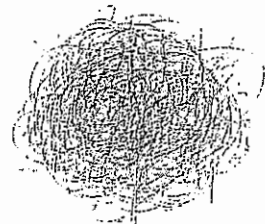


Nonsense



THE POWER OF NOT KNOWING

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red spades and calling them black. In the “Absolut Rarity” ad, that assumed familiarity resulted in a comic outcome. In the ad, the blue letters on the bottle read “Asbolut Vodka.” The rarity was the typo. But readers didn’t notice it. The misspelling didn’t register, and the ad had to be pulled.

Two

The Hidden A’s

THE SECRETS OF SENSE MAKING

TILBURG, IN THE Netherlands, is the kind of European town where well-behaved citizens stroll around politely on brick sidewalks. As a boy, Van Gogh took his first serious drawing lessons here. Trappist monks produce a delicious beer, La Trappe, on the eastern outskirts of the city. When I traveled there in the fall of 2012, the De Pont contemporary art museum, formerly a wool spinning mill, was exhibiting the sculptor Anish Kapoor. Visitors circled a pale, tubular mass with red lacquered lips; a gigantic funhouse mirror flipped the exhibition hall upside down; and a bloodied cannon sat aimed at a corner clotted with red, tumorous lumps like some sad war’s spent organic ammo. At the town’s central train station, long rows of bicycles hung from hooks on the wall and lined the racks like plates stacked neatly in a dishwasher.

The Netherlands is a hotbed of psychological research, competing in cited papers with the United States, Great Britain, and Germany. Travis Proulx, a social psychologist at Tilburg University and a rising star in his field, was the reason for my trip. With animated

blue eyes and sporting a reddish stubble, Proulx conveys a slightly frenzied energy. If his friends described him, he half-joked, they'd call him a "neurotic extrovert." He spent his twenties studying at the University of British Columbia in Vancouver and working at an independent video store. "In many ways, I'm a reformed hipster," he said, grinning. He is surprisingly direct, in person and in his research and writing.

Over the last few years, Proulx and another psychologist, Steven Heine, have conducted a series of extraordinary experiments. Their goal has been to build a deeper understanding of how people react to confusing and ambiguous events. In one 2009 study, they had subjects read a version of one of the most disorienting short stories of the twentieth century, Franz Kafka's "A Country Doctor." In the surreal original, a doctor gets a call to help a boy ten miles away. There's heavy snow, and the doctor doesn't have a horse. A stranger appears with horses and bites the doctor's servant girl on the cheek. Reaching the patient, the doctor sees that the boy isn't ill at all, but then, no, he realizes, the child has a wound filled with worms; he's going to die. Villagers strip the doctor naked and ask impossible things of him. The story dissolves.

"A Country Doctor" describes a nightmare world. Literary critic Henry Sussman wrote that the tale actually "never becomes what might be properly called a story. The results are so inconclusive, the characters so blurred as to deny any pretense to narrative cohesion." Yet for all its twists and turns, Sussman adds, "There is no lack of structure here." The story employs the musical logic of consonance and dissonance. Albert Camus, as Proulx and Heine noted, pointed to "the fundamental ambiguity" of Kafka's talent: "These perpetual oscillations between the natural and the extraordinary, the individual and the universal, the tragic and the everyday, the absurd and the logical, are found throughout his work and give it both its resonance and its meaning."

For their experiment, Proulx and Heine created an altered version of Kafka's story, removing all references to death so that the subjects wouldn't be distracted by thoughts of mortality—a powerful psychological factor, as other studies have shown. A control group read another, coherent version of the story that followed a standard narrative arc.

After reading the story, the subjects were shown a series of forty-five letter strings and asked to copy them down. Each string was between six and nine letters long and was made up of the letters *M*, *R*, *T*, *V*, and *X*. What the participants didn't yet know was that the strings contained patterns. Precise rules governed this artificial grammar, or Grammar A. Next, subjects received a sheet of paper with sixty new letter strings. Half of these novel letter strings followed the Grammar A rules, and half of them followed rules of a different artificial grammar. The participants were then told for the first time about the patterns in the strings they'd previously copied, and were asked to place a check mark beside the new strings that they thought matched.

The results reflected the subtle power of incoherence. Those who had read the surreal Kafka story checked off 33 percent more letter strings than the control group. The Kafka subjects saw more patterns and showed improvements in identifying which of the patterns were in fact Grammar A. These increases, critically, were the result of unconscious processes. Subjects weren't looking for particular letter sequences when they copied down the Grammar A strings. Yet even without knowing it, people who had read a disorienting story were more alert to the patterns.

In another experiment, Proulx and Heine had people argue against their "self-unity." The researchers asked participants to remember a situation in which they had been bold and one in which they'd been shy. Some people were then asked to argue that these two memories showed that they had "two different selves," while others were asked to argue that despite these conflicting memories, they were a "uni-

fied self." Subjects then performed the Grammar A letter-strings task. The results echoed the Kafka experiment. Those who argued against their self-unity—a potentially confused position—identified more patterns in the letter strings. In yet another experiment led by Daniel Randles, subjects were subliminally presented with nonsense word pairs that might have pleased Mad Libs fans. Having phrases like "turn-frog," "quickly-blueberry," "juicy-sewing," and "belly-slowly" flashed before their eyes again made people more pattern hungry. In yet another study, subjects shown the René Magritte painting *The Son of Man*, which depicts a man in an overcoat and a bowler hat, his face obscured by an apple, reported feeling a greater need for order in their lives than those who looked at a more conventional landscape painting.

What was going on here?

Jean Piaget's assimilation and accommodation, it turns out, aren't our only reactions to confusing experiences. Scientists have uncovered other, hidden *A's*.

PROULX AND I marched across the Tilburg University campus to the nondescript psychology building. His office looked out to birch trees on a flat landscape. There was a single plant on the windowsill beside a Dutch translation of Kafka's short stories and some classical music CDs. Scattered elsewhere were a DVD of Woody Allen's *Crimes and Misdemeanors*, Freud's *Civilization, Society, and Religion*, a stray bottle cap, a loose roll of tape, mountainous stacks of psychology papers, an unopened bottle of Château Beaulieu Côtes de Bourg, 2009, and a book on Søren Kierkegaard.

Proulx sat me down at his desk and opened a computer program. He'd agreed to let me try out a recent experiment that he and Uni-

versity of California, Santa Barbara, psychologist Brenda Major had adapted from Bruner and Postman's trick-card study. After subjects fill in some background information, Proulx explained, they're assigned to either the reverse-colored cards or the control condition, where only normal cards appear on the screen. One by one, the subjects see a particular card and are asked to designate its value as odd or even. Jacks are odd, queens even, and kings odd, Proulx added. Then he stepped out into the hallway to grab coffee.

The red queen of spades appeared on the screen. Three seconds passed, and I clicked the "even" option. Next were a black two of spades, a red seven of hearts, and a king of clubs, whose red suit I didn't notice at first. I began to grasp that as I was calculating whether a card was odd or even, I'd miss its suit. That's apparently the point. The experiment is designed so that people look at the anomalous cards without consciously noticing their atypical color. Reporting whether the card is odd or even is merely meant to be distracting. The funny thing is, I soon knew perfectly well that some of the cards were trick cards, and I still didn't catch them all. The same thing actually happened to Proulx. He'd received some scans of the reverse-colored cards from a colleague who had employed them for a different experiment. "I'm thinking," he said, "this idiot didn't send me any anomalous cards. These are all normal cards! So I'm starting to type out this email, and my colleague says, 'Travis, look at the screen. The four of hearts is black.'"

Proulx and Major put Bruner and Postman's cards to a completely new use. They asked their subjects (via a questionnaire) whether differences in how hard people work justified social inequality. Then, some subjects were subliminally exposed to the reverse-colored cards as they were busy calculating the cards' values. Finally, Proulx and Major measured people's support for affirmative action. Those who believed that inequality was unjust—and who'd seen the trick

cards—expressed *greater* support for affirmative action. Somehow, seeing anomalous cards made people more committed to their existing beliefs. Again, the increased commitment was the result of exposure to anomalies that didn't reach conscious awareness. Anyone who later reported consciously noticing the trick cards was excused from the experiment. People didn't register the reverse-colored cards, yet the incoherence of what they'd encountered stayed active in their unconscious minds, leading them to ardently affirm unrelated beliefs.

Proulx has spent his career studying how disorder—be it in the form of a surreal story, the idea of a contradictory self, a nonsense word pair, or reverse-colored cards—can stimulate behaviors that seem completely unrelated. Working toward nothing less than a comprehensive theory of how people deal with inconsistency, he describes through his research a sort of homeostasis that people seek to maintain between sense and nonsense, uncertainty and clarity. Along the way, he has helped spark a movement of psychologists and other researchers who are now collaborating on a general model of how people react to contradictions and threats. Together, they have detailed the precise relationship between Proulx's two major research threads: how confusion motivates the search for new patterns; and how it leads to the avid affirmation of ideals. A hunger for new connections in the face of uncertainty may seem opposed to a heightened commitment to existing beliefs. Yet these two reactions are actually sequential, integral parts of coevolved and functionally intertwined cognitive systems.

Proulx's work builds on Piaget's, as well as on that of another giant of twentieth-century psychology, Leon Festinger. It was Festinger who, in the 1950s, pioneered a new understanding of mental conflicts.

ON DECEMBER 16, 1954, the *Chicago Daily Tribune* ran an exceptional headline: HE QUILTS JOB TO WAIT END OF WORLD DEC. 21. The "he" in question was a forty-four-year-old physician named Charles Laughead who had been working for the Michigan State College hospital. Laughead (pronounced "laughed") had apparently predicted that the world would end only five days later, on a Tuesday.

John Hannah, president of the college, explained that Laughead seemed quite certain that before the world ended, flying saucers from Mars would scoop up a few select people from a Vermont mountaintop. Hannah asked Laughead to resign for holding "sect" meetings at his home and upsetting some of the students. One pupil even made a down payment on a Cadillac because, Hannah said, "he figured he wouldn't have to make the rest of the payments and wanted to enjoy it while he could."

Hannah described Laughead as happy to resign, saying that the physician "only seemed concerned about getting his way . . . for the balance of the month"—until doomsday hit. Laughead had gone off to Chicago to meet up with other believers.

The day after the *Chicago Daily Tribune* article, the *Los Angeles Times* ran a longer, more detailed accounting, along with two photos: one of Laughead looking respectable in a tie and jacket, and another of a fifty-four-year-old dark-haired woman with a bony frame. The caption read: "Mrs. Dorothy Martin of Oak Park, Ill., describes communications from outer space she gave Dr. Charles Laughead." Martin, it seemed, was one of Laughead's direct connections to the aliens.

There were more details. Laughead had not actually predicted the world's end, but rather a cataclysmic event that would affect Chicago and both seaboard. He foretold that the underwater continents of Atlantis and Mu would rise again. A new sea would cover central North America. Martin had received a number of communications

via automatic writing: "My arm feels warm. It's hard to explain, but I just put a pencil to paper and write." She asked that alien spacecraft not be referred to by the vulgar name of "flying saucers," but instead as "disks."

Additional particulars emerged, also on the seventeenth, from a *Tribune* follow-up. "There will be much loss of life, practically all of it, in 1955," Laughead said. "There will be a tidal wave, a volcanic action, and a rise in the ground extending from Hudson's bay to the Gulf of Mexico which will seriously affect the center of the United States.

"It is an actual fact that the world is a mess," he added. "But the Supreme Being is going to clean house by sinking all of the land masses as we know them now and raising the land masses now under the sea. . . . There will be a washing of the world with water. Some will be saved by being taken off the earth in space craft." Laughead wasn't the only devotee to visit Dorothy Martin's Oak Park home. Fifteen believers, eight of whom were deeply convinced of the upcoming flood, would congregate there between the middle of November and December 20. Some would take drastic steps, quitting school, their jobs, or throwing away their belongings.

Martin informed the group that the spacemen, fulfilling their promise to save the believers, would pick them up in her backyard on the seventeenth. When it didn't happen, the group concluded that this "false alarm" had been a training session. Eager reporters fishing for additional kooky details were now regularly ringing Martin's phone. The story had gone national, and all sorts of visitors began to show up in person. Martin started to receive prank calls, including one, the *Washington Post* relayed, inviting her to a party at a Chicago bar that would last until the end of the world. "That is typical of the moronic calls I've been getting," Martin said. "We have to expect that." The *Post* further noted that "Chicago newsmen, armed with ball-point pens that write under water," were prepared for the impending flood.

On the night of the twentieth, Laughead and the other believers again waited expectantly at Martin's house, where pickup was set for midnight—and not, it seemed, on a Vermont mountaintop. They were to be carried off just hours before the onset of the flood. By this time, among the eclectic group of believers now crowded into Martin's home was a cast of characters later identified only by pseudonyms. Mark Post had flunked out of a technical institute and was still dependent on his mother. Bob Eastman, a student of educational administration, spent three years in the army and liked to swear and drink. Arthur Bergen was a pale, thin, deferential boy of around fifteen. Bertha Blatsky was a former beautician from the northwest side of town.

At about 11:15 p.m., Dorothy Martin received another message from the aliens: prepare for pickup. The mood among the believers was anxious and excited. They'd packaged up Martin's "secret books" filled with the aliens' messages to take with them on their journey. Because wearing metal in a flying disk is apparently dangerous, they had taken care to remove their zippers, metal clasps, belt buckles, and bobby pins. Arthur Bergen peeled the tinfoil from every last stick of gum in his pocket. They were ready.

IT WAS NEARING midnight in Martin's home. But unbeknownst to the believers, they were not alone. A group of psychologists from the University of Minnesota had secretly infiltrated the group. Led by Leon Festinger, Henry Riecken, and Stanley Schachter and posing as believers, the researchers had set out to document how the group would react when the world wasn't destroyed. The result was a riveting minute-by-minute account.

There were two clocks in the room that night, one of which ran nine minutes faster than the other. When the first reached

12:05 a.m., one of the infiltrators pointed out that midnight had passed. No no, everyone said, the slower clock was correct. Four minutes remained. The second passing of midnight brought hushed silence:

There was no talking, no sound. People sat stock still, their faces seemingly frozen and expressionless. Mark Post was the only person who even moved. He lay down on the sofa and closed his eyes, but did not sleep. Later, when spoken to, he answered monosyllabically, but otherwise lay immobile. The others showed nothing on the surface, although it became clear later that they had been hit hard.

The believers' initial reaction was to not react at all. They couldn't even move, stuck between their beliefs and a cold reality. Hours passed. Poor Dorothy Martin "broke down and cried bitterly." The rest of the group didn't fare too well, either. "They were all, now, visibly shaken and many were close to tears," the psychologists reported.

Five a.m. had nearly arrived before Martin received another message from the aliens. The cataclysm had been called off. The believers' own good spirits had saved the earth from the tidal wave and earned Chicago a reprieve. There *had* been some seismic activity, actually, in Italy and in Eureka, California. As part of a string of interviews, Martin told reporters that these quakes "might have been" part of the "advance information" of the disaster. "It all ties in," she said. "The California earthquake is bearing this out." Even though a higher power had intervened, disaster would still eventually come, and she predicted it would strike "like a thief in the night."

Over the following days, Martin and Laughead fought to keep the group together. But as time went on, Martin couldn't help but

keep relaying intergalactic messages that were consistently disproven. When yet another prediction of a pickup on Christmas Eve proved faulty, Laughead was put in the awkward position of having to explain himself to a reporter. The aliens had instructed them to sing Christmas carols on the sidewalk until pickup, but once again the "space brothers" had pulled a no-show:

Newsman: Didn't you say you were going to be picked up by the spacemen?

Laughead: No.

Newsman: Well, what were you waiting out in the street for singing carols?

Laughead: Well, we went out to sing Christmas carols.

Newsman: Oh, you just went out to sing Christmas carols?

Laughead: Well, and if anything happened, well, that's all right, you know. We live from one minute to another.

Some very strange things have happened to us and—

Newsman: But didn't you hope to be picked up by the spacemen? As I understand it—

Laughead: We were willing.

Newsman: You were willing to be picked up by the spacemen. But didn't you expect them to pick you up? As I understand it, you said that you expected them to come but they might change their minds, that they're unpredictable. Is that correct?

Laughead: Well, ahh, I didn't see the paper, what was actually printed in the paper.

Newsman: Well, no, but isn't that what you said?

This conversation, a "mélange of incompatible and halfhearted denial, excuse, and reaffirmation," as the psychologists put it, was

“typical of the untidy fashion” in which the believers tried to explain away the failed pickup that Christmas Eve.

Believers were spending most of their time in between Piaget’s two reactions of assimilation and accommodation, in that uncomfortable middle ground. They couldn’t possibly feel assured that their beliefs had been entirely correct, but they also weren’t willing to simply replace their false beliefs about the cataclysm. Like the child who knows that the sun doesn’t follow him or her but still insists that its rays do, Martin’s followers felt that they had to adjust to reality and yet were reluctant to alter their views.

Festinger and his colleagues were interested in the side effects of this mental limbo. After the no-show cataclysm, in particular, he and his coauthors described two fascinating and noteworthy reactions—responses that would later be confirmed beyond the realm of fanatical doomsday prophets and their followers.

First, the psychologists noted an increase in the number of visitors to Martin’s home that she and the other believers suspected might be spacemen. Disconfirming events, in fact, had led them to scrutinize visitors more intently and made them more generally suspicious:

Following the major disconfirmation, [Dorothy Martin] made additional predictions. . . . [T]here was a growing tendency on the part of the group to identify their visitors as spacemen. . . . Though one or two visitors had been identified as spacemen in the months before the [first] disconfirmation of December 17th, after [that] disconfirmation not a day passed without two or three telephoners or visitors being nominated for the position. . . . Floundering, increasingly disoriented as prediction after prediction failed, they cast about for clues, watching television for orders, recording phone calls the better to search for coded messages, [and] pleading with spacemen to do their duty.

Martin’s disciples could neither deny the series of failed prophecies nor shed their belief that she was in touch with aliens. Imprisoned by a chronic uncertainty, they grew pattern hungry in their search for confirmation.

Second, especially in the long term, Festinger and his colleagues noticed that the believers turned to one another for social support. In the weeks following those December events, for example, the former beautician Bertha Blatsky found comfort in the network of group members. When she tried to cope alone with what hadn’t happened, Bertha’s “life had been a misery.” But after getting together with some of the group on January 7, her spirits lifted. She described it as an answer to a prayer. “The funny thing about it is that previously, I am the one that others leaned on—and now all of a sudden I am the one to need the help.” Instead of bolstering her beliefs by discovering new information, she found confirmation by surrounding herself with fellow believers.

Some of the believers, of course, came to acknowledge that Martin wasn’t in touch with aliens after all. Pale Arthur Bergen followed this route, modifying his views slightly, as he reported in February: “Arthur indicated that he no longer had faith in Mrs. Martin. He still believed in flying saucers, still believed in the possibility of contact with outer space, but he had given up on [Martin] and her beliefs.” Bergen had left Martin’s home at 2:30 a.m. on the morning of the twenty-first, just a few hours after the failed pickup and before the onset of the “flood.” He never returned.

FESTINGER, RIECKEN, AND Schachter’s 1956 narrative report on the doomsday group, *When Prophecy Fails*, painted a comprehensive picture of the believers’ responses. At a basic level, each of their

reactions served the same end: stabilizing a belief system that had been shaken by devastating counterevidence.

Festinger used the case study to further develop his theory of *cognitive dissonance*, a now-classic term that refers to the disturbing feeling of experiencing two conflicting cognitions—opinions, ideas, desires, or beliefs about the world, oneself, or one's behavior. We experience cognitive dissonance, for example, when we feel an urge to smoke despite a desire to be healthy, or when we flirt even when we expect to be rejected, or when we're fired from a job we thought we were good at. Festinger was focused on conflicts between beliefs and behaviors—for instance, how people react when they know a task is boring but have to publicly defend it later. He found that subjects try to dispel the unpleasant anxiety these inconsistencies cause, often by changing their opinions to align with past actions. Over a thousand published studies have made cognitive dissonance one of the most thoroughly confirmed theories of attitude change in all of psychology.

For Festinger, the unpleasant feeling of uncertainty was the signal that a discrepancy needed resolving. In 1974, psychologists Mark Zanna and Joel Cooper reported critical support for this idea in a study titled "Dissonance and the Pill." They told their subjects that they were interested in the effects of drug "M.C. 5771" on memory. Then they gave participants a placebo pill—just powdered milk—and told one group of subjects that it might make them tense, and another group that the pill would have no effect. Afterward, the participants were asked to support an opinion unrelated to the experiment and that ran counter to their beliefs. In this case, some subjects were gently requested to write an essay in support of banning inflammatory speakers from campus. Others were more forcefully instructed. Finally, all of the subjects completed a questionnaire assessing their views on excluding radical orators.

Participants who had been asked (but not instructed) to write anti-free speech essays were more likely to tell researchers that they supported such measures. This result reflects Festinger's classic finding: if we feel responsible for doing something that we believe to be wrong, we sometimes change our beliefs so that they align with our past actions. We resolve the dissonance by changing our minds.

Here's where things get interesting. When Zanna and Cooper's subjects were told that the placebo pill might make them feel tense, this readjustment effect disappeared. Subjects who had been asked nicely to support a ban on inflammatory speakers didn't revise their opinions in the questionnaire. If their discomfort was explainable, they weren't compelled to revisit their beliefs. When people had a plausible reason for their physical anxiety—even when the pill was powdered milk—they ignored having contradicted themselves. Zanna and Cooper's finding, known as the *misattribution of arousal*, implied that the physical discomfort of mental conflicts motivates attitude change. Any reasonable explanation for anxiety, it turned out, shut down the mind's drive for consistency: the heat or ventilation in the room, or even the lights.

Since Zanna and Cooper's study, the theory of cognitive dissonance has been subject to an intense tug-of-war. Some researchers questioned whether Festinger was correct at all. One camp argued that the true motivation underlying cognitive-dissonance effects was the need to maintain a positive self-image. Another camp claimed that Festinger's studies were actually concerned with "ego defense." Yet another group emphasized that the consistency urge was about avoiding negative outcomes. Part of the problem, especially in the 1980s, was that the measures used to detect dissonance—like changes in skin moisture—were unreliable. In the 1990s, however, researchers developed more-subtle measures and designed cleaner experiments to control for the role of self-interest. In the last fif-

teen years, accumulating research and advances in neuroscience have empowered a remarkable resurgence of Festinger's theory. Today's researchers have moved far beyond Festinger's early focus on attitude change toward a broader exploration of any conflict between opinions, beliefs, behaviors, desires, and ideas.

In 2014, nine researchers (including Proulx) across seven universities published an in-depth treatise laying out the growing evidence that a subtle physical anxiety is in fact the engine motivating us to reestablish order after encountering disorder. But the psychologists had in mind something even more ambitious than resurrecting elements of Festinger's original thesis.

THE STUDY OF human psychology, as Travis Proulx and others have mournfully detailed, is fragmented. Far too frequently, researchers fail to collaborate on general theories. Instead, they design micro-theories around provocative experimental effects. Gaps between related theories, consequently, are too rarely explored and identical psychological phenomena are too often reframed and presented as new.

We've seen the unhealthy outcomes of scientific competition in other times, in other fields. One illustrative case concerned the fossil hunters and rivals Edward Cope and Othniel Marsh. In the 1870s, Cope and Marsh were unearthing huge horned mammals and colossal Jurassic dinosaurs in the American West, revealing, to the world's amazement, a slew of gigantic creatures never before imagined, including *Stegosaurus* and *Triceratops*. But the men hated each other. They were in a fierce struggle to be the first to name new species in what became known as the Bone Wars. Fossils from Wyoming, Colorado, Montana, and Kansas were quickly classified and pub-

lished as new discoveries. A third fossil hunter, Joseph Leidy, was also in the mix. The problem was that the three men were separately "revealing" and classifying the same species under different names. Between Cope and Marsh alone, one species was "discovered" no less than twenty-two times. The paleontologists *were* making great discoveries, but were making overlapping discoveries.

Now imagine a field of inquiry in which the "bones"—that is, human reactions classified by psychologists—are far more difficult to parse. Researchers are enticed not merely to discover new evidence but to generate new explanations, a problem compounded by the bedeviling issue of language: there are many ways to say essentially the same thing. As psychologists (and husband and wife) Eddie and Cindy Harmon-Jones wrote in 2012, too often "social psychologists try to make their mark by coming up with a new name for an old phenomenon. . . . [T]his tendency has been rewarded by a field that prizes innovation." Proulx, in a 2012 article with the University of Toronto's Michael Inzlicht, was more bruising, arguing that fragmentation has resulted in a "scientific field that runs somewhat in reverse, generating an increasing number of labels for an increasing number of descriptions of increasing numbers of analogous effects." As Proulx, Inzlicht, and Eddie Harmon-Jones put it, it's as if "Newton had replaced his theory of gravity with a separate theory for every object that falls."

* Keith Thomson, in *The Legacy of the Mastodon*, writes: "It turns out that the suspicions first voiced out in Wyoming in July 1872 were correct: these rivals did all have the same materials. Marsh's *Dinoceras* and *Tinoceras* were really Leidy's *Uintatherium*. Leidy's *Uintamatrix* was his own *Uintatherium*. Cope's *Loxalophodon* was also the same as Leidy's *Uintatherium*. These uintatheres form the basis of Marsh's *Dinocerata*. Cope's *Eobasileus* was really Leidy's *Titanotherium* and therefore belonged with Leidy's *Palaeosyops* in the different group of giant, hornless mammals called titanotheres. Cope's *Megaceratops* was really the animal that Leidy in 1871 had described as *Megacerops* and it, too, was a titanotheres."

Proulx and his colleagues proposed that swaths of current theories are simply different parts of the same skeleton. When assembled—using the broadest conception of cognitive dissonance as the spine—these pieces reveal that humans have a central meaning-making system that responds to incoherence in a predictable sequence.

First, some situation, event, or message disturbs our sense of order and consistency. There's a mismatch, an "error" between what is and what should be. Rain is falling but the ground is not wet. You try to push open a door, but the door doesn't open that way. Whenever our assumptions about the world are violated, we experience a spike in brain activity, an error message that may or may not reach consciousness, and a jolt of adrenaline. Different brain regions have been implicated in error detection, but the anterior cingulate cortex, or ACC, appears to play a special role.

This human alarm system, as it has been described, goes off even if the violation ends up being *good* news. In a 2010 experiment out of the University of California, Santa Barbara, and Harvard University, Latinas, who expected to—but *did not*—encounter prejudice in a social setting, exhibited cardiovascular stress responses. In another study led by Wendy Mendes, subjects encountering an "error" as mild as an Asian American person speaking with a Southern accent reacted as if they were experiencing a threat. In a 2013 experiment, subjects with low self-esteem displayed lower changes in blood pressure when they received negative rather than positive feedback.

During the second phase of our response to incoherence, we enter a state of anxious vigilance. Here, we're more alert, motivated to seek out new information. In light of the pattern retrieval characterizing the phase, Proulx and Inzlicht have dubbed this response *abstraction*. It's when we're galvanized to collect clues from our environment. Abstraction probably evolved, Proulx and his colleagues suggest, as

a tool for overcoming obstacles to our goals. Think, for example, of a mouse that's looking for food and smells a cat nearby. The mouse becomes more hesitant and anxious. It continues to look for food but does so more alertly now, scanning the environment for the cat, rearing its head and sniffing. The neural network responsible for error detection and abstraction is called the *behavioral inhibition system*, and mice with lesions to this system are unable to solve problems by altering their course of action. Abstraction happens in a hyperattentive, anxious, and impulsive state of mind.

After some period, a second neural network, known as the *behavioral approach system*, takes over. This system coevolved with the behavioral inhibition system to deal with the anxiety of mental conflicts. It soothes our angst by pushing us *toward* commitment to an idea or a course of action. The approach system satisfies the need for closure, and Piaget's two A's—assimilation and accommodation—likewise enter the picture here. Let's say, for example, you see a white crow. At first you're a little surprised. You peer at the bird with heightened attention, and then eventually you switch into the more domineering mind state that making decisions requires. You can assimilate the experience and decide that the bird is a dove. Or you can accommodate it and recognize that albino crows exist. The rub, as Proulx's collaborator Steven Heine told me, is that "assimilation is so often incomplete." We act as if we're sure the bird is a dove, but the feeling that it's not is still there in the unconscious, leaving us trapped in a similar middle ground as the doomsday believers were, stuck between assuming we've understood and sensing we haven't. One way we respond to these lingering anxieties is by finding comfort in our social groups and passionately emphasizing our ideals.

Proulx and Inzlicht called this reaction *affirmation*. Affirmation is the intensification of beliefs, whatever those beliefs might be, in response to a perceived threat. In Proulx's research, it's when sub-

jects grew strident about affirmative action after seeing anomalous playing cards (without realizing it). After being reminded of death, authoritarian-leaning participants in a recent study evaluated an immigrant more critically than like-minded subjects who hadn't received such a reminder. The same effect held true for liberal participants' positive evaluation of the immigrant: their views grew more favorable. In another study, subjects who felt a lack of control expressed greater faith in God or Darwin's theory of evolution, as long as Darwin's theory was presented as predictable. Through affirmation, we turn to our existing sources of meaning for stability. We swim back to friendly shores.

Researchers have been selecting different parts of this puzzle—error detection, vigilant abstraction, and affirmation—and describing their effects under different banners. Proulx and his colleagues have argued that the theory of willpower depletion, for example, derives its evidence from cognitive dissonance: most famously, by forcing you to resist the chocolate that you want to eat. The so-called depletion occurs because anxious vigilance makes people impulsive.

Similarly, different theories describe various forms of affirmation. One of the theories under Proulx's scrutiny suggests that when we feel that we're losing control over an experience, we emphatically assert control elsewhere. Another theory suggests that when our personal goals are threatened, we affirm our personal values. After being reminded of death, another model suggests, we affirm our beliefs. All of these theories share the same pattern, and Proulx's most novel claim is that the beliefs we affirm can be completely distinct from the fact or beliefs that were violated. He calls it *fluid compensation*. In one of the strangest studies showing just how content-free our counter-adjustments to feelings of uncertainty can be, participants who ate an unexpectedly bitter chocolate later described their lives as more meaningful.

Our search for patterns (abstraction) and our fervent expression of beliefs (affirmation) are sequential. That's why researchers studying affirmation effects observe them most easily after a delay: in experimental settings, it's roughly five minutes after a subject encounters a jolt to his or her sense of normalcy. In fact, Proulx found that reading an ambiguous Kafka tale not only led people to identify more patterns, but in another experiment, the reading also pushed subjects, after a delay, to express their nationalism more fervently. The same held for nonsense word pairs. People grew pattern hungry, but after a delay in a different experiment, they ardently affirmed their beliefs. Festinger seemed to make the same observation of the doomsday believers. In the near term, they anxiously scanned their environment for new evidence, but later on, they reverted to their social support systems. Just holding a loved one's hand, a 2006 study found, mutes the activity of the brain's error center, the ACC.

"What's amazing," Proulx said, "is how much of human behavior bottlenecks at this very basic system." He speculates that dissonance reduction—broadly understood as our various efforts to restore order after sensing disorder—may explain as much as 60 percent of our day-to-day behavior.

As we'll see next, the effect of unrelated contradictions on our general relationship to uncertainty has wide implications. In Part 2, we'll explore how to handle ambiguity in daily life, especially in stressful situations. When we're under pressure, our urgent search for patterns and our dogmatic avowal of ideals can play out with dramatic consequences. Guarding against the pitfalls of the most powerful feelings of uncertainty in our lives means coming to grips with how our minds wrestle with ambiguity under hardship. Instability doesn't have to derail us. Understanding how and when we're vulnerable to mistakes, even in the face of shocking tragedies like natural disasters, makes uncertainty easier to master.