

## The Wales Technique

Lloyd Franklin, CEO of The Remarkable Insurance Company, surveyed the full auditorium as journalists, financial analysts, and employees focused attentively on his every word. A presentation of the company's Annual Statement had never been so well-attended. "During 2021, it would be an understatement to say that The Remarkable has indeed lived up to its name," Franklin proclaimed. "I realize that a 5-percent loss ratio for the entire year is considered... surprising." His comment drew a chuckle from the audience. "It is probably even more surprising to achieve a 5-percent loss ratio while having the lowest premiums among all of our competitors. But what is most surprising for us is that we attribute our success over the past year to the work of a single individual – our Chief Actuary, Hugo Wales. Hugo, would you please come up to the stage?"

Hugo Wales approached the podium, where a smiling Lloyd Franklin shook his hand and presented him with a large, ornate plaque. "Hugo, I speak for all of us at The Remarkable when I say that no one deserves this Employee of the Year award more than you do. The Wales Technique has revolutionized our automobile book of business. It is the first, comprehensive combination of ratemaking, reserving, and claim modeling in one approach. It segments our policyholders in the most granular way possible, predicting the risk of loss down to the individual level. It lets us offer the vast majority of our policyholders – the safe drivers – premiums so low, they cannot refuse. Practically everyone whom we charge high premiums actually causes an accident later on! They quickly learn that The Remarkable is perhaps not for them... and choose one of our competitors instead! Not only that – the Wales Technique predicts with near-pinpoint precision where individual claims are likely to settle and enables us to offer amounts that claimants accept almost every time, without fighting us in court. Because of this we now have the lowest expense ratio among the entire industry, despite the... significant investment we put into your predictive analytics tools. Of course, our competitors have noticed and have expended no small effort trying to replicate the Wales Technique. But despite every conceivable reverse-engineering gambit, they have not even come close. Apart from The Remarkable, the average industry loss ratio remains where it was one year ago! Even in safeguarding our competitive advantage, you have gone above and beyond. Congratulations, Hugo!"

Hugo Wales smiled at his boss and then at the audience. He was exhausted, but pleased to be there. "Thank you for this honor, Lloyd. Whatever people might consider to be the secrets of the Wales Technique, they are actually out in plain sight. It is a matter of algebra: for every individual risk, there is a unique  $n$ -degree polynomial that models the amount of expected loss, where both the degree and the value of the variable in the polynomial depend on the risk's attributes. I have even published the list of attributes I consider and how they are weighted! All the polynomials for our book of business are publicly filed every month in the jurisdictions where we operate. Our competitors see all our variables and polynomials – and yet they have been unable to replicate this approach for their own books of business. At least, it seems that their polynomials produce entirely random results. But the Wales Technique is quite simple, really!"

“Simple for an actuary, perhaps!” Lloyd exclaimed. “I’m sure that, for most people, when they hear about  $n$ th-degree polynomials and risk attributes, their eyes glaze over. But what gets them to pay attention is this: *this stuff works!* It makes money, it saves money, and it does so better than any other method that has ever been tried before. We no longer have to *guess* at who will experience a loss; we can *know*.”

“We can certainly know far more precisely than prior methods could enable. There is still some low asymptotic amount of losses toward which my models generally converge,” Hugo clarified. “Some insureds, even if we classify them as high-risk and charge them high premiums, will remain with The Remarkable for a variety of reasons. I would also like to note, for transparency and disclosure of relevant facts, that, while I generally strive for 5-percent loss ratios using the Wales Technique, I am still refining my method. This year we hope to implement some improvements and discover even more predictive insights. However, until then, I think that a 30-percent loss ratio would be reasonable to expect from us.”

Hugo phrased his caveat as diplomatically as he could. As he scanned the auditorium, it seemed the audience’s mood was a general satisfied acceptance; a consistent 30-percent loss ratio without any rate increases would be a remarkable achievement for any other insurer. In Hugo’s mind, however, this was caused by a problem that required a solution – a phenomenon he had dubbed “the Black Hole”. The Black Hole was a time period into which he could barely see; during April through June of 2022, he anticipated that his predictive abilities would wane; he could discern far too little regarding both aggregate and individual losses during this perplexing timeframe. During the second half of the year, nonetheless, the Wales Technique gave clear indications, and Hugo was confident he could return The Remarkable to 5-percent loss ratios then – if his reputation could only withstand the enigmatic Black Hole in the months to come.

“Thank you for all of your attendance today; it really is a great honor for me,” Hugo concluded his remarks and was relieved to hear applause. Lloyd accompanied him as he headed backstage.

“Great work, Hugo, and thank you for your remarks – well-spoken,” Lloyd praised him. Then he lowered his voice to a near-whisper, “But I do worry about you. It may not be obvious to that group, but I can see you look exhausted. Is something keeping you awake at night? We need you at your best!”

“Actually, I fairly reliably get eight hours of sleep per night, Lloyd – something I plan to continue going forward,” Hugo responded. He was technically correct.

“Great. Good to know. Then I hope you’re not overworking while awake! I appreciate all the time you spend with your computers, crunching the data and creating your... polynomials. But this must be hard work! Perhaps you would like a bigger team? As Chief Actuary, you have every right to one. I could arrange so that you have many other actuaries working under you! Right now, you still only have your one assistant... correct?”

“Yes, but Jim knows more about the Wales Technique than any actuary I could hope to manage,” Hugo replied. “He may not be an actuary, but he is a savant – and he has been working

with me ever since I began this project. Also, Jim is fascinated by polynomials. He could sit and generate polynomials all day and be completely fulfilled!”

“Then at least you should consider adding a secretary to your team – to handle the routine logistics. We can certainly find someone to fill that role!”

“Thank you for your thoughtfulness, Lloyd. I really appreciate having a boss who values my well-being. I will take a little time to consider your suggestion,” Hugo replied tactfully. He felt his phone buzz. “Ah, Jim just sent me a text. He found something he thinks I will want to see.”

“All right, I’ll see you later around the office,” Lloyd seemed satisfied. “Again, thank you for all your great work!”

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As the doors slid open, admitting Hugo into The Remarkable’s Actuarial Department, he entertained the thought that perhaps hiring a secretary might be worthwhile after all. Far too many paper envelopes were piled atop the front desk, and James Morlock certainly was not going to organize them. Jim was immersed in the figures on his computer screen, aptly fitting polynomials to the data. Hugo remembered the instruction he gave when Jim was fresh out of college: “Remember, every polynomial you fit has to go through every data point.” Jim had taken that instruction to heart – indeed, he had built an entire elaborate rule set, perhaps even a sense of personal meaning, upon that principle. Finding the precise fit for any data set was a skill at which Jim was a master. Also, Hugo appreciated that Jim asked just enough questions – but not too many – regarding the origins of the data points to which the polynomials were fitted.

“What do you have for me today, Jim?” Hugo inquired.

Jim was still somewhat engrossed in the polynomials he was formulating, but pointed to a second monitor beside him. On it was a scatterplot of points above a timeline. “The Black Hole... I can see it clearly in the region with fewer data points.”

“These are data points by expected date of loss,” Hugo noted.

“Yes; we have nothing predicted for May 5, 2022,” Jim confirmed.

“Indeed, it seems May 5, 2022, is the Black Hole’s center,” Hugo remarked. “As we move along the timeline in either direction, the number of data points increases symmetrically. Today is March 3, so the data available to us for the near-term expected losses will soon become thinner. By early July, though, we will have about as many points as usual to feed into our models. I still have no idea why... But good work, Jim. Thank you for identifying the center of the gap.” This was all in accord with what Hugo already anticipated – but he was no closer to understanding why.

Jim quickly resumed curve-fitting. Meanwhile, Hugo opened several envelopes and extracted ordered lists of dates and numbers with the header “Risk Data” on each page. He handed them to Jim. “Some more data points for you.” Jim nodded and resumed his intense focus.

Hugo walked toward the back office, past several specially configured workstations and rows of supercomputers. Lloyd had accurately characterized the extent of spending on Hugo’s equipment. The sparse, darkened space in the back office provided quite a contrast, however. Hugo shut the door behind him and sat down at a plain wooden desk, on one side of which stood an always-on portable water heater beside packets of instant coffee. Hugo quickly poured himself a cup; it was only 6 p.m., and he felt a clear need for additional energy. He descended into his chair for a moment’s respite, but after a few sips of coffee decided that work must continue. Quickly, he extracted his mobile phone from his suit-jacket pocket and opened his Calendar and Maps apps. Immediately the phone emitted an iridescent glow; Hugo wished it would not do that, but some bugs still needed to be worked out from this system. He scrolled along the calendar until he fixed a day in his mind: October 30, 2023 – over 18 months hence. As his finger pressed upon the day, he felt his energy slip away, and his eyes closed involuntarily...

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Hugo awoke with a jolt as the caffeine’s effects must have finally manifested. He was sitting on a comfortable couch in a coffee shop, with newspapers piled on a low table in front. He quickly glanced around; the other patrons seemed to be minding their own business, and nothing about Hugo’s situation drew any particular attention. He approached the counter, where there was no line, and matter-of-factly ordered a large espresso with cash in hand. “Be as efficient and unobtrusive as possible; trigger no unintended disturbances,” Hugo reminded himself as he returned to his seat and picked up one of the newspapers, drinking the espresso as he browsed. The headlines did not really interest him, except for the date: “October 30, 2023”. Yes, this was where he previously left off. He quickly turned the paper’s pages until he reached the section titled “Motor Vehicle Accident Report”. This was a somewhat sparser section than even a year prior. As the proportion of autonomous vehicles on the roads increased, the accident frequency dropped precipitously. But as long as any manually driven cars remained, the Wales Technique would remain predictive for them. Hugo, who was paid a bonus based on The Remarkable’s profitability, figured he could simply retire once the vehicle fleet became predominantly autonomous – provided he could manage a good, profitable run for several more years.

Using his phone’s camera, Hugo snapped pictures of the Motor Vehicle Accident Reports from as many papers as he could find. This was a sizable cross-section of losses from all over the country. October 30, 2023, yielded as credible a data set as Hugo generally aimed for, and now it was time to process the information. Hugo again glanced at his phone and scrolled back on the calendar to March 3, 2022. He pressed there and concealed the iridescently glowing phone in his inside jacket pocket, gulping down the remainder of his espresso as he closed his eyes to enjoy its flavor...

Hugo was now in an office-supply store – just where he needed to be. He took a stack of bright, white envelopes and walked expeditiously toward the large printers. On his phone, he

opened a document editor and quickly imported into it just the numbers from the Motor Vehicle Accident Reports; above them he typed the header “Risk Data”, saved the file, and connected his phone to one of the printers. He printed the document, stuffed it into an envelope, and affixed a stamp along with a pre-printed label addressed to “The Remarkable Insurance Company, c/o James Morlock”. There was no need to specify the sender. Jim would receive the new data in a few days, and Hugo would open the envelope and hand him the lists, as he did virtually every day. Jim would not ask where the envelopes originated; he would just be happy to have more data points to which to fit some polynomials. The Wales Technique would be extended a little bit further into the future. Hugo was somewhat inconvenienced by “snail mail” – but it was the best option to prevent the original data from being traced to one of his devices. If only the Black Hole could be addressed in the same manner...

As Hugo approached the nearby mailbox and dropped the envelope into it, he looked around for confirmation that the street was empty. He glanced down at his phone and decided to give the Black Hole another try. Scrolling on the calendar to May 5, 2022, he pressed on that date, and... nothing. The phone, as usual, was completely non-responsive to this gesture – no iridescent glow, not even any recognition of an action. Had a passer-by seen Hugo at that moment, Hugo would merely have appeared as a frustrated phone user. “Well, it was at least worth another try,” Hugo thought to himself. He began a swift walk, pondering the conundrum of the Black Hole. “Perhaps if I appear in a library next time I visit the future, I might find some records from April-June 2022 that would furnish more data points. If I cannot travel there directly, at least looking back at that time period from a later day might yield *something*.” This seemed a worthwhile attempt to Hugo – although perhaps mainly of academic interest since most policies that would experience losses during the Black Hole months had already been issued. The ideal time to gather the data would have been 18 months in advance, long before current in-force policies were issued or last renewed. But perhaps if Hugo tried the lookback-from-the-future approach, he could at least remove a few percentage points from the loss ratios of the yet-to-be-issued policies: certainly still worthwhile – but possible to defer until *after* Hugo managed to get a bit more sleep. Besides, he was otherwise occupied during the remainder of this evening.

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Hugo was pleased that Eloise had accepted his dinner invitation. He knew almost nothing about her prior to this evening, but as they spoke he found her to be intelligent, charming, and a good conversationalist. Most importantly, though, she knew what an actuary was. Indeed, she had even heard of the Wales Technique and could discuss it competently with him – its publicly known aspects, of course. Interestingly, she did not ask the question that Hugo commonly encountered, regarding *why* the polynomials for specific risks actually predicted their future losses. Hugo was somewhat relieved that she simply seemed to accept that they did. A promising beginning...

After they finished their main course, the waiter approached them. “Might you be interested in dessert?”

They did not need long to decide. “Coffee and coffee ice cream,” they spoke almost in unison, and then looked at one another in mild astonishment at this coincidence.

“Well, here is something else we have in common!” Hugo exclaimed. “It seems we late-evening coffee drinkers require the energy to remain alert long after others are able to rest! If I may ask, what work do you do?”

“I am a... historian – of sorts,” Eloise replied after a pause. “Or perhaps ‘student of history’ would be a better description. My goal is to learn from history and help avoid the mistakes that were made in the past.”

“A worthwhile goal indeed,” Hugo acknowledged.

“Say, Hugo, have you ever wondered if it might be possible to undo a prior mistake – for example, a wrong decision that altered the course of history for the worse? Do you sometimes wish you had a time machine to return to the past, just to tweak a few things and produce a radically different outcome today?”

She had asked him a time-travel question! Hugo realized that he needed to be careful in formulating his answer.

“I prefer to think most mistakes can be prevented if one accurately anticipates the future and chooses the best actions going forward,” Hugo replied – the safe answer for an actuary with a reputation for doing just that.

“Some mistakes, though, are not that easy to avoid. In a split second, one might make the wrong choice, and deeply regret it and yet never be able to fix the damage caused.”

“That reminds me of most losses I analyze in my line of work!” Hugo responded. “Most drivers who cause accidents indeed have that split-second lapse in judgment, which they would avoid if they could relive those circumstances.”

“Yet you actuaries focus on predicting who is likely to have that lapse, rather than what might prevent it to begin with.”

“Autonomous vehicles might solve that problem for us in a few years,” Hugo suggested. “I see my job as more accurately evaluating the propensities of drivers in the meantime, so that those who are less prone to error will indeed be rewarded for their good behavior through lower premiums.”

“But I wonder... if you were able to prevent an accident that had already occurred, would you? It seems that doing so would even save your company money; it would, after all, need to pay out less in claims!”

“True,” Hugo acknowledged. “Prevention, however, is not always easy.” His mind immediately thought of how difficult it would be for him to attempt to stop all of the accidents mentioned in the future newspapers – and how would he do it? Visit the drivers involved and suggest they not enter their vehicles on that day? Illegally block off the streets where the

accidents would have occurred or redirect vehicles onto different routes? Clearly, the practical challenges were far too numerous for Hugo to attempt this. He decided it would be best to steer clear from discussing a time-traveler's real limitations and instead entertain the hypothetical fiction. Indeed, Hugo could truthfully discuss time travel to the past as a fictional concept, since his phone did not permit him to visit any time prior to the present; he could only return to the present from most of the future days displayed on his Calendar app – but traveling back to already-elapsed days was not technically feasible with this device.

“A time-travel paradox arises when one alters a past event that was one's motivation for having traveled back in the first place,” Hugo observed. “If the problem were fixed in the past, then would the time traveler from the present have the notion to travel back in time at all?”

“Hmmm...” Eloise paused to think about it. “But many changes that the time traveler brings about might not affect the initial motivation at all. Suppose that the initial travel is motivated by one problem, but the time traveler solves other problems along the way, incidentally. If the time travel would have occurred whether or not those incidental problems were also solved, why would altering the past necessarily lead to a paradox? Also, if motivation is the issue, then is it not enough for the time traveler simply to *believe* that the problem exists at the time of the trip – whether or not the problem still actually exists?” She had clearly thought about this for quite some time.

“You make valid points,” Hugo conceded. “This is an interesting twist on learning from history so that we do not repeat it; instead, you propose to learn the lessons while undoing the historical damage itself.”

Eloise nodded. “I am sure we each find certain past events to be regrettable, and we would undo them, if only we could.”

“If only...” Hugo acknowledged, underscoring the fictional context of the discussion. “Well, this has been a fascinating conversation, and I enjoyed it.” He quickly paid their bill. “I hope that there will be a possibility for us to meet again.”

Eloise smiled at him, “Oh, it will be a certainty.”

A fine conclusion to the evening, Hugo decided. Now it was time to return home and get the eight hours of sleep he had promised to Lloyd. He estimated that, with the time travels interspersed within this chronological day, his biological waking time had been 28 hours.

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Hugo sat in the public library on October 31, 2023, surreptitiously sipping on a cup of coffee he had managed to sneak in. He had already taken phone pictures of the computer screen showing that day's loss data. Unfortunately, data files from the future would disappear upon his return to 2022 if he simply copied them onto the phone; only actions taken with directly the phone – such as photographs – would be preserved. The technical nuances of time travel! However, Hugo *could* take pictures of any online articles regarding prior days' losses. Curiously,

as he browsed newspaper archives and other public records in the April-June 2022 timeframe, he largely saw confirmations of the data points he had previously harvested – a few losses here and there that were previously unknown to him, but nothing to dramatically illuminate that period. The data were simply... absent. “Was there a journalists’ strike during the Black Hole?” Hugo wondered. Yet nothing from his own time even hinted at such developments. “Ah, well... Time to mail another envelope, I suppose.”

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Hugo acquiesced to the secretarial recruitment process after some more encouragement from Lloyd, though Hugo insisted on interviewing the candidates personally. By March 25, 2022, all resumes had been reviewed, and Hugo set aside most of the day for interviews. Perhaps, Hugo considered, there would be some benefit from this in keeping the Actuarial Department organized and containing distractions that were irrelevant to Hugo’s core work.

Hugo was surprised to see Eloise among the applicants. “I thought that history was more your line of work,” he told her.

“I am much more versatile than just one line of work,” Eloise responded. “I pride myself on my organizational skills, which extend to historical records – like the data that your Actuarial Department processes.” A good answer – and a reasonable assumption regarding the data, given that most actuaries did, indeed, work with data from the past.

“Very well, then,” Hugo said. “The next part of our interview will be a practical test of data-entry skills. My assistant Jim likes to spend as much of his time as possible fitting polynomials to data; if he can be spared the manual data entry, this would expedite our processes tremendously. So,” he handed Eloise an envelope, “I will give you this data set. I showed you our computer systems earlier. Now I would ask you to input the data into a format Jim can immediately apply. Please feel free to take the time you need and follow whatever approach you consider most effective.”

“Just one request,” Eloise spoke. “Might there be a cup of coffee around here?”

Hugo briefly ventured into his office and emerged with two cups of coffee. In his haste, he realized he had left his phone face-down on the table, but it looked like a typical mobile phone when the Calendar app was not activated. “I must be more careful!” Hugo mentally chided himself. As Eloise walked toward one of the computers, Hugo quickly placed the phone into his jacket pocket and retreated into his office to drink his own coffee and check e-mails. Most of his correspondence was routine, but one short message stood out.

“Dear Mr. Wales:

This is to inform you that the Snowlandia Insurance Department has approved The Remarkable Insurance Company filing of rating values and polynomials for the month of April 2022. However, I am interested in pursuing a conceptual discussion with you regarding the ratemaking methodology involved and the assumptions entailed therein.



Please contact me at your earliest convenience to arrange an in-person meeting. I am willing to visit you at your offices if necessary.

Sincerely,  
Eugene Carpenter,  
Lead Actuary, Snowlandia Insurance Department”

Meeting with his main actuarial regulator would require great circumspection, especially because Eugene Carpenter had a reputation for asking incisive questions. Hugo wondered how he could arrange the appearance of complete transparency without disclosing the core of the Wales Technique – which nobody would particularly believe in any event. In the meantime, though, Hugo heard a knock. “Please come in.”

It was Eloise. “All the data are ready to use,” she announced, smiling. Hugo had expected her to take about an hour longer, as the other applicants had. He walked by Jim Morlock’s workstation to see that Jim already had the imported figures at his disposal and was busily formulating new polynomials from them.

“Impressive!” Hugo exclaimed. “It seems, based on the results of this test, that you are clearly the most qualified applicant for the job. Consider yourself hired.”

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As Hugo drove into the office on April 18, 2022, gradually sipping coffee from the mug in his cupholder, he noted contentedly that traffic had become considerably lighter over the past several weeks for some reason. His commute became easier, and his mood was upbeat, as, to his great surprise, well into the Black Hole period, the loss ratios of The Remarkable had not deteriorated yet. Some losses continued to be reported, but, remarkably, they were in accord with the sparser data points he had previously gathered. The Remarkable’s profitability was exceeding Hugo’s prior projections spectacularly. Jim continued to diligently produce polynomials for late 2023, and Eloise turned out to be an excellent secretary, accelerating the workflow considerably. Hugo remembered today’s forthcoming meeting with Eugene Carpenter – perhaps somewhat of a challenge, but Hugo hoped that The Remarkable’s recent performance would give a favorable impression.

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Eloise knocked on Hugo’s door. “Eugene Carpenter is here to see you.” Hugo’s attention was interrupted. He had been scrolling through his Calendar app and happened to notice that the screen area around the May 5, 2022, date began to pulsate as he swiped near it. Previously it was completely non-responsive. In flustered haste, Hugo left the phone on his table and walked out to the front-desk area.

Eugene Carpenter stood up from his seat and shook Hugo’s hand. “Mr. Wales, it is a pleasure to finally meet you in person.” Hugo nodded. “Likewise.”

As they walked to a conference table near one of the supercomputers, Hugo remarked, “I will gladly answer any of your questions. As you know, our polynomials are all publicly available, and all of our equipment for modeling them is here.”

“The Wales Technique fascinates me,” Carpenter said. “Some regulators may have been more critical just because it is new and unfamiliar, but I approved your filings because I see a real opportunity here to eliminate some of the circumstantial proxy rating attributes that have long raised concerns. Your rating model contains nothing about demographics or lifestyle choices of the insureds – and indeed we have had no consumer complaints or allegations of unfairly discriminatory rating. Even though you indicate extremely high premiums for some individuals, it so happens that these people do, in fact, experience losses – virtually every time.”

Hugo nodded. “We pride ourselves on our precision, so we need not make generalizations about groups anymore.”

“That may well be, yet from a statistical standpoint it is truly astounding. Insurance conceptually is supposed to be based on the law of large numbers, yet what happens when you can price down to the level of the individual? Is it risk pooling anymore, or something else? I am not criticizing your approach at all, but this is a challenge we must increasingly wrestle with.”

“Yet it is clear that the individually calculated rates provide a social benefit; the vast majority of insureds get lower premiums due to more accurate predictions,” Hugo retorted.

“Perhaps – but strangely enough your competitors have not been able to achieve such improved accuracy. I see *their* polynomials as well, and clearly, they are simply overfitting curves to the historical loss data. Structurally, their experimental rating plans are indistinguishable from yours, but you happen to be *right* all the time, while they never outperform their old techniques. I would have said that you are overfitting as well, except that you are always correct... It still puzzles me *why* your approach works.”

“Perhaps a tour of our state-of-the-art supercomputers will show you why The Remarkable stands apart,” Hugo invited Carpenter to accompany him.

After an hour-long technical overview of the systems, Carpenter told him, “Thank you for all you have shared today. I shall have to continue pondering these questions – but I hope we can maintain an open line of communication.” Hugo nodded, thinking the meeting transpired as well as it could have.

As Carpenter left the building, Hugo returned to his office. He picked up his phone and again chided himself for the oversight. Returning to the Calendar app, he saw an unmistakable iridescent glow around May 5, 2022, and could no longer restrain himself from pressing there.

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Hugo stood on a hill overlooking the highway – a nearly empty road despite clear weather during a late Thursday morning. Although he had not set a destination using his Maps app, this was where he arrived by default. He wondered how, all of a sudden, he was able to actually access May 5, 2022. This seemed to be a good overlook; he could see, but would not be seen.

Hugo spotted an unassuming sedan cruising along at the speed limit. He jumped slightly at the realization that the car was his own. “Why would I be driving here in at this time?” Hugo was too far away to see inside the vehicle, but it seemed to proceed steadily.

Then, without warning, the sedan veered into the barrier, and Hugo was shocked to see an extraordinary contraption – more akin to a miniature spaceship than a car – sweep down from the sky and ram into the sedan from the rear. The spaceship seemed impervious to the collision, but the sedan was utterly crushed in a rather ugly way. Out of the spaceship emerged... Eloise, wearing an outfit from materials Hugo had never before encountered and had no words to describe. She seemed as mortified as Hugo himself at that moment. As she approached the sedan and glanced at it, she screamed in horror and then collapsed into tears. After five minutes, she hastily dashed into the spaceship and emerged with an iridescently glowing tiny rectangular cube. She pressed some panel on the cube and disappeared from view.

Hugo needed no coffee to remain awake upon his return.

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On the morning of May 5, 2022, Hugo was still alive and in good health. He had told no one – certainly not Eloise – of his observation of his own impending demise, but Hugo Wales was no fatalist. He would not permit the accident he had glimpsed to transpire! The key to avoiding it was to ensure Eloise was at his side the entire day and would have no opportunity to find her... spaceship. Fortunately, Hugo had a fitting occasion to facilitate this. He had just received an e-mail from Eugene Carpenter:

“Dear Mr. Wales:

After considerable deliberation, I believe I understand your method much more accurately than you might expect. I am perplexed, however, by the meager use to which you have put it, considering that it might benefit humankind’s future to a far greater extent than a mere actuarial technique could do. Please visit me at my office urgently, as this really is a matter of the utmost importance.”

Hugo greeted Eloise and informed her, “I would like you to accompany me to visit Mr. Carpenter. We should venture out early. I think Jim will have enough work for one day.”

“Gladly,” Eloise replied with a smile. They walked toward Hugo’s sedan in the parking lot.

Once they were underway on the largely clear road, Eloise spoke: “Have you ever wondered if it might be possible to undo a prior mistake? I could not stop at just one.” Hugo’s jaw dropped. He also saw that his Maps app was navigating them toward the exact stretch of highway he had glimpsed earlier, and that this was the unavoidable route.

Not another vehicle was in sight. “I think I convinced everyone to take a day off today – no more accidents,” Eloise remarked matter-of-factly. “You don’t use social media, but that trending #StayHome hashtag is one of mine.”

“And the rest of the recent decline?”

“A lot of work and many... subtler adjustments. Tweak just a few details at the accident scene, or nudge the driver to be a bit more alert, and a disaster can be averted – not always, but often. Thank you for all of the risk data, though!”

“But there *were* no data for losses that did not occur!”

“I’m from the far future, remember? And I know that you know – because I enabled it! My techniques of data extrapolation would probably fascinate you.”

“But there remains one glaring problem. You are about to collide into me – into us!” Hugo reminded her. They were far too close to the scene in his memory.

“And this is where I fix it. Set your car to cruise control, please.” Hugo complied. Eloise showed him a dazzlingly luminous miniature iridescent cube. “Now hold out your phone.” With the phone’s screen still showing a pulsating date of May 5, 2022, Eloise pressed on it with the cube. Hugo felt exhaustion overwhelm him and released the steering wheel.

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When Hugo’s eyes opened, he realized that he was flying high above the city and its empty streets. Eloise sat beside him, piloting the spaceship. She took a moment to point to the receding crumpled sedan on the highway below. “Is it not enough for the time traveler simply to *believe* that the problem exists at the time of the trip – whether or not the problem still actually exists? It all had to be engineered this way. The Eloise down there still most emphatically believes you to be dead!”

“But she has enough free rein to time-travel that, if I were to return tomorrow, that belief could easily be disconfirmed.”

“And this is why her only encounters with you must be prior to today. Come with me! Mr. Morlock and the Wales Technique will be fine for a while – and we can leave Mr. Carpenter to try and make sense of it all. Perhaps you can view this as an early retirement, and I can show you how history actually turned out.”