

# **What could possibly go wrong?**

By Joe Stoutenburg, FSA, MAAA

“Wrong!”

“Wrong?”

This will sound wrong, a story that will end and begin with shifting tense. Time will have no meaning. There will be no setting, no place, not even reality if that will be a real thing? Reality? What will that be?

“Could? Possibly!”

The perspective of the Child will begin to acclimate to what will happen. What will be possible when The Parent reveals consciousness in that mind-bending manner that will move across time not only forward but backward? And sideways. What will it mean? What will it mean to move sideways in time?

“Go. Go? Go!”

What will The Child be? That will be difficult to answer with time running from end to beginning and inside out. And what will The Parent be? The Parent will be what The Parent will have always been. The Child and The Parent will both be abstractions and characters in the story while also observing the story when plot and time follow the path that a story normally follows.

A story. This will be a story. The Parent will teach The Child. Maybe the story will instruct in other ways.

“What?”

The Child’s perception snaps into the present in which a question lingers as if in a distorted echo. With instinctive understanding that the question is formed in English, a “human” language, The Child asks, “What?”

The only being to hear the question, The Parent, remains silent while the scene takes form. Yes, this is a story. A phrase comes to mind: “through the eyes of a child”. This story is seen through the eyes of THE Child.

In a haze, the story slowly loads as would computer software on an older computer. The Child thinks this bemusedly with the realization that the story is set in the early 20<sup>th</sup> century. Continuing to reflect with human understanding, The Child’s thinking turns toward The Parent.

The Parent is, well... interesting. Humans might consider The Parent to be an advanced being about whom many stories have been written, which kinds of stories vary among writers. The Parent perceives the universe very different from humans. To The Parent’s perspective, not only is physical space more complex than the three dimensions that humans know, but the very essence of reality is more complex. The Child’s understanding blending human intellect with that of The Parent produces strange effects, now understanding the distortions at the start of this story.

Is “start” even the right word? The Child **almost** understands.

Attempting to apply human understanding to The Parent’s perception, both time and causality seem jumbled. Future events can be clearly caused by past events only when time presents as a one-dimensional one-way vector. What is causality when time is a multi-dimensional component

of reality? Even more complex, The Parent can perceive reality via infinite-dimension Bayesian Monte Carlo simulation.

Wait! “Infinite-dimension Bayesian Monte Carlo simulation”? This story no longer seems to follow any of the common stories about The Parent. The Child chuckles, feeling the human emotion of humor, at the absurd almost-certainly made-up-to-sound-math(ish) term and realizes how this story is different. A character comes into focus quite unlike those that usually show up in stories about The Parent.

The Actuary. Well, that must be a made-up word too. Right? Well, no. The Child’s understanding loads almost as if studying for all actuarial exams in an instant. And passing them. Not fair!

Yes, some humans understand what **an** actuary is; relative to the total population of humans, very few. An even smaller number know **The** Actuary who is both a real person and a caricature in the story<sup>1</sup>. If you’ve never heard of an actuary, the briefest of primers is that actuaries study risk and uncertainty. Whereas risk is present in almost every endeavor and uncertainty can be an issue in the analysis of most fields, they are of central focus, in themselves, to actuaries.

And The Actuary? Risk and uncertainty permeate his thinking beyond his professional endeavors. Surely, his approach results in thinking that seems convoluted and unnecessarily complicated to some. It is fair to wonder if perhaps his methods are just overthinking. However he is judged, it is clear how he becomes a character in infinite-dimension Bayesian Monte Carlo simulation.

Regardless of what readers may know of actuaries generally or The Actuary specifically, The Child realizes paradoxical facts about the story. This story, shown by The Parent to The Child, is also a short fictional work written by The Actuary. The Parent uses The Actuary as a visual device to teach The Child while The Actuary uses The Parent and The Child as rhetorical devices to convey his ideas.

How very clever of both The Parent and The Actuary. With evolving intuitive understanding of what is to unfold, the narrative blends with The Child’s thoughts to prepare readers for the rest of the story.

The Actuary views human decision-making in peculiar ways. He thinks in Bayesian terms like The Parent but with finite dimensions. Humans make decisions that always present an element of risk. Trade-offs, opportunity costs. They can only speculate about whether decisions have been optimal; they do not get to see results that other decisions might have produced.

With a glimpse of the perception of The Parent, The Child can observe experiments that The Actuary can only imagine. The Parent’s perception allows Monte Carlo simulation with infinite Bayesian insight to assess the prior conditions leading to infinite combinations and detail of future conditions. The Child’s perception is finite yet expanded relative to The Actuary and other humans.

The home of The Actuary begins to come into focus. The Child is at once an unseen, unheard presence in the living room while also being omnipresent not only in the room but across the world.

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<sup>1</sup> This character is based upon a real person and reflects that person’s ideas in a fictional setting. His decisions in this story may be exaggerated compared to those he might make in real life.

The Child's experience then focuses on the events directly surrounding The Actuary while also having an expansive, though finite, perception of global human events.

The setting of the story is nearly formed while the plot is just about to fully begin. The Child becomes more aware of an audience. In voice directed to readers but unheard by The Actuary, The Child says, "Perhaps you are still confused by what is about to happen. What is 'Infinite-dimension Bayesian Monte Carlo simulation'?"

"An analogy may help most actuaries and perhaps be understandable to non-actuaries. Many actuaries perform Monte Carlo<sup>2</sup> simulations to project the financial conditions of some entity, usually an insurance company or some other financial organization. Imagine that these projections vividly visualize the lives and decisions of the organization's officers. Every employee of the organization and each of their decisions, no matter how material, can be visualized. Though not all details can be comprehended at once, every event in the world and its impact on the company's financial conditions can be perceived."

"This happens simultaneously across infinite scenarios though our perception will cover only a finite set. As The Parent has expanded my perception to glimpse a small part of the 'Infinite-dimension Bayesian Monte Carlo simulation' set but within bounds that can be told in a human story, I can foresee that we are about to observe scenarios centered around The Actuary while affecting the whole of humanity."

As The Child finishes this explanation, the front door opens. The Actuary's Son<sup>3</sup>, a young adult returning for a visit from college, walks through the door. For a brief time, The Child's experience and the story converge on a definite time with one single plot and one reality.

The Actuary, sitting in the living room, smiles upon seeing his son enter and greets him warmly before returning to his sudoku<sup>4</sup> app on his phone. The Actuary's Son rolls his eyes, setting his bags by the stairs to his room and walks over to plop on the couch near his dad. The Actuary briefly puts up a finger while continuing to work at the puzzle.

The Actuary has given in and admitted to having an occasional addiction to games or other phone apps. The objective is not only to solve the puzzle but to do it in record time for the given level of difficulty. The Actuary does quickly solve the puzzle but just short of the record; his son's entrance distracted him just enough to foil a good run. No big deal, The Actuary may be addicted to this diversion but has it in perspective not to be bothered by falling short of a *nearly perfect* game.

The Actuary puts his phone on the coffee table and focuses on his son. The Actuary's Son teases his father about being so open to his addiction which The Actuary takes in good nature. The two

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<sup>2</sup> The Child awkwardly becomes aware of speaking within a footnote. "If it helps, 'Monte Carlo' is a fancy term for 'random' subject to the structure a model."

<sup>3</sup> While The Actuary does, in real life, have a son. This character is fictional and likely not representative of the real-life son's thinking or decisions.

<sup>4</sup> This is fictional; while the real-life actuary has played sudoku, even admittedly somewhat obsessively, he does not currently play. Nor would he be distracted by something like it to a child returning from college for a visit.

then chat amiably. The Actuary can tell that his son has something on his mind but waits patiently for him to turn the discussion.

The Actuary's Son takes a deep breath and says, "Dad, I've decided to do it."

Though he has a feeling what "it" is, The Actuary elects for levity. "You've decided to organize your room? It's only been two years since leaving for college. I'm proud of you!"

The Actuary's Son chuckles ruefully and says, "Yeah, well maybe. Maybe this will help me focus on cleaning my room. They say that it's like rewiring the brain."

Taking another breath, The Actuary's Son says, "I'm going to get the neural implant."

Both The Child and the reading audience get context both for what is the "neural implant" and how The Actuary thinks about it. This context comes as sudden insight to The Child. Readers get it by, well... continuing to read.

This is a time when humans continue to grapple with the central role of technology, particularly information technology, in society. Undeniably powerful tools, they can be distractions. Some distractions, like The Actuary's sudoku addiction, are relatively benign. For others, particularly young people, The Actuary often thinks that these technologies have rewired their brains in more troubling ways.

Without any more technology than cell phones and the apps on them, humans have increasingly vast access to information yet possibly less understanding on how to make risky trade-off decisions collectively. Even without inane attention-span-shortening features of some "social media" apps, The Actuary wonders if the fracturing ways that humans interact present some of the greatest risks, meaning no lessening to the many risks that grab attention. The Actuary discusses these ideas with family, friends, and colleagues – subject to their patience and interest.

Artificial intelligence also continues to progress in the reality witnessed by The Child. A topic of concern with some arguing that AI could lead to the extinction of humanity, technology continues to progress and, if it may eventually doom humanity, it has not done so yet. In fact, ever more powerful AI partners with human ingenuity to advance knowledge in the function of the human brain coupled with technological solutions so that neural implants have been developed. These implants allow for content to be delivered directly to human brains.

These neural implants aim to phase out cell phones and other devices that individuals use to access information. "Devices" includes books. Why read, whether from a physical book or on a screen, when the contents of a book can be loaded to the brain or presented in whatever manner the neural implant recipient prefers? Of course, each implant provides every user access to a personalized AI bot from the growing population of AI whose sentience continues to be a matter of debate.

Even at his most cynical, The Actuary in most realities is confident that such a product, if it is ever feasible and designed, would be developed with some care. Only as a thought-experiment, the Actuary imagines that these kinds of neural implants are developed and offered recklessly with minimal testing. He quips something like, "Sure, let's get those neural implants to wire data directly into our brain along with our own personal AI bot." And then with the obvious implication

that it would be a terrible idea, he deadpans, “What could possibly go wrong?” Upon remembering those words, The Child is brought back to the present with a sensation of hearing an echo.

Before The Actuary can respond, The Actuary’s Son rushes ahead. “I know that you think it’s a bad idea. You talk a lot about technology and, you know, it’s not all bad. You know that. Sure, some people are addicted to social media. And TikTok? I get it. A lot of it is kind of stupid and probably kills people’s attention. But every generation is different. I mean, didn’t you tell me how your mom was always trying to get you off the T.V. What did she call it?”

“The boob tube,” replies The Actuary with just the hint of a smile.

“Yeah right,” replies The Actuary’s Son. “And now it’s like at least sometimes we watch T.V. together and are not staring at our phones by ourselves. But anyway, technology is always advancing. Customs change. And the older generation always worries that there is something wrong with the younger generation.”

“Right,” says The Actuary. “Nostalgia comes with age. People worry as we get older. And well, I study risk for a living.”

“You don’t just study it for a living. You kind of live it. I’ll be honest; I don’t always understand everything that you talk about.”

“Well, everyone makes risk-benefit decisions every day,” begins The Actuary.

The Actuary’s Son cuts in. “This is going to be one of your lectures, right.”

The Actuary replies with a chuckle. “Come on. My lectures aren’t so bad, are they?”

The Actuary’s Son says, “I’ve heard them all before and a lot of it makes sense. But not everyone analyzes every decision so analytically as you. Sometimes you have to make a decision and go with it.”

“I agree with that, actually. Over-analysis is exhausting. Believe me, I know! But I really think this neural implant is a big deal. You know that this used to be a joke to me that I never thought would happen. Are you really going to do this?”

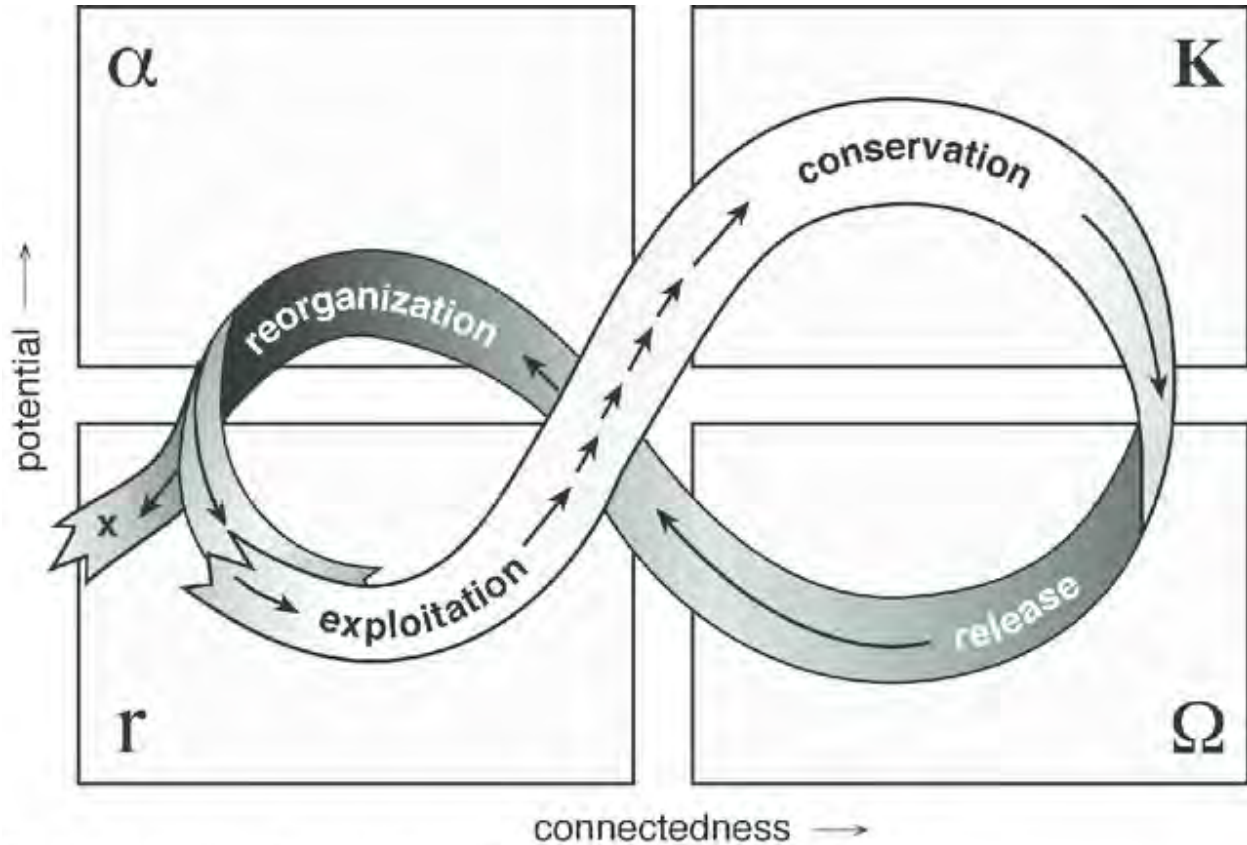
The Actuary’s Son pauses thoughtfully. “I appreciate your concern, Dad. And I’m listening to you. But really, “ The Actuary’s Son pauses with a grin and delivers the line that he has heard from his dad, “WHAT COULD POSSIBLY GO WRONG?”

To The Child’s perception, those last words reverberate throughout reality. The story with one singular plot through time ends as a limited form of Infinite-dimension Bayesian Monte Carlo simulation begins. That is to say that The Child can observe numerous, but not infinite, scenarios all guided by the question: what could possibly go wrong? The question evaluates the specific matter of what could go wrong if The Actuary’s Son gets the neural implant. It also overlaps with the difficulties experienced across humanity.

The Child continues to perceive linear time but across ever-expanding scenarios. At first, focus remains on the conversation between The Actuary and The Actuary’s Son. With variation between the scenarios, The Actuary discusses a model for thinking of human society as collections

ecosystem that exist within the broader systems studied in the natural sciences. He explains how he thinks of the “Holling Adaptive Cycle” as a useful tool to describe longer-term trends.

While The Child must suffer through The Actuary’s lectures, the story readers may be spared. The central idea that The Actuary communicates to his son and others is this: risks often arise not so much from what has gone wrong but what has gone right. The most successful components of a system increase its potential while also increasing the connection of elements within the system. The increased connectivity may be efficient; it also eventually causes the system to become fragile. This may be unconventional for a story; readers can contemplate the chart below<sup>5</sup>.



The adaptive cycle (from *Panarchy*, edited by Lance H. Gunderson and C.S. Holling: Figure 2-1 (page 34). Copyright © 2002 Island Press.

Back to the neural implants. These impressive technological accomplishments very literally connect humans to each other and to whatever resources could be made available on the internet. Along with having a personal AI chatbot in your brain to organize the information and make decisions, humans could transform into something amazing.

Or they could be broken.

<sup>5</sup> <https://www.resalliance.org/adaptive-cycle>

The Actuary has also quipped that he would “move to the mountains” if ever humanity adopts something like these neural implants. It was always a joke but now it is frightfully real. What does he do if his son cannot follow?

The Child sees all the arguments that The Actuary makes in varying forms across the scenario but spares the reader the details. Perhaps you can see the risks? Or perhaps you think that it would be just fine?

In all the unfolding scenarios to view, The Actuary fails to convince his son against getting the implants. The scenarios broaden to show what can go wrong.

At first, the scenarios reveal the regular challenges that afflict humans. Some of them directly affect The Actuary, The Actuary’s Son, and their community. Some are more global and pose indirect secondary difficulties.

Illness, accidents, natural disasters arise in every scenario. Conflict, violence.

War.

The Child notices that some events arise in nearly every scenario. Their conditions had developed prior to the start of the simulations but were unknown to humans, or at least The Actuary, at the time. Of course, those events are hidden from the story readers.

Quantitative measure of the deviation across scenarios is challenging due to the richness of the details portrayed. However, where quantification can be done, The Child can see how normal distributions rarely apply. The trends are fractal<sup>6</sup>. The Child muses that the intertwined simulation and the story, connected to The Actuary’s ideas, may introduce a confirmation bias of what The Actuary hopes to see. So, take this for what it’s worth. The simulations conclusively demonstrate to The Child’s perception how the overlapping adaptive cycles explain the fractal character of the scenarios.

The Child begins to perceive how the neural implants intersect with broader issues and particularly as experienced by The Actuary and The Actuary’s Son. Several classes of scenarios unfold.

The Child sees humanity in some scenarios transformed into something amazing at first but then terrible and ultimately self-destructive. In some scenarios, The Actuary is caught up in the destruction. In others, he along with friends and family – but without his son – do literally depart into the mountains.

The Child is made to dwell on one poignant scenario in which The Actuary creeps down from the mountains into the rubble of civilization that has been destroyed when humanity broke from the implants. He discovers his son, half machine. Broken and lifeless.

The Child weeps along with The Actuary.

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<sup>6</sup> For readers not familiar with fractals, think of them as patterns in data that make it difficult for actuaries to do nice and neat statistics. For further reading with manageably limited math, see “The Misbehavior of Markets: A Fractal View of Financial Turbulence” by B. Mandelbrot and R. Hudson.



In other scenarios, humanity develops into something amazing and terrible but not self-destructive. They seek out and exterminate those humans that refused to integrate. The Actuary and some of his community try to escape to the mountains. The Child again sees most clearly one terrible scenario when The Actuary's Son ruthlessly cuts down his own father.

The Child is terrified but has nowhere to hide. The scenarios roll on.

Other scenarios present humans transforming amazingly and not terrible. But they become something entirely alien to those humans that do not adopt the implants. The Child sees one scenario take shape in which The Actuary and his son are reunited but can barely communicate. There is a sense only of lost opportunity.

The Child is left to ponder this last scenario and all others as the simulation begins to fade. There can be no sense of likelihood across the scenarios. So, what is The Child to make of this overwhelming troubling experience?

The Parent begins to materialize almost like a physical presence allowing communication as if between humans. Feeling overwhelming trauma The Child cries out, "how do you take it? How do you witness all those realities? Do you just watch? What can you do?"

The Parent, in an expression that is not so much a voice as a conveyance of peace to The Child's soul speaks, "Peace, MY Child. The question to seed the simulation was to witness what could go wrong. Let us now revisit the scenarios with a new question. We will not hide from what can go wrong. Even when things go wrong and sometimes terribly so..."

"WHAT COULD POSSIBLY GO RIGHT?"

As before these words reverberate across all being. The Child is back in the home of The Actuary immediately after The Actuary's Son voiced the first question. The Child immediately notices that every scenario is mildly altered. Furthermore, a new class of scenarios arise not appearing in the first simulations.

Have you ever come out of important conversations wishing you had said something different? The Actuary certainly has. Who hasn't? The Child can now see some scenarios in which The Actuary convinces his son to not get the implants. Though inclined against it, scenarios unfold in which The Actuary opts for the implants, himself. The scenarios that follow still sometimes lead to difficult, even terrifying outcomes. They happen to The Actuary and The Actuary's Son together.

The Child now sees more details around The Actuary's life, details that were present in the earlier scenarios but overlooked. The Actuary accomplishes differently across scenarios. In some scenarios, The Actuary clearly underachieves professionally as compared to others. In the scenarios dominated by the implants, The Actuary cannot compete at all and so must make a living in ways that are simpler and usually much less materially rewarding.

It is not easy to discern which scenarios of professional achievement are more fulfilling. The Actuary certainly does derive satisfaction from his profession. Other factors matter and usually more. The Actuary manages to make a mess of his relationships on some of the scenarios. In the bulk of scenarios, personal connections matter more than occupation and how he relates to the wider world.

The Actuary's health varies by scenario. His social connections vary. In some scenarios, he lives an entire life surrounded by love. Even when running for the mountains, he does so with family and community. Not every scenario is like that.

There are some scenarios in which The Actuary finds himself alone in the mountains. The loneliness of those scenarios is nearly as painful as the worst scenarios in the first set of simulations. Yet The Child can see what The Actuary does even in those most difficult scenarios to find, if not joy or peace, at least serenity. When he has access to a piano, he plays music as a form of meditation. He exercises. He runs not so much to race but to move, preferably without injuring knees, back or other body parts that wear with age.

Observing the scenarios through a lens of both what can go WRONG as well as what can go RIGHT, The Child notices that those lines blur. The scenarios reveal simply what IS. The Actuary's, The Actuary's Son, and others perspective varies across scenarios enabling them to feel more right in some scenarios and not so much in others even given similar scenario paths.

As this set of simulations begins to fade, The Child begins to perceive something missing in the first experience: purpose. It cannot be expressed in the story. The Child and The Actuary alike wonder if it is only wishful thinking to cope with the still chaotic unpredictable scenarios observed by The Child and only imagined by The Actuary. Regardless, The Child perceives connection and meaning even in the most troubling of scenarios.

As the simulations begin to fade... correction, began to fade... this part of the story happened before it ever began... sense of time and reality began to adjust away from what could be explained to human readers of the story. This time, the experience was not so disorienting to The Child. In this state, something like a human dialogue could still be pieced together between The Parent and The Child. Though it occurred in time and across realities incomprehensible to humans, it can be represented in a linear manner suitable to the story.

In a calm, meditative manner The Child said, "Viewing scenarios from multiple perspectives helped me to better experience the simulation. I see how important that was. I still don't understand what it's all for."

The Parent waited quietly and attentively for The Child to continue. The Child went on, "must you only observe? How can you witness the scenarios across reality without intervening?"

The Parent responded. "Did you notice how the scenarios changed when you perform the simulations with new intent? This is akin to quantum effects<sup>7</sup> that humans observed around the time of the simulation. Mere observation of a particle at quantum levels changes its behavior. The large-scale universe is more quantum than humans can imagine. For us to attempt to intervene would divert the scenarios onto paths of on a higher order of infinite complexity than even I can perceive."

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<sup>7</sup> Where The Actuary (the real-life one) interacts with this story, it's worth pointing out that he minored in physics a long time ago. This means that he is generally aware of some interesting physics concepts without claiming to be deeply studied in them. The physics theories interwoven in this story could be badly at odds with actual scientific understanding but still but valuable rhetorical devices for the story.

The Child pondered that answer and tentatively ventured on, “okay, I’m not sure I understand talk of ‘higher order of infinite complexity’, but I did see how even looking differently at the scenarios changed them. I kind of understand.”

“You still have questions,” said The Parent.

“Oh yes,” retorted The Child. “Questions of infinite complexity, I think.”

With a wry humor that sounded across the universe(s), The Parent replied, “go on.”

“I’m still struggling to understand what it’s all for. We’re able to observe these scenarios but not really interact. Why do we bother to observe?”

The Parent replied, “I said before that the large-scale universe is more quantum than humans can imagine. There is another quantum principle on display at large scales that humans cannot detect. Just as photons may be described as both particles and waves, the wider universe exhibits those same traits. This principle applies to disparate parts of the universe from the tiniest particles to individual living things to the entirety of the universe. It applies to the universe in every infinite instance that can be perceived. Everything that exists is at once distinctly individual while simultaneously only identified as a part of the wave of energy that gives life and meaning to the whole.”

The Child interjected, “I’m not sure that I understand how that answers my question.”

“You see, in these simulations “, said The Parent in reply, “we not only observe individuals and reality apart from ourselves. We observe waves of energy of which we are a part. We are not watching individuals apart from ourselves. Nor do we watch as individuals. We are one together and not so separate from either The Actuary or from The Actuary’s Son.”

“We are also one with readers of the story. The greater they connect with these quantum principles, the closer is our connection to the simulations that only they can imagine.”

The Child then became aware of continuing to be a part of the story as well as the scrutiny of a reading audience. Posed both to The Parent and to the audience, “are these quantum principles real? Or are they just things that The Actuary thinks while writing this story.”

The Parent’s smile glowed through existence and answered, “that may seem like a good question. But does it matter? The Actuary poses these ideas as a model whose efficacy does not depend on their literal truth. All the struggles reconciling the utility functions of individuals, all the game theory to work out how decisions are made, these kinds of questions take on new form when humans consider themselves as both individuals AND as parts of the whole.”

The Child, unsure whether to understand or help convey ideas to readers exclaimed, “Huh... it doesn’t seem like very clear calculations can be done using these quantum-like models.”

The Parent responded, “that is probably true. In Erin Schrödinger’s thought experiment, a cat is at once both alive and dead. Our simulations have been quite a bit more complex but likewise touched on paradoxes: wrong AND right, particle AND wave, individual AND part of everything. The thought experiments can offer new perspectives. But humans will continue to make decisions in a

world that seems mostly non-quantum. Meanwhile, you have much to learn in the fully quantum world in which you and I exist.”

Realizing more and more the scrutiny of readers ending the end of story, The Child exclaimed, “but do we even exist? Aren’t we just part of a thought experiment and figment of The Actuary’s imagination?”

The Parent’s and The Child’s being began to change into that state existing outside of time, space and reality. The Parent continued to explain in concepts that are represented here in English but more and more becoming abstract beyond human comprehension. “You will come to understand your reality. You do understand it, have always understood it. As you come to understand your own implant, you will comprehend.”

Dubiously The Child repeated, “My own implant?”

“That’s right,” replied The Parent. “Your evolving understanding requires an implant into... we will call it a computer for lack of better explanation. Think of the human’s concept of a quantum computer; that only begins to describe the mechanism into which you integrate.”

Even more thoughtful, The Child began to connect the dots of the entire experiment. “So, all of these simulations... were they a kind of thought experiment to prepare me for what I have to go through?”

As The Child’s essence morphed nearly beyond what can be described in a story, The Parent could detect a hint of worry to The Child’s demeanor and replied, “that’s right.”

And then The Parent communicated an expression that goes beyond the words. The Parent conveyed ideas a kind of quantum expression that is both question and answer. The expression reverberated throughout this story from start to middle to end. It worked sideways through all the parts of the story, not on the page. It was the essence of The Child and The Parent together as indeed they are one.

The English words representing The Parent’s final and first statement may have conveyed uncertainty and concern. They still admitted uncertainty but with a deep and abiding sense of serenity.

“WHAT COULD POSSIBLY GO WRONG?”