot; whether humans and chimps share more than 98 percent identical DNA; or whether the air we breathe is 78 percent nitrogen.”²¹⁶ Objective truths like these exist outside any individual’s perception of reality. They can be verified by anyone with the tools and knowledge to do so. And they are true whether or not any particular person believes in them.²¹⁷

The value of science was recognized by the Founding Fathers of our country. Indeed, “[s]cientific findings and attitudes were common in those who invented the United States.”²¹⁸ Our government’s support for this principle has

²¹³ *Id.* From the toothpaste we brush with to the food we eat, from cars, trains, and planes to plumbing, heating, and lighting, from the medicine that keeps us healthy to the computing devices that put the world at our fingertips—nearly every aspect of our lives has been made better by scientific discoveries.

²¹⁴ See *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 596 (1993) (noting that “there are no certainties in science,” and that “[s]cience is not an encyclopedic body of knowledge about the universe,” but rather “represents a process for proposing and refining theoretical explanations about the world that are subject to further testing and refinement”).

²¹⁵ COMM. ON SCI. TECH. & L. POL’Y & GLOB. AFF., NAT’L RES. COUNCIL, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE (3d ed. 2001). David Goodstein frames this distinction as one “between science at the frontiers of knowledge (where by definition we do not yet understand everything and where theories are indeed vulnerable) and textbook science that is known with great confidence.” “Matter is made of atoms, DNA transmits the blueprints of organisms from generation to generation, light is an electromagnetic wave—these things are not likely to be proved wrong.”

²¹⁶ *Id.*; see also Tyson, *supra* note 211.

²¹⁷ COMM. ON SCI. TECH. & L. POL’Y & GLOB. AFF., *supra* note 215.

Personal truths, on the other hand, are ideas you may hold dear but have no real way of proving because they are based not on evidence but on your own beliefs. These are the foundations of most people’s opinions. Is the death penalty an appropriate punishment? Should abortion be legal? Should the government support the poor? Should America have invaded Iraq? Is Jesus your personal savior? Differences in opinion define the cultural diversity of a nation, and should be cherished in any free society. You don’t have to like gay marriage. Nobody will ever force you to gay-marry. But to create a law preventing fellow citizens from doing so is to force your personal truths on others. Political attempts to require that others share your personal truths are, in their limit, dictatorships.

²¹⁸ CARL SAGAN, THE DEMON HAUNTED WORLD: SCIENCE AS A CANDLE IN THE DARK 398 (1997). Thomas Jefferson, for instance, pursued science as an avocation throughout his life and had a keen and well-documented interest in natural history. He wrote in the Declaration of Independence that America’s right to separate from England rested on “the Laws of Nature and of Nature’s God.”

been reiterated on many fronts ever since, from Abraham Lincoln's signing into existence the National Academy of Sciences in 1863, based on an Act of Congress,²¹⁹ to the establishment of numerous other government entities with scientific missions, including NASA,²²⁰ which explores space and aeronautics; NIST,²²¹ which explores standards of scientific measurement, on which all other measurements are based; the NSF,²²² which supports fundamental research and education in all the non-medical fields of science and engineering; DOE,²²³

Jefferson himself explained in another document that these words connote the laws or principles of science. BERNARD COHEN, *SCIENCE AND THE FOUNDING FATHERS* 61 (1995). Specifically, the "laws of nature," to Jefferson, meant the axioms of Isaac Newton's *Principia*, the celebrated laws of motion. *Id.* at 132. Moreover, although Jefferson penned these words, the final wording was agreed to and approved of by the large number of delegates at the Second Continental Congress; these words reflected the ideas and wishes of the leading figures in the independence movement. Other examples of the Founding Fathers' recognition of the value of science abound. Dr. Benjamin Franklin was revered in Europe and America as the founder of the new field of electrical physics. At the Constitutional Convention of 1789 John Adams repeatedly appealed to the analogy of mechanical balance in machines; others, to William Harvey's discovery of the circulation of the blood. Late in life Adams wrote, "All mankind are chemists from their cradles to their graves . . . The Material Universe is a chemical experiment." James Madison used chemical and biological metaphors in *The Federalist Papers*. SAGAN, *supra* at 398. Indeed, Paragraph 8 of Section 8 of Article I of the U.S. Constitution, assigns to Congress the power "To promote the Progress of Science and useful Arts, by securing for limited Time to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." U.S. Constitution, Art. I, § 8. For a more thorough discussion of the Founding Fathers' commitment to the sciences, see generally COHEN, *supra*.

²¹⁹ *About NAS, Mission*, NAT'L ACAD. OF SCI. (2017), <http://www.nasonline.org/about-nas/mission/>.

²²⁰ The National Aeronautics and Space Administration (NASA) is an independent agency of the executive branch of the United States federal government responsible for the civilian space program as well as aeronautics and aerospace research. NASA, WIKIPEDIA (July, 19, 2017), <https://en.wikipedia.org/wiki/NASA>. It was established by the National Aeronautics and Space Act of 1958, which was passed by both houses of Congress and signed by President Dwight D. Eisenhower on July 29, 1958. *Id.*; see also *The Birth of NASA: November 3, 1957–October 1, 1958*, NASA (Oct. 8, 2017), <https://www.hq.nasa.gov/office/pao/History/monograph10/nasabrth.html>.

²²¹ The National Institute of Standards and Technology (NIST), established in 1901, is a measurement standards laboratory, and a non-regulatory agency of the United States Department of Commerce. NIST, WIKIPEDIA (July 26, 2017), https://en.wikipedia.org/wiki/National_Institute_of_Standards_and_Technology. Its official mission is to: "Promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life." NIST, *NIST General Information*, <https://www.nist.gov/director/pao/nist-general-information>.

²²² The National Science Foundation (NSF) is a United States government agency that supports fundamental research and education in all the non-medical fields of science and engineering. *About the National Science Foundation*, THE NAT'L SCI. FOUND. (2017), <https://www.nsf.gov/about/>. The NSF was established by the National Science Foundation Act of 1950. *Id.*; see also 42 U.S.C. §§ 1861-1887 (2017) (the National Science Foundation Act). Its stated mission is "To promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense." *The NSF Statutory Mission and Vision*, THE NAT'L SCI. FOUND., https://www.nsf.gov/pubs/2014/nsf14002/pdf/02_mission_vision.pdf.

²²³ The United States Department of Energy (DOE) is a Cabinet-level department of the U.S. government concerned with the United States' policies regarding energy and safety in handling

which explores energy in all usable forms; the EPA,²²⁴ which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress; NIH,²²⁵ which is the primary agency of the United States government responsible for biomedical and health-related research; and NOAA,²²⁶ which explores Earth's weather and climate.²²⁷

nuclear material. *United States Department of Energy*, WIKIPEDIA (July 4, 2017), https://en.wikipedia.org/w/index.php?title=United_States_Department_of_Energy&action=history. *Id.* Its responsibilities include the nation's nuclear weapons program, nuclear reactor production for the United States Navy, energy conservation, energy-related research, radioactive waste disposal, and domestic energy production. *Id.* It also directs research in genomics; the Human Genome Project originated in a DOE initiative. *Id.* DOE sponsors more research in the physical sciences than any other U.S. federal agency, the majority of which is conducted through its system of National Laboratories. *Id.*

²²⁴ The United States Environmental Protection Agency (EPA) is an agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress. *About EPA*, ENVTL. PROTECTION AGENCY (2017), <https://www.epa.gov/aboutepa>; *see also United States Environmental Protection Agency*, WIKIPEDIA (July 27, 2017), https://en.wikipedia.org/w/index.php?title=United_States_Environmental_Protection_Agency&action=history. On July 9, 1970, President Richard Nixon proposed an executive reorganization that consolidated many environmental responsibilities of the federal government under one agency, a new Environmental Protection Agency. *Reorganization Plans Nos. 3 and 4 of 1970: Message from the President of the United States to the House of Representatives*, House of Representatives, 91st Congress, 2d Session, July 9, 1970, Document no. 91-366, Environmental Protection Agency, <https://archive.epa.gov/ocir/leglibrary/pdf/created.pdf>. After conducting hearings during that summer, the House and Senate approved the proposal, thus creating the EPA. *The Guardian: Origins of the EPA* (EPA Historical Publication), ENVTL. PROTECTION AGENCY, <https://archive.epa.gov/epa/aboutepa/guardian-origins-epa.html>.

²²⁵ The National Institutes of Health (NIH) is an agency of the United States Department of Health and Human Services, and is the largest biomedical research agency in the world. *About NIH*, NAT'L INSTS. OF HEALTH, U.S. DEP'T OF HEALTH AND HUMAN SERVS., <https://www.nih.gov/about-nih>.

²²⁶ The National Oceanic and Atmospheric Administration (NOAA) is an American scientific agency within the United States Department of Commerce focused on the conditions of the oceans and the atmosphere. *National Oceanic and Atmospheric Administration*, WIKIPEDIA (Oct. 8, 2017), https://en.wikipedia.org/wiki/National_Oceanic_and_Atmospheric_Administration. NOAA warns of dangerous weather, charts seas, guides the use and protection of ocean and coastal resources, and conducts research to improve understanding and stewardship of the environment. *Id.*; *see also About Our Agency*, NAT'L OCEANIC AND ATMOSPHERIC ADMIN. (Oct. 8, 2017), <http://www.noaa.gov/about-our-agency>.

²²⁷ Importantly, the support for science throughout U.S. history has been bipartisan, as shown by the fact that U.S. presidents who established and supported many important scientific milestones came from both sides of the political aisle. Abraham Lincoln, a Republican, signed into existence the National Academy of Sciences in 1863, based on an Act of Congress. *See NAT'L ACADEMY OF SCIENCES*, *supra* note 219. In 1916 Woodrow Wilson, a Democrat, created the National Park Service, an idea championed by Theodore Roosevelt, a Republican. *About Us: History*, NATIONAL PARK SERVICE (Oct. 8, 2017), <https://www.nps.gov/aboutus/history.htm>. In 1930 Herbert Hoover, a Republican, created the NIH. *Origins of the National Institutes of Health*, NAT'L INSTS. OF HEALTH (Oct. 8, 2017), https://www.nlm.nih.gov/exhibition/nih_origins/NIH.html. Harry Truman, a Democrat, created the NSF in 1950. *A Timeline of NSF History*, NAT'L SCIENCE FOUND. (Oct. 8, 2017), <https://www.nsf.gov/about/history/overview-50.jsp>. In 1958, Dwight Eisenhower, a

Today, as a matter of course, the President works with a science adviser, Congress solicits advice from the National Academy of Sciences, and the scientific regulatory agencies often work with outside scientists, as well as their own, in their efforts to develop a work product that reflects good science.²²⁸ The common thread shared by all of these agencies, departments, principles, and procedures is the acknowledgement that science is in our national interest, and its value depends upon its objectivity and accuracy.

This aim, the search for objective truth, also underpins the judicial system.²²⁹ Indeed, on several occasions, courts have explicitly pointed to the public policy of protecting and promoting valid science.²³⁰ Justice Stephen Breyer commented on the myriad kinds of cases where scientific issues come into play in his article, *The Interdependence of Science and Law*.²³¹

There, Justice Breyer noted that

[s]cientific issues permeate the law. Criminal courts consider the scientific validity of, say, DNA sampling, or voice prints, . . . that can lead courts or juries to authorize or to withhold the punishment of death. Courts review the reasonableness of administrative agency conclusions about the safety of a drug, the risks attending nuclear waste disposal, the leakage potential of a toxic waste dump, or the risks to wildlife associated with the

Republican, created NASA. See NASA, *supra* note 220. In 1962 John F. Kennedy, a Democrat, announced we were going to explore the Moon. John F. Kennedy Moon Speech - Rice Stadium, September 12, 1962, NASA (Oct. 8, 2017), <https://er.jsc.nasa.gov/seh/ricetalk.htm>. In 1970, Richard Nixon, a Republican, created the EPA, and, later that year, the NOAA. See Reorganization Plans, Env'tl. Protection Agency, *supra* note 224, and WIKIPEDIA, *supra* note 226. In the mid-1990s, Bill Clinton, a Democrat, boosted research and development funding that enabled an exponential growth of the internet, as tens of millions of Americans come on line. *The Clinton Presidency: Unleashing the New Economy — Expanding Access to Technology*, NAT'L ARCHIVES (Oct. 8, 2017), <https://clinton5.nara.gov/WH/Accomplishments/eightyears-09.html>.

²²⁸ Stephen Breyer, *The interdependence of science and law*, 82 JUDICATURE 24, 26 (1998).

²²⁹ "The search for truth is foundational in science and law." Eric Nielson, Note, *The Admission of Scientific Evidence in a Post-Crawford World*, 14 MINN. J. L. SCI. & TECH 951, 951 (2013) (footnotes omitted), citing LINUS PAULING, NO MORE WAR! 209 (1958) ("Science is the search for the truth. . .") and FED. R. EVID. 102 (stating "[t]hese rules should be construed so as to administer every proceeding fairly, eliminate unjustifiable expense and delay, and promote the development of evidence law, to the end of ascertaining the truth and securing a just determination").

²³⁰ See, e.g., *Cty. of Fresno v. Sup. Court*, 92 Cal.App.3d 133, 138 (Cal. Ct. App. 1979) ("Public policy favors the use of objective, highly accurate scientific analysis."); *Lee v. Martinez*, 96 P.3d 291, 297 (N.M. 2004) ("Scientific evidence can only assist the trier of fact if it is 'grounded in valid, objective science' and is [therefore] 'reliable enough to prove what it purports to prove.'"); *Daubert v. Merrell Dow Pharms., Inc.*, 43 F.3d 1311, 1317–18 (9th Cir. 1995) (noting that, to determine admissibility of scientific expert witness evidence, "the district court must determine whether there exists any objective, verifiable evidence that the testimony is based on scientifically valid principles.") (internal quotation marks omitted).

²³¹ Breyer, *supra* note 228, at 26.

building of a dam. Patent law cases can turn almost entirely upon an understanding of the underlying technical or scientific subject matter. And, of course, tort law, assessing civil liability for injury or death, often involves difficult determinations about the degree of risk of death or injury associated with a chemical ingredient of, say, a pesticide or of any other product.

The importance of scientific accuracy in the decision of such cases may reach well beyond the case itself.²³²

This principle—"the importance of scientific accuracy in the decision of such cases"—has been echoed in a number of court decisions. One of the most notable among them is the Supreme Court's decision in *Daubert v. Merrell Dow Pharm., Inc.*²³³

In *Daubert*, two minor children and their parents sued a pharmaceutical company to recover for limb reduction birth defects allegedly sustained as a result of the mothers' ingestion of the antinausea drug Bendectin, which physicians prescribed to the mothers during pregnancy.²³⁴ The underlying facts of *Daubert* follow the scientific knowledge fraud case pattern,²³⁵ although the plaintiffs there sued for negligence,²³⁶ not fraud. The issue before the Court was which standard must be applied for admitting expert scientific testimony in a federal trial.²³⁷

²³² *Id.* at 25. Moreover, scientific issues "permeate the law" in a number of other ways, such as in the realms of bioethics, biotechnology, food oppression, and epigenetics, to name just a few. See Seema Mohapatra, *Politically Correct Eugenics*, 12 FIU L. REV. 51 (2016) (bioethics—analyzing how the acceptance of a politically correct eugenics, through the acceptance of new technologies and use of less politically-charged terminology like "family balancing," may affect and further disadvantage women of color and families of color); Chidi Oguamanam, *Toward a Constructive Engagement: Agricultural Biotechnology as a Public Health Incentive in Less-Developed Countries*, 7 J. FOOD L. & POL'Y 257 (2011) (biotechnology—examining the obstacles to deployment of agricultural biotechnology to mitigate public health challenges in less-developed countries); Andrea Freeman, *Fast Food: Oppression Through Poor Nutrition*, 95 CAL. L. REV. 2221, 2250 (2007) (food oppression—discussing how creating psychological cravings can cause powerful psychological addictiveness of fast food in adults and children, and how sugar contained in fast food and soft drinks has been shown to be physically addictive); Mark A. Rothstein et al., *The Ghost in Our Genes: Legal and Ethical Implications of Epigenetics*, 19 HEALTH MATRIX 1 (2009) (epigenetics—describing and analyzing the ethical and legal implications of this emerging area of scientific discovery).

²³³ *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 579 (1993).

²³⁴ *Id.* at 582.

²³⁵ *Id.* That is, in *Daubert*, there was a product that is both profitable and destructive, Bendectin, and the companies selling it tell the court "the science is unsettled" when in fact the science was clear enough to know it posed a serious danger to the mothers to which it was marketed.

²³⁶ See *Daubert v. Merrell Dow Pharm., Inc.*, 727 F.Supp. 570, 571-72 (S.D. Cal. 1989), the underlying case that was appealed first to the Ninth Circuit, and then to the Supreme Court.

²³⁷ *Daubert*, 509 U.S. at 582.

The Court held that Rule 702 of the Federal Rules of Evidence²³⁸ displaced the previously applied *Frye* standard²³⁹ for admitting scientific expert testimony.²⁴⁰ The Court charged trial judges with the responsibility of acting as gatekeepers to exclude unreliable scientific expert testimony.²⁴¹ *Daubert* set forth a non-exclusive checklist for trial courts to use in assessing the reliability of scientific expert testimony. The specific factors explicated by the *Daubert* Court were: (1) whether the expert's scientific technique or theory can be or has been tested—that is, whether the expert's theory can be challenged in some objective sense, or whether it is instead simply a subjective, conclusory approach that cannot reasonably be assessed for reliability; (2) whether the scientific technique or theory has been subject to peer review and publication; (3) the known or potential rate of error of the scientific technique or theory when applied; (4) the existence and maintenance of standards and controls; and (5) whether the technique or theory has been generally accepted in the scientific community.²⁴²

Each of these factors goes to the overarching inquiry: Is the expert's opinion based on “good” science or “junk” science?²⁴³ “Good” science, as the term is used in *Daubert*,²⁴⁴ is synonymous with “accurate” science.²⁴⁵ Today,

²³⁸ FED. R. EVID. 702, which was amended in 2000 in response to *Daubert*, and to the many cases applying *Daubert*, including *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 1167 (1999), see FED. R. EVID. 702, which provides:

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if: (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; (b) the testimony is based on sufficient facts or data; (c) the testimony is the product of reliable principles and methods; and (d) the expert has reliably applied the principles and methods to the facts of the case.

²³⁹ Under the *Frye* standard, “[t]he proponent of the evidence bears the burden of establishing by a preponderance of the evidence the general acceptance of the underlying scientific principles and methodology.” *Castillo v. E.I. Du Pont De Nemours & Co., Inc.*, 854 So.2d 1264, 1268 (Fla. 2003); see also *Frye v. United States*, 293 F. 1013, 1013 (D.C. Cir. 1923).

²⁴⁰ *Daubert*, 509 U.S. at 586-87.

²⁴¹ *Id.* at 589.

²⁴² *Id.* at 580. Although the current evidentiary standard is encapsulated in FED. R. EVID. 702, as discussed in *supra* note 238, which incorporates into it *Daubert* and its progeny, this Article sometimes refers to *Daubert* and to the *Daubert* standard as a shorthand reference to this new evidentiary standard first articulated in that case.

²⁴³ *Best v. Lowe's Home Centers, Inc.*, 563 F.3d 171, 176-77 (6th Cir. 2009) (“*Daubert* attempts to strike a balance between a liberal admissibility standard for relevant evidence on the one hand and the need to exclude misleading ‘junk science’ on the other.”); see also David L. Faigman, *The Daubert Revolution and the Birth of Modernity: Managing Scientific Evidence in the Age of Science*, 46 U.C. DAVIS L. REV. 893, 909-10 (2013) (noting that one purpose of *Daubert* was “to hold the line against junk science, thus . . . lead[ing] to greater exclusion of proffered expertise”).

²⁴⁴ *Daubert*, 509 U.S. at 593-94.

²⁴⁵ See generally *id.* (noting that “submission to the scrutiny of the scientific community is a component of ‘good science,’ in part because it increases the likelihood that substantive flaws in

judges in both state and federal court act as gatekeepers, admitting only accurate scientific evidence, while excluding evidence based on junk science.²⁴⁶

We have relied upon accurate science since the founding of this country. Its importance to our well-being and to our way of life has been recognized and reinforced by all three branches of government. Moreover, a reaffirmation of this principle is particularly important at this moment,²⁴⁷ when our scientific institutions and, indeed, science itself, are under attack by the President,²⁴⁸ his administration,²⁴⁹ and many others in power.²⁵⁰ Recent events have made it clear

methodology will be detected”) (emphasis added); *see also* Ecology Ctr., Inc. v. U.S. Forest Serv., 451 F.3d 1195, n.4 (10th Cir. 2006) (in discussing appellee’s need to seek out and rely on the “best available science,” the court noted it should “seek out and consider all existing scientific evidence relevant to the decision” and it “cannot ignore existing data,” and that it must determine which data “are the most accurate, reliable, and relevant,” and that will be reviewed deferentially, but it still must be *good science—that is reliable, peer-reviewed, or otherwise complying with valid scientific methods.*”) (emphasis added).

²⁴⁶ *See, e.g.,* Ex parte Robbins, 478 S.W.3d 678, 706 (Tex. Crim. App. 2014) (Johnson, J. concurring) (concurring opinion discussing Texas’s evidentiary rules guiding courts to exclude expert testimony based on “junk” science and that “it is the purpose of Article 11.073 to provide a statutory mechanism for relief and a retrial based upon “good” science and “good” scientific testimony); Edward K. Cheng & Albert H. Yoon, *Does Frye or Daubert Matter? A Study of Scientific Admissibility Standards*, 91 VA. L. REV. 471, 503 (2005) (noting that “the power of [Daubert] was not so much in its formal doctrinal test, but rather in its ability to create greater awareness of the problems of junk science”); Sophia I. Gatowski et al., *Asking the Gatekeepers: A National Survey of Judges on Judging Expert Evidence in a Post-Daubert World*, 25 L. & HUM. BEHAV. 433, 443 (2001) (in a survey of 400 state judges, 75% of respondents agreed that one purpose of the Daubert decision was to exclude “junk science” from the courtroom); *see also* David M. Flores et al., *Examining The Effects of the Daubert Trilogy on Expert Evidence Practices in Federal Civil Court: An Empirical Analysis*, 34 S. ILL. U. L. J. 533, 562-63 (2009).

²⁴⁷ Recent events demonstrate many recognize the urgency of strengthening our commitment to objective science, including the April 22, 2017 March for Science (*see March for Science*, WIKIPEDIA, https://en.wikipedia.org/wiki/March_for_Science (last edited July 12, 2017)) and the April 29, 2017 People’s Climate March (*see People’s Climate March*, WIKIPEDIA, [https://en.wikipedia.org/wiki/People%27s_Climate_March_\(2017\)](https://en.wikipedia.org/wiki/People%27s_Climate_March_(2017)) (last edited July 12, 2017)). Both of these were nationwide and worldwide demonstrations attended by millions of people.

²⁴⁸ *See e.g.,* Donald Trump (@realDonaldTrump), TWITTER (Nov. 6, 2012, 11:15 AM), <https://twitter.com/realdonaldtrump/status/265895292191248385?lang=en> (Tweet by Donald Trump: “The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive.”) (This was false.). Donald Trump (@realDonaldTrump), TWITTER (Mar. 28, 2014, 5:35 AM), <https://twitter.com/realdonaldtrump/status/449525268529815552?lang=en> (Tweet by Donald Trump: “Healthy young child goes to doctor, gets pumped with massive shot of many vaccines, doesn’t feel good and changes - AUTISM. Many such cases!”) (This was misleading, and preyed on misguided fears of many parents.).

²⁴⁹ The reports of how science is being attacked by the new administration are widespread and troubling. *See, e.g.,* Matthew Nisbet, *Ending the Crisis of Complacency in Science*, AM. SCIENTIST (Dec. 18, 2016), <https://www.americanscientist.org/article/ending-the-crisis-of-complacency-in-science> (“As newly elected president Donald Trump takes office, the scientific community faces the likelihood not only of unprecedented cuts in government funding for research, but also of bold new attacks on scientific expertise as a basis for policy making and decisions. Trump campaigned on a pledge to eliminate as much as \$100 million in ‘wasteful climate change spending,’ and there have been reports of plans to severely cut funding for NASA and other agencies.”); Lawrence M.

that many recognize the urgency of reaffirming our commitment to objective science, including the March for Science²⁵¹ and the People's Climate March,²⁵²

Krauss, *Donald Trump's War on Science*, THE NEW YORKER (Dec. 13, 2016), <http://www.newyorker.com/tech/elements/donald-trumps-war-on-science> ("The President-elect's cabinet appointments speak to a harsh reality: this is an anti-science Administration."); Sarah Kaplan, *Obama Official Urges Scientists to 'Fight Disinformation' Under Trump*, WASH. POST (Dec. 14, 2016) (noting that the president-elect has said "nobody really knows" whether climate change is real, that many of his Cabinet picks have strong ties to the oil and gas industry and are hostile to the scientific consensus on climate change, and that his transition team has asked the Energy Department to supply names of employees who do climate research—a request the agency denied); Donald Trump (@realDonaldTrump), TWITTER (Nov. 6, 2012, 11:15 AM), <https://twitter.com/realdonaldtrump/status/265895292191248385?lang=en> (Trump tweeted that global warming is a hoax perpetrated by the Chinese.); Television Interview with Bill McKibben, *Real Time with Bill Maher*, Episode 417, March 3, 2017 ("The level of just complete corruption from the fossil fuel industry that marks this administration is like nothing we've ever seen.").

²⁵⁰ For instance, the Department of Interior recently demanded that language connecting sea level rise and coastal flooding to climate change be removed from a press release announcing a new publication by scientists working for the United States Geological Survey. *Department of Interior Censors Press Release on USGS Study*, UNION OF CONCERNED SCIENTISTS (May 25, 2017), <http://www.ucsusa.org/center-science-and-democracy/attacks-on-science/departement-interior-censors-press-release-usgs-study#.WW-9MOmQzIU>. At the Department of Energy, Trump Administration officials are systematically editing departmental websites to strip references to climate change, downplay impacts of fossil fuels, and scale back benefits of clean energy. *Climate Change Language Altered on DOE Webpages*, UNION OF CONCERNED SCIENTISTS (May 25, 2017), <http://www.ucsusa.org/center-science-and-democracy/attacks-on-science/climate-change-language-altered-doe-webpages#.WW-96emQzIU>. In March 2017, EPA Administrator Pruitt falsely claimed that carbon dioxide is not a primary contributor to global warming. *EPA Administrator Scott Pruitt Lies About the Causes of Climate Change*, UNION OF CONCERNED SCIENTISTS (March 10, 2017), http://www.ucsusa.org/center-science-and-democracy/attacks-on-science/epa-administrator-scott-pruitt-lies-about-causes#.WW-_cOmQzIU; see also WENDY WAGNER & RENA STEINZOR, *RESCUING SCIENCE FROM POLITICS: REGULATION AND THE DISTORTION OF SCIENTIFIC RESEARCH* (Cambridge Univ. Press 2006) (stating that "[e]ven large, apolitical societies such as the American Association of the Advancement of Science have passed resolutions and filed comments on the increasing problems of biased research and literature reviews that damage scientific credibility," and noting "how far the legal system has strayed in its use of science, threatening scientific integrity at its core").

²⁵¹ The March for Science was a series of rallies and marches held in Washington, D.C., and more than 600 other cities across the world on Earth Day, April 22, 2017. Nicholas St. Fleur, *Scientists, Feeling Under Siege, March Against Trump Policies*, N.Y. TIMES (Apr. 22, 2017), <https://www.nytimes.com/2017/04/22/science/march-for-science.html>; *Pictures From the March for Science*, N.Y. TIMES (Apr. 22, 2017), <https://www.nytimes.com/2017/04/22/science/science-march-photos.html>; Lindzi Wessel, *The marches for science, on one global interactive map*, SCIENCE MAGAZINE (Feb. 7, 2017), <http://www.sciencemag.org/news/2017/02/marches-science-one-global-interactive-map>. The march was a non-partisan movement to celebrate science and the role it plays in everyday lives. MARCH FOR SCIENCE, OUR PRINCIPLES AND GOALS, <https://www.marchforscience.com/mission-and-vision/> (last visited Aug. 1, 2017). The goals of the marches and rallies were to emphasize that science upholds the common good and to call for evidence-based policy in the public's best interest. Ed Yong, *What Exactly Are People Marching for When They March for Science?*, THE ATLANTIC, Mar. 7, 2017, <https://www.theatlantic.com/science/archive/2017/03/what-exactly-are-people-marching-for-when-they-march-for-science/518763/>.

²⁵² The People's Climate March was a protest which took place on Washington, D.C.'s National

two of the largest social movements since President Donald Trump took office.²⁵³ Our commitment to reliable, objective, and accurate scientific information and evidence is central to scientific knowledge fraud cases. Courts in those cases are tasked with determining if a statement pertaining to a scientific idea is false, and to do that the court must first determine what the truth is—i.e., what the reliable, objective, and accurate science is on that issue, a question best answered by determining the scientific community's position on it.

V. A NEW FALSITY STANDARD FOR SCIENTIFIC KNOWLEDGE FRAUD CASES

“I believe that in this age of science we must build legal foundations that are sound in science, as well as in law.”

JUSTICE STEPHEN BREYER

A. The proposed standard

This Article proposes that a new falsity standard should be applied in scientific knowledge fraud cases. The standard can be summarized as follows:

A statement or omission that misrepresents knowledge held by the scientific community at the time such statement or omission was made fulfills the falsity element of a fraud claim.

This standard should apply in any fraud claim²⁵⁴ where the alleged misrepresentation pertains to scientific knowledge. The threshold inquiry of whether an alleged misrepresentation pertains to scientific knowledge is one of

Mall, at 300 locations throughout the United States, and at several locations outside the U.S., on April 29, 2017. Brian Moylan, *Environmental Activists Plan to March on Washington April 29*, VICE NEWS (Jan. 26, 2017), https://www.vice.com/en_us/article/wnzd85/environmental-activists-plan-to-march-on-washington-april-29-vgtrn. Its purpose was to protest the environmental policies of U.S. President Donald Trump and his administration. *Id.* Ryan Grenoble, *Activists Announce People's Climate March*, HUFF. POST (Jan. 25, 2017), http://www.huffingtonpost.com/entry/peoples-climate-march-washington_us_5888d9b4e4b0441a8f723bf8.

²⁵³ David Boddiger, *The Climate March Turnout Was Bigger Than Organizers Even Expected*, SPLINTER NEWS (April 29, 2017), <https://splinternews.com/the-climate-march-turnout-was-bigger-than-even-organize-1794775542> (discussing the March for Science and the People's Climate March: “For two straight weekends, hundreds of thousands of demonstrators descended on the nation's capital to stand up for science, demand action on climate change, and protect the earth's vital ecosystems.”).

²⁵⁴ This includes the broad array of species of fraud as discussed *supra* in note 6.

many questions relevant to this proposed falsity standard that must be answered by future scholarship.²⁵⁵

Applying this proposed standard will pose many challenges, which the author will address in forthcoming articles, but at a minimum the process would have three distinct components. First, once a court determines a fraud claim involves an alleged misrepresentation of scientific knowledge, the court would need to identify what the scientific community says about the fact at issue, i.e., the contemporary scientific knowledge. The second stop would be for the court to identify each specific representation by the defendant about the fact at issue. And third, the court would need to put these two statements side by side and compare them to determine if the defendant misrepresented the then-known scientific knowledge regarding the fact at issue. Each part will be discussed below.

B. Applying the proposed standard

1. Identify what the scientific community says about the fact at issue

Once a judge has determined that a fraud case involves an allegation that the defendant misrepresented scientific knowledge, he or she must next, under this standard, determine what that scientific knowledge *is*. This is the baseline objective truth against which the defendant's statement or omission must be judged.²⁵⁶

The court must identify the scientific community's knowledge pertaining to the fact at issue at the time of the defendant's alleged representation²⁵⁷—the contemporary scientific knowledge. If possible, this would ideally be comprised of a written statement of one or more direct quotes from one or more leading authorities representing the scientific community who testify or otherwise submit

²⁵⁵ Such unanswered questions include: (1) how to determine whether a particular alleged misrepresentation pertains to scientific knowledge, a threshold question necessary to answer to determine if the new standard should apply; (2) how courts should determine the baseline truth on which to judge whether the statement by the defendant was false—e.g., what scientific knowledge the scientific community held at the time the statement was made; (3) how courts should compare that baseline truth with the defendant's statement to determine falsity; (4) how to determine if a fraud case involves an alleged misrepresentation of scientific knowledge; (5) whether judges or juries should determine what scientific knowledge the scientific community holds at a given time for the purposes of deciding a scientific knowledge fraud case; and (6) what other fraud elements, if any, should be likewise amended to improve the law's application in scientific knowledge fraud cases.

²⁵⁶ See, e.g., *In re Innovatio IP Ventures, LLC Patent Litig.*, 921 F.Supp.2d 903, 914 (N.D. Ill. 2014) (explaining that in order to plead a claim for fraudulent misrepresentation, plaintiff must allege that defendant's statement was "objectively false").

²⁵⁷ See *Spreitzer v. Hawkeye State Bank*, 779 N.W.2d 726 (Iowa 2009) (to support a fraud claim, a representation must be false at the time it was made); *Mukhopadhyay v. Genesis Corp.*, 70 A.D.3d 520, 521, 894 N.Y.S.2d 430 (1st Dep't 2010); *Parker v. Byrne*, 996 A.2d 627, 634 (R.I. 2010).

satisfactory evidence on the current wisdom of the scientific community at the relevant point in time.²⁵⁸ In some cases, the contemporary scientific knowledge might be comprised of a simple, relatively short statement on the specific fact at issue. In other cases, however, complexities and nuances will likely render this task—the identification of the contemporary scientific knowledge—difficult, as well as highly contentious and potentially burdensome. One of the most significant challenges to implementing this proposed standard will be how the court will identify (which will involve pinpointing precise language from a statement submitted to court, or patching together two or more statements to create a unified one) the contemporary scientific knowledge. If possible, direct quotes should be used from the appropriate scientific authorities.

However it is identified, the contemporary scientific knowledge must accurately portray the scientific community's position, including how much confidence it has in that position and whether there are any significant and valid disputes within the scientific community.²⁵⁹ For instance, when determining the scientific community's knowledge on anthropogenic global warming, statements by the IPCC (an independent NGO created by the World Meteorological Organization and the United Nations Environmental Programme) should be given significant weight, while statements by the Global Climate Coalition (a lobbying group set up by oil companies with the express purpose of opposing greenhouse gas regulation) or by Dr. Wei-Hock Soon of the Harvard-Smithsonian Center for Astrophysics (whose research and salary have been largely funded by fossil fuel companies, including Exxon, and who referred to his academic research papers supporting the climate change denial agenda as "deliverables") should be given little or no weight. Indeed, giving any credence at all to biased individuals or organizations such as these would contaminate the baseline scientific community position by allowing private industry to purchase a favorable scientific consensus, undercutting the very purpose of determining the scientific community's position in the first place.

Whether the final determination of the contemporary scientific knowledge should be made by a jury or a judge is not a question answered in this Article. However, because this task is similar to the judge's gatekeeping duty in admitting or denying expert testimony under Rule 702, there is reason to believe

²⁵⁸ This determination of what scientific evidence to include in what is considered the scientific community's knowledge on any particular scientific topic is similar, and perhaps even analogous, to the gatekeeping role under *Daubert*, whereby judges determine the scientific validity of science-based testimony before it is admitted to trial. See *supra* note 241 and corresponding text.

²⁵⁹ This focus on objectivity is important. *Accurate science* and *objective science* are interchangeable terms; there cannot be one without the other. The value of scientific knowledge derives precisely from the fact it is arrived at by way of scientific methods specifically designed to uncover objective truths free from human error and bias. Accordingly, judges should give little or no weight to scientific ideas expressed by individuals or organizations that have a financial, ideological, political, or religious position consistent with the opinion expressed—i.e., a conflict of interest, as discussed in *supra* Section II.B.

the judge is in a better position to make this determination than is the jury. Under Rule 702, the judge must determine whether a given expert is qualified to testify and whether his or her testimony is scientifically reliable.²⁶⁰ Under the test first articulated in *Daubert*,²⁶¹ discussed above, the judge must admit only objective scientific community commentary on the subject, and reject biased or unsupported pseudo-scientific commentary.²⁶² Here, the judge is tasked with a virtually identical inquiry to the one under *Daubert*. The judge here could determine whether the scientific commentary on the fact at issue “reflects ‘scientific knowledge,’ whether [it is] ‘derived by the scientific method,’ and whether [it] amounts to ‘good science.’”²⁶³ Notably, since implementing the *Daubert* test, courts have become increasingly “scientifically sophisticated with judges questioning research designs, confidence intervals, meta-analysis, and statistical significance.”²⁶⁴

Regardless of whether the final determination of this question falls to the judge or jury, it is the judge’s responsibility under Rule 702 to ensure that scientific experts allowed to testify are reputable individuals recommended by established scientific organizations.²⁶⁵ Such experts can give guidance to the court on scientific principles and methods that the court may not otherwise grasp as quickly or as well.

Suppose Exxon shareholder Jane Smith brings a fraud action²⁶⁶ against Exxon, alleging statements made by the company raising doubt about the link

²⁶⁰ FED. R. EVID. 702; See *Callahan v. City of Chicago*, 78 F. Supp. 3d 791, 803 (N.D. Ill. 2015).

²⁶¹ *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 600 (1993).

²⁶² *Columbia Gas Transmission LLC v. United States*, No. 3:14-11854, 2016 WL 503195, at *7, (S.D.W.Va. Feb. 8, 2016) (discussing the *Daubert* test).

²⁶³ In re *Bextra and Celebrex Marketing Sales Prac. and Prod. Liab. Litig.*, 524 F.Supp.2d 1166, 1171 (N.D. Cal. 2007) (original quote: “the court must “determine nothing less than whether the experts’ testimony reflects ‘scientific knowledge,’ whether their findings are ‘derived by the scientific method,’ and whether their work product amounts to ‘good science.’”), quoting *Daubert*, 509 U.S. at 589-90, 593.

²⁶⁴ 2 TOXIC TORTS PRAC. GUIDE § 16:5 (2016).

²⁶⁵ See *General Elec. Co. v. Joiner*, 522 U.S. 136, 149-150 (1997) (Breyer, J., concurring). The Court there quoted a medical journal’s amici brief, stating:

[A] judge could better fulfill this gatekeeper function if he or she had help from scientists. Judges should be strongly encouraged to make greater use of their inherent authority ... to appoint experts. . . . Reputable experts could be recommended to courts by established scientific organizations, such as the National Academy of Sciences or the American Association for the Advancement of Science.

See also FED. R. EVID. 706. (A court may “on its own motion or on the motion of any party” appoint an expert to serve on behalf of the court, and this expert may be selected as “agreed upon by the parties” or chosen by the court.); J. WEINSTEIN, *INDIVIDUAL JUSTICE IN MASS TORT LITIGATION* 116 (1995) (A court should sometimes “go beyond the experts proffered by the parties” and “utilize its powers to appoint independent experts under Rule 706 of the Federal Rules of Evidence.”).

²⁶⁶ For the purposes of this hypothetical, it is irrelevant what particular kind of fraud claims Ms.

between CO₂ and global warming, specifically the advertorial Exxon published on March 23, 2000, entitled "Unsettled Science,"²⁶⁷ induced him to purchase and hold shares, causing him to lose money. Setting aside all the other elements for the sake of the hypothetical, and focusing only on falsity, the court would, once it determined that the fraud claim before it was a scientific knowledge fraud claim, be tasked first with determining what the scientific community knew about CO₂-linked anthropogenic global warming at the time of Exxon's statement, March 23, 2000. Using objective, reputable, and reliable sources,²⁶⁸ the following represents a realistic, if simplified, statement by the contemporary scientific community that could be adopted by the court:

CO₂ is accumulating in Earth's atmosphere as a result of human activities, causing air and ocean temperatures to rise. Natural forces do not explain the warming.

Increases in CO₂ concentrations are virtually certain to be due to fossil-fuel emissions. Stabilization of atmospheric CO₂ concentrations would require global CO₂ emissions to drop below year 1990 levels.

Climate change models based on a wide range of scenarios of future CO₂ emissions project that both temperature and sea level will continue to rise throughout the 21st century for all scenarios studied.

This statement consists of direct quotes and paraphrasing from a report by the National Academy of Sciences' Committee on the Science of Climate Change²⁶⁹ and from the IPCC's Third Assessment from 2001.²⁷⁰ Moreover, these verbatim sentiments were widely accepted and supported by numerous other reputable objective voices in the scientific community at the relevant time.²⁷¹ That said,

Smith brings. *See supra* note 6.

²⁶⁷ *See Unsettled Science*, attached hereto in Appendix II.

²⁶⁸ NAT'L ACAD. OF SCIENCES COMM. ON THE SCI. OF CLIMATE CHANGE, *Climate Change Science: An Analysis of Some Key Questions* (National Academy Press 2001) and J.J. MCCARTHY ET AL., EDS., *CLIMATE CHANGE 2001: IMPACTS, ADAPTATION, AND VULNERABILITY* (Cambridge Univ. Press 2001).

²⁶⁹ *Climate Change Science: An Analysis of Some Key Questions*, *supra* note 268, at 1 ("Greenhouse gases are accumulating in Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise.").

²⁷⁰ J.J. MCCARTHY ET AL., *supra* note 268 ("Human activities . . . are modifying the concentration of atmospheric constituents . . . that absorb or scatter radiant energy. . . . [M]ost of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations.").

²⁷¹ For instance, the American Academy of Sciences, the American Meteorological Society, the American Geophysical Union, and the American Association for the Advancement of Science all issued statements well before May 18, 2006, agreeing with these statements, and concluding that the evidence for human modification of climate was compelling. *See, e.g., Climate Change*

the author has, for the purposes of this hypothetical, presented this contemporary scientific knowledge statement in a shorter and simpler form than it would likely be in practice. Indeed, the statement of the scientific community will likely, in some circumstances, not be reducible to a clean and user-friendly statement such as this one.

2. Identify the representation by the defendant about the fact at issue

The next step in applying this standard is for the trier of fact to identify what the defendant represented, by statement or omission. This is a question of fact for the jury, to be determined from the evidence.²⁷² If there is more than one allegedly false representation by the defendant pertaining to scientific knowledge, each such representation should be put through the three-part test articulated herein.

Turning to the hypothetical action against Exxon by shareholder Jane Smith, the relevant statement by the defendant was contained in the company's March 23, 2000 advertorial, *Unsettled Science*, attached in Appendix II. The advertorial speaks for itself; it comprises the defendant's statement. Taking a few of the most relevant assertions from it, however, the following represents an accurate, and much shorter, rewording of what is said:

Unsettled Science

Fundamental gaps in knowledge leave scientists unable to make reliable predictions about future changes to the climate.

Two still-unanswered questions are (1) Has human activity already begun to change temperature and the climate, and (2) How significant will future change be?

Scientists remain unable to confirm whether humans are causing global warming.²⁷³

Science: An Analysis of Some Key Questions, *supra* note 268, at 3; AMERICAN METEOROLOGICAL SOC'Y, *Bull. Am. Meteorol. Soc.* 84, 508 (2003). Moreover, as noted by climate change expert Naomi Oreskes, "[t]he drafting of such reports and statements involves many opportunities for comment, criticism, and revision, and it is not likely that they would diverge greatly from the opinions of the societies' members." Naomi Oreskes, *The Scientific Consensus on Climate Change*, 306 *SCIENCE* 1686 (Dec. 3, 2004). Dr. Oreskes conducted a survey of 928 abstracts, published in refereed scientific journals between 1993 and 2003, and listed in the ISI database with the keywords "climate change." None of the papers disagreed with the consensus position as articulated by the IPCC and the National Academy of Sciences. *Id.*

²⁷² See, e.g., *Martin v. Sixty-Third & Halsted State Sav. Bank*, 299 Ill. App. 123, 127-28; 19 N.E.2d 634, 636 (Ill. App. Ct. 1939) (noting that in a fraud action the determination of the words used in defendant's representation is a question of fact for the jury).

²⁷³ See Appendix II.

Exxon made these and a number of other, similar assertions in the advertorial.²⁷⁴ Where possible, the assertions are presented here verbatim.

The next step is for the trier of fact to put these two statements—the contemporary scientific knowledge and the defendant's statement—side by side to determine if the defendant's statement was false. A side by side comparison of the statements in the hypothetical shareholder action would appear as follows:

<p align="center"><u>COLUMN A</u> The contemporary scientific knowledge</p>	<p align="center"><u>COLUMN B</u> The defendant's statement</p>
<p>CO₂ is accumulating in Earth's atmosphere as a result of human activities, causing air and ocean temperatures to rise. Natural forces do not explain the warming.</p> <p>Increases in CO₂ concentrations are virtually certain to be due to fossil-fuel emissions. Stabilization of atmospheric CO₂ concentrations would require global CO₂ emissions to drop below year 1990 levels.</p> <p>Climate change models based on a wide range of scenarios of future CO₂ emissions project that both temperature and sea level will continue to rise throughout the 21st century for all scenarios studied.</p> <p>[IPCC 2001, NAS 2001]</p>	<p align="center">Unsettled Science</p> <p>Fundamental gaps in knowledge leave scientists unable to make reliable predictions about future changes to the climate.</p> <p>Two still-unanswered questions are (1) Has human activity already begun to change temperature and the climate, and (2) How significant will future change be?</p> <p>Scientists remain unable to confirm whether humans are causing global warming.</p> <p>[March 23, 2000]</p>

The statement in the left-hand column, Column A, is what must be considered the truth on the matter spoken of by the defendant. That is the baseline against which the defendant's statement, in Column B, must be measured. The question is: given that the statement in Column A is true—i.e., expresses what the scientific community knew at the time of the defendant's statement—was the defendant's statement, in Column B, false? Materiality,

²⁷⁴ See Appendix II.

knowledge, intent, and all fraud elements other than falsity should be ignored for the purpose of this analysis.

In making the falsity determination, the trier of fact is comparing the two statements to determine if they say the same thing, or essentially the same thing. If they do, the defendant's statement should not satisfy the falsity element. However, because of the special challenges raised by scientific knowledge fraud cases,²⁷⁵ there are a number of other considerations the trier of fact should take into account that more precisely focus him or her on the scientific nature of the assertion made. When comparing the two statements, the trier of fact in such cases should ask the following additional questions. A "yes" answer to any of these questions should raise red flags and would likely render the defendant's statement false for the purposes of a fraud claim.

Question 1: Does the defendant's statement contain any words or phrases describing the fact at issue that give that statement a different meaning than the contemporary scientific knowledge? This could pertain to, for example, the likelihood of a phenomenon happening or the strength of evidence supporting a particular theory. For instance, if the contemporary scientific knowledge held that smoking "likely" causes cancer, and the defendant's statement said smoking "possibly" causes cancer, these would be inconsistent terms. They mean different things. These two words—likely and possibly—communicate different levels of certainty of the link between smoking and cancer.

Question 2: Even if there are no explicitly inconsistent words or phrases, does the defendant's statement, taken as a whole, present the fact at issue in a way that is inconsistent with the contemporary scientific knowledge? For instance, if the contemporary scientific knowledge held that "smoking likely causes cancer," while the defendant's statement states that "some studies have shown a link between smoking and cancer while other studies have shown the link is not clear," this would be enough to answer "yes" to this question. Though the defendant's statement does not explicitly contradict the contemporary scientific knowledge, it does so implicitly. The impression given by the contemporary scientific knowledge is one of a greater than fifty-fifty certainty that smoking causes cancer, whereas the defendant's statement asserts that the link is an open question, that the science is unsettled or unclear. It is important to point out the defendant's hypothetical statement may very well be factually correct—it is undoubtedly true that "some studies have shown a link between smoking and cancer while other studies have shown the link is not clear"—yet because this defendant's statement communicates a different level of certainty than the scientific community's, it is nonetheless false for the purposes of a fraud claim.²⁷⁶ What is important is whether the reader comes away from the

²⁷⁵ See *supra* Section II, p. 57.

²⁷⁶ *Grove Holding Corp. v. First Wis. Nat. Bank of Sheboygan*, 12 F. Supp. 2d 885, 890 (E.D. Wis.

defendant's statement with an accurate understanding of the scientific knowledge held by the scientific community.

Another way scientific knowledge is misrepresented is by turning the audience's or reader's attention to the wrong set of data. For instance, Exxon's President once insisted the science on climate change was uncertain and, as support for this idea, told his audience "[w]e also have to keep in mind that most of the greenhouse effect comes from natural sources, especially water vapor."²⁷⁷ This is a perfectly useless statement. It is both irrelevant (stating a fact unrelated to anthropogenic climate change) and misleading (giving the impression to unsophisticated nonscientists that it controverts the prevailing science on climate change). It preys on ignorance. Yes, there is a large amount of greenhouse gasses in the atmosphere naturally. Without them, the Earth's average surface temperature would be about -15 degrees Celsius (or 5 degrees Fahrenheit).²⁷⁸ Even assuming the other assertions contained in the statement were factual—which they were not—the statement itself serves only to give a false impression. Its purpose is misdirection.

In addition, when considering this question, the trier of fact should be on the lookout for cautionary terms and phrases often used by those trying to raise doubt about the certainty of a scientific idea or the confidence the scientific community has in the idea. These terms include: might, may, maybe, could, belief, believe, we believe, scientists believe, some believe, conjecture, opinion, judgment, view, viewpoint, possible, possibly, speculate, speculative, uncertain, unsettled, theory, theorize, theoretical, hypothesis, hypothesize, hypothetical, surmise, guess, suppose, suspect, although, while, albeit, even though, notwithstanding, sincere attempt to determine, unanswered questions, jump to the conclusion, variables, variability, difficult to determine, gaps in the data, missing data, more study needed, more proof needed, we will look into it, we are looking into it, we are investigating, studies are ongoing, this is a complex issue, we are trying to clear up misunderstandings, until it can be proved or disproved, until it is determined conclusively, remains an open question, our goal is the truth, and other similar or related terms or phrases. These terms and phrases simultaneously make the speaker appear to be embracing objective science while actually intending only to raise doubt about the scientific fact at issue.

1998) (holding that a representation can be technically accurate, yet still misleading, for purposes of negligent and intentional misrepresentation claims) (A statement can be technically true but nevertheless "false" for the purposes of a fraud claim); W. PAGE KEETON ET AL., *supra* note 140, at 736–37 ("[M]isrepresentation may be found in statements which are literally true, but create a false impression in the mind of the hearer.").

²⁷⁷ Lee R. Raymond, Energy, Remarks to the World Petroleum Congress: Key to growth and a better environment for Asia-Pacific nations (October 13, 1997), in Beijing, China, <http://www.climatefiles.com/exxonmobil/1997-exxon-lee-raymond-speech-at-world-petroleum-congress/>.

²⁷⁸ See *Carbon in the Atmosphere*, EARTHLABS, <http://serc.carleton.edu/eslabs/carbon/3a.html> (last visited Aug. 1, 2017).

Question 3: Is there any inconsistency between the scientific community's confidence in the fact at issue, and the confidence in the fact at issue as communicated by the defendant? This is a more specific analysis that overlaps somewhat with question number two, above. This question forces the trier of fact to zero in on how each statement presents the scientific community's confidence level in the fact at issue. For instance, if the contemporary scientific knowledge was that "there is no safe threshold level of lead in the body, any amount no matter how little is considered toxic," and the defendant's statement stated this very same sentence verbatim, but also preceded it with caveat language such as "some scientists believe...", this would satisfy this element, meaning the trier of fact should answer this question with a "yes." By adding "some scientists believe" to the statement, the defendant raises a level of doubt about how dangerous even trace amounts of lead are in the human body. Readers of those two statements come away with two different impressions.

As with question number two, when considering this question, the trier of fact should be on the lookout for cautionary terms and phrases. They are employed often to raise doubt about the certainty of a scientific idea or the confidence level the scientific community has in the idea.

Question 4: Does the defendant's statement misrepresent a controversy that may exist with regard to the fact at issue? It is a common practice for perpetrators of scientific knowledge fraud to point to a minority dissenting opinion, one that may represent 2 or 3% of the scientific community, for instance, and claim that the question is "undecided" or the "science is unsettled" because there is not 100% unanimity on the issue. This is disingenuous. Although there may very well be a valid "controversy," it should be presented in a manner that communicates the sway it holds in the scientific community.

Another way a defendant might misrepresent a controversy is where no valid scientific controversy exists at all. For instance, scientific evidence supports the view that the Earth is about 4.5 billion years old.²⁷⁹ However, some groups reject this view in favor of a young Earth theory that holds the Earth was created just a few thousand years ago.²⁸⁰ "This is a conflict over scientific knowledge, but not one within the scientific community."²⁸¹ Any statement referencing the young Earth idea should clearly state there is no scientific evidence to support it.

²⁷⁹ See, e.g., *Age of the Earth*, U.S. GEO. SURVEY (1997), <https://web.archive.org/web/20051223072700/http://pubs.usgs.gov/gip/geotime/age.html>; Dalrymple, G. Brent, *The age of the Earth in the twentieth century: a problem (mostly) solved*, GEO. SOC'Y OF LONDON, 190 (1): 205–221 (2001), www.blc.arizona.edu/courses/schaffer/449/Geology/Dalrymple%20Geol%20Time.pdf.

²⁸⁰ See, e.g., *Young Earth Creationism*, WIKIPEDIA, https://en.wikipedia.org/wiki/Young_Earth_creationism (last visited Aug. 1, 2017).

²⁸¹ *What controversy: is a controversy misrepresented or blown out of proportion*, UNDERSTANDING SCIENCE, http://undsci.berkeley.edu/article/0_0_0/sciencetoolkit_06 (last visited Aug. 1, 2017); see also *supra* note 279.

If a controversy is misrepresented, overstated, understated, or simply made up, the trier of fact should answer this question “yes.”

Question 5: Does the defendant’s statement attempt to discredit, undercut, belittle, question, or criticize the scientific community, the scientific community’s opinion, or individuals or organizations within the scientific community? One way scientific knowledge fraud is carried out is by attempting to discredit the sources of the scientific knowledge in question. One recurring allegation is that climate scientists who concur with the scientific community’s consensus opinion only do so because it helps them secure grant funding,²⁸² or it helps them further their careers,²⁸³ or it represents some kind of sheep mentality among scientists—each of them merely following others.²⁸⁴ Other ways these criticisms have shown up is by attempting to show that scientists are baffled by their own data, or that they cannot decide whether what they are saying is true is actually true.²⁸⁵

In this way, a defendant may attempt to avoid directly contradicting the science community’s opinion, but instead attack the scientific community itself. The effect on the listener or reader is the same. It misrepresents the scientific knowledge because it puts the authorities behind that knowledge in doubt. If there are any attacks against the scientific community or any members of it, however subtle, the trier of fact should answer this question “yes.”

In answering these five questions, courts should take into account (1) whether the defendant had, at the time of the statement or omission, any bias relevant to the fact at issue, and (2) what evidentiary support the defendant had for making the statement or omission. Turning to the first of these two inquiries, the trier of fact should ask: Does the defendant have an economic, political, ideological, or religious agenda that would motivate him or her to make a statement inconsistent with the opinion of the scientific community? If so, the

²⁸² See, e.g., Henry Payne, *Global Warming: Follow the Money*, NATIONAL REVIEW (Feb. 25, 2015), <http://www.nationalreview.com/article/414359/global-warming-follow-money-henry-payne> (Publishing in the politically-active conservative magazine, the National Review, made a number of false and unsubstantiated assertions, including that “[i]n truth, the overwhelming majority of climate-research funding comes from the federal government and left-wing foundations. And while the energy industry funds both sides of the climate debate, the government/foundation monies go only toward research that advances the warming regulatory agenda. With a clear public-policy outcome in mind, the government/foundation gravy train is a much greater threat to scientific integrity.”).

²⁸³ *Id.*

²⁸⁴ See John Timmer, *If climate scientists are in it for the money, they’re doing it wrong*, ARSTECHNICA.COM (last visited Aug. 1, 2017), <https://arstechnica.com/science/2016/05/if-climate-scientists-push-the-consensus-its-not-for-the-money/>.

²⁸⁵ See, e.g., Bob Ellis, *Some Scientists ‘Baffled’ by Lack of Global Warming*, DAKOTA VOICE (Nov. 19, 2009), <http://www.dakotavoice.com/2009/11/some-scientists-baffled-by-lack-of-global-warming/> (Importantly, these assertions—including those discussed in *supra* notes 282, 283, and 284, and the corresponding text—as well as others like them, have been roundly debunked, time and again); see also, e.g., Timmer, *supra* note 284.

trier of fact's assessment of Questions 1 through 5 should take this into account. A conflict of interest would not automatically render the defendant's statement false. It would, however, be grounds for heightened scrutiny of the statement. For instance, if the fact at issue is the link between smoking and cancer, a tobacco manufacturer or an individual or entity paid by the tobacco industry would benefit from understating the link between smoking and cancer. Thus, this conflict of interest should cause the trier of fact to look closely at the defendant's statement to determine if it in fact understates the smoking-cancer link. Unlike questions one through five above, however, a "yes" answer to this question would not, by itself, likely render any statement false.

Turning to the second inquiry, the trier of fact should ask: Does the defendant's statement have evidentiary support and, if so, what is the source of that evidence? If the defendant relies on biased or otherwise nonobjective sources or authorities, it is something the trier of fact should take into account when deciding the truthfulness or falsity of defendant's statement.

Applying this analysis to the hypothetical shareholder action by Ms. Jones—that is, comparing the contemporary scientific knowledge and the defendant's statement in the table on page 55, *supra*, and in Appendix II, *infra*—it is clear that the answer to all five questions should be "yes." The defendant's statement in Column A uses one or more words describing the fact at issue that are explicitly inconsistent with the words used by the contemporary scientific knowledge (Question 1) and also give a different overall impression (Question 2). By using words and phrases like "unsettled science," "fundamental gaps in knowledge," "still-unanswered questions," and "unable to confirm," the defendant's statement gives a very different impression of the level of confidence in the fact at issue (Question 3). By using this misleading language, the defendant's statement also disproportionately amplifies a minority scientific position (Question 4) and attempts to discredit the scientific community's opinion, as well as specific organizations within the scientific community (Question 5). Moreover, the defendant in question, Exxon Mobil Corp., has an economic interest in contradicting the contemporary scientific knowledge because certainty about emissions from its fossil fuels would lead to regulation, at a minimum, or perhaps even civil and criminal liability. Accordingly, its own statements on this topic should be viewed with heightened scrutiny.

VI. CONCLUSION

The time is long overdue to begin holding industry defendants accountable for scientific misrepresentations. Implementing the scientific knowledge fraud standard proposed in this Article should be a step toward making that happen.

There are, however, several unanswered questions pertaining to the proposed standard that must be addressed by future scholarship, including: (1) how to determine whether a particular case involves scientific knowledge fraud, meaning the proposed standard should apply to it; (2) how a court should

determine what knowledge the scientific community held at a given time for the purpose of assessing the truthfulness or falsity of a statement in a scientific knowledge fraud case; (3) what considerations should courts take into account when comparing the scientific community's knowledge with the defendant's statement to determine falsity; (4) whether judges or juries should determine what the contemporary scientific knowledge is at a given time for the purposes of deciding a scientific knowledge fraud case; (5) what other fraud elements, if any, should be likewise amended to improve the law's application in scientific knowledge fraud cases; and (6) how the scientific knowledge fraud standard should be applied in certain specific fraud claims, such as causes of action under SEC Rule 10b-5, state securities (Blue Sky) laws, state common law, and state truth in advertising laws.

The scientific knowledge fraud standard may also help courts in certain non-fraud-based claims, such as actions brought under truth in advertising, deceptive trade practices, or other consumer protection laws. Many of these claims require a deception or misrepresentation element, and in cases where the alleged deception or misrepresentation pertains to scientific knowledge, the scale is tipped heavily in favor of defendants as it is in fraud cases. Implementing the scientific knowledge fraud standard should, in both fraud-based and non-fraud-based actions, encourage judges and juries to focus on and adhere to accurate scientific principles, and help courts more accurately determine falsity as it relates to either misrepresentation or deception.

Implementing this standard is particularly important now because there is a growing misuse of science by corporate, political, and religious groups. The current presidential administration has, in recent months, attempted to dismantle environmental regulations, diminish the EPA, scrub climate change data and analysis from federal government websites, and defund scientific research and institutions. Climate change denial and other anti-science initiatives, laws, and policies are being implemented at an alarming rate. It is urgent we reaffirm our commitment to objective scientific information—indeed, to objective truth. Our health, wealth, and security depend on it.

APPENDIX I

As used in this Article, the term “fraud” encompasses common law fraud, misrepresentation, deceit, securities fraud, mail fraud, wire fraud, truth in lending laws, truth in advertising laws, and any other fraud or fraud-like claim or defense, state or federal, civil or criminal, which has as one of its elements that the wrongdoer made a false representation. Such claims include, *inter alia*, the following:

Federal Statutory Claims Involving Fraud or Deceit

- 15 U.S.C. § 45 (2012) (unfair and deceptive trade practices)
- 18 U.S.C. § 157 (2012) (bankruptcy fraud)
- 18 U.S.C. § 1029 (2012) (credit card fraud)
- 18 U.S.C. § 1037 (2012) (email fraud)
- 18 U.S.C. § 1040 (2012) (fraud in connection with major disaster or emergency services)
- 18 U.S.C. § 1341 (2012) (frauds and swindles)
- 18 U.S.C. § 1343 (2012) (fraud by wire, radio, or television)
- 18 U.S.C. § 1344 (2012) (bank fraud)
- 18 U.S.C. § 1347 (2012) (health care fraud)
- 18 U.S.C. § 1348 (2012) (securities and commodities fraud)
- 18 U.S.C. § 1961 (2012) (RICO; defines “racketeering activity” to include fraud)
- 26 U.S.C. § 7206 (2012) (tax fraud)
- 17 C.F.R. § 240.10b-5 (2017) (Securities and Exchange Commission Rule 10b-5; manipulative and deceptive devices)

State Common Law Fraud

- Alabama*: Jarrard v. Nationwide Mut. Ins. Co., 495 So. 2d 584, 586 (Ala. 1986)
- Alaska*: Shehata v. Salvation Army, 225 P.3d 1106, 1114 (Alaska 2010)
- Arizona*: Comercia Bank v. Mahmoodi, 229 P.3d 1031, 1033–34 (Ariz. Ct. App. 2010)
- Arkansas*: Hobson v. Entergy Ark., Inc. 432 S.W.3d 117, 123 (Ark. Ct. App. 2014)

California: West v. JPMorgan Chase Bank, N.A., 154 Cal. Rptr. 3s 285, 295 (2013)

Colorado: Nelson v. Gas Res. Inst., 121 P.3d 340, 434 (Colo. App. 2005)

Connecticut: Stuart v. Frieberg, 116 A.3d 1195, 1203 (Conn. 2015)

Delaware: Prairie Cap. III, L.P. v. Double E Holding Corp., 123 A.3d 35, 49 (Del. Ch. 2015)

District of Columbia: Sibley v. St. Albans Sch., 135 A.3d 789, 809–09 (D.C. 2016)

Florida: GEICO Gen. Ins. Co. v. Hoy, 136 So. 3d 647, 651 (Fla. Dist. Ct. App. 2013)

Georgia: Sun Nurseries, Inc. v. Lake Erma, LLC, 730 S.E.2d 556, 561 (Ga. Ct. App. 2012)

Hawaii: Shoppe v. Gucci Am., Inc., 14 P.3d 1049, 1067 (Haw. 2000)

Idaho: Path to Health, LLP v. Long, 383 P.3d 1220, 1229 (Idaho 2016)

Illinois: Connick v. Suzuki Motor Co., 675 N.E.2d 584, 591 (Ill. 1996)

Indiana: BSA Const. LLC v. Johnson, 54 N.E.3d 1026, 1031 (Ind. Ct. App. 2016)

Iowa: Dier v. Peters, 815 N.W.2d 1, 7 (Iowa 2012)

Kansas: St. Catherine Hosp. of Garden City v. Rodriguez, 971 P.2d 754, 757 (Kan. Ct. App. 1998)

Kentucky: Elendt v. Green Tree Servicing, LLC, 443 S.W.3d 612, 615 (Ky. Ct. App. 2014)

Louisiana: Benton v. Clay, 123 So. 3d 212, 219 (La. Ct. App. 2013)

Maine: Me. Eye Care Assocs. P.A. v. Gorman, 942 A.2d 707, 711 (Me. 2008)

Maryland: Martens Chevrolet, Inc. v. Seney, 439 A.2d 534, 537 (Md. 1982)

Massachusetts: Greenleaf Arms Realty Tr. I, LLC v. New Box. Fund, Inc., 962 N.E.2d 221, 227 (Mass. App. Ct. 2012)

Michigan: Pitsch v. ESE Mich., Inc., 593 NW.2d 565, 576 (Mich. Ct. App. 1999)

Minnesota: Angeles v. Medtronic, Inc., 863 N.W.2d 404, 422 (Minn. Ct. App. 2015)

Mississippi: Soni v. Dhaliwal, 203 So. 3d 628, 634 (Miss. Ct. App. 2016)

Missouri: Finest Place, Inc. v. Skidmore, 477 S.W.3d 745, 748 (Mo. Ct. App. 2016)

Montana: Bartlett v. Allstate Ins. Co., 929 P.2d 227, 231–32 (Mont. 1996)

Nebraska: Fast Ball Sports, LLC v. Metro. Entm't & Convention Auth., 835 N.W.2d 782, 791 (Neb. Ct. App. 2013)

Nevada: J.A. Jones Const. Co. v. Lehrer McGovern Bovis, Inc., 89 P.3d 1009, 1018 (Nev. 2004)

New Hampshire: Hair Excitement, Inc. v. L'Oreal U.S.A., Inc., 965 A.2d 1032, 1038 (N.H. 2009)

New Jersey: Catena v. Raytheon Co., 145 A.3d 1085, 1091 (N.J. Super. Ct. App. Div. 2016)

New Mexico: Papatheofanis v. Allen, 242 P.3d 358, 361 (N.M. Ct. App. 2010)

New York: Girozentrale v. Tilton, 48 N.Y.S.3d 98, 105 (N.Y. App. Div. 2017)

North Carolina: Town of Belhaven, NC v. Pantego Creek, LLC, 793 S.E.2d 711, 718 (N.C. Ct. App. 2016)

North Dakota: WFND, LLC v. Fargo Marc, LLC, 730 N.W.2d 841, 853 (N.D. 2007)

Ohio: Schmitz v. Natl. Collegiate Athletic Assn., 67 N.E.3d 852, 868 (Ohio Ct. App. 2016)

Oklahoma: Estrada v. Kriz, 345 P.3d 403, 408 (Okla. Civ. App. 2015)

Oregon: McNeff v. Emmert, 317 P.3d 363, 367 (Or. Ct. App. 2013)

Pennsylvania: Richards v. Ameriprise Fin., Inc., 152 A.3d 1027, 1035 (Pa. Super. Ct. 2016)

Rhode Island: Cote v. Aiello, 148 A.3d 537, 548 (R.I. 2016)

South Carolina: Moseley v. All Things Possible, Inc., 694 S.E.2d 43, 45 (S.C. Ct. App. 2010)

South Dakota: N. Am. Truck & Trailer, Inc. v. M.C.I. Commc'n Servs., Inc., 751 N.W.2d 710, 713 (S.D. 2008)

Tennessee: Est. of Lambert v. Fitzgerald, 497 S.W.3d 425, 456 (Tenn. Ct. App. 2016)

Texas: Zaidi v. Shah, 502 S.W.3d 434, 441 (Tex. App. 2016)

Utah: Robinson v. Robinson, 368 P.3d 105, 113 (Utah Ct. App. 2016)

Vermont: Lewis v. Cohen, 602 A.2d 352, 354 (Vt. 1991)

Virginia: Caperton v. A.T. Massey Coal Co., 740 S.E.2d 1, 9 (Va. 2013)

Washington: Brummett v. Washington's Lottery, 288 P.3d 48, 54 (Wash. Ct. App. 2012)

West Virginia: Sneberger v. Morrison, 776 S.E.2d 156, 172 (W. Va. 2015)

Wisconsin: State v. Abbot Labs., 816 N.W.2d 145, 161 (Wis. 2012)

Wyoming: Positive Progressions, LLC v. Landerman, 360 P.3d 1006, 1015 (Wyo. 2015)

State Statutory Fraud

Ala. Code 1975 § 6-5-101 (2017) (Alabama civil misrepresentations of material facts)

Ala. Code 1975 § 13A-8-113 (2017) (Alabama criminal encoded data fraud)

Ariz. Rev. Stat. Ann. § 44-1522 (2017) (Arizona unlawful or deceptive trade practices)

Cal. Civ. Proc. Code § 1710 (West 2017) (California civil deceit defined)

Cal. Civ. Proc. Code § 1572 (West 2017) (California civil fraud)

Del. Code Ann. tit. 6 § 73-201 (West 2017) (Delaware commerce and trade fraud)

D.C. Code § 22-3221 (2017) (District of Columbia criminal fraud)

Ga. Code Ann. § 23-2-51 (West 2017) (Georgia civil fraud)

Idaho Code § 30-14-501 (2017) (Idaho corporate fraud)

Ind. Code § 23-2-2.5-27 (2017) (Indiana corporate fraud)

N.M. Stat. Ann. § 30-16-6 (2017) (New Mexico criminal fraud)

N.D. Cent. Code Ann. § 9-03-08 (West 2017) (North Dakota contracts fraud)

Okla. Stat. tit. 15 § 58 (2017) (Oklahoma contracts fraud)

State Securities Fraud

Alabama: Ala. Code 1975 § 8-6-17 (2017)

Alaska: Alaska Stat. § 45.55.020 (2017)

Arizona: Ariz. Rev. Stat. Ann. § 44-1991 (2017)

California: Cal. Securities Code § 25401 (West 2017)

Colorado: Colo. Rev. Stat. § 11-51-501 (2017)

Connecticut: Conn. Gen. Stat. § 36b-29 (2017)

Delaware: Del. Code Ann. tit. 6, § 73-201 (2017)

District of Columbia: D.C. Code § 31-5606.05 (2017)

Florida: Fla. Stat. § 517.301 (2017)

Georgia: Ga. Code Ann. § 10-5-50 (2017)

Hawaii: Haw. Rev. Stat. § 485A-501 (2017)

Idaho: Idaho Code § 30-14-502 (2017)

Illinois: 815 Ill. Comp. Stat. 5 / 12 (2017)

Indiana: Ind. Code § 23-19-5-1 (2017)

Iowa: Iowa Code § 502.501 (2017)

Kansas: Kan. Stat. Ann. § 17-12a501 (2017)

Kentucky: Ky. Rev. Stat. Ann. § 292.320 (West 2017)

Louisiana: La. Stat. Ann. § 51:712 (2017)

Maine: Me. Stat. tit. 32, § 16502 (2017)

Maryland: Md. Code Ann. Corporations and Associations § 11-303 (West 2017)

Massachusetts: Mass. Gen. Laws Ch. 110A, § 101 (2017)

Michigan: Mich. Comp. Laws §451.2501 (2017)

Minnesota: Minn. Stat. § 80A.68 (2017)

New Jersey: N.J. Stat. Ann. § 49:3-71 (West 2017)

New York: N.Y. Gen. Bus. Law § 352-c (McKinney 2017)

Oklahoma: Okla. Stat tit. 71, § 1-501 (2017)

Pennsylvania: 70 Pa. Stat. and Cons. Stat. Ann. § 1-401 (West 2017)

Texas: Tex. Civil Statutes Code Ann. § 581-33 (West 2017)

Truth in Advertising

California: Cal. Bus. & Prof. Code § 17500 (West 2017)

Florida: Fla. Stat. § 817.40 (West 2017)

New York: N.Y. Penal Law § 190.20 (McKinney 2017)

Texas: Tex. Bus. & Com. Code Ann. § 17.12 (West 2017)

Utah: Utah Code Ann. § 13-11a-1 (West 2017)

APPENDIX II

Unsettled Science

Forecasting the weather forecasts are reliable for a few days at best, we should recognize the enormous challenge facing scientists seeking to predict climate change and its impact over the next century. In spite of everyone's desire for clear answers, it is not surprising that fundamental gaps in knowledge make scientists unable to make reliable predictions about future changes.

A recent report from the National Research Council (NRC) raises important issues, including these still-unresolved questions: (1) Has human activity already begun to change temperature and the climate, and (2) How significant will future change be?

The NRC report confirms that Earth's surface temperature has risen by about 1 degree Fahrenheit over the past 100 years. Some use this result to claim that humans are causing global warming, and they point to storms or floods to say that dangerous impacts are already under way. Yet scientists remain unable to confirm either contention.

Geological evidence indicates that climate and greenhouse gas levels experience significant natural variability for reasons having nothing to do with human activity. Historical records and current scientific evidence show that Europe and North America experienced a massive warm period one thousand years ago, followed centuries later by a little ice age. The geological record shows even larger changes throughout Earth's history. Against this backdrop of large, poorly understood natural variability, it is impossible for scientists to attribute the recent small surface temperature increase to human causes.

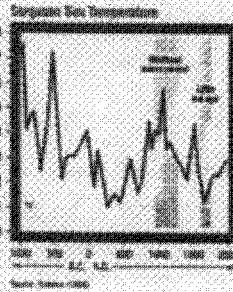
Moreover, computer models relied upon by climate scientists predict that ocean atmospheric temperatures will rise as fast as or faster than temperatures at the surface. However, only within the last 20 years have reliable global measurements of temperatures in the lower atmosphere been available through the use of satellite technology. These measurements show little if any warming.

Even less is known about the potential positive or negative impacts of climate change. In fact, many academic studies and field experiments have demonstrated that increased levels of carbon dioxide can promote crop and forest growth.

So, while some argue that the science debate is settled and governments should focus only on near-term policies—that is empty rhetoric. Inevitably, future scientific research will help us understand how human actions and natural climate change may affect the world and will help determine what actions may be desirable to address the long-term.

Science has given us enough information to know that climate changes may pose long-term risks. Natural variability and human activity may lead to climate changes that could be significant and perhaps both positive and negative. Consequently, people, companies and governments should take responsible actions now to address the issue.

One essential step is to encourage development of lower-carbon technologies to meet our future needs for energy. We'll need look at the promise of technology and what is being done today.



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...and it's better