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The (Next) Big Short and the End of the Anthropocene

M. Alexander Pearl
Texas Tech University School of Law

THE (NEXT) BIG SHORT AND THE END OF THE ANTHROPOCENE

M. Alexander Pearl[*]

[People's] intuitive expectations are governed by a consistent misperception of the world . . . .
—Amos Tversky and Daniel Kahneman[1]

Simply put, stories are a part, and seemingly an indispensable part, of the law with which rights are protected . . . .
—Robin West[2]

Abstract

It is incredibly difficult to imagine an event the likes of which humans have never seen before. That, in and of itself, renders the challenge to prepare for such an event even more difficult because there is no frame of reference pushing us to act. How do you prepare to avoid something which has never occurred in the history of human occupation? That is the challenge of climate change.

I argue that the Subprime Mortgage Crisis and its aftermath parallel the Climate Crisis in critical ways that should inform our tactics. Of course, there are obvious critical differences as well. The Subprime Crisis was a predictive failure that involved the misallocation of risk and blindness to uncertainty. This Article examines the predictive failures of the Subprime Crisis by focusing on what makes probabilities more likely to be accurate and the circumstances in which some predictions blind us to the uncertainty of large-scale negative consequences. This Article employs the theory of the Black Swan and other critiques from Nassim Nicolas Taleb to explore the application of probability theory in the context of the Climate Crisis.

At the same time, data and probabilities are insufficient to motivate both individuals and political entities to act. Even an accurate probabilistic assessment of global climate change risk is inadequate; the Climate Crisis demands a narrative that resonates with individuals at a local and emotional level. Narrative theory explains the difficulty

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[1] Amos Tversky & Daniel Kahneman, *Belief in the Law of Small Numbers*, 76 PSYCHOL. BULL. 105, 110 (1971).

[2] ROBIN WEST, NARRATIVE, AUTHORITY, AND LAW 419 (1993).

experienced in implementing legal solutions to mitigate the Climate Crisis. This Article synthesizes the link between narrative power in creating human understanding and our propensity for making bad predictions through the human cognitive bias research of Daniel Kahneman and Amos Tversky. While policy-makers, scientists, and political representatives play important roles in trying to shape public opinion, recent empirical research supports the idea that lawyers—through litigation—are best equipped to immediately address the Climate Crisis.

INTRODUCTION

In the morning on the day after Christmas of 2004, Mai Khao Beach probably felt like any other tropical beach—white sands, turquoise water.[3] The smell of salt water all around. The too-hot feeling of the sand on the bottom of bare feet and the laughter of children and adults against the backdrop of waves crashing on the beach. Tilly Smith was ten years old.[4] On vacation with her family from their home in Britain, they went to southern Thailand for a beach vacation like thousands of families do each year. As she walked along the beach with her mother, father, and little sister that morning, she noticed the water begin to foam and fizzle, little whirlpools formed nearby, and the ocean started to recede and flow out. With panic in her eyes, she started shouting to her mother, Penny, and father, Colin, that there was going to be a tsunami.[5] She was right. The tsunami that Tilly Smith accurately predicted would hit Phuket within ten minutes of her pleading with her parents to find high cover.[6] Her father, after being convinced by his persistent daughter, notified a nearby security guard at the hotel—who happened to be Japanese and was familiar with tsunamis due to their history in Japan.[7] The security guard quickly shouted for all the beachgoers to evacuate and make way inside the hotel.[8]

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[3] Jessica Hornig, *From Fear to Survival: Knowledge Is Key*, ABC NEWS (Jan. 22, 2009), http://abcnews.go.com/2020/fear-survival-knowledge-key/story?id=6691940 [https://perma.cc/65VE-EJQV].

[4] James Owen, *Tsunami Family Saved by Schoolgirl's Geography Lesson*, NAT'L GEOGRAPHIC (Jan. 18, 2005), https://educatoroutreach.uchicago.edu/sites/k12outreach.u chicago.edu/files/uploads/files/sti2013_arehart_nationalgeographic_tillysmith_tsunami.pdf [https://perma.cc/JP6Y-85ER].

[5] *Id.*; Colin Randall & Sebastien Berger, *Honour for Young Girl Who Saved Tourists from Tsunami*, TELEGRAPH (Dec. 26, 2005, 12:01 AM), http://www.telegraph.co.uk/news/uknews/1506286/Honour-for-young-girl-who-saved-tourists-from-tsunami.html [https://perma.cc/N4XB-FNQ9].

[6] Antonella Lazzeri, *If I Hadn't Spotted that the Sea Was Fizzing Then My Parents, Sister and Me Would All Be Dead*, SUN (Dec. 26, 2014, 2:40 PM), https://www.thesun.co.uk/archives/news/635504/if-i-hadnt-spotted-that-the-sea-was-fizzing-then-my-parents-sister-and-me-would-all-be-dead/ [https://perma.cc/D6BA-9SLJ].

[7] *Id.*

[8] *Id.*

Inside the hotel, Tilly was on an elevated floor in the lobby.[9] She connected with her family, and they all watched the lobby doors burst open with the roar of seawater and heard the crashing and banging that came with it.[10] They were safe. Her father hugged her tightly and, in shock, kept repeating, "What if we hadn't listened to you?"[11] How was a ten-year-old able to predict the worst tsunami to ever hit the modern world? Geography class.[12] "Normally I was bored during geography," Tilly would later say, "but our teacher[,] Andrew Kearney[,] had shown us a video of a tsunami in Hawaii and it had been really gripping."[13] Luckily, Tilly paid attention.[14] Tilly is credited with saving the lives of everyone on that particular beach on that Boxing Day of 2004. If Tilly's message had been discarded, the Smith family would have likely ended up like the other 230,000 people that were killed or lost as a part of the 2004 Indian Ocean tsunami.[15]

That 230,000 figure is just a number, a large one albeit, but it is an abstraction and a poor measure of what actually happened on that day. First-hand accounts, images, and videos provide the grit, heartbreak, and tragedy of the Sumatra tsunami. They depict the last moments of life for these people—siblings, parents, and spouses. Photographs capture the panic and terror on the faces of people fleeing the beachfront as the water emerges and confronts them.[16] Videos from the event show an old man clinging to the side railing of a parking garage as rushing water filled the area.[17] Author Jerry Thompson describes the scene: "Exhausted and in shock, he finally let go."[18] Throughout that region, the water tore away houses, belongings, cars, and buses and carried them off. Streets were then flooded, "full of death and floating debris."[19] More waves were to come, bringing more death. This says nothing of the aftermath of the tsunami, the consequences of such devastation and the hardship it presented to the region.

This Article is about tsunamis of a different kind. It is about how we can anticipate dire problems, prepare for them, and either avoid their occurrence or mitigate their effects. It is about generating a legal action before the consequences

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[9] *Id.*

[10] *Id.*

[11] *Id.*

[12] *Girl, 10, Used Geography Lesson to Save Lives*, TELEGRAPH (Jan. 1, 2005, 10:50 AM), http://www.telegraph.co.uk/news/1480192/Girl-10-used-geography-lesson-to-save-lives.html [https://perma.cc/3GQP-MD4N].

[13] Lazzeri, *supra* note 6.

[14] Due in no small part to her teacher's effective use of in-class simulations, hands-on learning opportunities, and mixed media presentations—fellow law professors, take note. Owen, *supra* note 4.

[15] JERRY THOMPSON, CASCADIA'S FAULT xviii (2012).

[16] Alan Taylor, *Ten Years Since the 2004 Indian Ocean Tsunami*, ATLANTIC (Dec. 26, 2014), https://www.theatlantic.com/photo/2014/12/ten-years-since-the-2004-indian-ocean-tsunami/100878/ [https://perma.cc/8G9Q-LUFJ].

[17] THOMPSON, *supra* note 15, at xvii.

[18] *Id.* at xviii.

[19] *Id.*

of the crises occur or worsen. The Sumatra tsunami is a metaphor for how we view the world and how we choose which actions to take—whether we stay on the beach or take high cover. This Article looks in detail at two crises, one finished and one ongoing. The completed crisis is the Subprime Mortgage Crisis of the 2000s (the Subprime Mortgage Crisis).[20] By no means have we fully recovered from it, but it is in a sense, finished. The ongoing crisis is the Climate Crisis.

The Climate Crisis mirrors the Subprime Mortgage Crisis in important ways. Of course, the magnitude of the Subprime Mortgage Crisis, while significant and pervasive, pales in comparison to the current and anticipated effects of the Climate Crisis. But they are similar in that the consequences—direct and indirect—are difficult to forecast thereby making the ramifications all the graver due to their uncertainty in time, locale, intensity, and cost. We should learn from the mistakes made by the actors and stakeholders of the Subprime Mortgage Crisis and be proactive rather than reactive. In other words, we need to be Tilly Smith. Or, as described later in this Article, Meredith Whitney and Steve Eisman (among others), both of whom saw the structural problems in the financial system prior to and during the Subprime Mortgage Crisis.

But we need more than just sound principles and data in order to compel action and legal intervention. In the context of climate change, there is no shortage of people that see the ocean receding or the water foaming. There is clear consensus among the scientific community that anthropogenic climate change is real and that we are living the current consequences. But the statistics and data are not moving the political or legal needle. The current Climate Crisis and our collective nonresponse lack a narrative or frame of reference. It is defined by data but has few stories and faces. The Climate Crisis needs a narrative that provides a framework for our collective understanding of what is at stake, thereby compelling a comprehensive, immediate, broad-spectrum legal response. The narrative is critical given our cognitive biases for decision-making and our penchant, as humans, to use heuristics in deciding what to believe and do.

This is the great value in the parallel between the Subprime Mortgage Crisis and the Climate Crisis. The Subprime Mortgage Crisis provides a reference point for us and a way of understanding the grave and systemic consequences brought about by climate change. People typically use a series of cognitive heuristics to make daily decisions. Most of the time, they are effective because they reach a rational decision in an efficient time frame. But occasionally, our heuristics fail us, and our actions are irrational and harmful. Therefore, it is imperative that we either (1) avoid the operation of heuristic shortcuts by processing information in a deep and analytical manner, or (2) use narrative to successfully inform our heuristics to reach the rational decision.

In the context of the law, the Subprime Mortgage Crisis is helpful because it can demonstrate the consequences of regulatory and legal failure. In human psychology, the Subprime Mortgage Crisis is helpful because it is the potential

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[20] It goes by many names; I will use the Subprime Mortgage Crisis to define the financial crisis of the mid to late 2000s.

frame of reference for comprehending the direct and indirect consequences of misjudging risk and uncertainty in complex pervasive systems. We must frame the issue of the Climate Crisis in the context of humanity at a local and personal level—the tragedy of the man who slipped away as a consequence of an avoidable crisis. He was not simply one among 230,000 lost; he was perhaps a father, a spouse, and a friend. The narrative is critical—it draws us closer to the consequences. All too often, in the aftermath of a tragedy, people across the globe send thoughts and prayers but do little. But, if the tragedy happens in your hometown, on your street, or to your family, it is different. It *feels* different. The dangers of the Climate Crisis are not currently *felt*.

What we do not fully appreciate in the age of the Climate Crisis is that we are all the man who slipped away in the Sumatra tsunami. Maybe not now, or next year, but we (or our offspring) will all be him. The people that slip away in the Climate Crisis will be my daughter, Tilly Smith, your mother, and your neighbor's grandchildren. The opportunity to avoid that end is upon us. The Climate Crisis has moved past the arguments over data points or the accuracy of predictions because it is upon us and we can see the effects—the tragedies—in instances across the globe. This time is about how our own narratives end, why they end, and what we did with the knowledge we had.

This Article proceeds in five parts. First, this Article looks at the bigger picture of what Tilly Smith did that day—she made a prediction. In examining the contemporary views on predictions and probability theory, the Article focuses on two authors and public intellectuals that represent important perspectives on prediction: Nassim Nicholas Taleb and Nate Silver. Part I focuses on the under-theorized role of narrative in the context of crisis—specifically, the Climate Crisis. This Part argues that the level of abstraction and the prominence of numbers can slow the motivation to act. Part II utilizes cultural cognitive theory and longstanding research from Tversky and Kahneman on human cognitive biases to link our narrative and predictive failures together via a common causative basis. Next, a review of the Subprime Mortgage Crisis, in terms of law-and-economic spheres with a focus on the regulatory action (or lack thereof) is necessary to understand the interaction between psychology, human action, and the role of narrative in the context of that crisis. In addition, the Article incorporates the views of both Silver and Taleb regarding predictions and the Subprime Mortgage Crisis. Part IV considers the Climate Crisis; the science, models, and predictions; public opinion; and Taleb's and Silver's views on climate change predictions and risk. In particular, one area of potential grave direct and indirect danger—the climate-water nexus—is explored especially regarding the ramifications of climate change in the water law context. Finally, the Article ends with recommendations for moving forward with a comprehensive legal response to the Climate Crisis as informed by the Subprime Mortgage Crisis and the importance of the predictions, narrative, and cognition and in that process.

I. RISK ENGINEERING

Predictions and forecasts are a part of everyday American life. Everything from the weather, the World Series, stock prices, and elections are the subject of predictions. They are made in all manner of ways: grandmothers, media pundits,[21] computers,[22] groundhogs,[23] and even an octopus.[24] Some are good at predicting what may happen, others are not. Tilly Smith made a prediction that the receding ocean and foaming water was the precursor to a tsunami. Her prediction saved her and her family as well as countless others on Mai Khao Beach in 2004.[25] Twelve years later, predictions about the U.S. presidential election were the subject of every evening news channel, news website, and twenty-four-hour news station—understandably so, given the historic nature and intrigue surrounding the election. Everyone had a prediction about the outcome. The nearly unanimous view was that Secretary Hillary Clinton would win.[26] Cast in terms of likelihood, the *New York*

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[21] Katelyn Fossett, *16 Worst Predictions of 2016*, POLITICO (Nov. 6, 2016, 7:33 AM), http://www.politico.com/story/2016/11/2016-election-worst-predictions-230806 [https://perma.cc/8HME-6UHH]; Charley Lanyon & Margaret Hartmann, *Pundits' Presidential Predictions: What the Map Will Look Like*, N.Y. MAG. (Nov. 8, 2016, 6:35 AM), http://nymag.com/daily/intelligencer/2016/11/pundits-predict-what-the-presidential-map-will-look-like.html [https://perma.cc/CQ9L-DNTC].

[22] Michael Kaplan, *Wall Street Firm Uses Algorithms to Make Sports Betting Like Stock Trading*, WIRED (Nov. 1, 2010, 12:00 PM), https://www.wired.com/2010/11/ff_midas/ [https://perma.cc/2ZVG-K462]; Emmett Knowlton, *Microsoft's Sports Algorithm Is Probably Better at Picking NFL Winners than You Are*, FISCAL TIMES (Sept. 10, 2015), http://www.thefiscaltimes.com/2015/09/10/Microsoft-s-Sports-Algorithm-Probably-Better-Picking-NFL-Winners-You-Are [https://perma.cc/QU8V-G4FP].

[23] A 131—or 120 depending on various sources—year old tradition, Punxsutawney Phil (a groundhog), will come out of his burrow and if he sees his shadow, that means six more weeks of winter. Interestingly, Phil is not very accurate in his predictions. Remy Melina, *How Accurate Are Punxsutawney Phil's Groundhog Day Forecasts?*, LIVESCIENCE (Feb. 2, 2017), http://www.livescience.com/32974-punxsutawney-phil-weather-prediction-accuracy .html [https://perma.cc/YE6A-HGBQ]; Alanne Orjoux, *More Winter, Early Spring, End of Days — Groundhog Day Predictions Vary*, CNN http://www.cnn.com/2017/02/02/us/groun dhog-day-trnd/ [https://perma.cc/2LA5-2ZW7].

[24] Paul the Octopus gained "international notoriety" upon his successful prediction of Germany's national soccer team's matches in the 2008 World Cup. Paul also correctly predicted Spain to prevail over the Netherlands in the 2008 World Cup Final. In response, Spain made him an honorary citizen, and Paul represented England as its Ambassador for the nation's 2018 World Cup bid. *Paul, the Octopus Who Predicted World Cup Matches, Dies*, N.Y. TIMES: GOAL (Oct. 26, 2010), https://goal.blogs.nytimes.com/2010/10/26/paul-the-octopus-who-predicted-world-cup-matches-dies/?_r=0 [https://perma.cc/7BAT-PYLF]; *Paul the World Cup Octopus Dies in His Tank in Germany*, BBC NEWS (Oct. 26, 2010), http://www.bbc.com/news/world-europe-11626050 [https://perma.cc/Q4ZN-X34K].

[25] *See* Lazzeri, *supra* note 6.

[26] John Sides, *A Comprehensive Average of Election Forecasts Points to a Decisive Clinton Victory*, WASH. POST: MONKEY CAGE (Nov. 8, 2016), https://www.washingtonpost

Times,[27] the *Washington Post*,[28] and even Nate Silver (albeit to a lesser extent) on his website, FiveThirtyEight,[29] rated Secretary Clinton's chances at being elected as nearly a *fait accompli*. Donald Trump won. Why did ten-year-old Tilly Smith get it right when the collective statistical and political experts in the United States get it wrong?

A. The Iconoclast, Taleb

> *What is surprising is not the magnitude of our forecast errors, but our absence of awareness of it.*[30]

Nassim Nicholas Taleb is many things: an iconoclast, blunt, harsh,[31] a thinker,[32] a trader,[33] an avid tweeter,[34] and rarely boring. More formally, he is the Distinguished Professor of Risk Engineering at New York University.[35] His most famous book, *The Black Swan*, describes the phenomenon of particular events that are (1) "outlier[s] . . . outside the realm of regular expectations, because nothing in the past can convincingly point to its possibility," (2) "carr[y] an extreme impact," and (3) are explained "*after* the fact" by "concoct[ed]" reasons that make the event appear "explainable and predictable."[36] Taleb writes that "since we left the

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.com/news/monkey-cage/wp/2016/11/08/a-comprehensive-average-of-election-forecasts-points-to-a-decisive-clinton-victory/?utm_term=.ffd1c64a61f6 [https://perma.cc/QKE9-AV6D].

[27] Josh Katz, *Who Will be President?*, N.Y. TIMES: UPSHOT, https://www.nytimes.com/interactive/2016/upshot/presidential-polls-forecast.html [https://perma.cc/T39Z-9XCU].

[28] *Post Opinion Writers Predict What Will Happen on Election Night*, WASH. POST: POSTPARTISAN (Nov. 8, 2016), https://www.washingtonpost.com/blogs/post-partisan/wp/2016/11/08/post-opinion-writers-predict-what-will-happen-on-election-night/?utm_term=.95d3fd650b43 [https://perma.cc/K9AE-9GHB].

[29] Nate Silver, *Who Will Win the Presidency?*, FIVETHIRTYEIGHT https://projects.fivethirtyeight.com/2016-election-forecast/ [https://perma.cc/MKZ6-D6QM].

[30] NASSIM NICHOLAS TALEB, THE BLACK SWAN xxv (2d ed. 2010).

[31] Michiko Kakutani, *You Are All Soft! Embrace Chaos!*, N.Y. TIMES (Dec. 16, 2012), http://www.nytimes.com/2012/12/17/books/antifragile-by-nassim-nicholas-taleb.html [https://perma.cc/A42S-9H2P].

[32] Tim Morrison, *Nassim Nicholas Taleb*, TIME (Oct. 24, 2008), http://content.time.com/time/business/article/0,8599,1853531,00.html [https://perma.cc/XF4A-P53M]; *Nassim Nicholas Taleb: Biography*, JESUS & MARY SCH., http://www.jmrab.edu.lb/index.php/1/front-page-news/author-of-the-week/849-nassim-nicholas-taleb [https://perma.cc/87K9-73AS].

[33] Morrison, *supra* note 32.

[34] Nassim Nicholas Taleb (@nntaleb), TWITTER, https://twitter.com/nntaleb [https://perma.cc/6WB6-6YHV].

[35] *Nassim Nicholas Taleb*, NYU TANDON SCH. ENGINEERING, http://engineering.nyu.edu/people/nassim-nicholas-taleb [https://perma.cc/8EYK-5JY7].

[36] TALEB, *supra* note 30, at xxii; Mehrsa Baradaran, *Regulation by Hypothetical*, 67 VAND. L. REV. 1247, 1278–79 (2014); Chad D. Emerson, *A Troubled House of Cards:*

Pleistocene, some ten millennia ago, the effect of these Black Swans has been increasing."[37] Increased complexity of the world breeds more Black Swan events.[38] An essential aspect of Taleb's book is not the Black Swan itself, but the phenomenon of "act[ing] as if it does not exist! . . . [A]lmost all 'social scientists' . . . have operated under the false belief that their tools could measure uncertainty."[39] Another core point for Taleb is "our blindness with respect to randomness, particularly large deviations."[40]

Speaking on the 2004 Sumatra tsunami, he says "[h]ad it been expected, it would not have caused the damage it did—the areas affected would have been less populated, an early warning system would have been put in place. What you know cannot really hurt you."[41] The same goes for the terrorist attacks of September 11. For Taleb, rare events equal uncertainty.[42] He argues that academics, a primary target of his criticisms, are responsible for miscalculating the likelihood of Black Swans by studying only the "usual."[43] This blinds them, and significantly misleads everyone else, in thinking that large-impact events simply will not occur.[44] By "focusing on the known," he suggests, the future will be increasingly *less* predictable.[45]

Taleb also talks about the "triplet of opacity."[46] He believes "[h]istory is opaque. You see what comes out, not the script that produces events, the generator of history."[47] There is an "incompleteness" in our understanding of these events

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Examining How the Housing and Economic Recovery Act of 2008 Fails to Resolve the Foreclosure Crisis, 61 OKLA. L. REV. 561, 565–66 (2008); Dru Stevenson & Nicholas J. Wagoner, *Bargaining in the Shadow of Big Data*, 67 FLA. L. REV. 1337, 1385 (2015).

[37] TALEB, *supra* note 30, at xxii.

[38] *Id.*

[39] *Id.*; Dru Stevenson, *The Function of Uncertainty Within Jury Systems*, 19 GEO. MASON L. REV. 513, 526–27 (2012).

[40] TALEB, *supra* note 30, at xxiii; Stevenson & Wagoner, *supra* note 36, at 1385–86; J.B. Ruhl & Daniel Martin Katz, *Measuring, Monitoring, and Managing Legal Complexity*, 101 IOWA L. REV. 191, 231 (2015).

[41] TALEB, *supra* note 30, at xxiv.

[42] *Id.* at xxviii.

[43] *Id.* at xxviii–xxix.

[44] *Id.* at xxviii; James Fanto, *Anticipating the Unthinkable: The Adequacy of Risk Management in Finance and Environmental Studies*, 44 WAKE FOREST L. REV. 731, 742–43 (2009).

[45] TALEB, *supra* note 30, at xxxii (emphasis added); *see also* Baradaran, *supra* note 36, at 1278–79 (referencing Taleb's "black swan theory" and explaining that "any model that uses past events to predict the probability of future events suffers from a black-swan bias"); Fanto, *supra* note 44, at 742–43 (discussing Taleb's criticisms of risk modeling); Stevenson, *supra* note 39, at 524–25 (explaining that Taleb's theory of system-fragility "relies on the principle that large organizations that continually rely on a model that fails to account for all possible failures render themselves inherently susceptible to hidden dangers").

[46] TALEB, *supra* note 30, at 8–15.

[47] *Id.* at 8.

since the contents and mechanics of the box are unknown.[48] Our inability to understand history stems from three traits: (1) "the illusion of understanding" a world that is much more "complicated (or random)" than thought,[49] (2) the "distortion" that comes from the ability to analyze events only after they have occurred which allows them to be presented in a "clearer and more organized" fashion,[50] and (3) the Platonic inclination to generate "intellectual maps of reality" composed of "[m]odels and constructions" which provide maps of our reality that do not actually reflect the messiness and imprecision of the world.[51] These factors convince people that the world is precise, well-understood, and predictable—which is not necessarily the case.[52] The categorization of our world, via models and constructs, "always produces reduction in true complexity."[53] Taleb cautions that "[a]ny reduction of the world around us can have explosive consequences since it rules out some sources of uncertainty; it drives us to a misunderstanding of the fabric of the world."[54]

But some problems or events are easier to understand—less complex—than others. Taleb acknowledges this in what he calls Mediocristan and Extremistan.[55] Mediocristan entails circumstances and populations where there are "few extreme successes or failures."[56] Under such parameters where the sample size is large, "no single instance will significantly change the aggregate or the total."[57] Information about such instances of Mediocristan are reliable and amenable to accurate predictions; in Taleb's words, "[w]hat you can know from data in Mediocristan augments very rapidly with the supply of information"[58] because there is no possibility of significant deviations. In contrast, Taleb considers the opposite circumstance—Extremistan.[59] Under those conditions, "inequalities [within the group] are such that one single observation can disproportionately impact the aggregate, or the total."[60] Taleb illustrates the contrast by imagining an example of

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[48] *Id.*

[49] *Id.*; *see also* Fanto, *supra* note 44, at 742 ("catastrophic events are always new and unimaginable . . . risk management actually enhances risk because it leads risk modelers and their followers to believe that risk is 'managed' (an impossible task)"); Stevenson & Wagoner, *supra* note 36, at 1385–86 (explaining that predictions, information, and forecasts can cause decision makers to be overconfident so that they take more risks).

[50] TALEB, *supra* note 30, at 8.

[51] *Id.* at xxx, 8.

[52] *Id.* at 9.

[53] TALEB, *supra* note 30, at 16.

[54] *Id.* at 16.

[55] *Id.* at 26.

[56] *Id.* at 303.

[57] *Id.* at 32 (emphasis omitted).

[58] *Id.* at 34.

[59] *Id.* at 33.

[60] *Id.* (emphasis omitted); *see also* Stevenson, *supra* note 39, at 526 (explaining how business leaders concentrate authority and implement programs to reduce their exposure to certain known liabilities, while ignoring "the unknowable perils that can affect everything at once").

selecting one thousand people at random and evaluating both their (1) weight and height and (2) net worth.[61] In the context of weight and height, even if the sample included the most extreme ends of the population—say Shaquille O'Neal[62] or Simone Biles[63]—they would not represent much more of the total sum than their peers.[64] Regarding net worth, if Warren Buffett[65] or Jay-Z[66] were in the sample, they might very well represent 90–95 percent of the group's total net worth. Predictions in Mediocristan are reliable. By sampling the weights of one thousand people, you can predict average weights for people on the planet, and they will by and large be accurate. Not so for Extremistan.[67] Taleb contends that the list of things that belong in Extremistan are much longer than those that belong in Mediocristan.[68]

The last remaining key concept from *The Black Swan* relevant to the idea of predictions concerns the problem of induction, or more colorfully, the parable of the American turkey.[69] On a farm with other turkeys, a turkey will get fed each day by someone, and each feeding confirms "the bird's belief that it is the general rule of life to be fed every day by friendly members of the human race."[70] However, on the day before Thanksgiving, the turkey will have a completely unexpected experience: "[i]t will incur a revision of belief" when it is killed and prepared for dinner.[71] This is the problem of induction whereby projections about the future are made based on past data.[72] The question, then, is how do we know whether we are a turkey? How

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[61] TALEB, *supra* note 30, at 32–33.

[62] SHAQUILLE O'NEAL, BASKETBALL REFERENCE, http://www.basketball-reference.com/players/o/onealsh01.html [https://perma.cc/N6YK-X2GL] (discussing the former professional basketball player and noting that, during his playing days, Shaq was 7'1" and weighed approximately 325 pounds).

[63] Luan Peszek, *Simone Biles*, ENCYCLOPÆDIA BRITANNICA, https://www.britannica.com/biography/Simone-Biles [https://perma.cc/WW73-KWT9] (discussing the gold medal winning Olympian gymnast, whom is widely regarded as among the best in history, and noting that she is approximately 4'9").

[64] TALEB, *supra* note 30, at 32.

[65] *Warren Buffet*, FORBES, https://www.forbes.com/profile/warren-buffett/ [https://perma.cc/2ZN7-DUYR] (noting his estimated net worth, which is $84 billion).

[66] Zack O'Malley Greenburg, *Jay Z Net Worth: $610 Million in 2016*, FORBES (May 6, 2016, 10:21 AM), https://www.forbes.com/sites/zackomalleygreenburg/2016/05/06/jay-z-net-worth-610-million-in-2016/#7a19f317654c [https://perma.cc/5TLT-3R5Q] (noting his estimated net worth, which is $610 million).

[67] TALEB, *supra* note 30, at 32–33.

[68] *Id.* at 35.

[69] *Id.* at 40.

[70] *Id.*

[71] *Id.*

[72] TALEB, *supra* note 30, at 41; *see also* Baradaran, *supra* note 36, at 1279–80 (explaining how risk models for the housing market only accounted for inflation risk that had been encountered before in the 1970s and 1980s but failed to "account for the possibility of a precipitous decline in national housing prices" that had not been seen before).

do we know whether we are in Mediocristan or Extremistan? Taleb's forceful thesis focuses on the idea that, in general, we think we understand more about the world—and can make more accurate predictions concerning the future—than we actually do.

B. The Statistician, Silver

We love to predict things—and we aren't very good at it.[73]

Nate Silver is known for many things in different spheres. A self-proclaimed nerd, Silver is a prominent blogger, writer, and founder and operator of the statistics and forecasting website, FiveThirtyEight.[74] In the sports world, he is recognized for developing the PECOTA system, which attempts to predict the statistics of Major League Baseball players.[75] In politics, he is known for his website, FiveThirtyEight, and his successful prediction in the 2008 election of all thirty-five U.S. Senate races and the presidential race outcome in forty-nine of fifty states.[76] Silver represents, for the purposes of this Article, the view that it is possible to understand and accurately predict events in the world.

Important parameters, or qualifiers, exist for Silver in developing forecasts and predictions. "Data driven predictions can succeed—and they can fail. It is when we deny our role in the process that the odds of failure rise."[77] The problem with predicting the future, Silver contends, is in part due to the fact that "[w]e are wired to detect patterns."[78] One problem with detecting patterns is that seeing objects in complicated situations requires some level of generalization, which can create patterns where there are none in reality.[79] Silver describes this as looking for a signal in the noise—we mistake the noise for a signal—and do so because we have a basic human instinct to see the patterns.[80] Silver acknowledges the subjectivity and bias that goes into formulating a model and predictions but recognizes that hope in formulating better predictions lies in, among other things, falsifiability.[81] Finally, Silver recognizes that some ideas or phenomenon cannot be tested at all precisely because falsifying (or testing) the accuracy of the model takes too long, or the sample size is too small or infrequent.[82] The solution, posits Silver, is becoming

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[73] NATE SILVER, SIGNAL AND NOISE 13 (2015).

[74] Adam Sternbergh, *The Spreadsheet Psychic*, N.Y. MAG. (Oct. 12, 2008), http://nymag.com/news/features/51170/ [https://perma.cc/KBD9-CZVJ].

[75] SILVER, *supra* note 73, at 9.

[76] *Id.*

[77] *Id.*

[78] *Id.* at 12.

[79] *Id.*

[80] *Id.* at 12–13.

[81] *Id.* at 14–15.

[82] *Id.*

"comfortable with probability and uncertainty" and "think[ing] more carefully about the assumptions and beliefs that we bring to a problem."[83]

Silver describes phenomena that are susceptible to accurate predictions and explains why they are. Baseball, chess, and meteorology have all demonstrated areas where accurate forecasts are achievable.[84] The statistics of baseball players may be accurately forecasted for several reasons. First, baseball players—in contrast to football players—"are largely responsible for their own statistics."[85] Silver says that "[t]here are relatively few problems involving complexity and nonlinearity. The causality is easy to sort out."[86] In addition, baseball players produce an enormous data set with which to test the hypothesis against—this emphasizes the importance of falsifiability that Silver trumpets as essential to developing a proper forecast.[87] A good forecast for a baseball player, says Silver, will do three things: (1) contextualize players' statistics, (2) "separate out skill from luck," and (3) account for the relationship between players' age and their performance.[88] Silver acknowledges that the system he developed is different than other systems designed to predict statistical outcomes for baseball players in that its "forecasts were probabilistic . . . , outlining a range of possible outcomes for each player."[89] This idea in itself accounts for some degree of uncertainty within the system of baseball statistics that is not subject to certain future prediction.

Using the rich, and very long historical data set available to statisticians, they can develop a system to forecast likely outcomes—a range of possibilities for players. All things that account for how successful a batter is can be examined using the data available. As Silver points out, a high batting average (success at getting hits in a plate appearance) is easier to obtain in the Boston Red Sox's home stadium—Fenway Park—because it is a smaller field than those in other baseball stadiums.[90] By accounting for a given player's performance in a given stadium, statisticians can develop "park factors" to account for these distinctions.[91] A failure to do this might overvalue a player who has played most of their games in Fenway Park. Other issues similar to these park factors exist in baseball. But there is data available that may be used to incorporate those distinctions resulting in better forecasts of likely possibilities for player performance in the future.

Chess is another example of a phenomenon susceptible to good predictions. In chess, there is complete knowledge of the rules governing the game and the available pieces.[92] Chess presents a challenge to a person's information processing capability—the usefulness of prediction in chess arises *not* from uncertainty as all

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[83] *Id.* at 15.
[84] *Id.* at 9.
[85] *Id.* at 80.
[86] *Id.*
[87] *Id.* at 79–81.
[88] *Id.* at 79.
[89] *Id.*
[90] *Id.*
[91] *Id.*
[92] *Id.* at 267.

pieces and moves are known—but from our inability to understand all our options because it extends "beyond our capacity."[93] The capacity problem is mitigated by applying a heuristic approach. A heuristic approach involves "employing rules of thumb when a deterministic solution to a problem is beyond our practical capacities."[94] These rules of thumb are generalizations about the options available and which options are best. Computers can help solve this problem because of their capacity for calculations. Computers do some things much better than humans: they do not get tired or emotional in the context of a chess match.[95] Silver points out that this alone does not ensure an accurate prediction: "If you give a computer bad data, or devise a foolish set of instructions for it to analyze, it won't spin straw into gold."[96] The capacity problem is solved by computers in fields "where the system abides by relatively simple and well-understood laws, but where the equations that govern the system must be solved many times over in order to produce a good forecast."[97] Chess and baseball are fields in which good forecasts are achievable because they behave according to well-understood rules. In contrast, Silver notes that forecasts are not as good when they seek to make predictions about the field of economics or earthquakes because "our understanding of root causes is blurrier and the data is noisier."[98]

C. Common Ground

Taleb and Silver agree in principle on four items. First, Taleb's critique of our propensity to "Platonify"[99]—the mapping of well-defined and clean objects onto the world while ignoring the messy and blurrier reality—is consistent with Silver's contention that we tend to "make approximations and assumptions about the world that are much cruder than we realize."[100] Of course, Taleb and Silver may disagree about which fields are messy and which are clean, but they both describe the same flaw that impairs accurate predictions.

Two additional points of agreement stem from the same problem: human bias. Taleb describes the "narrative fallacy," which is the "need to fit a story or pattern to a series of connected or disconnected facts."[101] Silver agrees that, as humans, we tend to want to see patterns and find the "signal in the noise" even though it may not really be there.[102] In addition, Silver's discussion of seeing these patterns gets to the

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[93] *Id.*

[94] *Id.*

[95] *See, e.g.*, Tracy Pearl, *Fast and Furious: The Misregulation of Driverless Cars*, 73 N.Y.U. ANN. SURV. AM. L. 24, 38 (2017) (explaining that computer-operated driverless cars do not "get tired or suffer from such distractions as texting while driving").

[96] SILVER, *supra* note 73, at 289.

[97] *Id.*

[98] *Id.*

[99] TALEB, *supra* note 30, at 131.

[100] SILVER, *supra* note 73, at 20.

[101] TALEB, *supra* note 30, at 303.

[102] SILVER, *supra* note 73, at 13.

same core as Taleb's description of the illusion of understanding—that we understand a great deal more about the world than we actually do—from his "triplet of opacity."[103]

Finally, both theorists agree that certain fields may be subject to accurate forecasting and others are not. Taleb describes these contrasting fields as Mediocristan and Extremistan, and Silver identifies the distinguishing characteristic as fields that function according to well-understood and simple rules versus those that are complex, blurry, and not well-understood. All those points of common ground among them are interconnected. Much of the concern over the accuracy of the prediction lies in what you are trying to predict (a specific outcome versus a range of likely possibilities), which field you are operating in (Mediocristan versus Extremistan), and whether you see the world's messy state or smooth it to fit your pattern (Platonify versus Noisy Reality). In order to understand whether the prediction is reliable, these are the questions to ask about the fundamental aspect of the field being forecasted. If we are certain that a particular prediction pertains to a field of Mediocristan, where we clearly understand the simple rules at work, and we have a lot of historical data to falsify our forecast, then we should get a clear recommendation to which we conform our behavior. In other words, you get Tilly Smith. She acts in congruence with her prediction. But this is not always the case. This bears on a different question: why people do not act consistent with accurate forecasting.

II. NARRATIVE, LAW, AND HUMAN UNDERSTANDING

If we can accurately predict an outcome—assuming that the principles described above by Silver and Taleb are followed—then as rational actors, our human actions should conform to that outcome. As Taleb said, "[w]hat you know cannot really hurt you."[104] But facts, data, and accurate forecasts about the future do not always compel the rational behavior consistently with that expectation.

A. Narrative, Understanding, and Law

Law lives on narrative.[105]

Using narrative in the context of law and legal advocacy is an idea as old as the profession itself.[106] An inquiry into the value and importance of narrative certainly goes beyond the legal profession and the storytelling dimension of law. However, examining how narrative functions in the context of law informs our understanding of the role narrative plays in broader human understanding.

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[103] TALEB, *supra* note 30, at 8.
[104] *Id.* at xxiv.
[105] ANTHONY G. AMSTERDAM & JEROME BRUNER, MINDING THE LAW 110 (2002).
[106] *Id.* at 112.

Dr. Jerome Bruner, one of the most prominent psychologists of the twentieth century, has said that the narrative—a series of events expressed by an agent—is a fundamental and instinctive process of the human condition.[107] He is not alone in this claim. Marshall Grossman contends that the "construction of narrative is an essential activity of the human mind."[108] Chester and Sneddon argue that even if narrative is not inherently and uniquely human, even if narrative is learned or imposed externally in some sense, "narrative is certainly a predominant method employed to distill and disseminate information."[109] This is readily apparent by even "a cursory review of popular culture and media [which] reveals extensive use and reliance on the power of narrative."[110] They affirm that "[n]arrative techniques facilitate the composition and production of an accessible, and often memorable, text."[111] Bernard Jackson determines that narrative is a "major (perhaps the major) form of cultural communication of common-sense notions" and that it "is the mode in which many of our value-judgments are stored and transmitted—rather than being conceptualised or communicated in analytical discourse."[112]

Exploration of the intersectionality of narrative and law is not necessarily new.[113] It is a rich and multilayered confluence of disciplines. Professor Anthony

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[107] *See* JEROME BRUNER, ACTS OF MEANING 45 (rev. ed. 1990) (identifying the human "predisposition to organize experience into narrative form").

[108] Marshall Grossman, *The Subject of Narrative and the Rhetoric of the Self*, 18 PAPERS ON LANGUAGE & LITERATURE 398, 398 (1982); *see generally* Richard Delgado, *Storytelling for Oppositionists and Others: A Plea for Narrative*, 87 MICH. L. REV. 2411 (1989) (speaking to the use of stories by outgroups as an effective tool in the legal context to create compelling narratives); Louis J. Goldberg, *Expanding the Narrative: The Grand Compulsion of a Storytelling Species*, 6 J. CONTEMP. LEGAL ISSUES 281 (1995) (categorizing story telling into either event-driven or relational views and explaining that the creation of ideation pathways help humans to navigate an ever changing world); Lorie M. Graham & Stephen M. McJohn, *Cognition, Law, Stories*, 10 MINN. J.L. SCI. & TECH. 255 (2009) (exploring the intersection between cognitive sciences, word usage and storytelling); Lea B. Vaughn, *Feeling at Home: Law, Cognitive Science, and Narrative*, 43 MCGEORGE L. REV. 999 (2012) (using cognitive and evolutionary phycology to explain the compelling nature of narrative).

[109] Susan M. Chesler & Karen J. Sneddon, *Once Upon a Transaction: Narrative Techniques and Drafting*, 68 OKLA. L. REV. 263, 264 (2016).

[110] *Id.* at 264–65.

[111] *Id.* at 265. ARTHUR ASA BERGER, NARRATIVES IN POPULAR CULTURE, MEDIA, AND EVERYDAY LIFE 1–4, 14–16 (1996); *see also* MIEKE BAL, NARRATOLOGY: INTRODUCTION TO THE THEORY OF NARRATIVE 220 (1999) (noting an "omnipresence of narrative in culture").

[112] BERNARD S. JACKSON, LAW, FACT, AND NARRATIVE COHERENCE 61 (1988).

[113] *See generally* DAVID RAY PAPKE, NARRATIVE AND THE LEGAL DISCOURSE: A READER IN STORYTELLING AND THE LAW (1991) (reviewed by Jane B. Baron, *The Many Promises of Storytelling*, 23 RUTGERS L.J. 79 (1991)) (asserting that legal narratives and their component parts shape the legal system and are largely ignored); Jane B. Baron & Julia Epstein, *Is Law Narrative?*, 45 BUFF. L. REV. 141 (1997) (advocating for more precise definitions and terminology surrounding the discussion of legal narratives); Peter Brooks, *Narrativity of the Law*, 14 LAW & LITERATURE 1 (2002); Peter Brooks, *Narrative Transactions—Does the Law Need a Narratology?*, 18 YALE J.L. & HUMAN. 1 (2006)

Amsterdam, noted law professor and lawyer, and the previously mentioned Dr. Jerome Bruner explored the role of narrative in the law in their book, *Minding the Law*.[114] In the context of a legal situation, the answers to questions of fact are not wholly dependent upon logic and analytical coherence, instead, "we are coming to recognize that both the questions and the answers in such matters of 'fact' depend largely upon one's choice . . . of some overall narrative as best describing *what happened or how the world works*."[115] How those facts fit within a narrative that, to the listener, seems to explain the circumstances leads to adherence. Even more, stories "are not just recipes for stringing together a set of 'hard facts' . . . . [S]tories *construct* the facts that comprise them."[116] Amsterdam and Bruner go on to say that "[f]or this reason, much of human reality and its 'facts' are not merely recounted by narrative but *constituted* by it."[117] The nature of things in the world

> may take the shape of rules and principles, institutions . . . , values and goals. However we conceive of them, they are grounded in what our culture designates as mattering. And what does or doesn't matter to a culture can be traced back through the culture's stories, its genres, to its enduring myths. Narrative is the carrier of those myths and, at the same time, our means for recognizing that a present situation needs telling in a way linked to this myth or that one.[118]

A seminal work of Robert Cover, *Nomos and Narrative*, reinforces these ideas. Cover focused on narrative in the law and argued that "[n]o set of legal institutions or prescriptions exists apart from the narratives that locate it and give it meaning."[119] In other words, law derives meaning from narrative in critical ways. Some background on Cover's work is necessary, and Samuel Levine's thoughtful dissection of Cover's writing is instructive.[120]

(arguing that if narrative turn is as important as the literature has suggested it needs to be discussed more by legal decision makers); Daniel A. Farber & Suzanna Sherry, *Telling Stories Out of School: An Essay on Legal Narratives*, 45 STAN. L. REV. 807 (1993) (searching for a sustained and public examination of legal narrative as a form of scholarship); Nancy Levit, *Reshaping the Narrative Debate*, 34 SEATTLE U. L. REV. 751 (2011) (discussing the debate over legal narrative and storytelling).

[114] *See* AMSTERDAM & BRUNER, *supra* note 105.

[115] *Id.* at 111.

[116] *Id.*

[117] *Id.*

[118] *Id.* at 111–12.

[119] Robert M. Cover, *The Supreme Court, 1982 Term—Foreword: Nomos and Narrative*, 97 HARV. L. REV. 4, 4–5 (1983).

[120] *See generally* Samuel J. Levine, *Halacha and* Aggada*: Translating Robert Cover's Nomos and Narrative*, 1998 UTAH L. REV. 465 (providing analysis and discussion of Robert Cover's 1983 Article *Nomos and Narrative*).

According to Cover a *nomos* is a "normative universe," a "world of right and wrong, of lawful and unlawful." Although "formal institutions of the law, and the conventions of a social order are, indeed, important to that world," Cover is careful to emphasize that they are "but a small part of the normative universe." [121]

Levine describes Cover's point as reiterating the idea that the institution of the law, rights, and limitations are only "understood in the context of the narratives that [provide] meaning."[122] Narrative plays an essential role in forming the *nomos*—"a world in which we live"[123]—by locating these legal concepts in a context we understand.[124] Levine refers to these narratives that connect legal principles as myths—just as Bruner and Amsterdam do.[125] These myths allow law to make sense in the broader context of society, community mores, and human conduct.[126] The narrative aids in defining facts, how they fit together, the functioning of the world we encounter, and the meaning of law.

Law is a "concept rooted in 'the sacred narratives of our world.'"[127] Narrative, be it within the confines of a legal trial or the broader sense of the functioning of our world, cements our understanding. This is more precisely put by Steven Winter when he identifies the "attraction of narrative" as stemming from the fact "that it corresponds more closely to the manner in which the human mind makes sense of experience than does the conventional, abstracted rhetoric of law."[128] Narrative allows us to make meaning out of our human experience.[129] "In narrative, we take experience and configure it in a conventional and comprehensible form. This is what gives narrative its communicative power . . . ."[130] It serves "as a link between experience and the effective crystallization of social mores."[131] Finally, "narratives . . . are the trajectories plotted upon material reality by our imaginations."[132]

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[121] *See id.* at 470; Cover, *supra* note 119, at 4.

[122] Levine, *supra* note 120, at 470.

[123] Cover, *supra* note 119, at 5.

[124] Levine, *supra* note 120, at 470.

[125] *Id.*; AMSTERDAM & BRUNER, *supra* note 105.

[126] Levine, *supra* note 120, at 470.

[127] Steven L. Winter, *The Cognitive Dimension of the Agon Between Legal Power and Narrative Meaning* 2225, 2225 (1989) (citing Robert M. Cover, *The Folktales of Justice: Tales of Jurisdiction*, 14 CAP. U. L. REV. 179, 180 (1985)).

[128] *Id.* at 2228.

[129] *Id.*

[130] *Id.*

[131] *Id.*

[132] ROBERT COVER, NARRATIVE, VIOLENCE, AND THE LAW: THE ESSAYS OF ROBERT COVER 96 (Martha Minow et al. eds., 1992).

B. Narrative and Prediction

To be human is to seek coherence, constantly to engage in an "effort after meaning."[133]

A strong point of agreement between Taleb and Silver concerns the propensity of people to see patterns in the noisy data[134] and our urge to sand down the rough edges of reality so they resemble the nice clean lines of the illusions of our preexisting view of the world.[135] Indeed, one criterion for a Black Swan event is that, after the fact, we explain the event by reverse engineering its occurrence in order for it to conform to our sense of the world—a narrative that we know. Narrative is a tool we use, a heuristic as Silver describes it. Cover, Bruner, and other thinkers have identified it as an essential tool and perhaps even an innate one.[136]

Narrative can be used to make bad predictions by shoring up the oversimplification of the world or increased—misplaced—reliance on historical information. For example, we can return to Taleb's turkey parable. Imagine some other farm animal—perhaps a pig from a farm owned by George Orwell—says to the turkey, "The human doesn't really have your best interests at stake. He took a turkey inside the house last month and that turkey never came back." The *nomos* for the turkey might be defined by the longstanding experience of having a human feed it each day, which the narrative "humans are nice" supports. The turkey could reasonably discard the Orwellian pig's outlier information because it is so inconsistent with the turkey's understanding of the world.

The story that the pig is spinning—that humans conspired to create an entire world just for the sake of fattening them up to be killed and eaten—simply does not ring true. This is an important tactic in legal storytelling at trial. Determining the objective truth is not necessarily the goal, instead, the goal is the development of a plausible story.[137] This idea is based in the theory of narrative coherence, which is relevant "in the absence of truth based upon observation."[138] A fundamental challenge is to differentiate between the narrative that blinds us to useful inconsistent information and the narrative that helps us to understand our world and circumstances.

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[133] Winter, *supra* note 127, at 2230.
[134] SILVER, *supra* note 73, at 54.
[135] *See* TALEB, *supra* note 30.
[136] BRUNER, *supra* note 107; Cover, *supra* note 119, at 7.
[137] JACKSON, *supra* note 112, at 11–12.
[138] *Id.* at 19.

C. Defining Narrative

Knowing how to tell [narratives] and to comprehend them may be part of the human survival kit.[139]

In the context of prediction, defining narrative as inherently bad or automatically blinding misses the point. Narrative is an essential and unavoidable aspect of human cognition and community culture and method of understanding our world. With the importance of narrative in human cognition and belief established, it is critical to define the general contours of a narrative. A map of "those essential features that give [narrative] its form and that serve to convert 'things in the world' into *story*, real or fictional" is necessary.[140]

Scholars from a variety of disciplines have defined narrative.[141] Amsterdam and Bruner provide this description: a narrative

> needs a *cast of human-like characters*, beings capable of *willing their own actions*, *forming intentions*, *holding beliefs*, *having feelings*. It also needs a *plot* with a beginning, a middle, and an end, in which particular characters are involved in particular events. The unfolding of the plot requires (implicitly or explicitly):
> (1) an initial *steady state* grounded in the legitimate ordinariness of things
> (2) that gets disrupted by a *Trouble* consisting of circumstances attributable to human agency or susceptible to change by human intervention,
> (3) in turn evoking *efforts* at redress or transformation, which succeed or fail,
> (4) so that the old steady state is *restored* or a new (*transformed*) steady state is created,
> (5) and the story concludes by drawing the then-and-there of the tale that has been told into the here-and-now of the telling through some *coda*—say, for example, Aesop's characteristic *moral of the story*.[142]

Narrative is powerful in conveying information and knowledge to human beings. We see the world through stories. We tell ourselves stories about our lives and how we understand events in the world. But the primacy of narrative is not simply cultural, abstract, or theoretical. The groundbreaking work of Daniel Kahneman and Amos Tversky characterized their career-long devotion to scientifically documenting the connection between narrative, predictions, uncertainty, subjective bias, and human cognition. The next Part examines these connections.

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[139] *Id.*
[140] AMSTERDAM & BRUNER, *supra* note 105, at 112–13.
[141] *See, e.g.*, Baron & Epstein, *supra* note 113, at 147.
[142] AMSTERDAM & BRUNER, *supra* note 105, at 113–14.

III. HUMAN COGNITIVE BIASES AND DECISION-MAKING

There is an intuitive appeal to the idea that narrative drives human understanding, but there is also a scientific psychological basis for that principle as well. In addition, errors in evaluating risk and acknowledging uncertainty are more than mathematical or statistical mistakes. The thesis advanced by Taleb and Silver is supported by scientific principles, the discovery of which are famously attributed to Daniel Kahneman and Amos Tversky.[143] Tversky and Kahneman explain and link these two concepts: the power of narrative and the probabilistic errors humans typically make.

Kahneman and Tversky wrote that people's "intuitive expectations are governed by a consistent misperception of the world."[144] This comment focuses on the errors we make in understanding, and they are not due simply to our being tricked or deceived by some external force or agent. They have argued, and shown with empirical evidence, that our *own* subjective cognitive biases prevent us from making rational decisions.[145] In other words, we often stack the deck against ourselves through these biases, called heuristics.

Heuristics are mental shortcuts we use to make decisions more quickly. They pervade everything we do on a daily basis. "[P]eople rely on a limited number of heuristic principles which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors."[146] In their groundbreaking article, Tversky and Kahneman focused on three biases: representativeness, availability, and anchoring.[147]

Representativeness concerns the tendency of people to evaluate the likelihood of an event by ascertaining a similar circumstance and assuming that the likelihoods will be close to the same.[148] For example, Tversky and Kahneman considered the thought experiment as to how one might assess the probability that a person, Steve, belonged to a particular profession—farmer, airline pilot, physician, librarian, or salesperson.[149] Steve was described as "very shy and withdrawn, invariably helpful, but with little interest in people or in the world of reality. A meek and tidy soul, he has a need for order and structure, and a passion for detail."[150] Steve sounds like a

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[143] *See, e.g.*, Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCIENCE 1124 (1974) [hereinafter *Judgment Under Uncertainty*]; Daniel Kahneman & Amos Tversky, *Subjective Probability: A Judgment of Representativeness*, 3 COGNITIVE PSYCHOL. 430 (1972) [hereinafter *Subjective Probability*]; Amos Tversky & Daniel Kahneman, *Belief in the Law of Small Numbers*, 76 PSYCHOL. BULL. 105 (1971) [hereinafter *Belief in the Law of Small Numbers*].

[144] *See Belief in the Law of Small Numbers*, *supra* note 143, at 110.

[145] *See Judgment Under Uncertainty, supra* note 143, at 1130.

[146] *Id.* at 1124.

[147] *Id.* at 1131.

[148] *Id.* at 1124.

[149] *Id.*

[150] *Id.*

librarian because he has the traits that relate to the stereotype of a librarian—in other words, they are similar—or representative. The problem, Tversky and Kahneman point out, is that ordering probability in this way, by representativeness, disregards the prior probabilities of the outcomes. There are more farmers than librarians so that fact alone should "enter into any reasonable estimate of the probability that Steve is a librarian rather than a farmer."[151] But, the stereotype—or narrative— dominates the thinking and derails the correct attribution of probability based on the data. Our own internal *nomos* distracts us from the raw facts. Another aspect of the representativeness heuristic bears emphasizing. Tversky and Kahneman called it "the law of small numbers."[152] This is the idea that sample size is irrelevant in predicting outcomes. Therefore, this compels the expectation that when random samples are selected from a population, we have a belief that those two samples will be "more similar" to each other and to the larger population "than sampling theory predicts, at least for small samples."[153]

The availability heuristic focuses on a person's ability to "assess the frequency . . . or the probability of an event by the ease with which instances or occurrences can be brought to mind."[154] For purposes here, primarily three concepts affect the availability of occurrences: retrievability, salience, and imaginability.[155] Retrievability deals with the degree to which a person is familiar with an event occurring—the more familiar the event is, the more available it is and the more likely it is to be recalled in the person's mind.[156] Salience refers to the idea that more prominent events will be more readily available. For example, the impact of seeing a giant tsunami destroy an entire town will have a greater impact on the "subjective probability" of the recurrence of such an event than if someone were to merely read about the event in a book.[157] Likewise, salience also occurs in relation to how recent the occurrence was observed—more recent occurrences are judged to be an indication of a higher frequency of happening.[158]

Where there are no retrievable or salient instances of an event occurring, people assess the likelihood of an event happening via imagination.[159] The ease or difficulty in imagining an event's occurrence affects the subjective probability that it will indeed occur. "[T]he risk involved in an undertaking may be grossly underestimated if some possible dangers are either difficult to conceive of, or simply do not come to mind."[160]

Finally, anchoring focuses on the heuristic that people make estimations based on the starting point or beginning value, and then adjust and come to a final

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[151] *Id.*

[152] *Belief in the Law of Small Numbers*, *supra* note 143, at 106.

[153] *Id.* at 105.

[154] *Judgment Under Uncertainty, supra* note 143, at 1127.

[155] *Id.*

[156] *Id.*

[157] *Id.*

[158] *Id.*

[159] *Id.*

[160] *Id.* at 1128.

determination.[161] Empirical data shows that "different starting points yield different estimates, which are biased toward the initial values."[162] The starting point, or initial frame, is likely to prevent the individual from considering an adjustment that significantly deviates from the initiating point, thereby leading to errors in judgment of probability and risk.[163]

At the end of their groundbreaking paper, Tversky and Kahneman argue that a "better understanding of these heuristics and of the biases to which they lead could improve judgments and decisions in situations of uncertainty."[164] Indeed, Taleb and Silver both suggest the same thing—we are not to be trusted with our own intuitive judgments about risk, uncertainty, and probability.

Related to the errors from human cognitive biases described by Tversky and Kahneman is the emerging research on cultural cognition. In some sense, these are two conflicting models for why people make irrational decisions and errors of risk assessment.[165] Professor Dan Kahan is the most recognized and prolific scholar on this topic and broke new ground in his application of this concept to legal and nonlegal fields. Cultural cognition concerns the

> tendency of individuals to fit their perceptions of risk and related factual beliefs to their shared moral evaluations . . . . The *cultural cognition thesis* asserts that individuals are psychologically disposed to believe that behavior they (and their peers) find honorable is socially beneficial and behavior they find base socially detrimental.[166]

Kahan and other theorists explain that the cultural cognition thesis derives from two related disciplines: anthropology and social psychology.[167] The cultural theory of risk advanced by Mary Douglas and Aaron Wildavsky identified a "typology of cultural worldviews."[168]

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[161] *Id.*

[162] *Id.*

[163] *Id.* at 1129.

[164] *Id.* at 1131.

[165] Dan M. Kahan et al., *The Tragedy of the Risk-Perception Commons: Culture Conflict, Rationality Conflict, and Climate Change* 213 (Cultural Cognition Project, Working Paper No. 89, 2011), https://www.law.upenn.edu/live/files/296-kahan-tragedy-of-the-riskperception1pdf [https://perma.cc/A2JG-NBXD].

[166] Dan M. Kahan et al., *Cultural Cognition of Scientific Consensus*, 14 J. RISK RES. 147, 149 (2011).

[167] Dan M. Kahan & Donald Braman, *Cultural Cognition and Public Policy*, 24 YALE L. & POL'Y REV. 149, 151–52 (2006).

[168] *Id.* at 153.

Figure 1. Cultural World Typology Based on Douglas' Grid/Group Classifications.

High Grid
(Strongly Hierarchical)

Low Group   **High Group**
(Strongly Individualistic)   **(Strongly Communitarian)**

Low Grid
(Strongly Egalitarian)
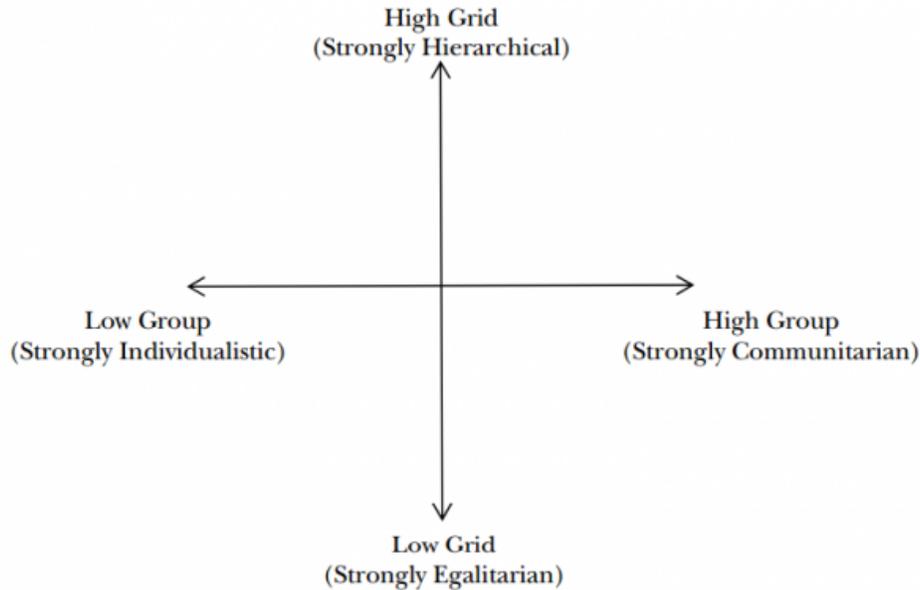
Professor David Jaros summarized the typology as follows:

Persons exhibiting a "high grid" worldview believe in a highly stratified society in which roles, resources, opportunities, and the like are distributed based on clear and generally immutable characteristics like gender, class, and lineage. Conversely, persons believing that such characteristics should have no bearing on the distribution of roles, resources, and opportunities have a "low grid," or egalitarian, worldview. A person with a "high group" worldview believes that society should be composed of interconnected, mutually supportive groups that share tasks and regularly interact with each other. A person with a "low group" perspective is highly individualistic and views the world as being composed of competitive individuals who are primarily responsible for their own well-being.[169]

Kahan asserts that the typology alone does not condition an individual's action or decision—social psychology fills that gap.[170] The basic premise is that cultural values shade our perceptions. One particular mechanism is "cognitive dissonance avoidance."[171] This psychological mechanism describes the significant difficulty for

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[169] David Jaros, *Flawed Conditions and the Politics of Crime*, 99 IOWA L. REV. 1473, 1480–81 (2014).

[170] Kahan & Braman, *supra* note 167, at 155.

[171] *Id.* at 157.

an individual to "entertain beliefs about what's harmless and what's harmful *that force one to renounce commitments and affiliations essential to one's identity.*"[172] Another key mechanism is "affect" which connects factual belief to cultural value.[173] Our subjective judgments about the degree of harm or danger in an activity are "informed by the visceral reactions those activities trigger."[174] Of course, those reactions, and whether they are good or bad, are largely informed by our cultural values.[175] Kahan argues that the last mechanism is the most important—group identity formation.[176] Formulations of risk are often difficult to make without the aid of others. These calculations are made more challenging when an individual is confronted with seemingly conflicting evidence. So individuals rely on those they trust to make the assessment and determine which risks are valid and dangerous as compared to those that are made up or not dangerous.[177] Kahan asserts that the people we trust are almost always those who tend to share the same worldview.[178] "[T]he belief-generative power of culture feed[s] on itself" resulting in the likelihood of increasingly insular groups that are ever-more polarized.[179]

The cultural cognition thesis is not without its critics. Dr. Sander van der Linden is a noted scholar and critic of viewing the cultural cognition thesis as the end-all guidepost for how to educate the public about climate change.[180] One of the significant claims made by Kahan is that who qualifies as an "expert" is in the eye of the beholder. For example, a preacher may be an expert in all things to a particular person—including climate change—given that person's cultural worldview typology and cultural frames. So, the thought experiment goes, that person will refuse to recognize the value of "scientific consensus" regarding climate change because scientists are not the experts they trust. Van der Linden disputes this claim and points to empirical studies showing the existence of scientific consensus as having a neutralizing effect on the politically polarized worldviews.[181]

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[172] *Id.* at 155 (emphasis added).

[173] *Id.*

[174] *Id.*

[175] *Id.*

[176] *Id.* at 155–56.

[177] *Id.* at 156.

[178] *Id.*

[179] *Id.*

[180] *See generally* Sander van der Linden, *The Social-Psychological Determinants of Climate Change Risk Perceptions: Towards a Comprehensive Model*, 41 ENVTL. PSYCHOL. 112 (2015); Sander van der Linden, *A Conceptual Critique of the Cultural Cognition Thesis*, 38 SCI. COMM. 128 (2016).

[181] *See generally* Stephan Lewandowsky et al., *The Pivotal Role of Perceived Scientific Consensus in Acceptance of Science*, 3 NATURE CLIMATE CHANGE 339 (2013), https://www.nature.com/articles/nclimate1720 [https://perma.cc/NV9L-3MJG]; *see* Sander van der Linden et al., *The Scientific Consensus on Climate Change as a Gateway Belief: Experimental Evidence*, 10 PLOS ONE 1, 6–8 (2015), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0118489 [https://perma.cc/2293-TNR9]; John Cook et al., *Neutralizing Misinformation Through Inoculation: Exposing Misleading Argumentation Techniques Reduces Their Influence*, 12 PLOS ONE 1, 10 (2017), https://journals.plos.org/

Dr. van der Linden also makes the broader critique that "in studying human behaviour, many explanations can and are likely to be simultaneously true. A more nuanced perspective that carefully integrates—rather than polarizes—well-established theories to evaluate what works, when, for whom, and in what context . . . ."[182] Finally, van der Linden argues that cultural cognition suffers from the fact that much of it is "sourced from western, educated, industrialized, rich, and democratic (WEIRD) populations, which has led to narrow views of both human culture and the sorts of communication strategies that are effective in practice."[183]

We make bad predictions by using heuristics to inform our understanding of the world we are trying to predict. We are influenced heavily by our own memories—our stories—in deciding what is and is not true. We see the world, subconsciously, through a veil of our own pre-existing cultural lens. We shape what we think is true and how risky something is based on how we see ourselves as members of a particular group. The empirical data from the findings point to no clear answers for advocates to deploy in shaping public policy or informing public opinion. There is one thread that links them all—the idea that people need a way to make an abstract concept concrete and personal while not threatening their core concepts of self-identification and culture. The most recent, salient, pervasive, and personal event for most Americans is the Subprime Mortgage Crisis. Using it as the frame for contextualizing the Climate Crisis presents a possible method for making people *feel* the consequences of inaction that connects to their cultural outlook.

IV. THE SUBPRIME MORTGAGE CRISIS

The "tsunami" that has defined the recent era of American political economy is the Subprime Mortgage Crisis. This Part examines that crisis through the lenses of prediction, narrative, and cognition. Because the Subprime Mortgage Crisis is technical, complex, and subject to specialized knowledge in the fields of economics, finance, risk management, and others, some background is necessary. Of course, there is little to no agreement about the actual causes—likely due to (as described earlier) the cognitive biases of the individuals telling the story.[184] But this Article

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plosone/article?id=10.1371/journal.pone.0175799 [https://perma.cc/X7R3-8W3M].

[182] Sander van der Linden, Opinion, *Culture Versus Cognition Is a False Dilemma*, 7 NATURE CLIMATE CHANGE 1, 1 (2017).

[183] *Id.*

[184] VIRAL V. ACHARYA & MATTHEW RICHARDSON, RESTORING FINANCIAL STABILITY 32 (2009) (noting that a potential cause of the Subprime Mortgage Crisis was the lack of regulation); Robert Hardaway, *The Great American Housing Bubble Re-Examining Cause and Effect*, 35 U. DAYTON L. REV. 33, 33–35 (2009); Adam J. Levitin & Susan M. Wachter, *Explaining the Housing Bubble*, 100 GEO. L.J. 1177, 1179 (2012); Robert T. Miller, *Morals in a Market Bubble*, 35 U. DAYTON L. REV. 113, 113 (2009); Eamonn K. Moran, *Wall Street Meets Main Street: Understanding the Financial Crisis*, 13 N.C. BANKING INST. 5, 20–22 (2009); Antony Page, *Revisiting the Causes of the Financial Crisis*, 47 IND. L. REV. 37, 37–38 (2014).

will attempt to sidestep the weeds of those debates by focusing on analyzing the problem of prediction and the accompanying narratives.

It started with mortgages offered to, and applied for by, borrowers that were not ideal candidates for home loans—i.e., *sub*prime.[185] Approved borrowers had many traits but were viewed as high risk, and the interest rate provided to them attempted to reflect that enhanced risk.[186] Most subprime loans were adjustable-rate mortgages (ARMs).[187] ARMs shift the risk of rate variation from the lending entity to the borrower. "Many borrowers obtained ARMs under the impression that they would be able to refinance at favorable terms before rising interest rates triggered the ARMs to reset."[188] Lending standards declined and entities expanded their use of the "infamous" NINJA loan, which "stood for 'No income, no job, no assets,' which meant that a potential borrower did not need to show any proof of income or assets in order to qualify for a loan—she merely needed to *state* her income and assets."[189]

In addition, the participants involved in the process of finding, applying for, and obtaining a mortgage increased. Enter the mortgage broker. "Mortgage brokers act as intermediaries between lenders and borrowers, and for a fee, help connect borrowers with various lenders that may provide a wider selection of mortgage products. In 2006, brokerages accounted for 58 percent of total origination activity."[190] All in all, subprime loans "represented over 20 percent of total loan-origination volume" at roughly 2.8 million home loans originated—a significant increase from 2001 when less than one million subprime loans were originated.[191]

A lot of subprime home loans were provided to people. This was potentially problematic but not necessarily ruinous to the American and world economy. Securitization of the mortgage industry, including subprime loans, exacerbated what was at stake. "Generally, securitization is 'the aggregation and pooling of assets with

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[185] Oren Bar-Gill, *The Law, Economics and Psychology of Subprime Mortgage Contracts*, 94 CORNELL L. REV. 1073, 1087–88 (2009); Kenneth C. Johnston et al., *The Subprime Morass: Past, Present, and Future*, 12 N.C. BANKING INST. 125, 131 (2008).

[186] Bar-Gill, *supra* note 185, at 1075; Richard M. Hynes, *Securitization, Agency Costs, and the Subprime Crisis*, 4 VA. L. & BUS. REV. 231, 233 (2009); Moran, *supra* note 184, at 22–23; Alexander S. Bonander, Note, *Fannie Mae, Freddie Mac, and Due-Diligence Failures: Should Comparative Responsibility Be Imposed on a Government-Sponsored Entity's Claims Brought Under Sections 11(a) and 12(a)(2) of the Securities Act of 1933?*, 98 IOWA L. REV. 835, 840 (2013).

[187] Johnston et al., *supra* note 185, at 126; Bar-Gill, *supra* note 185, at 1076.

[188] Johnston et al., *supra* note 185, at 126; Bar-Gill, *supra* note 185, at 1075; Steven L. Schwarcz, *The Future of Securitization*, 41 CONN. L. REV. 1313, 1317 (2009); Bonander, *supra* note 186, at 840.

[189] Kale Gans, Note, *Anatomy of a Mortgage Meltdown: The Story of the Subprime Crisis, the Role of Fraud, and the Efficacy of the Idaho Safe Act*, 48 IDAHO L. REV. 123, 131 (2011); *see also* Alan M. White, *The Case for Banning Subprime Mortgages*, 77 U. CIN. L. REV. 617, 634 (2008).

[190] Bar-Gill, *supra* note 185, at 1090 (citations omitted).

[191] *Id.* at 1089.

similar characteristics in such a way that investors may purchase interests or securities backed by those assets.'"[192] This allows assets to be "acquired, classified into pools, and offered as collateral for third-party investment."[193] Applied to the mortgage industry, an investment bank may purchase mortgages from an originator, pool the purchased loans, and separate out cash flows from the underlying mortgages into securities with tranches representing various levels of risk.[194] An exacerbation of this problem came in the form of incentivizing the selling off of mortgages to other entities, such that the initial "lenders did not have to live with the credit consequences of their loans."[195] The arranger responsible for structuring these securities organizes them this way so that investors may purchase different tiers, which are rated by credit rating agencies.[196]

The credit rating agencies are an essential player in the crisis.[197] Rating agencies emerged as indispensable players in the federal regulatory system because of the designation Nationally Recognized Statistical Ratings Organization (NRSRO).[198] Because federal regulations included "incentives for broker-dealers to hold debt that has received an investment-grade rating from at least two NRSROs and some regulated investors are limited to investing in securities rated investment-grade, obtaining this designation can be very valuable and profitable to any credit rating agency."[199] In addition, it goes without saying that the credit agency's rating is relied upon by investors.[200]

The "big three" credit rating agencies—Moody's, Standard and Poor's, and Fitch—are the most important here.[201] They also "dominated the field early on by being designated as NRSROs by the Securities and Exchange Commission . . . in 1975."[202] As of today, the SEC designates just ten agencies as NRSROs.[203] The

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[192] Bonander, *supra* note 186, at 841.

[193] Moran, *supra* note 184, at 32–33.

[194] *Id.* at 33; Richard E. Mendales, *Collateralized Explosive Devices: Why Securities Regulation Failed to Prevent the CDO Meltdown, and How to Fix It*, 2009 U. ILL. L. REV. 1359, 1367; Schwarcz, *supra* note 188, at 1316.

[195] Schwarcz, *supra* note 188, at 1319.

[196] Moran, *supra* note 184, at 33–34; Bonander, *supra* note 186, at 841.

[197] Jeffrey Manns, *Downgrading Rating Agency Reform*, 81 GEO. WASH. L. REV. 749, 754 (2013); Charles W. Murdock, *The Dodd–Frank Wall Street Reform and Consumer Protection Act: What Caused the Financial Crisis and Will Dodd–Frank Prevent Future Crises?*, 64 SMU L. REV. 1243, 1301 (2011); PRESIDENT'S WORKING GRP. ON FIN. MKTS., POLICY STATEMENT ON FINANCIAL MARKET DEVELOPMENTS 2 (2008), http://www.law.du.edu/images/uploads/presidents-working-group.pdf [https://perma.cc/L9 QS-HNMB] [hereinafter PWG MARCH POLICY STATEMENT].

[198] Caitlin M. Mulligan, Note, *From AAA to F: How the Credit Rating Agencies Failed America and What Can Be Done to Protect Investors*, 50 B.C. L. REV. 1275, 1277 (2009).

[199] *Id.* at 1278.

[200] *Id.* at 1278–79.

[201] Manns, *supra* note 197, at 758, 796, 799; Mendales, *supra* note 194, at 1373.

[202] Mulligan, *supra* note 198, at 1279.

[203] U.S. SEC. & EXCH. COMM'N, ANNUAL REPORT ON NATIONALLY RECOGNIZED STATISTICAL RATING ORGANIZATIONS 2 (2016), https://www.sec.gov/ocr/reportspubs/

development of the regulatory oversight of securities incorporated the NRSROs and relied upon their ratings—the NRSROs became a part of the federal regulatory structure.[204] In short, the ratings agencies continued to rate these mortgage backed securities (MBSs) and other collateralized debt obligations (CDOs) highly (i.e., not risky), despite the readily observable increase in foreclosure rates among subprime mortgage borrowers.[205] Credit rating agencies had a variety of reasons not to downgrade securities that they had previously rated highly.[206]

Because this Article focuses on predictions, uncertainty, and risk, Professor Antony Page nicely summarizes the principle aspect of the Subprime Mortgage Crisis at issue: "Risk, largely unobserved and linked to sub-prime mortgages and derivative securities that were based on them, built up in the financial system."[207]

A. Systematic Failure, Uncorrelated Risk Assessment

A catastrophic failure of prediction.[208]

Nobel laureate economist Joseph Stiglitz contends that the Subprime Mortgage Crisis occurred due to "system failure," defined as "when not just a single decision, but a cascade of decisions, produces a tragic result."[209] The concern, of course, with subprime mortgages is default. Borrowers might be ambitious and make a bad bet that either (1) home prices will continue to increase or (2) they will be able to refinance before the loan adjusts. Or borrowers might be (1) deceived by mortgage brokers or (2) unaware of the terms and associated risks of the ARM loan. Regardless of where the blame lies, borrowers' lives will be negatively impacted by their own default. Their neighbors' lives might be impacted in an indirect way by suffering a decrease in their fair-market-value home price.[210] Perhaps the community suffers by losing a member due to the borrower having to relocate. But the consequences of a single mortgage borrower defaulting are potentially very local; it certainly could not be described as "system failure." However, as the world knows all too well now, a narrowly confined and small-scale disruption is definitely not what resulted.

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annual-reports/2016-annual-report-on-nrsros.pdf [https://perma.cc/8AFX-J9JZ].

[204] Mendales, *supra* note 194, at 1374–75; Benjamin H. Brownlow, Note, *Rating Agency Reform: Preserving the Registered Market for Asset-Backed Securities*, 15 N.C. BANKING INST. 111, 114 (2011); Mulligan, *supra* note 198, at 1281–83.

[205] Olivia Schmid, Note, *Rebuilding the Fallen House of Cards: A New Approach to Regulating Credit Rating Agencies*, 2012 COLUM. BUS. L. REV. 994, 1008.

[206] Brownlow, *supra* note 204, at 121; Manns, *supra* note 197, at 760.

[207] Page, *supra* note 184, at 41.

[208] SILVER, *supra* note 73, at 19.

[209] Page, *supra* note 184, at 39.

[210] *See* A. Mechele Dickerson, *Sorting the Neighborhood*, 23 J. AFFORDABLE HOUSING & COMMUNITY DEV. L. 311, 326 (2015); John P. Relman, *Foreclosures, Integration, and the Future of the Fair Housing Act*, 41 IND. L. REV. 629, 645 (2008).

The leveraging of securities upon borrowers successfully paying their mortgage or refinancing in time to avoid default is what turned what could have been a local problem into a global problem. If one loan failed, a lot of other things were stacked on top of that loan. In addition, the failure of one borrower to pay her mortgage might be viewed as an isolated incident—bad luck for that person. Perhaps she lost her job. It is this inquiry—why the borrower defaulted—that Silver discusses in detail as a primary flaw in the credit rating agencies' assessment of risk.

Silver lists the mistakes that lead to bad predictions triggering the Subprime Mortgage Crisis—which also underlie all bad predictions: (1) focus on "signals" that conform to our preexisting view of the world, (2) ignoring of difficult-to-ascertain risks *even when* they "pose the greatest threat to our well-being," (3) use of shorthand to estimate and assume facts that are not true, and (4) strong disfavor of the existence of uncertainty.[211] Silver recounts Standard and Poor's (S&P's) advice to investors: "when [S&P's] rated a [CDO] at AAA, there was only a 0.12 percent probability—about 1 chance in 850—that it would fail to pay out over the next five years."[212] Silver found that, "[i]n fact, around 28 percent of the AAA-rated CDOs defaulted, according to S&P's internal figures . . . [which] means that the actual default rates for CDOs were more than two hundred times higher than S&P had predicted."[213]

The head of S&P, Deven Sharma, told Congress that "nobody saw it coming."[214] Sharma was wrong. Michael Lewis's book, *The Big Short*, details several people that did see the inherent problems and risky nature of these newly created MBSs and CDOs.[215] What did they do that the big three agencies did not do, or did not want to do?

Silver, legal scholars, and economists have all commented on the inherent conflicts of interest that lie at the base of the credit rating agencies' interaction with investment banks and their influence on the ratings that they provide.[216] At base, Silver contends that the models used by the agencies viewed the risk level of each tranche of a CDO as uncorrelated with the others. Back to the previous subprime borrower who defaulted, if she defaulted because she lost her job, that is one thing. Bad luck: a one-off event that has no bearing on the likelihood of default by the other subprime borrowers. "But suppose instead that there is some common factor that ties the fate of these homeowners together. For instance: there is a massive housing

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[211] SILVER, *supra* note 73, at 20.

[212] *Id.*

[213] *Id.* at 20–21 (internal citations and emphasis omitted).

[214] SILVER, *supra* note 73, at 22.

[215] *See generally* MICHAEL LEWIS, THE BIG SHORT (2011) (recounting the story of a small group of investors who did, in fact, anticipate the 2008 financial collapse).

[216] SILVER, *supra* note 73, at 24.

bubble that has caused home prices to rise by 80 percent without any tangible improvement in the fundamentals."[217] The ramifications of this are major. "Now you've got trouble: if one borrower defaults, the rest might succumb to the same problems."[218]

The Subprime Mortgage Crisis had a fair share of people who saw bad news coming—they saw the tide recede and the water begin to foam, and they took high cover. Some of them also made a mint. People like Meredith Whitney,[219] Steve Eisman,[220] and Michael Burry[221]—all of whom are well-documented in the Lewis's *The Big Short*—and Nouriel Roubini.[222] Many of them may have anticipated that the subprime mortgage loans would fail at great numbers, well beyond what the credit rating agencies predicted, but they could not have foreseen the shock waves that reached across the globe and into communities big and small. The scope, in other words, of the coming damage was difficult to predict, precisely because of the degree of complexity built into the financial system. Securitization bred this complexity and multiplied it through multilayered leveraging.

Taleb's book, *The Black Swan*, was published amid the Subprime Mortgage Crisis, but it is well-documented that he, like other main players in Lewis's book, shorted the market and made a significant sum of money.[223] A fundamental question is whether the Subprime Mortgage Crisis qualifies as a Black Swan event. For Taleb, the answer is easy—as is often the case.[224] No, the financial crisis was a "white swan."[225] Taleb goes much farther than Silver in criticizing the models used in the context of subprime loans and CDOs: "[t]he system used to analyze risk is completely defective, and actually could not keep up with the complexity of the financial products that are involved."[226] Because of the complexity of the system, and the failure to understand it, and the usage of oversimplified and narrow modeling practices, Taleb posits that these models provide a false sense of security by measuring the "known" and blinding us to the unknown—which will necessarily be

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[217] *Id.* at 28.

[218] *Id.*

[219] *See generally* THE BIG SHORT (Paramount Pictures 2015) (Whitney and her fellow investors anticipated the financial collapse and bet against the market, reaping substantial returns on their market shorts).

[220] *Id.*

[221] *Id.*

[222] S. Jhoanna Robledo, *The Descent*, N.Y. MAG. (Oct. 2, 2006), http://nymag.com/realestate/features/21675/ [https://perma.cc/3YL4-4TRZ].

[223] Joe Nocera, *Risk Management*, N.Y. TIMES MAG (Jan. 2, 2009), http://www.nytimes.com/2009/01/04/magazine/04risk-t.html [https://perma.cc/9ZEG-7CAA].

[224] For an in-depth analysis, see generally Nassim Nicholas Taleb & George A. Martin, *How to Prevent Other Financial Crises*, 32 SAIS REV. 49 (2012), http://www.fooledbyrandomness.com/sais.pdf [https://perma.cc/L769-GW2W].

[225] Morrison, *supra* note 32.

[226] *Id.*

absolutely devastating to the system.[227] The propagation of these models by persons or entities entitles them to one of Taleb's favorite labels: "intellectual charlatans."[228]

The models, predictions, and data that served the industry all, in some fashion, expected home prices to continue to appreciate. Subprime borrowers either (1) shared that assumption or (2) did not realize that they needed to share that assumption. Professor Steven Schwarcz has said that "[t]he failure of subprime mortgage securitization was thus caused by its almost absolute dependence on home appreciation."[229] To use Taleb's allegory, everyone acted like turkeys. *Moreover*, they thought that the past few years of home appreciation would serve as an accurate prediction of the future, *à la* Mediocristan. Instead, in March 2008, the American economy contained an estimated 8.8 million homeowners—almost 11 percent of all homeowners—who had zero or negative equity in their homes.[230] Two years later, unemployment had doubled,[231] and there was a record number of homes foreclosed—more than one million.[232] Thanksgiving Day had come, and we "incur[red] a revision of belief"[233] about our world.

B. Narrative Coherence in Economic Ruin

We focus on those signals that tell a story about the world as we would like it to be, not how it really is.[234]

Ever since the Subprime Mortgage Crisis, we have tried to explain it and understand it. An important narrative that arose in its aftermath consists of four simple words: "too big to fail."

The phrase "too big to fail" denotes "a firm that has become so large that the government cannot afford to let it fail because the consequences of its failure would be too severe."[235] The term recognizes and incorporates the vast leveraging that occurs in the financial sector as well as the systemic nature of finance. Stemming

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[227] Nocera, *supra* note 223.

[228] *Id.*

[229] Schwarcz, *supra* note 188, at 1317.

[230] Moran, *supra* note 184, at 31.

[231] *Databases, Tables & Calculators by Subject, Unemployment Rate,* BUREAU OF LABOR STATISTICS, U.S. DEP'T OF LABOR, https://data.bls.gov/timeseries/LNS14000000 [https://perma.cc/S23V-2LCY].

[232] Corbett B. Daly, *Home Foreclosures in 2010 Top 1 Million for First Time*, REUTERS (Jan. 13, 2011, 8:32 AM), http://www.reuters.com/article/us-usa-housing-foreclosures-idUSTRE70C0YD20110113 [https://perma.cc/9ATZ-VGRV].

[233] TALEB, *supra* note 30, at 40.

[234] SILVER, *supra* note 73, at 20.

[235] Kenneth C. Kettering, *Securitization and Its Discontents: The Dynamics of Financial Product Development*, 29 CARDOZO L. REV. 1553, 1633 (2008).

from this concept is one that is equally important as a narrative: moral hazard.[236]
Professor Mark Roe has explained it nicely:

> As is now well known, big financial firm managers have reason to accept
> otherwise too-large risks in too-big-to-fail financial firms: If the risk pays
> off, shareholders gain and managers get big bonuses. If the risk turns out
> badly, then shareholders and other financiers of the firm are unhappy, but
> the government will bail out many of them. This makes the downside for
> a too-big-to-fail financial firm not as unpleasant as it would be for a typical
> industrial firm, which would have to file for bankruptcy when a major risk
> turns out badly.[237]

These narratives are inherently coupled, and more importantly, they are not new
in the United States.[238] Of course, other narratives exist. From the political right, the
blame is laid squarely at the feet of big federal government involvement in the
financial markets.[239] Others have the view that there is plenty of blame to go
around.[240] Or, this entire crisis may be so complicated that, as the narrator in the film
version of *The Big Short* says about it and public understanding, "I'm guessing most
of you still don't know what really happened. Yeah, you've got a soundbite that you
repeat so you don't sound dumb, but c'mon."[241] The film acknowledges the idea that
the complexity and abstraction inherent in the crisis is so foreign and difficult that it

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[236] *Id.*; Lucian A. Bebchuk & Holger Spamann, *Regulating Bankers' Pay*, 98 GEO. L.J.
247, 267 (2010); Steven L. Schwarcz, *Systemic Risk*, 97 GEO. L.J. 193, 231 (2008).

[237] Mark J. Roe, *Structural Corporate Degradation Due to Too-Big-to-Fail Finance*,
162 U. PA. L. REV. 1419, 1426 (2014).

[238] *See generally* Carrie Stradley Lavargna, *Government-Sponsored Enterprises Are
"Too Big to Fail": Balancing Public and Private Interests*, 44 HASTINGS L.J. 991 (1993)
(arguing for a new standard of responsibility which balances public and private interests for
quasi-public corporations); Jonathan R. Macey & Geoffrey P. Miller, *Bank Failures, Risk
Monitoring, and the Market for Bank Control*, 88 COLUM. L. REV. 1153 (1988) (considering
causes and consequences of current bank failures and reforms to resolve problems and
strengthen the economy); Mark J. Roe, *Some Differences in Corporate Structure in
Germany, Japan, and the United States*, 102 YALE L.J. 1927, 1991 (1993) (arguing bank
solvency to be too important to risk deregulating banking); Dorit Samuel, *The Subprime
Mortgage Crisis: Will New Regulations Help Avoid Future Financial Debacles?*, 2 ALBANY
GOV'T L. REV. 217, 224 (2009) (explaining the common economic pattern which leads to
market crashes and subsequent government intervention); Arthur E. Wilmarth, Jr., *The
Transformation of the U.S. Financial Services Industry, 1975–2000: Competition,
Consolidation, and Increased Risks*, 2002 U. ILL. L. REV. 215 (calling for reform of financial
regulation to avoid risks which the current regulatory systems cannot control).

[239] Douglas J. Elliott & Martin Neil Baily, *Telling the Narrative of the Financial Crisis:
Not Just a Housing Bubble*, BROOOKINGS INST. (Nov. 23, 2009), https://www.brookings.edu/
wp-content/uploads/2016/06/1123_narrative_elliott_baily.pdf   [https://perma.cc/G6ZH-
UNU7].

[240] *Id.*

[241] THE BIG SHORT, *supra* note 219.

uses brief vignettes of celebrity cameos to explain certain important terms, like subprime, CDOs, and leverage.[242] These serve the purpose of making the narrative comprehensible.

The question becomes which narrative of fault and the predictability (or not) of failure is most compatible with our American *nomos*. There will be many answers to that, which likely depend on various factors such as political party affiliation, income level, geography, etc. But the narrative most likely to take hold will be one that resonates with individuals personally, via their experience in their *nomos*, to use Cover's term. The narrative must be congruent with that world or it will be discarded. The data, numbers, and statistics involved in the Subprime Mortgage Crisis serve to disassociate most people from the event. They are abstractions unless they resonate with that person—unless they are one of the unemployed or the foreclosed upon. If they are not, an alternative narrative takes hold and compels a different course of conduct consistent with that worldview. The question of which narrative has taken hold in the United States is beyond the scope of this Article. Moreover, it is likely that there are multiple narratives. The fractured view of the crisis, fault, and prediction impacts the legal and political response. If constituents are demanding different things because of their conception of the story of the crisis, then there will be a lack of clarity with respect to the objectives to be accomplished by any legal-reform efforts.

Narrative is essential to responding to a crisis while it is occurring, or preferably before it occurs. Without the narrative, the data alone does not demand human attention and action. But the narrative can shift from group to group, emphasizing different aspects of the events that comport with the listener's cultural outlook. The absence of a clear narrative breeds confusion and collective action problems and leaves a vacuum able to be filled by entities designed to create doubt. A clear and simple narrative, based on data, which connects with people's *nomos* and culture is instrumental in addressing crisis.

V. THE CLIMATE CRISIS

The hard science underlying anthropogenic climate change is much easier to understand than how a mortgage bond security is created. Also, in contrast to the Subprime Mortgage Crisis, *everyone agrees* that (1) climate change is occurring, and (2) we are the cause of it.[243] As the Intergovernmental Panel on Climate Change

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[242] *Id.*

[243] William R. L. Anderegg et al., *Expert Credibility in Climate Change*, 107 PROC. NAT'L ACAD. SCI. 12107, 12107–09 (2010); John Cook et al., *Consensus on Consensus: A Synthesis of Consensus Estimates on Human-Caused Global Warming*, 11 ENVTL. RES. LETTERS 1, 6 (2016); John Cook et al., *Quantifying the Consensus on Anthropogenic Global Warming in the Scientific Literature*, 8 ENVTL. RES. LETTERS 1, 6 (2013) ("The number of papers rejecting AGW [Anthropogenic, or human-caused, Global Warming] is a miniscule proportion of the published research, with the percentage slightly decreasing over time. Among papers expressing a position on AGW, an overwhelming percentage (97.2% based on self-ratings, 97.1% based on abstract ratings) endorses the scientific consensus on

(IPCC) [244] stated, "[h]uman influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system."[245] Furthermore, "It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century."[246]

A. Hard Science

Anthropogenic climate change is focused only on certain gases released into the atmosphere: carbon dioxide, methane, nitrous oxide, water vapor, and other man-made gases like chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).[247] When these gases are emitted into the atmosphere they "allow direct sunlight (relative shortwave energy) to reach the Earth's surface unimpeded."[248] This shortwave energy heats the surface and "longer-wave (infrared) energy (heat) is reradiated to the atmosphere."[249] The "greenhouse gases" absorb this longer-wave energy and prevent heat from the Earth's surface from returning to space.[250] It is contained in the lower atmosphere.[251]

The primary greenhouse gas at issue is carbon dioxide since humans produce so much of it. Once carbon dioxide is dispersed into the air, "it is repartitioned among the atmosphere, the ocean, and the near-surface materials of the land. That portion that remains in the atmosphere causes global warming and other forms of

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AGW."); Peter T. Doran & Maggie Kendall Zimmerman, *Examining the Scientific Consensus on Climate Change*, 90 EOS 22, 22 (2009); Naomi Oreskes, *The Scientific Consensus on Climate Change*, 306 SCIENCE 1686, 1686–87 (2004).

[244] The IPCC is the leading international body for the assessment of climate change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. In the same year, the UN General Assembly endorsed the action by WMO and UNEP in jointly establishing the IPCC. The IPCC reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It does not conduct any research nor does it monitor climate related data or parameters. *About the IPCC*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, https://www.ipcc.ch/organization/organization.shtml [https://perma.cc/L97A-BS39].

[245] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SUMMARY FOR POLICYMAKERS 15 (2013), http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf [https://perma.cc/763R-8TYL].

[246] *Id.* at 17.

[247] *What Are Greenhouse Gases?*, NAT'L CTRS. FOR ENVTL. INFO., https://www.ncdc.noaa.gov/monitoring-references/faq/greenhouse-gases.php [https://perma.cc/5BWS-X42M].

[248] *Id.*

[249] *Id.*

[250] *Id.*

[251] *Id.*

climate disruption, while that portion that enters the ocean causes ocean acidification."[252] Another reason to focus on carbon dioxide is that it stays in the atmosphere far longer than other greenhouse gases.[253] In contrast, methane, which is more potent, has an atmospheric life of only ten to twelve years.[254] Therefore, given that (1) humans produce a significant amount of carbon dioxide, (2) carbon dioxide is the most prominent greenhouse gas, and (3) it has the longest atmospheric lifespan, it is the focus of nearly all climate change mitigation solutions and strategies.

The Earth's climate is habitable for humans, but it is fragile—much like the American economy. It is also complex, like the American economy, such that a change which may seem small, can have unanticipated and significant consequences which stretch across the globe. Unless we understand *all* the rules governing that complex system, tinkering with it is quite dangerous given the magnitude of consequences that may result. The habitable climate is analogous to the American economy after the securitization of subprime mortgage loans—*everything* depended on the success or failure of the underlying loans—and in the context of the Climate Crisis, *everything* depends on the reduction in the release of greenhouse gases, particularly carbon dioxide. This parallels the description of networked risk[255] or systemic risk absent in so many of the predictions and models from the Subprime Mortgage Crisis.

B. Systematic Complexity and Legal Interdependence

Bedrock scientific principles hold that the range of habitable climates for human beings is limited and subject to change based on our actions. It is not simply the case that climate change will render an area of the world too hot to live in. The consequences of climate change go far beyond simply warming the planet to an uncomfortable degree. For example, the Subprime Mortgage Crisis did not just directly affect the defaulting subprime loan borrowers, it affected the administrative assistants and janitorial staff at Lehman Brothers as well as the thousands of tenants in foreclosed homes.[256] Those consequences were the ones no one saw coming. This

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[252] R.T. Pierrehumbert, *Cumulative Carbon and Just Allocation of the Global Carbon Commons*, 13 CHI. J. INT'L L. 527, 528 (2013).

[253] The atmospheric life of carbon dioxide is longer than methane, but measuring its exact lifespan is difficult. Indeed, in *Atmospheric Lifetime of Fossil Fuel Carbon Dioxide*, the authors state that "[t]he fate and lifetime of fossil fuel CO2 released to the atmosphere is not inherently scientifically controversial, but the packaging of this information for public consumption is strewn with such confusion." David Archer et al., *Atmospheric Lifetime of Fossil Fuel Carbon Dioxide*, 37 ANN. REV. EARTH & PLANETARY SCI. 117, 118 (2009); *see also* Pierrehumbert, *supra* note 252, at 529–30.

[254] *Methane*, NAT'L CTRS. FOR ENVTL. INFO., https://www.ncdc.noaa.gov/monitoring-references/faq/greenhouse-gases.php [https://perma.cc/5BWS-X42M] (click CH4).

[255] *See* Ruhl & Katz, *supra* note 40, at 234–35.

[256] Vicki Been & Allegra Glashausser, *Tenants: Innocent Victims of the Nation's Foreclosure Crisis*, 2 ALBANY GOV'T L. REV. 1, 2–7 (2009).

Section examines one particular consequence that we can expect to see due to the failure to respond to climate change.

The increase in global temperature already has, and will continue to have, an effect on water resources.[257] Three primary areas of water resources will be impacted by temperature increase. Surface water evaporation will be enhanced.[258] Snowpack accumulation, location, and timing will be modified.[259] And weather patterns will change—resulting in drought intensification.[260] Changes to the availability of water resources—groundwater, surface water, rainfall, and snowpack—shake the foundation of communities because the systems of water resources regulation have been built upon the idea of stationarity. Examining the law's reliance on this concept is critical.

Stationarity, as used here, refers to "the idea that natural systems fluctuate within an unchanging envelope of variability."[261] This means that any variable, like stream flows in a river, has a time-*invariant* function that allows for future planning to be done based on past measurements.[262] Some scientists assert that, in the context of water management, "stationarity is dead" and anthropogenic climate change killed it.[263] It is intuitive to see the problems that can arise when the Farmer's Almanac is no longer very good at predicting rainfall for a given region. That makes the farmers' jobs harder and riskier. But this idea, that stationarity is unreliable, is more important when water resources are placed in the context of law and regulation. This is because the legal system of water resources control operates to foster reliance in the minds of people and communities across the planet. The fostering of this reliance parallels the concept of leverage in the Subprime Mortgage Crisis. Since the past is no longer a reliable data set to utilize in planning for the future in the context of water resources, the indirect consequences have an undefined reach and degree.

The changes that come with temperature increase are bad enough by themselves. Indeed, the water-climate nexus is another example of how leveraged our climate is. But the effects are exacerbated when they are situated within the legal context of water resources use and regulation. Thus, you have physical problems and legal problems. All water resources are subject to some degree of state, federal,

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[257] *See* C.K. FOLLAND ET AL., CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS 105–20, 130–33 (J.T. Houghton et al. eds., 2001); Kathleen A. Miller, *Grappling with Uncertainty: Water Planning and Policy in a Changing Climate*, 5 ENVTL. & ENERGY L. & POL'Y J. 395, 396 (2010).

[258] C.K. FOLLAND ET AL., *supra* note 257, at 119–20.

[259] *Id.* at 92–96.

[260] *Id.* at 97, 105.

[261] P.C.D. Milly et al., *Stationarity Is Dead: Whither Water Management?*, 319 SCIENCE 573, 573 (2008).

[262] *Id.*

[263] *Id.*

or tribal sovereign control.[264] Water law is generally divided into two categories: surface water and groundwater. Each category is subject to potentially different rules regarding ownership and use of the water resource.[265] For surface water, a typical state uses either riparian principles from English common law[266] or the doctrine of prior appropriation from American common law as legal structures.[267] Furthermore, water law generally exists within the realm of state law.[268] Even where the watercourse, like the Mississippi River, traverses multiple states, each sovereign has the authority to regulate that portion of the river running through its boundaries. The same goes for groundwater aquifers—like the Ogallala Aquifer, which underlies eight states—where water located in a common underground pool will be subject to different legal and regulatory structures.[269] This fact of state regulatory control over common-pool resources (CPRs) already produces difficulties in the context of regulating a watercourse sustainably. One jurisdiction may have a different view of what amount of water may be diverted without undermining the long-term supply of water in the watercourse. However, this is a problem symptomatic of regulating all CPRs.[270]

The fundamental problem with water law is that it imposes an inflexible property-rights regime on an inherently variable resource. It attempts to create certainty out of uncertainty. This presents problems that water-scarce areas already understand all too well. Under the doctrine of prior appropriation, the first person to put water to a beneficial use obtains a property right in the continuation of that use in the amount actually used.[271] So long as it is used beneficially, that right may not be abridged absent eminent domain, prescription, or abandonment or forfeiture. The same goes for a riparian landowner's use of water; as long as no harm is caused to

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[264] Joseph W. Dellapenna, *The Evolution of Riparianism in the United States*, 95 MARQ. L. REV. 53, 83 (2011); Jane Marx et al., *Tribal Jurisdiction over Reservation Water Quality and Quantity*, 43 S.D. L. REV. 315, 316 (1998).

[265] *See* Dellapenna, *supra* note 264, at 68.

[266] *See* Lynda L. Butler, *Allocating Consumptive Water Rights in a Riparian Jurisdiction: Defining the Relationship Between Public and Private Interests*, 47 U. PITT. L. REV. 95, 95, 172 n.197 (1985); Dellapenna, *supra* note 264, at 53–55; Christopher L. Len, *Synthesis—A Brand New Water Law*, 8 U. DENV. WATER L. REV. 55, 56–60 (2004).

[267] *See* Lawrence J. MacDonnell, *Prior Appropriation: A Reassessment*, 18 U. DENV. WATER L. REV. 228, 229 (2015); Janet C. Neuman, *Beneficial Use, Waste, and Forfeiture: The Inefficient Search for Efficiency in Western Water Use*, 28 ENVTL. L. 919, 920, 963–64 (1998); Joseph L. Sax, *The Constitution, Property Rights and the Future of Water Law*, 61 U. COLO. L. REV. 257, 268 (1990); Michael Toll, *Reimagining Western Water Law: Time-Limited Water Right Permits Based on a Comprehensive Beneficial Use Doctrine*, 82 U. COLO. L. REV. 595, 596–97 (2011).

[268] *See* Dellapenna, *supra* note 264, at 53; *but see* Robert T. Anderson, *Water Rights, Water Quality, and Regulatory Jurisdiction in Indian Country*, 34 STAN. ENVTL. L.J. 195, 196 (2015).

[269] *See* M. Alexander Pearl, *Tragedy of the Vital Commons*, 45 ENVTL. L. 1021, 1023, 1043 (2015).

[270] *Id.* at 1023–24, 1056–57.

[271] *See* Neuman, *supra* note 267, at 920.

other riparian owners, the use may continue.[272] These concepts are rooted in real property law—the use and enjoyment of property and the bundle of entitlements that come with ownership. Those property entitlements work perfectly well in the context of land, which does not move, evaporate, or cease to exist if sufficient rainfall or snowmelt does not materialize.

The implicit and well-founded assumption is that each morning when a real property owner wakes up and looks out her window, her property will still be there. The structure functions nicely by setting clear bright lines and well-defined rights that are separable and alienable. This, however, is not the *actual* state of things in the context of water resources. Perhaps such an approach functioned well in the water plentiful eastern United States, but not so in the West where water is scarcer. The problem of water scarcity that westerners have grown up with is exacerbated by anthropogenic climate change. Uncertainty about the quantity and timing of rainfall and snowpack increases with climate change magnifying the inherent flaws in the property-rights structure applied to water resources. The legal paradigm for control and regulation of water resources is built upon the property-rights paradigm. This is leverage; and the measure of the indirect negative consequences is hard to fathom, akin to the indirect and severe consequences which stemmed from the defaulting subprime borrowers.

In the context of climate change, the nexus for the existence of a reliable water supply, food security, reliable weather patterns, and human health is Earth's habitable climate. In prior work, I described certain watercourses and aquifers as a type of CPR. I have written about certain types of CPRs that warrant special attention, called vital commons.[273] The Earth's habitable climate is a vital commons. A vital commons is one in which:

> 1) the benefits of the CPR are internalized by nearly all members of a given massive population; 2) the costs of the CPR's depletion are externalized among nearly all members of that same massive population; 3) augmentation or depletion of the CPR by one party affects the ability to use the CPR by another party within the same massive population; 4) the CPR itself is necessary for sustenance; and 5) damage or depletion of the CPR is non-remediable or extremely difficult to correct.[274]

The habitable climate meets the above definition. Garrett Hardin's iconic work, *The Tragedy of the Commons*, provides a helpful and clear illustration.[275] Imagine a

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[272] Dellapenna, *supra* note 264, at 54. Under common property systems like riparian rights, co-owners are left to their individual judgements to decide whether, when, and how to use the resource. Collective decision-making, operating through courts, only becomes involved when one use directly interferes with another, with such disputes being decided according to the reasonableness of the competing uses.

[273] *See* Pearl, *supra* note 269, at 1024.

[274] *Id.* at 1022, 1041.

[275] *See generally* Garrett Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243 (1968).

common pasture used by a number of ranchers.[276] Each person lets her cattle graze on the pasture.[277] When a rancher adds a cow, she internalizes the benefit of that addition because she is able to sell the cow and claim the profit.[278] This simultaneously imposes a cost on the pasture by reducing the grass available for consumption.[279] She certainly bears some of that cost but so do all other ranchers in equal share.[280] The cost she imposes by adding the cow is externalized to the community.[281] Hardin claims that the economically rational action—adding cows— necessarily means ruin for the common pasture.[282]

Harold Demsetz argued that in the above commons example the regime of private-property rights solves the problem of exhausting common pool resources.[283] Private property solves the tragedy of the commons by conferring the right to exclude among all members of the former commons.[284] In theory, Demsetz asserts that landowners will want to preserve the natural resource for their future generations and use it in accordance with that goal.[285] They will not allow neighbors to use their scarce resource; instead, they will manage it prudently to ensure sustainable use.[286] Whether this idea is born out in CPRs generally is not the inquiry here. It is not even an option in the context of this vital commons. There is no method of privatizing a nation's portion of the habitable climate. To pick up the common pasture example, it is as if the United States (a neighbor in the commons pasture) has sent a herd of cattle onto the property of Guatemala and the Guatemalans can do nothing about it.

The global habitable commons is nonprivatizable. As Professor Sarah Krakoff has said, "[t]he atmosphere is a global commons; no matter where in the world you are, your emissions contribute to its increasing insulating properties."[287] She states that the habitable commons "cannot be compartmentalized."[288] She goes on,

> For example, the fact that the United States has the highest historical greenhouse gas emissions does not mean that our atmosphere is "thicker" and that we will suffer from global warming proportionately more than other countries. The spatial dispersion also means that reductions in one

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[276] *Id.* at 1244.

[277] *Id.*

[278] *Id.*

[279] *Id.*

[280] *Id.*

[281] *Id.*

[282] *Id.*

[283] Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347, 355 (1967).

[284] *Id.*

[285] *Id.*

[286] *Id.*

[287] Sarah Krakoff, *American Indians, Climate Change, and Ethics for a Warming World*, 85 DENV. U. L. REV. 865, 866 (2008).

[288] *Id.*

part of the globe can be rendered meaningless by increases in another part of the globe. If the total parts per million of CO2 continue to rise overall, it does not matter where the parts come from. This spatial dispersion feature of global warming means that disparate effects from climate change cannot be redressed by targeting the emitters closest to the affected area.[289]

In the context of Hardin's ordinary pasture, overuse and exhaustion would force the population to, perhaps, move elsewhere. In contrast, overuse of the vital commons does not simply result in the rancher moving to the city and working at a factory or selling insurance. Exhaustion of the vital commons *is* the Climate Crisis. There is nowhere else—save for Mars or the Moon—for us to go.

There are two legal responses that attempt to avoid the Climate Crisis: litigation and regulation. A recent and prominent case that goes directly to the challenges of litigation to effectively reduce carbon emissions is *Native Village of Kivalina v. ExxonMobil Corp.*[290] Kivalina is a sovereign federally recognized Indian tribe located 625 miles northwest of Anchorage, Alaska.[291] The Village is located within a six-and-a-half-mile barrier reef island seventy miles north of the Arctic Circle.[292] Four hundred people live there, almost all of whom are native Inupiat.[293] They carry on the traditions of the generations that came before them, engaging in subsistence fishing, whaling, and hunting to sustain themselves.[294] Kivalina has withstood harsh weather because of the sea ice formations that protect the Village from storms and also serve as the land upon which structures are built.[295]

The sea ice is melting faster and faster in the region thereby exposing the Village to greater storms and an increased risk that floods will wipe out the Village.[296] Moreover, significant erosion of the sea ice has resulted in the loss of land.[297] In 2009, Kivalina filed a claim in federal court against a group of energy companies that produce carbon emissions, arguing that it constituted a public

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[289] *Id.* (citation omitted).

[290] Native Vill. of Kivalina v. ExxonMobil Corp., 696 F.3d 849, 853 (9th Cir. 2012).

[291] *Community Planning Grants: Kivalina*, DEP'T COM., COMMUNITY, AND ECON. DEV.: COMMUNITY & REGIONAL AFF., https://www.commerce.alaska.gov/web/dcra/Plan ningLandManagement/ACCIMP/CommunityPlanningGrants/KivalinaCPG.aspx [https:// perma.cc/G89U-3A9J].

[292] *Kivalina*, NANA REGIONAL CORP., http://nana.com/regional/about-us/overview-of-region/kivalina/ [https://perma.cc/QZ9T-F576].

[293] *Our People*, NANA REGIONAL CORP., http://nana-dev.com/about/our_people/ [https://perma.cc/DF5Z-9MWX].

[294] Madeline Stano, *Fighting for Home in the Melting Arctic*, 15 VT. J. ENVTL. L. 744, 745 (2014).

[295] *Id.*; Nicole Johnson, Native Village of Kivalina v. Exxonmobil Corp*: Say Goodbye to Federal Public Nuisance Claims for Greenhouse Gas Emissions*, 40 ECOLOGY L.Q. 557, 558 (2013).

[296] Stano, *supra* note 294, at 746.

[297] *Id.*

nuisance.[298] The District Court held that the Village lacked Article III standing because it "could not demonstrate either a 'substantial likelihood' that defendants' conduct caused plaintiff's injury nor that the 'seed' of its injury could be traced to any of the Energy Producers."[299] The Ninth Circuit affirmed the dismissal of Kivalina's case by holding that the Clean Air Act had preempted the Village's federal common public nuisance claim.[300]

Kivalina's suit demonstrates the immense difficulty confronting plaintiffs seeking to directly hold carbon emitters responsible for contributions to climate change. Causation will always be a significant hurdle given the science of climate change. In addition, fashioning a remedy can be challenging. The ideal remedy would not amount to damages but would be calculated by reference to the rehabilitative costs and measures that must be undertaken to unwind the emission of greenhouse gases—itself a difficult scientific and technologic problem.

The prevailing administrative and legislative approaches to protecting the habitable commons focuses on regulating carbon emissions. This Article is not focused on which solutions are the best; but all regulatory approaches seek, in some fashion, to price carbon based on the anticipated cost of a warmer climate on the future populations that must endure it. The problem, of course, is that political representatives must be moved by their constituents to address these concerns—which, as demonstrated above, is why nothing has been done. Americans are not demanding change as there is a decided lack of urgency in their minds regarding the uncertainty and risk of a warmer world.

C. Predicting the End of the Anthropocene

The greatest concern over the effects of climate change centers on uncertainty—uncertainty in when they will occur or start to occur, how grave they will be, and the regions to be affected by them.[301] A primary source for collecting the various modeling on climate change is the Intergovernmental Panel on Climate Change (IPCC)—the international organization that sets out the positions of the scientific community.

The IPCC has produced Representative Concentration Pathways (RCPs) whose "primary purpose is to provide time-dependent projections of atmospheric

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[298] Native Vill. of Kivalina v. ExxonMobil Corp., 696 F.3d 849, 854 (9th Cir. 2012).

[299] *Id.*

[300] *Id.* at 856.

[301] FOLLAND ET AL., *supra* note 257, at 119–23; Alejandro E. Camacho, *Adapting Governance to Climate Change: Managing Uncertainty Through a Learning Infrastructure*, 59 EMORY L.J. 1, 10–15 (2009); Walter W. Immerzeel et al., *Climate Change Will Affect the Asian Water Towers*, 328 SCIENCE 1382, 1384 (2010); Yasir Mohamed & H. H. G. Savenije, *Impact of Climate Variability on the Hydrology of the Sudd Wetland: Signals Derived from Long Term (1900–2000) Water Balance Computations*, 22 WETLANDS ECOLOGY MGMT. 191, 195–96 (2014).

greenhouse gas concentrations."[302] The RCPs will encourage conversation that integrate the many facets of climate change—social, economic, etc.—so that new literature may emerge that connects our emissions goals with humanities' choices of action.[303] The IPCC technical summary explains that the RCPs are intended to be "representative of plausible alternative scenarios for the future but are not predictions or forecasts of future outcomes."[304] This caveat is important—it serves to explain what the RCPs are doing. They function as guides to describe the range of plausible ramifications of carbon emissions under certain scenarios of carbon dioxide emissions.

In other words, the RCPs are not akin to the credit rating agencies' AAA rating which purported to make a prediction about the chance a security would fail. As Silver described, complex systems where the rules are not well understood are much more likely to produce errors when describing the future. The IPCC appears to agree on this point by expressly disclaiming any conception that it is predicting what will happen. To be sure, there are models that do try to predict temperature increase and sea level rise due to anthropogenic climate change, but they serve a different function than the RCPs. However, even those models appear to underestimate the temperature increase sustained by anthropogenic climate change.[305]

To use Taleb's language, the IPCC acknowledges that it is operating in Extremistan, and not Mediocristan. Given that the field of operation is inherently complex and therefore difficult to predict, one could question the value of the RCPs. In the context of climate models that *do* seek to predict, with some degree of specificity, temperature increase, one could argue that the great complexity and uncertainty about causation should compel no urgency to act immediately. However, Taleb himself would strongly disagree with that approach. He—and his coauthors— argue that much of the current debate about emissions limitations wrongly focuses on the accuracy of warming scenarios and predictions.[306] This results in opponents of climate change mitigation demanding proof that future events will occur exactly as the models predict, while proponents of emission mitigation use them as the basis for demanding aggressive immediate action.[307] Taleb rejects the binary choice presented and argues that this misframes the issue. Instead, we should focus on risk and ask, "what would the correct policy be if we had no reliable models?"[308] He

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[302] RICHARD MOSS ET AL., INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, TOWARDS NEW SCENARIOS FOR ANALYSIS OF EMISSIONS, CLIMATE CHANGE, IMPACTS, AND RESPONSE STRATEGIES: IPCC EXPERT MEETING REPORT 10–12 (2007).

[303] *Id.* at 9.

[304] *Id.* at 43.

[305] Keynyn Brysse et al., *Climate Change Prediction: Erring on the Side of Least Drama?*, 23 GLOBAL ENVTL. CHANGE 327, 328 (2013).

[306] Joseph Norman et al., Forum, *Climate Models and Precautionary Measures*, 2015 ISSUES IN SCI. & TECH. 15, https://static1.squarespace.com/static/5b68a4e4a2772c2a206180 a1/t/5c0837c1cd8366b6e610859f/1544042434339/sum15.pdf   [https://perma.cc/YT69-JZUE].

[307] *Id.*

[308] *Id.*

reasons that we have only one planet and really only one version of the planet that is habitable for us.[309] "This fact radically constrains the kinds of risks that are appropriate to take at a large scale. Even a risk with a very low probability becomes unacceptable when it affects all of us—there is no reversing mistakes of that magnitude."[310]

Taleb reasons that since we understand the basic scientific principle that carbon dioxide "destabiliz[es] the climate" the integral nature of that resource to human life compels the conclusion to reduce *regardless* of what any model says.[311] No prediction is necessary since the simple rule—that carbon dioxide reaches the atmosphere and warms the planet—is the only principle necessary to compel the conclusion. This avoids the complexity and error in predictions and forecasts by rendering them irrelevant for policy purposes. It is precisely the complexity of the habitable climate system that drives this heightened concern of the uncertainty associated with the scale of the effect. "It is the degree of opacity and uncertainty in a system, as well as asymmetry in effect, rather than specific model predictions, that should drive the precautionary measures. Push a complex system too far and it will not come back."[312]

The Climate Crisis is a white swan; it is foreseeable in the same way that Taleb viewed the Subprime Mortgage Crisis as a white swan. It is a white swan because the adverse consequences are dictated by simple, scientific rules that are always true. There is more to explain though. Professor Baradaran has stated that "it is . . . difficult to imagine a severe crisis when one has not occurred in the recent past."[313] She references the phrase "Disaster Myopia"—the idea that we have a "propensity to underestimate the probability of adverse outcomes, in particular small probability events from the distant past."[314] A habitable climate ending event is unimaginable, unless you are a dinosaur, therefore the application to climate change is apt. The research describing this problem of distance is significant and does not necessarily provide a clear antidote.[315] Research indicates that "proximising" climate change—framing the effects of climate change as currently occurring rather than anticipated in the future—does not automatically translate into urgency to act.[316] Furthermore, proximising climate change increases the likelihood of creating fear, which can slow the motivation to engage in solutions.[317]

This reinforces the ideas described in human cognition and the lessons learned from Kahneman, Tversky, Kahan, and van der Linden. Ultimately, and in a variety

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[309] *Id.*

[310] *Id.*

[311] *Id.*

[312] *Id.*

[313] Baradaran, *supra* note 36, at 1280.

[314] *Id.* (internal citations and quotations omitted).

[315] Brugger et al., *"Proximising" Climate Change Reconsidered: A Construal Level Theory Perspective*, 46 J. ENVTL. PSYCHOL. 125–42 (2016).

[316] *Id.*

[317] *Id.*

of contexts, "[T]ime is at the heart of understanding climate change."[318] The challenge is undoing Disaster Myopia; except it is so ingrained in our psychology. "The human brain developed in a time when humans were largely concerned with their direct environment (e.g., foraging for food) and immediate dangers (e.g., from predators)."[319] We are evolutionarily conditioned to focus on emphasizing "short-term consequences of behavior and immediate futures."[320] Furthermore, "psychological discounting" research shows that we place less value on events that occur in the future as opposed to in the present.[321] This is particularly true of our perceptions of future environmental consequences.[322]

I argue that while there is no clear-cut empirically supported theory of the magic bullet for climate communication, some harmony may be achieved in stitching together these pieces of research. Fundamentally, this is about improving science communication around the concepts of risk, harm, and uncertainty. Except the communication should not focus on those aspects of climate change. Instead, the development of an appropriate narrative could facilitate the conception of the world in a manner consistent with the scientific understanding of climate change risk. The narrative could function in two ways: first, it could operate to challenge the longstanding perceptions of the world thereby resulting in a change of the individual's behavior or, second, the salience of the narrative could replace the preexisting conceptions of the world with different and more recent stories that compel *action* rather than inaction.

We know that reading about a house burning down will be less effective in compelling the purchase of fire insurance than watching your neighbor's house burn down. This is the availability heuristic described by Tversky and Kahneman. But, the availability heuristic dovetails with Disaster Myopia. Generations of people have only the memory of a world that, while it fluctuates in temperature, is never too hot to live in. Therefore, the easiest memories to recall are ones that tell us everything will be fine. They create an expectation that things will be correct to the norm in the future—because that is the way the world has always worked. In addition, one particular person's experience (even a multigenerational one) is an example of Tversky and Kahneman's Law of Small Numbers. Take, for example, a theoretical rural community predominantly engaged in the practice of farming or ranching. The rural farmer within the community is one sample. His neighbors do not really operate to broaden the sample. His experience and his beliefs are representative of the experience of most other people. The other farmers do not really function to broaden the sample size in any statistically significant way. In the scope of the global population, these "random samples" the farmer contacts—local farmers—all have similar experiences. This compels the belief that their experience—of an incredibly

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[318] Sabine Pahl et al., *Perceptions of Time in Relation to Climate Change,* 5 WIRES CLIMATE CHANGE 375, 375–88 (2014).

[319] *Id.* at 376.

[320] *Id.*

[321] *Id.* at 380–81.

[322] *Id.* at 380.

and nonrepresentative small sample size—is attributable to the much larger population of people, including those in Kivalina whose houses are falling into the ocean. The idea that Kivalina might be falling into the ocean is incomprehensible to them given their heuristic biases. But this is not their perception; it is inconsistent with everything they know to be true about the world. This is the availability heuristic at work. His experience is closest to him, easiest to recall, and most prominent in his mind.

D. Solutions and Narrative

[T]he highest use and greatest facility of narrative is as an iconoclastic tool of persuasion to legal and social change.[323]

The need for a narrative is clear. As Taleb states—albeit condescendingly so—it allows us to understand (or at least have the illusion of understanding) our world and surroundings.[324] The Climate Crisis is based on hard science and the simple rule that carbon dioxide stays in the atmosphere and warms the earth. But the climate-change narrative is defined by high-level mathematics, forecasting, and scientific principles. We know that there is a problem with scientific communication. A significant portion of the population is not science-literate or math-literate, let alone able to understand (or interested in) an explanation of Bayesian statistical theory. Although the scientific principles underlying the Climate Crisis are clear and simple, their adverse ramifications are complex, systemic, multilayered, and—in some respects—uncertain. In other words, the consequences of the Climate Crisis *will be bad*. But we do not know *how bad* they will be, and we cannot exactly forecast *when and where they will be that bad*. This psychological distance compounds the difficulty in translating the risks to the public.

Part of the problem lies in the fact that the current narrative concerning climate is defined by (1) statistics, data, and numbers or (2) the distant future will be terrible. Both concepts are as abstract as legal principles like the Rule Against Perpetuities. What the scientists are telling us—that our planet is in grave danger—directly contradicts our current understanding of the world as well as our learned experience up to this point—our *nomos* and heuristics. Our *nomos* leaves no room for the possibility that the world would end, even gradually so, like a frog perishing in a pot of increasingly boiling water. Disaster Myopia certainly captures this idea. Furthermore, our evolutionary development has conditioned us to prioritize short-term consequences. Even if people can properly weigh the long-term risks, there is no narrative for the extinction-level circumstance on Earth—that memory is not *available* to us. In simplified parabolic form, we are all turkeys and the butcher has not yet come for us. In addition, this country has experienced a variety of purported world-ending crises—such as the depletion of the ozone layer and the gas crisis of the late 1970s and 1980s. All those so-called crises turned out not to be crises at all.

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[323] Winter, *supra* note 127, at 2228.
[324] TALEB, *supra* note 30, at xxvii.

Much of the population may adhere to the narrative that scientists cry wolf a lot, and why should we believe them now?

Steven Pinker has said that "narratives without statistics are blind, [and] statistics without narratives are empty."[325] We need a clear narrative, relatable to as many people as possible. The research described presents a series of conflicting, overlapping, and interrelated findings that prevent the identification of a single narrative. We do not need more facts in communicating climate change. No more stories about polar bears and Arctic sea ice. No more charts about the dangers of a two-degree Celsius increase in temperature. Because we know that when someone hears that the climate is getting warmer, they think, "Great, I hate the cold!" or, "I guess I'll wear shorts in early March instead of jeans." The actual amount of increase in degrees makes matters worse because it seems inconsequential to the average person. Many Americans are not necessarily science literate enough to understand the consequences to the water-climate-food nexus of that increase in temperature. Plus, under Kahan's Cultural Cognition Thesis, it does not matter—what matters is their collective identity adoption.

Kahan set out to test these various explanations of why people do not perceive the risks of climate change. Does improving science literacy aid in moving an individual to believe in climate change? Does preventing the operation of heuristics make it more likely that an individual will believe in climate change? Or is it all dependent upon whether an individual's cultural identity group believes in it? In Kahan's empirical work, the results demonstrate that when science literacy is improved—meaning that respondents are able to articulate and comprehend the scientific basis for climate change—respondents' concern over the risks of climate change *decreased*.[326] The same was true when respondents were tested on the basis of the operation of heuristics—as respondents decreased reliance on heuristics, the perception of the risks of climate change also decreased.[327] However, when Kahan tested the cultural cognition thesis, there was a clear correlation along the cultural worldview typology developed by Douglas. Those with "Low Grid and High Group" typologies believed climate change was a significant concern while those with "High Grid and Low Group" typologies did not.[328] Kahan's ultimate recommendation concerns the "science of science communication." In conveying messaging about climate change, scientists have done the data and predictions well, but the messaging should be mindful of the cultural barriers that exist among individuals.[329]

In light of all this, it makes sense then, that the average member of the public does not immediately go out and buy LED bulbs, finance a Tesla Model S, and call a solar panel installation company. People care about themselves. Moreover, they care about themselves *now*. There is no perceived urgency and even if things will be very bad in the future, we worry about that then. We must focus on what people are

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[325] STEVEN PINKER, THE BETTER ANGELS OF OUR NATURE 193 (2012).
[326] Kahan et al., *supra* note 165, at 4–5.
[327] *Id.*
[328] *Id.*
[329] *Id.*

moved by. That is an incredibly difficult question to answer, but it is essential to our survival. This is a problem of advocacy, not of legal solution-making, regulatory drafting, or technological innovation. The challenge concerns how to resonate with people in order to move them to change. Whatever legal and regulatory mechanism is employed, they all function similarly—to force carbon emissions producers/users to internalize the costs of carbon emissions that are currently externalized to the globe and future global inhabitants. What helps us in developing an advocacy strategy is that we know a great deal about attitudes concerning climate change.

The Yale Program on Communication and Climate Change (YPCC) provides vast amounts of data about American attitudes concerning climate change.[330] The YPCC "conduct[s] scientific research on public climate change knowledge, attitudes, policy preferences, and behavior at the global, national, and local scales."[331] A primary contribution to the narrative on climate change stems from the YPCC's project on the "Six Americas."[332] This study sought to understand the audience receiving the information about climate change.[333] Six groups exist within the United States, at one end of the spectrum are "Alarmed" people who are convinced climate change is occurring and harmful and support aggressive action to mitigate its effects.[334] On the other end are "Dismissive" people who either do not believe it is a problem or believe that it is a hoax.[335] In between those two groups are the remaining four, "Concerned," "Cautious," "Disengaged," and "Doubtful."[336] These groups "are strongly associated with a range of characteristics, including climate and energy beliefs and policy preferences; political ideology and party identification; cultural values; political efficacy, and consumer and political behavior."[337] The challenge is moving people from the "doubtful," "disengaged," and "cautious" categories into positions where they are engaged, demand change from governmental entities, and implement changes themselves.

The project makes recommendations for various groups to facilitate engagement. For the "alarmed" and "concerned" groups since "[t]hey are already

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[330] *The Program*, YALE PROGRAM ON CLIMATE CHANGE COMM., http://climatecommunication.yale.edu/about/the-program/ [https://perma.cc/64QU-K562].

[331] *Id.*

[332] *Global Warming's Six Americas*, YALE PROGRAM ON CLIMATE CHANGE COMM. (Nov. 1, 2016), http://climatecommunication.yale.edu/about/projects/global-warmings-six-americas/ [https://perma.cc/U5S8-CRSY]; *see also* YALE PROJECT ON CLIMATE CHANGE & GEORGE MASON UNIV. CTR. FOR CLIMATE CHANGE COMM., GLOBAL WARMING'S SIX AMERICAS 2009: AN AUDIENCE SEGMENTATION ANALYSIS (2009), http://climatecommunication.yale.edu/wp-content/uploads/2016/02/2009_05_Global-Warmings-Six-Americas.pdf [https://perma.cc/RVN3-VEPJ].

[333] *See* Connie Roser-Renouf et al., *Engaging Diverse Audiences with Climate Change: Message Strategies for Global Warming's Six Americas*, *in* ROUTLEDGE HANDBOOK OF ENVIRONMENT AND COMMUNICATION 368 (Anders Hanson & Robbie Cox eds., 2015).

[334] *Id.*

[335] *Id.*

[336] *Id.*

[337] *Id.*

strongly convinced of the reality and danger of climate change, . . . strong arguments on these topics aren't needed; they need instead well-reasoned information on solutions that are both feasible and effective."[338] In focusing on the "disengaged" and "cautious" groups, the study found that both groups pay less attention to the news about global warming but have questions about the existence and consequences of climate change.[339] Connecting with these groups through the news media and answering their questions is unlikely, given their lack of interaction with news sources.

In response to these "low involvement" groups, the YPCC makes certain recommendations.[340] The YPCC notes that these "audience members are unlikely to pay attention if understanding the content requires cognitive effort," thereby emphasizing the importance of messaging and doing the cognitive work for them.[341] A key recommendation and method to accomplish this is to "generate involvement through the use of narratives."[342] The program emphasizes the value in showing rather than telling the individual about climate change and its effects.[343] In showing these effects, the communicator should seek to "personalize the threat" to the viewer by connecting climate change with places that are "physically close" or "emotionally significant."[344] The YPCC summarizes the benefits of deploying these approaches *across all segments of the Six Americas*, "we are all influenced by social norms, we become emotionally engaged with compelling narratives, are drawn to attractive sources, and process visual information effortlessly and instantly."[345] We need less facts, data, and cognitive intensive explanation and more stories that pull at heart strings and connect at a local level.

E. The Paris Accord and the United States 2016 Election

In the aftermath of Donald Trump's election as President of the United States, he has decided to withdraw the United States from participating in the Paris Agreement.[346] The YPCC found that nearly seven out of ten registered voters in the United States supported U.S. participation in international climate agreements such as the Paris Accord.[347] Climate change is not an issue that drives the voting

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[338] *Id.* at 375.

[339] *Id.* at 377.

[340] *Id.*

[341] *Id.* at 378.

[342] *Id.*

[343] *Id.* at 378.

[344] *Id.*

[345] *Id.*

[346] Michael D. Shear, *Trump Will Withdraw U.S. from Paris Climate Agreement*, N.Y. TIMES (June 1, 2017), https://www.nytimes.com/2017/06/01/climate/trump-paris-climate-agreement.html [https://perma.cc/3D67-WPBV].

[347] YALE PROGRAM ON CLIMATE CHANGE COMM. & GEORGE MASON UNIV. CTR. FOR CLIMATE CHANGE COMM., POLITICS AND GLOBAL WARMING, NOVEMBER 2016 (2016),

preferences of individuals—clearly. If it were, then Mr. Trump would not have won the 2016 election, and the candidate advocating for broad and clearly defined action on climate change would have. In the abstract, seven of ten registered voters may support mitigation of climate change, but when that issue is thrown into the mix of other political matters like taxes, job creation, women's rights, foreign affairs, terrorism, or crime, it may no longer be the driver of political preference in elections. Part of why this may be the case has to do with narrative. Recall that the YPCC found that only a small percentage of Americans felt that they were experiencing climate change—personally.[348]

Many Americans see climate change as a distant problem because they are not negatively affected by it or do not realize that they are being affected by it. Therefore, there must be a personal and present connection between the person and climate change in order for it to drive political preferences and engagement. The most effective means to get people thinking about climate change have recently occurred in Arizona, which experienced record-setting high temperatures.[349] Flights are canceled or delayed due to extreme heat, which is an effect of climate change.[350] The power of inconvenience to motivate business persons needing to attend a client meeting or parents of excited children waiting to go on vacation cannot be understated.[351]

Of course, the late summer of 2017 has brought us events that reach well-beyond the inconvenience of missing a flight or replacing a trash can. Houston was ravaged by a hurricane, flooding, and deluge. Less than a month later, the Caribbean was ravaged by another hurricane before it made its way to South Florida. In the following weeks, forest fires devastated Northern California. These are all good examples of the consequences of climate change. Warmer global temperatures result in warmer ocean water which contributes to increased strength of hurricanes.[352] Forest fires increase in likelihood during extended droughts, brought on by changing weather patterns and the increased temperature. There are scientific correlations to

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http://climatechangecommunication.org/wp-content/uploads/2016/12/Global-Warming-Policy-Politics-November-2016.pdf [https://perma.cc/2LVW-3MU6].

[348] *Id.*

[349] John Bacon et al., *Withering Heat Sweeps Southwest: Phoenix Braces for 120 Degrees*, USA TODAY (June 27, 2017, 2:43 PM), https://www.usatoday.com/story/news/nation/2017/06/20/withering-heat-sweeps-southwest-phoenix-braces-120-degrees/103030730/ [https://perma.cc/A5VE-9VUU].

[350] Rhett Allain, *Why Phoenix's Airplanes Can't Take the Heat*, WIRED (June 20, 2017, 2:51 PM), https://www.wired.com/story/phoenix-flights-canceled-heat/ [https://perma.cc/L8BM-SQNE]; Amy Wang, *It's So Hot in Phoenix that Airplanes Can't* Fly, WASH. POST (June 21, 2017), https://www.washingtonpost.com/news/capital-weather-gang/wp/2017/06/20/its-so-hot-in-phoenix-that-airplanes-cant-fly/ [https://perma.cc/NK92-AZMB].

[351] Having been in both of those positions, I can attest to this.

[352] Kevin Trenbert et al., *Hurricane Harvey Links to Ocean Heat Content and Climate Change Adaptation*, 6 EARTH'S FUTURE 1, 10–11 (2018), http://www.cgd.ucar.edu/staff/trenbert/trenberth.pdf/2018_Trenberth_et_al-Earths_Future.pdf [https://perma.cc/MJ3T-VXCR].

draw between these disasters and global warming. However, this does not necessarily mean that those connections are intuitive for the rest of the population. The rest of the population may simply say, "Yes, we've had hurricanes before, forest fires have happened throughout history, and this is simply part of the natural cycle." This is an example of people taking pieces of evidence and construing them so as to conform to and reinforce their preexisting conception of the world—their *nomos*.

CONCLUSION

In the Subprime Mortgage Crisis, the economic collapse showed the systemic fragility that exists in complex interdependent systems. The legislative response to that "tsunami" echoed the commentary from previous economic crises—some entities are "too big to fail" and warrant a government bailout. The "'too big to fail' problem extends to any system that depends on everything being predictable."[353] In those systems, like the way we have constructed the legal/physical and climate/water interdependence, "external events or small errors by decisionmakers can be catastrophic when they have effects for which the system's structure does not account."[354] Our system of water rights is based on stationarity, certainty, and assumes that water will continue to flow. These assumptions are no longer well-founded or appropriate given the "external event" of climate change. The very idea that our way of life will continue undisturbed in a generally predictable manner, just as in the past, is similarly unfounded.

At some point, there will be a recalibration. It may not be linear—like the drastic revision of belief experienced by the turkey on the day before Thanksgiving. Instead, it may be more like the harm being done to the traditional Inupiat people in the Village of Kivalina. Their way of life stretches back hundreds and hundreds of years, well before Christopher Columbus got lost. It is ending, and it is ending through no fault of their own. It is ending because the habitable climate is a global commons, and they could not prevent carbon emitters from exhausting the Villages' lifeways.

If the village of Kivalina does not move—the cost of the move is estimated at anywhere from \$100–\$400 million[355]—it will end the lives of those who do not leave. "There is no means to leave the island on foot or by vehicle during a storm, and transport by boat or plane in storm conditions would be dangerous."[356] At some point, during a storm, the sea will rise up and take them away, and along with it their traditional knowledge and indigenous culture. As an indigenous person, I view this—consistent with the YPCC's recommendation to develop narratives that hit close to home emotionally—as happening to me and my community. The pictures of the children on the island are my children, the elders are my elders, and the

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[353] Stevenson, *supra* note 39, at 526.

[354] *Id.*

[355] F.S. Chapin, *Relocating Kivalina*, U.S. CLIMATE RESILIENCE TOOLKIT (Jan. 17, 2017, 3:38 PM), https://toolkit.climate.gov/case-studies/relocating-kivalina [https://perma.cc/VTZ6-TY6H].

[356] *Id.*

indigenous lifeways are those of the Chickasaw people who have demonstrated resilience and endurance against significant obstacles for centuries. Instead of sea ice falling into the ocean, for us, it is the perpetuation of drought in southern Oklahoma, increased tornado activity, public health effects and deaths due to extreme heat exposure, and an increase in the cost of sustenance because of the fragility of the food-water nexus.

As a legal scholar interested in policy, I reiterate the concern of a noted journalist: "If we can't figure out how to save a village with fewer than 600 people from falling into the sea, what hope is there for everyone else?"[357] It strikes at the core of narrative power. Adaptation cannot be our only plan to address the Climate Crisis because we will underestimate the effects, the costs, and the losses. In this way, our underestimation of the adverse effects of climate change, the Climate Crisis parallels the Subprime Mortgage Crisis. In other ways, the two crises diverge.

While the failure of the habitable commons certainly falls into the category of things that are "too big to fail," it differs from the Subprime Mortgage Crisis response in one important way: *there is no bailout for the Climate Crisis*. They diverge because the expenditure of taxpayer money cannot restore the habitable commons in the manner that the government bailout attempted to rehabilitate the American economy and mitigate the job losses felt by thousands and thousands of people. These two crises converge when comparing carbon emission producers— primarily the fossil fuel energy sector and transportation—with the mortgage brokers making NINJA loans to borrowers. The brokers off-load the risk of defaulting loans on others, while the carbon emission producers off-load the risk of the dire effects of anthropogenic climate change on the habitable commons— including us. The former disrupted the world economy, which is only recently beginning to recover, while the latter will disrupt every community and segment of the world in time. The deployment of legislative solutions to create disincentives to offloading the risk of "anthropocide," whether by a carbon tax or otherwise, are immediately necessary given what is at stake. In order for those solutions to come to fruition, public opinion must demand it first. Therefore, a comprehensible narrative showing that the changes will come to local communities is a sufficient condition. In other words, we must show that all global citizens are like the indigenous people of Kivalina. We are all pre-refugees hoping that the sea ice won't fall into the ocean and carry with it our stories, histories, accomplishments, and loved ones.

Dire social problems like climate change are not necessarily new to the United States. This problem is comparable to the problem of *de jure* racial segregation adopted in *Plessy v. Ferguson*.[358] The "legality of separate but equal" was supported by the majority of Americans even after *Brown v. Board of Education*. One need

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[357] Kate Sheppard, *If We Can't Stop this Tiny Alaskan Town from Falling into the Sea, What Hope Is There for the Rest of Us?*, MOTHER JONES (Dec. 15, 2014, 6:09 PM), http://www.motherjones.com/environment/2014/12/alaskan-town-shows-just-how-unprepa red-we-are-climate-change [https://perma.cc/BY8D-N2QC].

[358] *See generally* 163 U.S. 537 (1896) (addressing racial segregation in transportation).

only to look at the photographs of Elizabeth Eckford, one of the Little Rock Nine, walking calmly and stoically into the school building to assess the prevailing popular opinion concerning racially integrating schools.[359] Had it been left up to Congress, as driven by popular opinion, to address the issue of school integration, the Civil Rights story would be dramatically different. The Climate Crisis is no different.

Just like in *Brown*, where the remedy to "separate but equal" was long overdue, there was no time to wait. Yes, educating the public, pushing a different narrative, and lobbying political leaders was all important. But, lawyers and the cause of action brought by their private attorney, Thurgood Marshall, and the bravery of Linda Brown and the other plaintiffs were responsible for systemic change. That is the role and function of law. To demand change despite public opinion. The law checks our base or erroneous decisions even if they are arrived at "rationally" and democratically.

The scientists have done their jobs. The social scientists and psychologists are doing their jobs. It is time for lawyers to do ours. While the action on behalf of Kivalina failed, we can file others. The psychological research demonstrates the deafening sound of silence when trying to answer the question, "how do we get people to believe in the immediate risk of climate change?" With no clear answer, and with public opinion languishing on demanding action to mitigate climate change, it is incumbent upon lawyers and legal scholars to work with their clients to creatively seek redress for the Climate Crisis.

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[359] MILDRED A. SCHWARTZ, NAT'L OP. RESEARCH CTR., TRENDS IN WHITE ATTITUDES TOWARD NEGROES (1967).