The Actuary's Riddle

"Hut, hut, hike!"

My fingers closed around the football and I dropped back, surveying the field. One of my teammates had pushed past his defender, and I threw the ball to him. My throw was under, but he managed to scoop it up. A pull of the flags from his waist ended the play.

> YOU ARE OVERDUE TO COMMENCE YOUR RETURN TO TERMINUS.

"Let's see if we can score here," I encouraged my friends. This play, I ran the ball, which accomplished nothing but me ending up on my back, with at least three bodies piled on mine.

> FAILURE TO RETURN AT YOUR DESIGNATED TIME WILL RESULT IN PENALTIES, INCLUDING LOSS OF FUTURE SURFACE PRIVILEGES.

James D., my friend who had caught the ball on the previous play, helped me to my feet. His grip on my hand tugged on my glove, which revealed my wristband, which was now flashing red.

"Robert, you need to go. A game of football is not worth it," he told me.

I was ready to protest, to tell him I knew exactly how long it would take to return to Terminus at a full run, but he was right. If I made a mistake in my calculation, the penalty would be... it would not have been worth it.

I did spare a few minutes to say goodbye to my new friends before taking off, my android body maintaining a fast jog. I didn't worry about the simulated aches and pains that would result from this overexertion, as it was my Moving Day, my last day in this body, my last day on the surface for the next eleven years.

I reached Terminus with plenty of time to spare, at least ten minutes. I turned to get one last look at my home over the past year. Orion was a simulation of a small American town from Before, and for my Moving Day, I had chosen a fitting party, a picnic in the park. Grilled vegetables and meat substitutes, soda and beer, Frisbee and flag football. Sure, it all could be done in the virtual world, but the physical world simulation somehow felt more real.

> WELCOME HOME, ROBERT C.161485. YOU HAVE RETURNED IN A TECHNICALLY ACCEPTABLE TIMEFRAME.

"I would have preferred to stay on the surface permanently."

> ONLY THOSE WHO ANSWER THE ACTUARY'S RIDDLE MAY REMAIN ON THE SURFACE PERMANENTLY. EVERYONE UNDERSTANDS THIS RULE, INCLUDING YOU.

It wasn't my first Moving Day, so I knew what to do without prompting. A throne-like chair waited for me, and I moved my android body to sit in it. Wires connected to the port in the back of my neck, and my perspective suddenly shifted as I returned to the virtual world. I was now looking at the android body, watching as its face melted. My features, the features I would have had if I had been born in a human body, vanished, leaving only a small nose and the hint of other facial features.

At this point, I could have reinstated the normal avatar for Oracle, but she was being snarky, so I left her communications as text. I'd rather not see her face right now.

> YOUR NEXT ELEVEN YEAR CYCLE BEGINS TOMORROW. YOU WILL NEED TO SELECT AN AREA OF FOCUS FOR WORK AND AN AREA OF FOCUS FOR HUMAN CULTURE FOR THIS CYCLE.

"For culture, I select American cinema, with an emphasis on popular cinema from 1970 onward."

> YOU HAVE MADE THIS SELECTION IN THREE PREVIOUS CYCLES. ARE YOU SURE? (Y/N)

"It is my passion. However, I will choose something different if this field is available as my area of focus for work."

> THERE IS INSUFFICIENT DEMAND FOR THAT WORK. YOUR CULTURE SELECTION IS NOW NOTED. YOU HAVE PREVIOUSLY WORKED IN THE FIELDS OF ASTROPHYSICS, CHEMISTRY, AND ARTIFICIAL INTELLIGENCE PROGRAMMING. HAVE ANY OF THESE FIELDS STOKED THE SAME PASSION IN YOU?

They hadn't. But I had already decided what my next field of study would be during my sojourn on the surface. "I wish to study actuarial science."

> WITH YOUR SEEMING FASCINATION FOR THE SURFACE WORLD, IT IS SURPRISING YOU HAVE NOT MADE THIS SELECTION EARLIER.

"I know many people who have studied actuarial science. Since they are still here, it is clear that knowing actuarial science will not allow one to answer the Actuary's Riddle."

> THAT INSIGHT MEANS YOU JUST MIGHT BE ABLE TO ANSWER THE ACTUARY'S RIDDLE. SOME DAY.

I took that response as a win.

The Actuary's Riddle is a simple question: Why were there so few cases of influenza in the 2020-2021 season? This fact was noted at the time. Some people claimed it was because of mitigation factors implemented in response to the first novel virus of the End Times, while others said influenza was still present, just misclassified as the novel virus. But it is common knowledge that neither of these responses is the answer to the Actuary's Riddle.

That first virus was only the beginning. In the decades to follow, more viruses emerged, deadlier, somehow more transmittable, and fatal to humans as well as most mammals and birds. It contradicted everything we knew about viruses and how they worked. Despite throwing every resource against the threat, nothing worked. New viruses emerged faster than humankind could respond to them.

Facing extinction, the survivors realized the only hope for humanity's survival rested in a virtual realm. With continued growth in computer technology, an entire person's genome could easily be stored on a chip. A new technology to upload one's mind to a digital brain, originally invented to preserve the knowledge of the world's greatest virologists, was now readily available and scalable. From there, the next logical step was to reproduce digitally, with a combined genome describing the basis for the mind, and the digital brain learning much in the way humans once did. Humankind now numbers in the billions again, if just virtually.

But humankind did not evolve in a virtual environment, and the first generation born digitally did not thrive like the survivors before them. People needed to see and experience the physical world. And the only way to do that was to use robots. These were originally little more than metal skeletons, designed in a utilitarian manner, to service the infrastructure than supports our virtual reality. These were less than fulfilling for those who entered the physical world for the first time. It took only a few years of experience to learn that experiencing something like the old human world was what even virtual humans need. Those original robots became androids, with all the functionality of the human form.

I certainly needed my year away.

But no amount of musing about the state of the world was going to change the fact that I had a new job. And the first thing I had to do was study. With any new job, one must learn first, and the actuarial profession had a lot of studying associated with it. My virtual living space has a library with bookshelves and a comfortable armchair, and the actuarial study material was already there,

represented as textbooks. They were arranged in a recommended order of study, and I saw no reason not to follow it.

The first subject was theory of interest. I had seen some of these ideas before. For the first eighteen years, every new virtual human learns about the human world from Before. It includes not only the kind of material learned in a traditional primary and secondary education, but also how humans actually lived. Families. Homes. Jobs. Even taxes. Thus, I was familiar with the basics of bank accounts, retirement investments, and mortgages, not to mention the splashiest example of the concept of present value, the lottery. But I had never looked at the mathematics behind these instruments, and I found the results fascinating.

The next subject was life contingencies. The previous subject covered future amounts with certain terms, and the current subject added the uncertainty of a payment due to death. The insight that this created a discount in the value of something like a future annuity payment, and that there could be an actuarial present value, was eye-opening.

Each completed subject earned me a credit reward, with the amounts starting small. Credits could be spent on improving one's virtual homes, like I did with my library, or allowing one to create and lead social events. The interesting thing about a digital brain is that it still requires sleep, so to speak, a period of downtime allowing the processing of learned facts, building mental connections, and thus truly learning. This downtime only required four hours, so that meant the remaining twenty hours were split evenly between work and recreation.

I worked through my studies, continuing to save my credits earned. I spent my recreation time visiting friends, including the new friends I met during my time in Orion. When there are no obstacles to meeting any of several billion people, it is nearly impossible to forge a new connection, a friendship. Living on the surface was a chance to allow connections to develop naturally over a smaller group of people. I joined my new friends as they participated in their favorite forms of human culture. We talked about our experiences on the surface, our current and previous jobs, and of course shared rumors about the answer to the Actuary's Riddle. When I mentioned that I was now working in the actuarial field, I learned that many of the people I had met had spent one cycle studying actuarial science, and every one of them said something like what Oracle had confirmed, that nothing in the field was relevant to answering the Actuary's Riddle.

My studies proceeded quickly. Having perfect memory meant no fact or formula could be forgotten, so as long as I focused on learning, it became easier and easier to understand the topics. The use of math dropped off a lot after my first two subjects. I learned about various insurance products and their many variations, along with pensions. Investments was an area of study that I hadn't expected to be packaged with actuarial science, but after thinking about it, it made perfect sense. The course on analyzing data using computer programming languages was trivial, given my past work.

The final subjects for study concerned applying the principles of actuarial science to virus replication and pandemics. Almost all fields of study added this focus during the End Times, a reminder that, even as humans prepared to abandon the physical world, they remained confident that they could overcome any challenge, even a deadly plague of viruses.

After a little less than a year, I had completed my studies, and was now ready to work as an actuary, as well as a computer programmer, chemist, and astrophysicist. My biography was updated to include a new title, Fellow. And I noticed a minor increase in the number of jobs open to me, where the knowledge of actuarial science was deemed a useful contribution to answering the question.

All jobs now are Big Questions, where people with various knowledge bases working to answer questions like "What are the potential failure points and mitigation options for third generation underwater mining robots?" Artificial intelligence is very good at imitating a human answer to these questions, but never achieved that spark of human creativity to create new insights, new knowledge. We still needed thousands of humans, building on each other's ideas, to advance.

I searched the new jobs opened to me. "What changes in the populations of surviving bird species in the Americas could be an early indicator of a new mutation in fatal viral agents?" My new base of knowledge offered several avenues to investigate, though I expected most will have been fully explored by others. My enthusiasm dimmed as I was reminded that I was no closer to answering the Actuary's Riddle.

After completing my studies, I felt like I should be doing something big to celebrate. But I was mentally exhausted; it would probably take a few days before all my new knowledge was fully synthesized, and I would feel back to normal. With a thought, I reached out to various friends to hang out that evening, just something low-key. The first certain response came from one of my friends from Orion, Kenneth G. Our times on the surface had overlapped by nine months, and while we didn't do much together then, he was enthusiastic about maintaining our friendship in the virtual world.

We met for coffee and snacks. The virtual venue was a fairly generic coffee shop, with a 1990s feel to the décor. There were no brand names visible—someone would have to spend credits to make a specific venue like that—but it felt like that most popular chain from Before.

I settled into a plush chair with a blueberry muffin and an Americano coffee. Blueberry was my favorite kind of muffin, or at least that's what my genome suggested would appeal to my taste buds. Coffee was not my favorite, but I did enjoy the energy the virtual caffeine provided.

Kenneth G. arrived soon after, holding a sweet latte drink. He drank a third of it before setting the drink down.

"Tough day?" I asked.

"Two cycles ago, I worked in computer programming, specifically related to archiving and searching data. That entire cycle, I was fighting against algorithms created by the old tech giants. And thirteen years later, we're still finding code that conceals or changes information." He took another big drink of his latte. "It's insidious."

"This was all done for money?" I asked.

"Much of it was trying, and failing, to stop people from gaming the system with irrelevant links. There was a fair amount of governments trying to control information, and a few big egos thinking they knew better than you. But yes, it was primarily because controlling the flow of information was big money," Kenneth replied.

"Until the world ended," I said.

"I often wonder if we could have stopped the viral plagues if the exchange of information had remained unaffected. Probably not, but...."

"I just finished the coursework for actuarial science, and the biggest lesson I learned from that is how hard it was to model, since past data was not a reliable indicator of what all these new viruses would do," I said.

"I hear that from a lot of people. Different fields. It's so frustrating to feel we're no closer to answering the most important question of all."

"The Actuary's Riddle?"

"No, the whole virus thing. But maybe the Actuary's Riddle is related," Kenneth said.

"It has to be, right?" But I didn't see how.

I noticed I was out of coffee, and I didn't feel like getting another. Kenneth had already made his cup disappear at some point during our conversation. So it felt like time to part. "It was great seeing you," I said to him. "Thanks for always being up for getting together."

"Anything for the one person who doesn't make fun of my name," Kenneth replied.

"Who would do that?" I asked. "It's not like you have one of those weird names from the time when everyone was trying to be unique."

"You don't have to lie," he said. "Tell you what. I'll give you one free joke."

"A joke? What's funny about your name?" I said.

Kenneth looked at me. "You're serious? You're serious. Robert, what cultural focuses have you had?"

"Movies. American popular cinema, to be precise," I replied.

"And?"

"And nothing. Always that."

"I'm sure you will know why the next time we get together," Kenneth said. "The one free joke offer is still on the table. Make it a good one."

I shifted back to my virtual residence, forgoing the normal virtual walk I would take when going out. I went to my computer room, which felt more appropriate for interacting with Oracle. Sure, the avatar wouldn't be Oracle, but Oracle heard all.

In my opinion, the best way to search for information in the vast database of human knowledge was a plain language interpreter, most often called ChatBot, a generic version of a term popular at the start of the End Times. To bring it up, I spoke. "ChatBot?"

I am ChatBot, ready to help. What is your question?

I forgot that I hadn't changed from a text avatar since Moving Day, so ChatBot appeared as a box, yellow text on a medium gray background. It was a friendlier look than the all capital letter text of angry Oracle. I mentally switched the interaction to a human face.

"What would the typical person think of when hearing the name Kenneth G.?" I asked ChatBot.

"The typical person would think of American saxophonist Kenny G (1956-2032), known for his smooth jazz and frizzy hair."

The response brought up a picture of the musician, as well as selected details about his life. Obviously anyone studying music, both jazz and popular, would have been exposed to the name. Looking for other links, I saw televised concerts, television commercials, a music video by Katy Perry, and a reference in the television series *South Park*. If Kenny G had ever been referenced in popular

cinema, it was in a movie I had never watched, and one that ChatBot deemed irrelevant in its response to my question.

At least now I understood why Kenneth G. was unhappy with his name. His was the one case where the naming convention of a single letter followed by a string of number was actually better than the shorthand of just using the initial. Perhaps my limited exposure on the human culture side was something I needed to address, as Oracle not-so-subtly hinted.

I froze, and nearly fell out of my computer chair. I knew that there was nothing in the entirety of the actuarial knowledge I had studied that was relevant to the Actuary's Riddle. But what if the actuary in the Actuary's Riddle was a reference to pop culture?

I had to investigate. I decided to start with my specialty, movies. "ChatBot, please provide a list of actuaries and professions similar to actuaries in popular cinema, ranked by relevance."

"I have created two lists, the first by cinematic relevance and the second by thematic relevance."

ChatBot returned two possible interpretations of my request, and to be honest, it could be either of them, if my hunch was correct. Two lists made my next move obvious.

Double feature!

I splurged when I created my event, using all those saved credits to create the perfect theater experience. I chose the 1950s as the setting, with an older theater built in the 1920s. A chandelier in the lobby, velvet curtains, old wood and brass, the smell of fresh popcorn—it had everything. And as the creator of the space, I got to take the best seat in the house, first row of the balcony, center of the theater.

My event was open to the public, and the virtual theater filled quickly. True to the selected time period, the theater first showed an animated short and a newsreel, before then showing the first movie, ChatBot's suggestion for cinematic relevance.

About Schmidt was the kind of movie that was part of my cultural focus, but not the kind of movie I chose to watch, as I preferred action-packed blockbusters. All I knew about the film was that it was an Academy Award nominee and starred Jack Nicholson. Forty minutes into the movie, I knew why I had never watched it before. A character piece was how I would describe it. I felt that the character's career as an actuary had no relevance to the story. A quick information check during the boring parts of the movie confirmed this, as the movie was based on a book, where the main character was a lawyer.

The second movie, the one chosen for thematic relevance, was *The Billion Dollar Bubble*, which portrayed an actuary doing actuarial work, even if that work was perpetrating insurance fraud. The movie was also not to my taste, but at least it was short—too short. A check revealed that this wasn't a theatrical release, but a piece created for the BBC. I would have to make sure ChatBot understood what I meant by movies the next time I asked it a question.

Still, neither movie led me to the answer for the Actuary's Riddle. The first movie was completely irrelevant, and the only connection I could draw from the second was if actuaries were somehow responsible for the mutation and spread of the viruses. I had read hundreds of conspiracy theories about the viruses; all were more plausible than that.

I spent my days working on the bird population question, but my heart wasn't in it. Each night, I went down the list of actuarial movies. I concluded actuaries don't get any respect, as quite a few "actuarial" characters were called something else in their movies. I also concluded that nothing in these movies was relevant to the Actuary's Riddle.

The only insight I had derived from all this work was the one about actuaries being responsible for the viral plagues. That was something I could investigate. "ChatBot?"

The avatar appeared in front of me. "I am ChatBot, ready to help. What is your question?"

"Can you show me links to written media that prominently features actuaries and viruses?"

"Here is a list of links meeting the requested criteria."

It was a long list. And I recognized many of them from my actuarial studies. These were papers that were part of my reading list or referenced by other books.

"ChatBot, refine the list by showing only fictional writing."

The resulting list was just garbage, nothing relevant at all. Curious. There was the possibility what I saw was intentional—one can't simply ask ChatBot for the answer to the Actuary's Riddle—but this looked like the kind of thing Kenneth G. was complaining about, the whole gaming the system and ruining the ability to find information. It was doubtful anyone had ever paid to make people see their links with the search terms I chose, so no results came from that. And efforts to make responses "relevant" eliminated random articles or old Web pages that featured these words. All that was left was a few irrelevant links that had slipped through the cracks.

I recalled something Kenneth had said one day when we were talking over beers in Orion. He called it "One Simple Trick", which sounds like a term that would mean something if I had chosen the Internet as a cultural focus. The one simple trick? Just have ChatBot pretend to be something else.

"ChatBot, simulate a search engine using the technology of 1998, and give it access to the entirety of knowledge as of today."

"I can do that," ChatBot replied.

"Search for the exact phrase 'The Actuary's Riddle'."

"There are no results."

I didn't expect that to work, but it was worth a shot.

I thought back to my studies related to computer programming, looking for the way search engines worked before natural language interfaces were created. "Run a search using the terms 'actuary OR actuarial' AND 'virus OR viral' AND 'fiction'," I said.

This time, ChatBot provided a long list of results. And the results weren't very good. There were digitized books and newspapers where the terms appeared in separate places. Ancient blogs where the words appeared in separate posts. Dictionaries and word lists. Apparently, there were actual improvements made since the early days of search engines.

But around the twelfth page of results, I found works of short fiction that included both actuaries and viruses. In the few words that appeared in the search results, one of the links caught my immediate attention. The story involved time travel from a future world where an actuary used the principles of actuarial science to create deadly viruses used in biological warfare. It was exactly what I was certain couldn't have happened, but the writer, an actuary, envisioned it happening. Amazingly enough, this piece was written well before the End Times.

Most of the stories, however, were written during the period that would become known as the End Times, but were not known as such at the time. There were stories from a time when a novel virus was thought to be a one-time thing. They were naively optimistic, one even imagining a scenario where the first virus was successfully prevented through various means. The stories grew more and more bleak as years passed, until the point when they stopped. There was no place for frivolities in the End Times.

I do have to give credit to the one writer in 2027, after the arrival of the second virus, who imagined a future for humanity that was eerily like what actually happened. Whether by luck or insight, sometimes speculative fiction can become reality.

What struck me about all these stories is that actuaries, who at the time had no particular knowledge about viruses or pandemic modeling, were able to imagine futures extrapolated from the current world and a few what-if questions. On the other hand, that still left me no insight into the answer to the Actuary's Riddle. But I summoned my Actuary's Riddle notebook, which took the form of a very thick composition book, to jot down my thoughts from these stories.

One page in my notebook was titled "The actuary in the Actuary's Riddle", and collected a number of thoughts I have had about why it was called the Actuary's Riddle.

- Related to research conducted by actuaries during the End Times
- Related to an actuarial principle or a field of actuarial study from before the End Times
- Referencing a public statement from a prominent actuary
- Related to an actuary in a movie or other media
- Referencing an observation originally made by an actuary

My investigations during my previous cycles had focused on the first three items. I had found nothing then, and my more thorough exposure to actuarial science this cycle confirmed my findings. The fourth item was not entirely ruled out, but it didn't look hopeful. That left the fifth item.

Playing with the terms of my simulated search engine query, I didn't come up with any other ideas. But I did see there were plenty more stories written by actuaries, on subjects other than viruses and pandemics.

I knew what I was going to do with my recreation time over the next few weeks.

I didn't see it when I read it. No, I had to sleep on it. I drew connections and learned during my digital brain's down time. One of the stories I read featured an actuary working in farm insurance, who was out of a job because a service was accurately forecasting the weather months, even years in advance. He investigated the situation as an actuary would, trying to see if this mysterious service somehow had better actuarial models than every actuary in the world. But he realized that it simply wasn't possible to forecast the weather with that level of accuracy, which meant the only way to generate those results was to control the weather. It resonated with my own thought process trying to figure out why the Actuary's Riddle had that name.

In fact, that was the nature of the Actuary's Riddle itself. The stated question was a distraction. What mattered was that it was an impossibility, according to everything we knew at the time, but it was only the first impossibility of many decades of impossibilities. Every aspect of viruses changed in ways they never had before, and no one could explain it, much like there was no agreed-upon explanation for a data blip that would have been forgotten, had it not been enshrined in the Actuary's Riddle.

I took out my trusty notebook and reviewed four cycles of research. I shaped the arguments in my mind. It was time.

"Oracle."

A door opened before me, revealing the visualization Oracle preferred. It was a combination of Ancient Greece and a science fiction starship. Broad stone steps led to a facade of columns, each shining red in an unseen light. Oracle sat, not by a fire, but by a glowing orb. The walls were panels displaying constantly shifting scenes both terrestrial and cosmic. And directly behind Oracle were two steel doors, doors that somehow appeared to be miles distant.

"Welcome, Robert C.161485," Oracle spoke.

"I wish to answer the Actuary's Riddle," I said.

"You may only attempt to answer the Actuary's Riddle once per cycle. Are you sure?"

"I am," I replied.

"Then speak."

"The Actuary's Riddle speaks of observed data that simply should not have been possible. There are four main responses, with a dozen variations for each, that are understood to not be the answer to the Actuary's Riddle. But what's important is not the answer to the posed question, but to recognize the impossibility of the situation.

"We observed viruses mutate in ways never before seen in nature. These changes also were not consistent with techniques of genetic engineering known to man. An impossibility.

"We observed animal species die off due to influenza viruses, animals that had never been shown to be at risk from these viruses in the past. Also an impossibility.

"We observed viruses that could survive weeks, and later months, in the atmosphere. Again impossible.

"Viruses have grown more deadly and more transmittable at the same time. With everything we thought we knew about viruses, that was also impossible.

"But each of these impossibilities is something that actually happened, in the physical world outside this simulation. It is not possible for this to have happened naturally. It is not possible for this to have happened because of mankind's actions. An actuary once observed that the weather could not

be predicted a year in advance, so anyone accurately predicting the weather that far in the future had to be controlling the weather. And we see that here. The End Times are not natural. Some force is controlling it. And as it is not something humans can control, the source is extraterrestrial."

Throughout my speech, Oracle had remained calm, unmoving. She remained this way. I shifted nervously. I didn't want to wait a minimum of twelve years to try again.

The doors behind Oracle opened. She spoke one word. "Proceed."

I ran forward. I finally could see what was behind those doors. But my eyes focused on one thing.

My own, personal, permanent android body.

A portal, much like Terminus, was before me. I adjusted my shoulders, trying to get used to the sensations of a physical body again. I was ready for my final Moving Day.

The portal opened directly into a command center that would have fit perfectly in a blockbuster action movie, housing top government brass or a squad of superheroes. All around me were people who had the intelligence, knowledge, and creativity to tackle the biggest Big Question of all, the survival of humanity and all the species of Earth. I was just someone who, in another reality, would have been happy working an office job and watching my favorite movies on the weekend. I hardly felt worthy.

One giant screen attracted my attention, a star chart with a line heading to our solar system and a large digital countdown, its first field fortunately still counting decades. "That's it, isn't it?" I muttered.

"It sure isn't a comet," said a woman as she approached. "Welcome, Robert C. I am Alexandra Cosmos, head of astrophysics. There will be a formal introduction process later, but since you have studied astrophysics, I wanted to let you know my team is looking for help. We think there's another probe or sensor array that's directly forcing the changes of the viruses on Earth, but so far we have been unable to detect it. Think you're up to the task?"

"I'm not going to be locked into my choice for eleven years, am I?"

Alexandra laughed. "We're not bound by those silly rules."

"Your offer sounds interesting, but first, I want to know what's going on. Tell me everything!"

"This place is filled with people who will gladly talk about everything they're doing, in great detail," Alexandra said. "But first, there's a custom here. Everyone who answers the Actuary's Riddle can choose a last name, however you want to define yourself. Do you need time to think it out?"

I looked at the star chart and shook my head. "I don't need any time. As long as my mind remains strong, I will fight to save humankind, and so my name will reflect the source of this danger.

"Call me Robert Centauri."