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The anatomy of ignorance

Diagnoses from literature

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I. Ignorance in life and literature: An introduction

Ignorance represents a situation in which some potential outcomes are not even identified. Often they are both unknown and unknowable (Gomory, 1995; Zeckhauser, 2006). On a continuum that begins with risk and progresses through uncertainty, ignorance is the third, final, and most extreme state in the sequence. With risk and uncertainty, the possible future states of the world are known. With risk, their probabilities are known as well; with uncertainty their probabilities are unknown. A roll of two dice involves risk; a prediction about the stock market a year hence involves uncertainty.

The well-developed discipline of decision analysis prescribes how to make decisions when confronted with either risk or uncertainty. One of its central prescriptions is to start by assigning probabilities—*objective* if risk, *subjective* if uncertainty—to the alternative future states of the world. But with ignorance, where those states are not even identified, attaching probabilities is clearly impossible. Note, these states are not extreme outliers on some understood spectrum; they are outcomes that the decision maker fails to even conjecture.

Our title, "The Anatomy of Ignorance," introduces a medical metaphor. Our analysis diagnoses ignorance as a malady that inflicts significant damages at the individual and societal levels. Fortunately, as with many maladies, understanding ignorance can help us recognize its presence and treat it more effectively.

Focus on consequential ignorance

We should make clear at the outset that we are not studying run-of-the-mill ignorance, such as not knowing that Germany lies east and mostly north of France. The ignorance we study is characterized by the inability to identify potentially consequential future states of the world. Such ignorance is not merely a vague lack of comprehension or indeterminate cluelessness about the future. Rather it represents the unavoidable "non-knowledge" that impacts decision outcomes in notable life domains where even low-probability unforeseen events can have immense import.

Our study of ignorance addresses situations that can lead to a *consequential amazing development*, henceforth referred to by the acronym "CAD." To qualify, a CAD must be not only amazing but also consequential to the decision maker. To amaze, a CAD must be an outlier such that even an individual who has long contemplated the future might not have envisioned such an outcome. To illustrate, applying and being hired for a long-shot job would not qualify as a CAD; such a development can be anticipated and is not amazing. In contrast, receiving a phone call out of the blue from someone offering a terrific job that you take is a CAD—it is an amazing development with significant consequence.

CADs can be *narrow*, affecting one or a few individuals, or *broad*, impacting large groups, even societies as a whole. A CAD can be good or bad, but it must be *very* good or *very* bad, something an individual would have worked hard to promote or avoid, had he known of its possibility.[1] Although they can be beneficial—an unexpected economic boom, for instance—most CADs are bad news, and bad CADs shall get most of our attention.

An individual asked to identify a broad CAD will likely name a natural disaster, such as an earthquake or a tornado that strikes without warning. However, human action is the cause of many of the most dramatic broad CADs. Think of the Holocaust and the Great Chinese Famine of 1958–61 or, more recently, the collapse of the Soviet Union and the 2008 worldwide financial meltdown. CADs caused by purposeful human agency—the Holocaust and 9/11 come to mind—were meticulously planned by their perpetrators, but simply unimagined by their victims. Even natural calamities are frequently augured by scientists, authors, and public intellectuals, but turn out to be CADs for society-at-large.

CADs are determined from the standpoint of the decision maker. Thus, he must be amazed and the outcome must be consequential to him. We argue that literature can sensitize us to understand better when CADs are more likely and when less, and to bring what is conjecturable closer to conscious attention. Literature also imparts a painful powerful lesson about CADs. In many circumstances, a CAD might be readily inferred by outside observers, but nevertheless prove unknowable to the decision maker himself because he severely restricts his own thought processes. We refer to these as *blindered* CADs.[2] Poor choices undertaken in the callowness of youth, errors in judgment made under the rosy glow of infatuation, or the painful influence of alcohol, all have the potential to lead to blindered CADs, as would simple overconfidence that we know how things will turn out. Blindered CADs eventuate in literary fiction most famously through narratives of love gone awry. Leo Tolstoy's heroine Anna Karenina's blindered infatuation prevented her from contemplating that her step into an adulterous affair was onto a path littered with severely adverse CADs. Jay Gatsby, F. Scott Fitzgerald's titular hero, suffered similarly.

Deep CADs fall at the opposite extreme: they are simply unimaginable.[3] The Malaysian airliner that reversed course and wandered over the Indian Ocean till it was lost is a good example. So too is living in a seemingly sturdy building that suddenly collapses. Deep CADs receive little attention here. Our concern is an improved understanding of conjecturable CADs, including those that are missed because of blindered choices, and our prime subject, what we might think of as textbook CADs—those where objective contemplation could alert the decision maker that there is a good chance that something consequential is lurking in the shadows. Given the high stakes, for both individuals and society, the 2008 financial meltdown is a good example of a textbook CAD.

Primary ignorance denotes the failure to recognize that one is ignorant and that highly consequential potential outcomes loom that cannot be identified. If a CAD does not occur—and CAD occurrences are rare—one's ignorance is never revealed. No doubt this pattern makes people less alert to ignorance. *Recognized ignorance* is the condition of being alert to and aware that one cannot identify important future states. Such recognition may arise because changed

conditions convey a signal, such as birds flying low before a storm or animals seeking safety before a tsunami. At times, an individual with much broader experience may issue a warning, such as a doctor cautioning us about a medical calamity. Occasionally, our cognitive processes may subconsciously alert us to some critical but poorly understood situation.

Challenges to prescriptive and descriptive decision analysis

Why has decision analysis failed to address ignorance? We believe the answer is that the concept challenges organized, systematic study. Economists and psychologists who investigate decision making employ two common approaches:

1 controlled laboratory experiments, the most familiar asking subjects to choose among alternatives (balls of different colors, marbles from urns) with a payoff depending on chance outcomes; and
2 tracking real-world decision making—decisions such as how much people save, how they invest, what employment they choose—to create a quantitative dataset for detailed analysis.

Neither approach yields insights into the unique character of ignorance, for four reasons:

1 Ignorance is impossible to distill or recreate in a laboratory. To keep matters under control, experimental methods generally reduce decision problems to a clean, clear-cut set of variables. However, CADs arise from situations that are unusual and often complex. Beyond that, if one were studying *unrecognized ignorance*, it would be nearly impossible to describe a relevant situation without giving away the game.
2 Ignorance and the impact of CADs play out over long stretches of time and would be difficult to accommodate in a controlled experiment.
3 CADs, which by definition have high consequences, would be prohibitively expensive to create if those consequences were positive, and unethical to create were they negative.
4 CADs are rare and often highly unusual events. Extremely extensive field data would be required to produce even a modestly homogeneous set of CADs.

In brief, the traditional methods of the social scientist translate poorly to the ill-defined chaos of ignorance.

II. Literature as a diagnostic tool

We shall analyze ignorance through literature, drawing on some of the world's best-known stories. This approach brings two great virtues. First, the available universe of decisions expands dramatically beyond experiments in the laboratory. Second, stories enable us to get inside the heads of literary characters—the imaginary men and women who populate the world of literary fiction—who are facing CADs, and to experience the world as these characters do, in all its degrees of amazement and consequence. Stories are the central mechanism through which the human mind encodes reality.[4]

Literature as mimesis

The term *mimesis* means the representation of the real world in art and literature. The central argument of Aristotle's *Poetics* (2013) is that *mimesis*, or the imitation of reality, is one of the

central functions of art.[5] Roman poet Horace goes further, and makes the case for literature as learning for life; in *Ars Poetica*, he asserts, "My advice to one who is trained in representation is to look to life and manners for his model [. . .]. Poets aim either to confer benefit or to give pleasure, or to say things which are at once both pleasing and helpful to life. [. . .] Fictions intended to give pleasure should approximate to the truth" (2011: 114). Assessing Horace's dictum that fiction can inform reality (in contrast to the social scientist's empirical approach) we notice an overlap: economists and psychologists run controlled experiments, examine behavioral phenomena, or investigate large quantities of data—strategies seeking to distill information that, following Horace, gets as "approximate to the truth" as possible. Similarly, authors depict literary characters making decisions under the very same conditions of interest to this essay: ignorance, amazement, and consequence.

For centuries, human beings have used stories as representative models of the real world, a condensed version of life. Stories offer what psychologists Raymond Mar and Keith Oatley term "simulations of the social world" (2008: 173) via abstraction, compression, and simplification, while giving readers the pleasure of losing themselves in the lives of strangers who, in many ways, share cognitive and behavioral characteristics with them. Recent work in literary studies proposes that literary fiction helps readers understand the human mind (Turner, 1996; Oatley et al., 2012). Economist Thomas Schelling distills it best: "Novels, plays . . . and stories give the reader . . . a stake in the outcome. . . . The characteristic that interests me is the engrossment[,] the participation, the sense of being in the story or part of it, caring, and wanting to know" (1988: 345). English lexicographer Samuel Johnson remarks in *Rambler No. 4* that the writer's "task . . . arise[s] from . . . accurate observation of the living world" (1752: 28). M. H. Abrams in *The Mirror and the Lamp* (1953), a classic text on literary theory, posits that literature provides a mirror for society, a looking glass reflecting the social life and mores of the real world.

Literary fiction leads us into truly interesting territory in terms of complex decision making with idiosyncratic variables. Authors convey tremendous amounts of information involving psychological insight and probability judgment on the high side, and blind ignorance on the low, by placing literary characters in situations involving complex decisions with insufficient information to identify what might happen. CADs are low-probability events that have great impact. Literature often depicts situations where a CAD unexpectedly appears and wallops its unsuspecting victims. Our literary examples often reveal that the characters involved could not have recognized the possibility of a CAD from past experience, much less calculated its probability. Moreover, they are ordinary men and women—people who resemble us in their behavior and thinking.

In Gustave Flaubert's *Madame Bovary* (2002), Charles Bovary is a stolid rural doctor who marries the young and beautiful Emma Bovary, ignorant of her true character. Dazzled by her attractions, which seemingly confirm his opinion that she will make a suitable wife, he ends up with an adulterous partner who plunges him into debt. Emma is equally ignorant of her husband's true character. Her head filled with romantic fantasies, she yearns for a sophisticated partner and the glamour of city life, but finds herself trapped in a somnolent marriage with a rustic man. In this case, neither Charles nor Emma had the past experience or warning from others to indicate the potential for the CADs that overtook their future life.[6]

These literary characters are portrayed as cognitively and behaviorally similar to men and women in real life. Characters in mythology and fantasy have experiences that ordinary folks would never encounter, but to capture our interest, they too must face decisions as do ordinary humans. And they encounter CADs, plentifully. The *Odyssey*, Homer's epic poem, describes Greek hero Odysseus's ten-year journey home to Ithaca following the destruction of Troy. Odysseus repeatedly confronts circumstances that he could not have conceived—or, to use our

label, situations of ignorance. His legendary cunning, his tenacity, and his skills as a strategist do not enable him to banish or overcome ignorance, but they do enable him to grapple with it.

Odysseus has a significant advantage over most mortals; he is frequently forewarned by the gods (who are running interference) that he will be confronted with yet another unforeseeable challenge as he wends his way home. CADs continue to occur: a debilitating lethargy in the Land of the Lotus-Eaters, the catastrophic loss of all but one of his ships to the cannibalistic Laestrygonians, the lengthy marooning on Calypso's island, the looming menace of the giant Cyclops Polyphemus who threatens to eat Odysseus after consuming his men, the perilous encounter with the enchantress Circe who turns some of his men into swine, the hypnotic lure of the Sirens, the watery hazards between Scylla and Charybdis, and finally, the challenge in clearing his house of a band of rapacious and sybaritic suitors for his wife once he is back in Ithaca disguised as a beggar (a flexible and shrewd strategy that allows him to learn the lay of the land before revealing himself). Odysseus represents the ideal of measured decision making, admittedly with a bit of divine help. Had he failed to anticipate some of the CADs he faced, had he been frozen with indecision when a CAD struck, and had he not given full flight to his creativity in overcoming each one, he would have been doomed. His forward-looking and thoughtful approach to ignorance distinguishes him from the vast swath of humanity, as we detail in Section III of this chapter.

Stories such as Homer's epics, in portraying ignorance, raise empirical questions that decision theorists will someday be able to answer. They also prompt some age-old questions: How did these literary characters end up in their current predicaments? What clues did they encounter, and ignore, along the way? What should they do now? But our immediate question as analysts of decisions is: How can readers employ literature to train themselves to anticipate and respond appropriately to CADs? Literary fiction, with its narratives that are threaded through with the unknown and the unknowable, we argue, provides material for both critical self-contemplation and the development of alternative methodologies; each is necessary for training in anticipating CADs. For our purposes, a literary narrative frequently depends on unpredictable narrative arcs and the ignorance of the literary characters involved. Plots and sub-plots stretch out over long periods of time—a sufficient horizon for examining CADs, which, by their very nature, defy the human control and agency that characterize randomized controlled experiments.

Literary lessons on ignorance

There are two critical ingredients for lessons gleaned from literature: first, they require a close reading of text and sub-text (or underlying meaning) with sharp literary analysis skills; second, any useful information patterns should be translated into testable propositions. That said, literature provides two main areas of training on ignorance:

1 *Anticipation*. Literary narratives demonstrate that ignorance is commonplace, and that CADs leap in seemingly from nowhere. Literature teaches the reader the importance of anticipating possible CADs when making decisions that affect critical life areas such as education, employment, and marriage. Our analysis deals mainly with personal CADs, since they constitute the theme of most well-known works of literature, but our hypotheses extend well to societal CADs such as revolutions and financial meltdowns.
2 *Contemplation*. Examining fiction teaches the reader the importance of the imagination in contemplating and envisioning CADs. We concede that while vigilance regarding contemplation is difficult to achieve, it is a critical ingredient for dealing effectively with ignorance. Thus, we propose reading fiction to develop one's contemplation "muscles."

Three elements must be considered for an effective decision under uncertainty: the future states of the world, the probability of each, and possible actions. When an action meets a state of the world, a payoff—also called a *utility*—is reaped. For each action, an expected utility can be computed by multiplying the respective probability times the utility the action yields. Decision analysis prescribes that the action yielding the highest expected utility is the course to be chosen.

Four discouraging themes emerge below. First, if important future states cannot be identified, people cannot perform the required utility calculations just described. Second, even when ignorance might be conjectured, individuals fail to recognize it. Third, when ignorance is recognized, individuals frequently make poor decisions. Fourth, in matters of ignorance, organizations and societies fail in much the way that individuals fail: through poor anticipation and poor decisions. We pursue these themes, drawing lessons from literature. In essence, we use literature to better understand human decision processes. This chapter shows that examination of great works of literature provides untapped learning opportunities for studying ignorance in systematic ways and at modest expense.

Learning about ignorance has important implications. Once ignorance becomes a part of the decision-theoretic discourse, decision scientists can develop methods and train decision makers to cope with it. The greater our understanding of ignorance and CADs, the more improved our recognition of and responses to these phenomena will be. Even without divine intervention, we can, like Odysseus, undertake certain actions to recognize ignorance and to prepare for potential CADs.

A systematic study of ignorance is important for a number of reasons. When contemplating the future, people frequently fail to account for their ignorance of events and their outcomes. People who do attempt to be forecasters run into grave difficulties:

1 When unpredictable events occur, such as the completely unforeseen successes of ISIS in 2014, they are usually *sui generis*. For such events, it is not possible to assemble multiple instances, much less a sufficient number of instances to apply the statistical methods that provide the backbone for effective forecasting.[7]
2 Potential CADs are many. Occurring CADs are few. Moreover, for most potential CADs, their potential existence never becomes known. Furthermore, those CADs that do arise have no schedule. The 2008 financial meltdown came after a sustained boom; the Arab Spring toppled long-standing despots. These properties would make it almost impossible for a sophisticated decision theorist much less a mere mortal to compute a base rate for CADs of a particular type, yet knowing base rates in various situations could give fair warning.
3 People who do contemplate CADs tend to be limited by the parameters of what they have already seen or experienced. Human beings are given to over-extrapolate likelihoods from the known past to the unknown future. This is a form of the Availability Heuristic (Tversky and Kahneman, 1973) and its cousin, the Recognition Heuristic (Goldstein and Gigerenzer, 2002)—both mental shortcuts describing people's tendencies to predict the likelihood of an event based on how easily memory brings such an event to mind.

Greek mythology's Oedipus provides one of the best examples for our theory of ignorance. His fate demonstrates the invisible but nevertheless forbidding boundary that separates the present from our knowledge of the future—knowledge that is epistemologically questionable, unreliable, and frequently chimerical. Son of Theban King Laius and his wife Jocasta, the infant Oedipus is abandoned to die on Mount Cithaeron by his father, after an oracle warns Laius

that his own son will kill him. But Oedipus is ultimately saved and later adopted by Corinthian King Polybus and his wife Merope. The adult Oedipus, ignorant of the history of his parentage, eventually returns to Thebes, the land of his birth. His ignorance allows him to take two consequential actions he would never consider had he possibly contemplated their implications. First, he murders Laius in a freak, rage-fuelled incident (unaware he has committed patricide). Then he marries Jocasta not knowing she is his mother. Oedipus and Jocasta have four children: daughters Antigone and Ismene, and sons Polyneices and Eteocles. Oedipus ultimately discovers the entire truth of his personal history. Jocasta commits suicide and Oedipus blinds himself. Captured by Greek tragedian Sophocles in his play *Oedipus Rex* (1984), Oedipus depicts how ignorance can neither be "domesticated" nor controlled. Frequently we make decisions not contemplating devastating CADs. Randomness in the world—a dramatic drop in the stock market, an implausibly hot summer—is readily imagined, but unique outlier events—one's love object turns out to be one's mother—are often beyond conjecture.

III. Cognitive biases and heuristics: What ails us?

Ignorance represents an unknown and vast ocean of unpredicted possibilities. As our study shows, ignorance can be more consequential than the much-studied uncertainty and risk, certainly in terms of expected value lost from inadequate decision making. Yet ignorance remains virtually unexamined by decision theorists. We alluded above to the poor decisions individuals make with respect to ignorance. A major reason is that cognitive biases and heuristics severely impede appropriate responses (Kahneman and Tversky, 1979). We would further argue that as problems get murkier along the spectrum from risk to uncertainty to ignorance, the challenges to effective decision making mount, and biases and heuristics play an ever-greater role.

Why should this be? One explanation is that individuals simply choose not to think about ignorance. Thus, even when it might be readily identified, it lays hidden. Psychologists Amos Tversky and Daniel Kahneman's initial research (1973, 1974) identified three prime biases—*availability*, *anchoring*, and *representativeness*—that have since been joined by dozens of additional biases identified by an entire generation of behavioral scientists. From Samuelson and Zeckhauser's (1988) *status quo bias* to Kahneman, Knetch, and Thaler's (1991) *endowment effect*, decision theory's greatest contribution in the last forty years has been recognizing patterns of behavioral quirks, and examining such irregularities through creative, often lively, experiments. Identifying new cognitive biases that surround CADs—a modest start is made here—would be an exciting frontier for future research on ignorance. We suggest that the best way to prepare people for ignorance is to train them in an awareness of inconsistencies in their thinking. Many of these inconsistencies doubly impair decision making in the presence of ignorance.

Ignorance interacts in significant ways with biases and heuristics. Under the *availability heuristic*, people contemplate events that reside within their cognitive horizons but may occur infrequently. Examples range from earthquakes in an earthquake zone to shark attacks on a beach, even a beach where sharks have never been present.[8] In contrast, CADs are not *available* since they would then cease to be amazing. CADs also defy the *representativeness heuristic* since they are usually unique and unlikely to belong to a typical class of similar events. Given *hindsight bias* (Fischoff and Beyth, 1975) people will tend to overestimate the future likelihood of a former CAD that they have experienced. In doing so, they may let down their guard. Such a person's defective reasoning might be: "I am now aware of my error in not predicting the particular CAD that happened. Therefore, I am alert to predicting CADs in the future."

Confirmation bias (Nickerson, 1998) refers to people's tendency to form an initial hypothesis and then look for evidence that supports it. People fail to consider alternative hypotheses; they

also avoid looking for evidence that contradicts their initial hypothesis since they are cognitively anchored to it, finding refuge in an inadequate psychological reference point. Even when the anchor is clearly random, people tend toward estimates close to the initial anchor, seeking the comfort of a cognitive "security blanket." In the case of CADs, or indeed of any decision making under uncertainty, anchoring severely limits our contemplation of consequences.

Early humans associated natural calamities with bad behavior and drew the conclusion that the gods were angered. The Old Testament frequently elaborates on this theme, as with the Great Flood in *Genesis*. CADs continue to throw sand in the eyes of modern people. Extreme outliers, being unique, often provide too little evidence to explain their origins. The human desire to point the finger of blame when a catastrophe happens, however, often causes people to arrive incorrectly at causal conclusions. Moreover, most CADs—the sudden collapse of the Soviet Union, one's romantic calamity, or the 2008 meltdown—have multiple contributing sources. Yet, people often apply the cause-and-effect thinking we encounter in detective fiction, seeking a single perpetrator. A complementary failing arises from the bias of *persisting with prior beliefs* as an explanation of causation (Michotte, 1963; Rips, 2011). Such beliefs may lead observers to avoid noticing informative relationships that do exist. In short, people fail to learn effectively when CADs strike. Sometimes, they conclude more than the evidence will bear; at other times, they overlook available evidence on causality.

Fortunately, unlike Odysseus, few humans encounter one CAD after another. The CADs that do arise tend to be quite disparate. The rarity of such encounters is good for one's welfare, but bad for learning. Here literature can make a contribution. An hour spent with William Shakespeare or William Faulkner will expose the reader to a vicarious CAD, and the next hour to another. As we detail in the following sections, reading great works of literature makes us aware of the nuanced, often insidious, ways in which our own cognitive biases and the decision heuristics they engender, exacerbate the affliction of ignorance.

Biases that impede the recognition of ignorance

To cope with ignorance, we urge self-awareness, asking ourselves whether a state of consequential ignorance is likely in this situation. Essentially, we suggest continually estimating a base rate for a CAD. Such estimation is challenging, since two fundamental biases intrude.

1 Overconfidence

As Alpert and Raiffa (1982) have demonstrated, individuals are overconfident when estimating quantities. Extrapolating from the Alpert and Raiffa results, if individuals are asked to identify states of the world that they can envision for the future, they will overestimate the density for which they can account.

William Shakespeare's *King Lear* decides to divide his kingdom among his three daughters and then retire, but not before he tests their loyalty. He is woefully overconfident that he can discern the true feelings for him of his daughters, Goneril, Regan, and Cordelia, merely by asking—a very weak test. The two older daughters respond with profuse professions of filial affection. Cordelia, Lear's favorite, is more measured in her response. This angers her father, who disowns her and proceeds to divide his time between Goneril and Regan. Lear finds that they treat him in an autocratic, peremptory, and cruel manner. Lear never contemplated the CADs that now occur. This once all-powerful monarch ends up wandering homeless during a terrifying storm, rendered nearly mad by his daughters' hypocrisy and abuse, accompanied only by his Fool, the court jester. Goneril and Regan plot against one another. Lear and Cordelia are

captured, and Cordelia is hanged by her captors. Her beloved father is unable to save her. He now realizes his folly: his extraordinary overconfidence in relying on his elder daughters' cheap talk of their filial ties. This betrayal by Goneril and Regan represents a blindered CAD for Lear. An objective observer could have told him not to make consequential reliance on words that were cheap for these daughters to utter. Such reliance would risk awful CADs.

2 Salience

Individuals tend to identify states that are salient—in other words, circumstances with which they have some experience (*recognition bias*) or those that are easily brought to mind (*accessibility)* from an active to a latent state following activation by an external stimulus (Higgins, 1996). They overestimate the likelihood of such events (*availability heuristic*) when envisioning the future.

Jonathan Swift's novel *Gulliver's Travels* (2001) vividly demonstrates the hero's attempt to frame imagination-defying CADs and successive situations of ignorance in terms of *salience*, *accessibility*, and the *availability bias*. The book describes the travels of Lemuel Gulliver, a literal-minded surgeon, to four different lands that lie beyond the bounds of human expectation: Lilliput, a kingdom of tiny people where Gulliver is considered a giant; Brobdingnag, a land of giants where Gulliver finds himself defenseless on account of his small size; the floating island of Laputa; and finally, the land of the Houyhnhnms, ruled by exceedingly rational horses who are served by Yahoos—brute, human-like creatures. While *Gulliver's Travels* was intended as a satire on contemporary religion and politics in eighteenth-century England (and not as children's literature, as is frequently assumed), the novel is also an excellent study of behavioral proclivities under ignorance. Gulliver deals with each CAD by bringing to mind salient experiences from his former life as a stolid English doctor, even though these former experiences have no relevance to his current situation. He misses some cues, miscalculates the applicability of others, and frames his situation incorrectly because he has no base-rate information.[9]

Biases once ignorance is recognized

Even if ignorance is recognized, different heuristics and biases come into play.

People are likely to draw wrong lessons from the past, a bias we call *Retrospective Recollection of Contemplation* (RRC). RRC whitewashes an individual's past ignorance. Though we did not anticipate the CAD that transpired, RRC steers us to recollect erroneously that it was among the possibilities we had considered, perhaps due to a memory of a thought that can be construed as having been vaguely close.

Love affairs gone awry often bring RRC into play. In Jane Austen's *Persuasion* (2012), the heroine Anne Elliott is, at twenty-seven, unhappy, single, and full of regret at her earlier decision to reject the marriage offer of her former suitor, Frederick Wentworth. In this decision, she was *persuaded* (the source of Austen's title) by the seemingly benevolent hand of family friend Lady Russell, who believed Wentworth's financial prospects were insufficient for Anne, a baronet's daughter. This rejection strikes as a CAD in Wentworth's life, who responds by enlisting in the Royal Navy. When the novel begins, eight years have passed and he has returned as a decorated and wealthy naval captain, a reversal of fortune in contrast to the slide of Anne's own aristocratic family, who are now living in shabby gentility.

Wentworth then falls prey to RRC under recognized ignorance. He determines that in the past, he was willfully oblivious to Anne's true character, blinded by his love. With his new maturity of age and achievement, he notices that she is easily influenced by others and much

diminished in beauty, retaining none of the qualities that he once found so alluring. The first CAD that happened—the rejection of his love—now appears to him to have then been on his mental map of the world as an inevitability. Although *Persuasion* ends happily with Anne and Wentworth's wedding, for much of the novel, Wentworth falls prey to RRC in contemplating his past ignorance of her character.

Ignorance recognized is, alas, not ignorance conquered. Heuristics continue to distort thinking. We highlight two of many:

1 *Status quo bias* (SQB). SQB leads one to stay the course by "doing nothing or maintaining one's current or previous decision" (Samuelson and Zeckhauser 1988: 7). One prominent psychological explanation is that errors of commission weigh more heavily than errors of omission (Ritov and Baron 1990, 1992). Potential blame, from oneself and others, reinforces this disparity. Thus, SQB is particularly potent when the CADs that loom are likely to be unfavorable.
2 *Indecision bias* (IB). IB arises when one must choose among alternatives, the future is cloudy, and consequential outcomes are possible. When individuals recognize their ignorance, they are frequently frozen with indecision and in a state of complete inaction. IB differs strongly from SQB in that it is characterized by the evasion of a decision, perhaps while waiting for something ill-defined to happen, rather than by the choice to do nothing.

We encounter IB in its full glory in Samuel Beckett's existential drama, *Waiting for Godot* (1956). On a country road, tramps Vladimir and Estragon wait endlessly for the arrival of the mysterious Godot, who continually defers arrival while sending word that he is on his way. A rational choice would be to leave, but Vladimir and Estragon continue to wait. They pass the time in rambling conversations on mundane topics and in meaningless banter with two other characters, Lucky and Pozzo. Twice, a boy brings news that Godot will arrive tomorrow. At the end of the play, Vladimir and Estragon discuss their miserable lot in life and consider hanging themselves. And yet they continue to wait. The stage directions make their indecision clear. At the end of the final act, Estragon asks, "Well, shall we go?" to which Vladimir replies, "Yes, let's go." The stage direction reads: "They do not move."

IV. Heal thyself: Prescriptions for a world of ignorance

Ignorance is present across a multiplicity of real-life domains—from an individual's decision whether to try a new city to improve job prospects, to a society's choice as to whether or not to legalize drugs. The theme of our analysis is that literature, by reporting broadly on human experience, may offer key insights into ignorance and prescriptions for coping with it. The first challenge with ignorance is to recognize its presence. Reading great works of literature can sensitize us to clues that CADs—amazing and consequential developments—are potential future occurrences. CADs are almost always low-probability occurrences; if not, they would not be amazing. But if extremely low, they are not worth worrying about. To co-opt George Orwell's understated account of equal animals: "All low probabilities are low, but some are less low than others." CADs with probabilities less low make ignorance important.[10]

Strategic use of System 1 and System 2

Once we understand the potential for ignorance and the CADs that can follow, what is to be done? The individual can tailor his decision making processes in response. The *dual process*

theory of decision making attributes choices to either fast and unconscious intuition or to slow and deliberate reasoning. These cognitive mechanisms are labeled as *System 1* and *System 2* (Stanovich and West, 2000; Kahneman, 2003, 2011). While System 1 demands less conscious mental attention since it is largely automatic, System 2 brings superior contemplation. It is thus better at confronting ignorance, but is expensive to employ in terms of time and effort.

The key implication of this unavoidable tradeoff between dual cognitive systems is that the mind's resources should be employed strategically and parsimoniously. Where minor decisions are involved (which shirt to buy or what to order at a restaurant), reliance on the cognitively inexpensive System 1 will suffice. However, when the product of likelihood and consequence for CADs is large, the slower and more deliberate processes involved in System 2 are merited. So, too, it is for societies responding to ignorance. For one's personal life, a sound heuristic is to employ System 2 for big decisions, such as those involving marriage, jobs, or investment for retirement. Beyond that, unfamiliar circumstances reinforce the potential for CADs, implying a tilt to System 2.

Herbert Simon (1990) argues that behavior is shaped by the two blades of a pair of scissors, one blade representing cognition and the other symbolizing the decision environment. To recognize the potential presence of ignorance, both blades should be deployed. If ignorance is unlikely, seek cognitive economy and utilize System 1. However, if ignorance appears to be a factor, careful consideration using System 2 is warranted. This strategy should push thinking persons first toward efforts to avert unfavorable CADs, then toward the adoption of flexible strategies that will be superior should a CAD strike, and finally toward struggles to overcome the behavioral biases that afflict attempts to recognize and deal with ignorance. It is simply impractical to employ System 2 every time one must order at a restaurant or answer an e-mail. It would take a person a full day to address a single hour's challenges.

People should stay alert and attempt to recognize ignorance, asking themselves, "Might something truly consequential happen in this context?" System 1 should be able to do the required scanning, much as it regularly scans for everyday dangers, such as driving accidents. Perhaps 2 percent of the time, the answer will be yes, CADs are a realistic concern, and then the deliberations of System 2 should be brought into play. In the vast majority of cases in that high-alert 2 percent, nothing consequential will happen, which makes maintaining vigilance more difficult.

Summing up

The chroniclers of everyday life, from Jane Austen and Franz Kafka to those who write soap operas, make clear that even regular folks living in ordinary times experience CADs. Broad CADs—for example, revolutions and financial collapses—are portrayed by authors from Dickens and Pasternak to tomorrow's novelists of Wall Street. Ignorance abounds, yet it often goes unrecognized. Like keeping your eye on the ball in tennis, or leaning your weight downhill in skiing, staying alert to ignorance is an unnatural skill that has to be learned. So too is the skill of responding to ignorance effectively. Literature, as we have shown in these pages, can be effective as both tocsin and teacher.

Notes

1 We admit there could be a balanced CAD, very good on some dimensions and very bad on others, but we expect that balanced CADs are extremely rare.
2 We use "blinder" as a modifier and also as a verb in this essay, which we recognize is uncommon usage. It serves to convey the idea of having one's field of cognitive vision distorted and limited, like that of a horse wearing actual blinders.

3 Joseph K., an innocuous and conscientious bank employee in Kafka's novel *The Trial*, experiences a deep CAD nightmare. He is arrested one morning; charges are never revealed; and, ultimately, he is executed.
4 See, for instance, the work of psychologist Jerome Bruner who suggests that we "cling to narrative models of reality and use them to shape our everyday experiences" (2002: 7) and literary theorist Brian Boyd who argues, "Minds exist to predict what will happen next" (2009: 134).
5 "Art" here refers broadly to creative products of the imagination, and not merely to visual art such as paintings.
6 Literary narratives also present positive CADs. In Jane Austen's *Pride and Prejudice* (2000), for instance, a famous love story begins rather unpromisingly: the hero and the heroine cannot stand each other. The arrogant Mr. Darcy claims Elizabeth Bennet is "not handsome enough to tempt *me*," while Elizabeth offers the equally withering riposte that she "may safely promise . . . *never* to dance with him." Both are ignorant of the possibility of a future romance and have no idea that their lives, as detailed in the novel, will be overtaken by an impossible-to-conceive but extremely beneficial development: they fall in love, wed, and have a seemingly compatible marriage.
7 With narrow CADs, similar events may have struck other individuals, but the person affected was amazed, implying that he did not extrapolate from a substantial sample of the experiences of others. Perhaps he was unaware of such experiences. Perhaps, like Madame Bovary and Anna Karenina, strong emotions clouded his thinking.
8 Emphasizing the role played by visceral factors in decision making under risk and uncertainty, George Loewenstein argues, "People's cognitive evaluations of risks often diverge from their emotional reactions to those risks; people fear things that they recognize, at a cognitive level, to be benign, and do not fear things that they realize are objectively threatening. These divergences occur because the determinants of fear are different from the determinants of cognitive evaluations of riskiness" (2000: 430). We posit that these cognitive evaluations are further blurred, if not entirely nullified, under conditions of ignorance.
9 For more on the phenomenon wherein the decision maker incorporates irrelevant information through a combination of salience and anchoring, see Chapman and Johnson (2002).
10 Of course, the magnitude of potential CADs also matters, but ways to estimate magnitudes of unidentifiable events is beyond the scope of this chapter.

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