Oracle

by Greg Egan

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On his eighteenth day in the tiger cage, Robert Stoney began to lose hope of emerging unscathed.

He'd woken a dozen times throughout the night with an overwhelming need to stretch his back and limbs, and none of the useful compromise positions he'd discovered in his first few days — the least-worst solutions to the geometrical problem of his confinement — had been able to dull his sense of panic. He'd been in far more pain in the second week, suffering cramps that felt as if the muscles of his legs were dying on the bone, but these new spasms had come from somewhere deeper, powered by a sense of urgency that revolved entirely around his own awareness of his situation.

That was what frightened him. Sometimes he could find ways to minimise his discomfort, sometimes he couldn't, but he'd been clinging to the thought that, in the end, all these fuckers could ever do was hurt him. That wasn't true, though. They could make him ache for freedom in the middle of the night, the way he might have ached with grief, or love. He'd always cherished the understanding that his self was a whole, his mind and body indivisible. But he'd failed to appreciate the corollary: through his body, they could touch every part of him. Change every part of him.

Morning brought a fresh torment: hay fever. The house was somewhere deep in the countryside, with nothing to be heard in the middle of the day but bird song. June had always been his worst month for hay fever, but in Manchester it had been tolerable. As he ate breakfast, mucus dripped from his face into the bowl of lukewarm oats they'd given him. He staunched the flow with the back of his hand, but suffered a moment of shuddering revulsion when he couldn't find a way to reposition himself to wipe his hand clean on his trousers. Soon he'd need to empty his bowels. They supplied him with a chamber pot whenever he asked, but they always waited two or three hours before removing it. The smell was bad enough, but the fact that it took up space in the cage was worse.

Towards the middle of the morning, Peter Quint came to see him. “How are we today, Prof?” Robert didn't reply. Since the day Quint had responded with a puzzled frown to the suggestion that he had an appropriate name for a spook, Robert had tried to make at least one fresh joke at the man's expense every time they met, a petty but satisfying indulgence. But now his mind was blank, and in retrospect the whole exercise seemed like an insane distraction, as bizarre and futile as scoring philosophical points against some predatory animal while it gnawed on his leg.

“Many happy returns,” Quint said cheerfully.

Robert took care to betray no surprise. He'd never lost track of the days, but he'd stopped thinking in terms of the calendar date; it simply wasn't relevant. Back in the real world, to have forgotten his own birthday would have been considered a benign eccentricity. Here it would be taken as proof of his deterioration, and imminent surrender.

If he was cracking, he could at least choose the point of fissure. He spoke as calmly as he could, without

looking up. “You know I almost qualified for the Olympic marathon, back in forty-eight? If I hadn't done my hip in just before the trials, I might have competed.” He tried a self-deprecating laugh. “I suppose I was never really much of an athlete. But I'm only forty-six. I'm not ready for a wheelchair yet.” The words did help: he could beg this way without breaking down completely, expressing an honest fear without revealing how much deeper the threat of damage went.

He continued, with a measured note of plaintiveness that he hoped sounded like an appeal to fairness. “I just can't bear the thought of being crippled. All I'm asking is that you let me stand upright. Let me keep my health.”

Quint was silent for a moment, then he replied with a tone of thoughtful sympathy. “It's unnatural, isn't it? Living like this: bent over, twisted, day after day. Living in an unnatural way is always going to harm you. I'm glad you can finally see that.”

Robert was tired; it took several seconds for the meaning to sink in. *It was that crude, that obvious?* They'd locked him in this cage, for all this time … as a kind of ham-fisted *metaphor* for his crimes?

He almost burst out laughing, but he contained himself. “I don't suppose you know Franz Kafka?”

“Kafka?” Quint could never hide his voracity for names. “One of your Commie chums, is he?”

“I very much doubt that he was ever a Marxist.”

Quint was disappointed, but prepared to make do with second best. “One of the other kind, then?”

Robert pretended to be pondering the question. “On balance, I suspect that's not too likely either.”

“So why bring his name up?”

“I have a feeling he would have admired your methods, that's all. He was quite the connoisseur.”

“Hmm.” Quint sounded suspicious, but not entirely unflattered.

Robert had first set eyes on Quint in February of 1952. His house had been burgled the week before, and Arthur, a young man he'd been seeing since Christmas, had confessed to Robert that he'd given an acquaintance the address. Perhaps the two of them had planned to rob him, and Arthur had backed out at the last moment. In any case, Robert had gone to the police with an unlikely story about spotting the culprit in a pub, trying to sell an electric razor of the same make and model as the one taken from his house. No one could be charged on such flimsy evidence, so Robert had had no qualms about the consequences if Arthur had turned out to be lying. He'd simply hoped to prompt an investigation that might turn up something more tangible.

The following day, the CID had paid Robert a visit. The man he'd accused was known to the police, and fingerprints taken on the day of the burglary matched the prints they had on file. However, at the time Robert claimed to have seen him in the pub, he'd been in custody already on an entirely different charge.

The detectives had wanted to know why he'd lied. To spare himself the embarrassment, Robert had explained, of spelling out the true source of his information. Why was that embarrassing?

“I'm involved with the informant.”

One detective, Mr Wills, had asked matter-of-factly, “What exactly does that entail, sir?” And Robert — in a burst of frankness, as if honesty itself was sure to be rewarded — had told him every detail. He'd known it was still technically illegal, of course. But then, so was playing football on Easter Sunday. It

could hardly be treated as a serious crime, like burglary.

The police had strung him along for hours, gathering as much information as they could before disabusing him of this misconception. They hadn't charged him immediately; they'd needed a statement from Arthur first. But then Quint had materialised the next morning, and spelt out the choices very starkly. Three years in prison, with hard labour. Or Robert could resume his war-time work — for just one day a week, as a handsomely paid consultant to Quint's branch of the secret service — and the charges would quietly vanish.

At first, he'd told Quint to let the courts do their worst. He'd been angry enough to want to take a stand against the preposterous law, and whatever his feelings for Arthur, Quint had suggested — gloatingly, as if it strengthened his case — that the younger, working-class man would be treated far more leniently than Robert, having been led astray by someone whose duty was to set an example for the lower orders. Three years in prison was an unsettling prospect, but it would not have been the end of the world; the Mark I had changed the way he worked, but he could still function with nothing but a pencil and paper, if necessary. Even if they'd had him breaking rocks from dawn to dusk he probably would have been able to day-dream productively, and for all Quint's scaremongering he'd doubted it would come to that.

At some point, though, in the twenty-four hours Quint had given him to reach a decision, he'd lost his nerve. By granting the spooks their one day a week, he could avoid all the fuss and disruption of a trial. And though his work at the time — modelling embryological development — had been as challenging as anything he'd done in his life, he hadn't been immune to pangs of nostalgia for the old days, when the fate of whole fleets of battleships had rested on finding the most efficient way to extract logical contradictions from a bank of rotating wheels.

The trouble with giving in to extortion was, *it proved that you could be bought*. Never mind that the Russians could hardly have offered to intervene with the Manchester constabulary next time he needed to be rescued. Never mind that he would scarcely have cared if an enemy agent had threatened to send such comprehensive evidence to the newspapers that there'd be no prospect of his patrons saving him again. He'd lost any chance to proclaim that what he did in bed with another willing partner was not an issue of national security; by saying yes to Quint, he'd made it one. By choosing to be corrupted once, he'd brought the whole torrent of clichés and paranoia down upon his head: he was vulnerable to blackmail, an easy target for entrapment, perfidious by nature. He might as well have posed *in flagrante delicto* with Guy Burgess on the steps of the Kremlin.

It wouldn't have mattered if Quint and his masters had merely decided that they couldn't trust him. The problem was — some six years after recruiting him, with no reason to believe that he had ever breached security in any way — they'd convinced themselves that they could neither continue to employ him, nor safely leave him in peace, until they'd rid him of the trait they'd used to control him in the first place.

Robert went through the painful, complicated process of rearranging his body so he could look Quint in the eye. “You know, if it was legal there'd be nothing to worry about, would there? Why don't you devote some of your considerable Machiavellian talents to that end? Blackmail a few politicians. Set up a Royal Commission. It would only take you a couple of years. Then we could all get on with our real jobs.”

Quint blinked at him, more startled than outraged. “You might as well say that we should legalise treason!”

Robert opened his mouth to reply, then decided not to waste his breath. Quint wasn't expressing a moral opinion. He simply meant that a world in which fewer people's lives were ruled by the constant fear of discovery was hardly one that a man in his profession would wish to hasten into existence.

When Robert was alone again, the time dragged. His hay fever worsened, until he was sneezing and gagging almost continuously; even with freedom of movement and an endless supply of the softest linen handkerchiefs, he would have been reduced to abject misery. Gradually, though, he grew more adept at dealing with the symptoms, delegating the task to some barely conscious part of himself. By the middle of the afternoon — covered in filth, eyes almost swollen shut — he finally managed to turn his mind back to his work.

For the past four years he'd been immersed in particle physics. He'd been following the field on and off since before the war, but the paper by Yang and Mills in '54, in which they'd generalised Maxwell's equations for electromagnetism to apply to the strong nuclear force, had jolted him into action.

After several false starts, he believed he'd discovered a useful way to cast gravity into the same form. In general relativity, if you carried a four-dimensional velocity vector around a loop that enclosed a curved region of spacetime, it came back rotated — a phenomenon highly reminiscent of the way more abstract vectors behaved in nuclear physics. In both cases, the rotations could be treated algebraically, and the traditional way to get a handle on this was to make use of a set of matrices of complex numbers whose relationships mimicked the algebra in question. Hermann Weyl had catalogued most of the possibilities back in the '20s and '30s.

In spacetime, there were six distinct ways you could rotate an object: you could turn it around any of three perpendicular axes in space, or you could boost its velocity in any of the same three directions. These two kinds of rotation were complementary, or "dual" to each other, with the ordinary rotations only affecting coordinates that were untouched by the corresponding boost, and *vice versa*. This meant that you could rotate something around, say, the x-axis, and speed it up in the same direction, without the two processes interfering.

When Robert had tried applying the Yang-Mills approach to gravity in the obvious way, he'd floundered. It was only when he'd shifted the algebra of rotations into a new, strangely skewed guise that the mathematics had begun to fall into place. Inspired by a trick that particle physicists used to construct fields with left- or right-handed spin, he'd combined every rotation with its own dual multiplied by i, the square root of minus one. The result was a set of rotations in four *complex* dimensions, rather than the four real ones of ordinary spacetime, but the relationships between them preserved the original algebra.

Demanding that these "self-dual" rotations satisfy Einstein's equations turned out to be equivalent to ordinary general relativity, but the process leading to a quantum-mechanical version of the theory became dramatically simpler. Robert still had no idea how to interpret this, but as a purely formal trick it worked spectacularly well — and when the mathematics fell into place like that, it had to mean *something*.

He spent several hours pondering old results, turning them over in his mind's eye, rechecking and reimagining everything in the hope of forging some new connection. Making no progress, but there'd always been days like that. It was a triumph merely to spend this much time doing what he would have done back in the real world — however mundane, or even frustrating, the same activity might have been in its original setting.

By evening, though, the victory began to seem hollow. He hadn't lost his wits entirely, but he was frozen, stunted. He might as well have whiled away the hours reciting the base-32 multiplication table in Baudot code, just to prove that he still remembered it.

As the room filled with shadows, his powers of concentration deserted him completely. His hay fever had abated, but he was too tired to think, and in too much pain to sleep. This wasn't Russia, they couldn't hold him forever; he simply had to wear them down with his patience. *But when, exactly, would they have to let him go?* And how much more patient could Quint be, with no pain, no terror, to erode his

determination?

The moon rose, casting a patch of light on the far wall; hunched over, he couldn't see it directly, but it silvered the grey at his feet, and changed his whole sense of the space around him. The cavernous room mocking his confinement reminded him of nights he'd spent lying awake in the dormitory at Sherborne. A public school education did have one great advantage: however miserable you were afterwards, you could always take comfort in the knowledge that life would never be quite as bad again.

"This room smells of mathematics! Go out and fetch a disinfectant spray!" That had been his form-master's idea of showing what a civilised man he was: contempt for that loathsome subject, the stuff of engineering and other low trades. And as for Robert's chemistry experiments, like the beautiful colour-changing iodate reaction he'd learnt from Chris's brother —

Robert felt a familiar ache in the pit of his stomach. *Not now. I can't afford this now.* But the whole thing swept over him, unwanted, unbidden. He'd used to meet Chris in the library on Wednesdays; for months, that had been the only time they could spend together. Robert had been fifteen then, Chris a year older. If Chris had been plain, he still would have shone like a creature from another world. No one else in Sherborne had read Eddington on relativity, Hardy on mathematics. No one else's horizons stretched beyond rugby, sadism, and the dimly satisfying prospect of reading classics at Oxford then vanishing into the maw of the civil service.

They had never touched, never kissed. While half the school had been indulging in passionless sodomy — as a rather literal-minded substitute for the much too difficult task of imagining women — Robert had been too shy even to declare his feelings. Too shy, and too afraid that they might not be reciprocated. It hadn't mattered. To have a friend like Chris had been enough.

In December of 1929, they'd both sat the exams for Trinity College, Cambridge. Chris had won a scholarship; Robert hadn't. He'd reconciled himself to their separation, and prepared for one more year at Sherborne without the one person who'd made it bearable. Chris would be following happily in the footsteps of Newton; just thinking of that would be some consolation.

Chris never made it to Cambridge. In February, after six days in agony, he'd died of bovine tuberculosis.

Robert wept silently, angry with himself because he knew that half his wretchedness was just self-pity, exploiting his grief as a disguise. He had to stay honest; once every source of unhappiness in his life melted together and became indistinguishable, he'd be like a cowed animal, with no sense of the past or the future. Ready to do anything to get out of the cage.

If he hadn't yet reached that point, he was close. It would only take a few more nights like the last one. Drifting off in the hope of a few minutes' blankness, to find that sleep itself shone a colder light on everything. Drifting off, then waking with a sense of loss so extreme it was like suffocation.

A woman's voice spoke from the darkness in front of him. "Get off your knees!"

Robert wondered if he was hallucinating. He'd heard no one approach across the creaky floorboards.

The voice said nothing more. Robert rearranged his body so he could look up from the floor. There was a woman he'd never seen before, standing a few feet away.

She'd sounded angry, but as he studied her face in the moonlight through the slits of his swollen eyes, he realised that her anger was directed, not at him, but at his condition. She gazed at him with an expression of horror and outrage, as if she'd chanced upon him being held like this in some respectable neighbour's basement, rather than an MI6 facility. Maybe she was one of the staff employed in the upkeep of the

house, but had no idea what went on here? Surely those people were vetted and supervised, though, and threatened with life imprisonment if they ever set foot outside their prescribed domains.

For one surreal moment, Robert wondered if Quint had sent her to seduce him. It would not have been the strangest thing they'd tried. But she radiated such fierce self assurance — such a sense of confidence that she could speak with the authority of her convictions, and expect to be heeded — that he knew she could never have been chosen for the role. No one in Her Majesty's government would consider self assurance an attractive quality in a woman.

He said, “Throw me the key, and I'll show you my Roger Bannister impression.”

She shook her head. “You don't need a key. Those days are over.”

Robert started with fright. *There were no bars between them.* But the cage couldn't have vanished before his eyes; she must have removed it while he'd been lost in his reverie. He'd gone through the whole painful exercise of turning to face her as if he were still confined, without even noticing.

Removed it how?

He wiped his eyes, shivering at the dizzying prospect of freedom. “Who are you?” An agent for the Russians, sent to liberate him from his own side? She'd have to be a zealot, then, or strangely naive, to view his torture with such wide-eyed innocence.

She stepped forward, then reached down and took his hand. “Do you think you can walk?” Her grip was firm, and her skin was cool and dry. She was completely unafraid; she might have been a good Samaritan in a public street helping an old man to his feet after a fall — not an intruder helping a threat to national security break out of therapeutic detention, at the risk of being shot on sight.

“I'm not even sure I can stand.” Robert steeled himself; maybe this woman was a trained assassin, but it would be too much to presume that if he cried out in pain and brought guards rushing in, she could still extricate him without raising a sweat. “You haven't answered my question.”

“My name's Helen.” She smiled and hoisted him to his feet, looking at once like a compassionate child pulling open the jaws of a hunter's cruel trap, and a very powerful, very intelligent carnivore contemplating its own strength. “I've come to change everything.”

Robert said, “Oh, good.”

Robert found that he could hobble; it was painful and undignified, but at least he didn't have to be carried. Helen led him through the house; lights showed from some of the rooms, but there were no voices, no footsteps save their own, no signs of life at all. When they reached the tradesmen's entrance she unbolted the door, revealing a moonlit garden.

“Did you kill everyone?” he whispered. He'd made far too much noise to have come this far unmolested. Much as he had reason to despise his captors, mass murder on his behalf was a lot to take in.

Helen cringed. “What a revolting idea! It's hard to believe sometimes, how uncivilised you are.”

“You mean the British?”

“All of you!”

“I must say, your accent's rather good.”

“I watched a lot of cinema,” she explained. “Mostly Ealing comedies. You never know how much that will help, though.”

“Quite.”

They crossed the garden, heading for a wooden gate in the hedge. Since murder was strictly for imperialists, Robert could only assume that she'd managed to drug everyone.

The gate was unlocked. Outside the grounds, a cobbled lane ran past the hedge, leading into forest. Robert was barefoot, but the stones weren't cold, and the slight unevenness of the path was welcome, restoring circulation to the soles of his feet.

As they walked, he took stock of his situation. He was out of captivity, thanks entirely to this woman. Sooner or later he was going to have to confront her agenda.

He said, “I'm not leaving the country.”

Helen murmured assent, as if he'd passed a casual remark about the weather.

“And I'm not going to discuss my work with you.”

“Fine.”

Robert stopped and stared at her. She said, “Put your arm across my shoulders.”

He complied; she was exactly the right height to support him comfortably. He said, “You're not a Soviet agent, are you?”

Helen was amused. “Is that really what you thought?”

“I'm not all that quick on my feet tonight.”

“No.” They began walking together. Helen said, “There's a train station about three kilometres away. You can get cleaned up, rest there until morning, and decide where you want to go.”

“Won't the station be the first place they'll look?”

“They won't be looking anywhere for a while.”

The moon was high above the trees. The two of them could not have made a more conspicuous couple: a sensibly dressed, quite striking young woman, supporting a filthy, ragged tramp. If a villager cycled past, the best they could hope for was being mistaken for an alcoholic father and his martyred daughter.

Martyred all right: she moved so efficiently, despite the burden, that any onlooker would assume she'd been doing this for years. Robert tried altering his gait slightly, subtly changing the timing of his steps to see if he could make her falter, but Helen adapted instantly. If she knew she was being tested, though, she kept it to herself.

Finally he said, “What did you do with the cage?”

“I time-reversed it.”

Hairs stood up on the back of his neck. Even assuming that she could do such a thing, it wasn't at all clear to him how that could have stopped the bars from scattering light and interacting with his body. It should merely have turned electrons into positrons, and killed them both in a shower of gamma rays.

That conjuring trick wasn't his most pressing concern, though. “I can only think of three places you might have come from,” he said.

Helen nodded, as if she'd put herself in his shoes and catalogued the possibilities. “Rule out one; the other two are both right.”

She was not from an extrasolar planet. Even if her civilisation possessed some means of viewing Ealing comedies from a distance of light years, she was far too sensitive to his specific human concerns.

She was from the future, but not his own.

She was from the future of another Everett branch.

He turned to her. “No paradoxes.”

She smiled, deciphering his shorthand immediately. “That's right. It's physically impossible to travel into your own past, unless you've made exacting preparations to ensure compatible boundary conditions. That *can* be achieved, in a controlled laboratory setting — but in the field it would be like trying to balance ten thousand elephants in an inverted pyramid, while the bottom one rode a unicycle: excruciatingly difficult, and entirely pointless.”

Robert was tongue-tied for several seconds, a horde of questions battling for access to his vocal chords. “But how do you travel into the past at all?”

“It will take a while to bring you up to speed completely, but if you want the short answer: you've already stumbled on one of the clues. I read your paper in *Physical Review*, and it's correct as far as it goes. Quantum gravity involves four complex dimensions, but the only classical solutions — the only geometries that remain in phase under slight perturbations — have curvature that's either *self-dual*, or *anti-self-dual*. Those are the only stationary points of the action, for the complete Lagrangian. And both solutions appear, from the inside, to contain only four real dimensions.

“It's meaningless to ask which sector we're in, but we might as well call it self-dual. In that case, the anti-self-dual solutions have an arrow of time running backwards compared to ours.”

“Why?” As he blurted out the question, Robert wondered if he sounded like an impatient child to her. But if she suddenly vanished back into thin air, he'd have far fewer regrets for making a fool of himself this way than if he'd maintained a façade of sophisticated nonchalance.

Helen said, “Ultimately, that's related to spin. And it's down to the mass of the neutrino that we can tunnel between sectors. But I'll need to draw you some diagrams and equations to explain it all properly.”

Robert didn't press her for more; he had no choice but to trust that she wouldn't desert him. He staggered on in silence, a wonderful ache of anticipation building in his chest. If someone had put this situation to him hypothetically, he would have piously insisted that he'd prefer to toil on at his own pace. But despite the satisfaction it had given him on the few occasions when he'd made genuine discoveries himself, what mattered in the end was understanding as much as you could, however you could. Better to ransack the past and the future than go through life in a state of wilful ignorance.

“You said you've come to change things?”

She nodded. “I can't predict the future here, of course, but there are pitfalls in my own past that I can help you avoid. In my twentieth century, people discovered things too slowly. Everything changed much too slowly. Between us, I think we can speed things up.”

Robert was silent for a while, contemplating the magnitude of what she was proposing. Then he said, “It's a pity you didn't come sooner. In this branch, about twenty years ago —”

Helen cut him off. “I know. We had the same war. The same Holocaust, the same Soviet death toll. But we've yet to be able to avert that, anywhere. You can never do anything in just one history — even the most focused intervention happens across a broad ‘ribbon’ of strands. When we try to reach back to the '30s and '40s, the ribbon overlaps with its own past to such a degree that all the worst horrors are *faits accompli*. We can't shoot *any* version of Adolf Hitler, because we can't shrink the ribbon to the point where none of us would be shooting ourselves in the back. All we've ever managed are minor interventions, like sending projectiles back to the Blitz, saving a few lives by deflecting bombs.”

“What, knocking them into the Thames?”

“No, that would have been too risky. We did some modelling, and the safest thing turned out to be diverting them onto big, empty buildings: Westminster Abbey, Saint Paul's Cathedral.”

The station came into view ahead of them. Helen said, “What do you think? Do you want to head back to Manchester?”

Robert hadn't given the question much thought. Quint could track him down anywhere, but the more people he had around him, the less vulnerable he'd be. In his house in Wilmslow he'd be there for the taking.

“I still have rooms at Cambridge,” he said tentatively.

“Good idea.”

“What are your own plans?”

Helen turned to him. “I thought I'd stay with you.” She smiled at the expression on his face. “Don't worry, I'll give you plenty of privacy. And if people want to make assumptions, let them. You already have a scandalous reputation; you might as well see it branch out in new directions.”

Robert said wryly, “I'm afraid it doesn't quite work that way. They'd throw us out immediately.”

Helen snorted. “They could try.”

“You may have defeated MI6, but you haven't dealt with Cambridge porters.” The reality of the situation washed over him anew at the thought of her in his study, writing out the equations for time travel on the blackboard. “*Why me?* I can appreciate that you'd want to make contact with someone who could understand how you came here — but why not Everett, or Yang, or Feynman? Compared to Feynman, I'm a dilettante.”

Helen said, “Maybe. But you have an equally practical bent, and you'll learn fast enough.”

There had to be more to it than that: thousands of people would have been capable of absorbing her lessons just as rapidly. “The physics you've hinted at — in your past, did I discover all that?”

“No. Your *Physical Review* paper helped me track you down here, but in my own history that was never published.” There was a flicker of disquiet in her eyes, as if she had far greater disappointments in store on that subject.

Robert didn't care much either way; if anything, the less his alter ego had achieved, the less he'd be troubled by jealousy.

“Then what was it, that made you choose me?”

“You really haven't guessed?” Helen took his free hand and held the fingers to her face; it was a tender gesture, but much more like a daughter's than a lover's. “It's a warm night. No one's skin should be this cold.”

Robert gazed into her dark eyes, as playful as any human's, as serious, as proud. Given the chance, perhaps any decent person would have plucked him from Quint's grasp. But only one kind would feel a special obligation, as if they were repaying an ancient debt.

He said, “You're a machine.”

2

John Hamilton, Professor of Mediaeval and Renaissance English at Magdalene College, Cambridge, read the last letter in the morning's pile of fan mail with a growing sense of satisfaction.

The letter was from a young American, a twelve-year-old girl in Boston. It opened in the usual way, declaring how much pleasure his books had given her, before going on to list her favourite scenes and characters. As ever, Jack was delighted that the stories had touched someone deeply enough to prompt them to respond this way. But it was the final paragraph that was by far the most gratifying:

However much other children might tease me, or grown-ups too when I'm older, I will NEVER, EVER stop believing in the Kingdom of Nescia. Sarah stopped believing, and she was locked out of the Kingdom forever. At first that made me cry, and I couldn't sleep all night because I was afraid I might stop believing myself one day. But I understand now that it's good to be afraid, because it will help me keep people from changing my mind. And if you're not willing to believe in magic lands, of course you can't enter them. There's nothing even Belvedere himself can do to save you, then.

Jack refilled and lit his pipe, then reread the letter. This was his vindication: the proof that through his books he could touch a young mind, and plant the seed of faith in fertile ground. It made all the scorn of his jealous, stuck-up colleagues fade into insignificance. Children understood the power of stories, the reality of myth, the need to believe in something beyond the dismal grey farce of the material world.

It wasn't a truth that could be revealed the “adult” way: through scholarship, or reason. Least of all through philosophy, as Elizabeth Anscombe had shown him on that awful night at the Socratic Club. A devout Christian herself, Anscombe had nonetheless taken all the arguments against materialism from his popular book, *Signs and Wonders*, and trampled them into the ground. It had been an unfair match from the start: Anscombe was a professional philosopher, steeped in the work of everyone from Aquinas to Wittgenstein; Jack knew the history of ideas in mediaeval Europe intimately, but he'd lost interest in modern philosophy once it had been invaded by fashionable positivists. And *Signs and Wonders* had never been intended as a scholarly work; it had been good enough to pass muster with a sympathetic lay readership, but trying to defend his admittedly rough-and-ready mixture of common sense and useful shortcuts to faith against Anscombe's merciless analysis had made him feel like a country yokel stammering in front of a bishop.

Ten years later, he still burned with resentment at the humiliation she'd put him through, but he was grateful for the lesson she'd taught him. His earlier books, and his radio talks, had not been a complete waste of time — but the harpy's triumph had shown him just how pitiful human reason was when it came to the great questions. He'd begun working on the stories of Nescia years before, but it was only when the dust had settled on his most painful defeat that he'd finally recognised his true calling.

He removed his pipe, stood, and turned to face Oxford. “Kiss my arse, Elizabeth!” he growled happily,

waving the letter at her. This was a wonderful omen. It was going to be a very good day.

There was a knock at the door of his study.

“Come.”

It was his brother, William. Jack was puzzled — he hadn't even realised Willie was in town — but he nodded a greeting and motioned at the couch opposite his desk.

Willie sat, his face flushed from the stairs, frowning. After a moment he said, “This chap Stoney.”

“Hmm?” Jack was only half listening as he sorted papers on his desk. He knew from long experience that Willie would take forever to get to the point.

“Did some kind of hush-hush work during the war, apparently.”

“Who did?”

“Robert Stoney. Mathematician. Used to be up at Manchester, but he's a Fellow of Kings, and now he's back in Cambridge. Did some kind of secret war work. Same thing as Malcolm Muggeridge, apparently. No one's allowed to say what.”

Jack looked up, amused. He'd heard rumours about Muggeridge, but they all revolved around the business of analysing intercepted German radio messages. What conceivable use would a mathematician have been, for that? Sharpening pencils for the intelligence analysts, presumably.

“What about him, Willie?” Jack asked patiently.

Willie continued reluctantly, as if he was confessing to something mildly immoral. “I paid him a visit yesterday. Place called the Cavendish. Old army friend of mine has a brother who works there. Got the whole tour.”

“I know the Cavendish. What's there to see?”

“He's doing things, Jack. *Impossible things.*”

“Impossible?”

“Looking inside people. Putting it on a screen, like a television.”

Jack sighed. “Taking X-rays?”

Willie snapped back angrily, “I'm not a fool; I know what an X-ray looks like. This is different. You can see the blood flow. You can watch your heart beating. You can follow a sensation through the nerves from … fingertip to brain. He says, soon he'll be able to watch a thought in motion.”

“Nonsense.” Jack scowled. “So he's invented some gadget, some fancy kind of X-ray machine. What are you so agitated about?”

Willie shook his head gravely. “There's more. That's just the tip of the iceberg. He's only been back in Cambridge a year, and already the place is overflowing with … wonders.” He used the word begrudgingly, as if he had no choice, but was afraid of conveying more approval than he intended.

Jack was beginning to feel a distinct sense of unease.

“What exactly is it you want me to do?” he asked.

Willie replied plainly, “Go and see for yourself. Go and see what he's up to.”

The Cavendish Laboratory was a mid-Victorian building, designed to resemble something considerably older and grander. It housed the entire Department of Physics, complete with lecture theatres; the place was swarming with noisy undergraduates. Jack had had no trouble arranging a tour: he'd simply telephoned Stoney and expressed his curiosity, and no more substantial reason had been required.

Stoney had been allocated three adjoining rooms at the back of the building, and the “spin resonance imager” occupied most of the first. Jack obligingly placed his arm between the coils, then almost jerked it out in fright when the strange, transected view of his muscles and veins appeared on the picture tube. He wondered if it could be some kind of hoax, but he clenched his fist slowly and watched the image do the same, then made several unpredictable movements which it mimicked equally well.

“I can show you individual blood cells, if you like,” Stoney offered cheerfully.

Jack shook his head; his current, unmagnified flaying was quite enough to take in.

Stoney hesitated, then added awkwardly, “You might want to talk to your doctor at some point. It's just that, your bone density's rather —” He pointed to a chart on the screen beside the image. “Well, it's quite a bit below the normal range.”

Jack withdrew his arm. He'd already been diagnosed with osteoporosis, and he'd welcomed the news: it meant that he'd taken a small part of Joyce's illness — the weakness in her bones — into his own body. God was allowing him to suffer a little in her stead.

If Joyce were to step between these coils, what might that reveal? But there'd be nothing to add to her diagnosis. Besides, if he kept up his prayers, and kept up both their spirits, in time her remission would blossom from an uncertain reprieve into a fully-fledged cure.

He said, “How does this work?”

“In a strong magnetic field, some of the atomic nuclei and electrons in your body are free to align themselves in various ways with the field.” Stoney must have seen Jack's eyes beginning to glaze over; he quickly changed tack. “Think of it as being like setting a whole lot of spinning tops whirling, as vigorously as possible, then listening carefully as they slow down and tip over. For the atoms in your body, that's enough to give some clues as to what kind of molecule, and what kind of tissue, they're in. The machine listens to atoms in different places by changing the way it combines all the signals from billions of tiny antennae. It's like a whispering gallery where we can play with the time that signals take to travel from different places, moving the focus back and forth through any part of your body, thousands of times a second.”

Jack pondered this explanation. Though it sounded complicated, in principle it wasn't that much stranger than X-rays.

“The physics itself is old hat,” Stoney continued, “but for imaging, you need a very strong magnetic field, and you need to make sense of all the data you've gathered. Nevill Mott made the superconducting alloys for the magnets. And I managed to persuade Rosalind Franklin from Birkbeck to collaborate with us, to help perfect the fabrication process for the computing circuits. We cross-link lots of little Y-shaped DNA fragments, then selectively coat them with metal; Rosalind worked out a way to use X-ray crystallography for quality control. We paid her back with a purpose-built computer that will let her solve hydrated protein structures in real time, once she gets her hands on a bright enough X-ray source.” He

held up a small, unprepossessing object, rimmed with protruding gold wires. “Each logic gate is roughly a hundred Ångstroms cubed, and we grow them in three-dimensional arrays. That's a million, million, million switches in the palm of my hand.”

Jack didn't know how to respond to this claim. Even when he couldn't quite follow the man there was something mesmerising about his ramblings, like a cross between William Blake and nursery talk.

“If computers don't excite you, we're doing all kinds of other things with DNA.” Stoney ushered him into the next room, which was full of glassware, and seedlings in pots beneath strip lights. Two assistants seated at a bench were toiling over microscopes; another was dispensing fluids into test tubes with a device that looked like an overgrown eye-dropper.

“There are a dozen new species of rice, corn, and wheat here. They all have at least double the protein and mineral content of existing crops, and each one uses a different biochemical repertoire to protect itself against insects and fungi. Farmers have to get away from monocultures; it leaves them too vulnerable to disease, and too dependent on chemical pesticides.”

Jack said, “You've bred these? All these new varieties, in a matter of months?”

“No, no! Instead of hunting down the heritable traits we needed in the wild, and struggling for years to produce cross-breeds bearing all of them, we designed every trait from scratch. Then we manufactured DNA that would make the tools the plants need, and inserted it into their germ cells.”

Jack demanded angrily, “Who are you to say what a plant needs?”

Stoney shook his head innocently. “I took my advice from agricultural scientists, who took their advice from farmers. They know what pests and blights they're up against. Food crops are as artificial as Pekinese. Nature didn't hand them to us on a plate, and if they're not working as well as we need them to, nature isn't going to fix them for us.”

Jack glowered at him, but said nothing. He was beginning to understand why Willie had sent him here. The man came across as an enthusiastic tinkerer, but there was a breath-taking arrogance lurking behind the boyish exterior.

Stoney explained a collaboration he'd brokered between scientists in Cairo, Bogotá, London and Calcutta, to develop vaccines for polio, smallpox, malaria, typhoid, yellow fever, tuberculosis, influenza and leprosy. Some were the first of their kind; others were intended as replacements for existing vaccines. “It's important that we create antigens without culturing the pathogens in animal cells that might themselves harbour viruses. The teams are all looking at variants on a simple, cheap technique that involves putting antigen genes into harmless bacteria that will double as delivery vehicles and adjuvants, then freeze-drying them into spores that can survive tropical heat without refrigeration.”

Jack was slightly mollified; this all sounded highly admirable. What business Stoney had instructing doctors on vaccines was another question. Presumably his jargon made sense to them, but when exactly had this mathematician acquired the training to make even the most modest suggestions on the topic?

“You're having a remarkably productive year,” he observed.

Stoney smiled. “The muse comes and goes for all of us. But I'm really just the catalyst in most of this. I've been lucky enough to find some people — here in Cambridge, and further afield — who've been willing to chance their arm on some wild ideas. They've done the real work.” He gestured towards the next room. “My own pet projects are through here.”

The third room was full of electronic gadgets, wired up to picture tubes displaying both phosphorescent words and images resembling engineering blueprints come to life. In the middle of one bench, incongruously, sat a large cage containing several hamsters.

Stoney fiddled with one of the gadgets, and a face like a stylised drawing of a mask appeared on an adjacent screen. The mask looked around the room, then said, “Good morning, Robert. Good morning, Professor Hamilton.”

Jack said, “You had someone record those words?”

The mask replied, “No, Robert showed me photographs of all the teaching staff at Cambridge. If I see anyone I know from the photographs, I greet them.” The face was crudely rendered, but the hollow eyes seemed to meet Jack's. Stoney explained, “It has no idea what it's saying, of course. It's just an exercise in face and voice recognition.”

Jack responded stiffly, “Of course.”

Stoney motioned to Jack to approach and examine the hamster cage. He obliged him. There were two adult animals, presumably a breeding pair. Two pink young were suckling from the mother, who reclined in a bed of straw.

“Look closely,” Stoney urged him. Jack peered into the nest, then cried out an obscenity and backed away.

One of the young was exactly what it seemed. The other was a machine, wrapped in ersatz skin, with a nozzle clamped to the warm teat.

“That's the most monstrous thing I've ever seen!” Jack's whole body was trembling. “What possible reason could you have to do that?”

Stoney laughed and made a reassuring gesture, as if his guest was a nervous child recoiling from a harmless toy. “It's not hurting her! And the point is to discover what it takes for the mother to accept it. To ‘reproduce one's kind’ means having some set of parameters as to what that is. Scent, and some aspects of appearance, are important cues in this case, but through trial and error I've also pinned down a set of behaviours that lets the simulacrum pass through every stage of the life cycle. An acceptable child, an acceptable sibling, an acceptable mate.”

Jack stared at him, nauseated. “These animals fuck your machines?”

Stoney was apologetic. “Yes, but hamsters will fuck anything. I'll really have to shift to a more discerning species, in order to test that properly.”

Jack struggled to regain his composure. “What on Earth possessed you, to do this?”

“In the long run,” Stoney said mildly, “I believe this is something we're going to need to understand far better than we do at present. Now that we can map the structures of the brain in fine detail, and match its raw complexity with our computers, it's only a matter of a decade or so before we build machines that think.

“That in itself will be a vast endeavour, but I want to ensure that it's not stillborn from the start. There's not much point creating the most marvellous children in history, only to find that some awful mammalian instinct drives us to strangle them at birth.”

Jack sat in his study drinking whisky. He'd telephoned Joyce after dinner, and they'd chatted for a while,

but it wasn't the same as being with her. The weekends never came soon enough, and by Tuesday or Wednesday any sense of reassurance he'd gained from seeing her had slipped away entirely.

It was almost midnight now. After speaking to Joyce, he'd spent three more hours on the telephone, finding out what he could about Stoney. Milking his connections, such as they were; Jack had only been at Cambridge for five years, so he was still very much an outsider. Not that he'd ever been admitted into any inner circles back at Oxford: he'd always belonged to a small, quiet group of dissenters against the tide of fashion. Whatever else might be said about the Tiddlywinks, they'd never had their hands on the levers of academic power.

A year ago, while on sabbatical in Germany, Stoney had resigned suddenly from a position he'd held at Manchester for a decade. He'd returned to Cambridge, despite having no official posting to take up. He'd started collaborating informally with various people at the Cavendish, until the head of the place, Mott, had invented a job description for him, and given him a modest salary, the three rooms Jack had seen, and some students to assist him.

Stoney's colleagues were uniformly amazed by his spate of successful inventions. Though none of his gadgets were based on entirely new science, his skill at seeing straight to the heart of existing theories and plucking some practical consequence from them was unprecedented. Jack had expected some jealous back-stabbing, but no one seemed to have a bad word to say about Stoney. He was willing to turn his scientific Midas touch to the service of anyone who approached him, and it sounded to Jack as if every would-be skeptic or enemy had been bought off with some rewarding insight into their own field.

Stoney's personal life was rather murkier. Half of Jack's informants were convinced that the man was a confirmed pansy, but others spoke of a beautiful, mysterious woman named Helen, with whom he was plainly on intimate terms.

Jack emptied his glass and stared out across the courtyard. *Was it pride, to wonder if he might have received some kind of prophetic vision?* Fifteen years earlier, when he'd written *The Broken Planet*, he'd imagined that he'd merely been satirising the hubris of modern science. His portrait of the evil forces behind the sardonically named Laboratory Overseeing Various Experiments had been intended as a deadly serious metaphor, but he'd never expected to find himself wondering if real fallen angels were whispering secrets in the ears of a Cambridge don.

How many times, though, had he told his readers that the devil's greatest victory had been convincing the world that he did not exist? The devil was *not* a metaphor, a mere symbol of human weakness: he was a real, scheming presence, acting in time, acting in the world, as much as God Himself.

And hadn't Faustus's damnation been sealed by the most beautiful woman of all time: Helen of Troy?

Jack's skin crawled. He'd once written a humorous newspaper column called “Letters from a Demon,” in which a Senior Tempter offered advice to a less experienced colleague on the best means to lead the faithful astray. Even that had been an exhausting, almost corrupting experience; adopting the necessary point of view, however whimsically, had made him feel that he was withering inside. The thought that a cross between the *Faustbuch* and *The Broken Planet* might be coming to life around him was too terrifying to contemplate. He was no hero out of his own fiction — not even a mild-mannered Cedric Duffy, let alone a modern Pendragon. And he did not believe that Merlin would rise from the woods to bring chaos to that hubristic Tower of Babel, the Cavendish Laboratory.

Nevertheless, if he was the only person in England who suspected Stoney's true source of inspiration, who else would act?

Jack poured himself another glass. There was nothing to be gained by procrastinating. He would not be

able to rest until he knew what he was facing: a vain, foolish overgrown boy who was having a run of good luck — or a vain, foolish overgrown boy who had sold his soul and imperilled all humanity.

"A *Satanist*? You're accusing me of being a Satanist?"

Stoney tugged angrily at his dressing gown; he'd been in bed when Jack had pounded on the door. Given the hour, it had been remarkably civil of him to accept a visitor at all, and he appeared so genuinely affronted now that Jack was almost prepared to apologise and slink away. He said, "I had to ask you —"

"You have to be doubly foolish to be a Satanist," Stoney muttered.

"Doubly?"

"Not only do you need to believe all the nonsense of Christian theology, you then have to turn around and back the preordained, guaranteed-to-fail, absolutely futile *losing side*." He held up his hand, as if he believed he'd anticipated the only possible objection to this remark, and wished to spare Jack the trouble of wasting his breath by uttering it. "I *know*, some people claim it's all really about some pre-Christian deity: Mercury, or Pan — guff like that. But assuming that we're not talking about some complicated mislabelling of objects of worship, I really can't think of anything more insulting. You're comparing me to someone like … *Huysmans*, who was basically just a very dim Catholic."

Stoney folded his arms and settled back on the couch, waiting for Jack's response.

Jack's head was thick from the whisky; he wasn't at all sure how to take this. It was the kind of smart-arsed undergraduate drivel he might have expected from any smug atheist — but then, short of a confession, exactly what kind of reply would have constituted evidence of guilt? *If you'd sold your soul to the devil, what lie would you tell in place of the truth?* Had he seriously believed that Stoney would claim to be a devout churchgoer, as if that were the best possible answer to put Jack off the scent?

He had to concentrate on things he'd seen with his own eyes, facts that could not be denied.

"You're plotting to overthrow nature, bending the world to the will of man."

Stoney sighed. "Not at all. More refined technology will help us tread more lightly. We have to cut back on pollution and pesticides as rapidly as possible. Or do you want to live in a world where all the animals are born as hermaphrodites, and half the Pacific islands disappear in storms?"

"Don't try telling me that you're some kind of guardian of the animal kingdom. You want to replace us all with machines!"

"Does every Zulu or Tibetan who gives birth to a child, and wants the best for it, threaten you in the same way?"

Jack bristled. "I'm not a racist. A Zulu or Tibetan has a *soul*."

Stoney groaned and put his head in his hands. "It's half past one in the morning! Can't we have this debate some other time?"

Someone banged on the door. Stoney looked up, disbelieving. "What is this? Grand Central Station?"

He crossed to the door and opened it. A dishevelled, unshaven man pushed his way into the room. "Quint? What a pleasant —"

The intruder grabbed Stoney and slammed him against the wall. Jack exhaled with surprise. Quint turned bloodshot eyes on him.

“Who the fuck are you?”

“John Hamilton. Who the fuck are you?”

“Never you mind. Just stay put.” He jerked Stoney's arm up behind his back with one hand, while grinding his face into the wall with the other. “You're mine now, you piece of shit. No one's going to protect you this time.”

Stoney addressed Jack through a mouth squashed against the masonry. “Dith ith Pether Quinth, my own perthonal thpook. I did make a Fauthtian bargain. But with thtrictly temporal —”

“Shut up!” Quint pulled a gun from his jacket and held it to Stoney's head.

Jack said, “Steady on.”

“Just how far do your connections go?” Quint screamed. “I've had memos disappear, sources clam up — and now my superiors are treating *me* like some kind of traitor! Well, don't worry: when I'm through with you, I'll have the names of the entire network.” He turned to address Jack again. “And don't *you* think you're going anywhere.”

Stoney said, “Leave him out of dith. He'th at Magdalene. You mutht know by now: all the thpieth are at Trinity.”

Jack was shaken by the sight of Quint waving his gun around, but the implications of this drama came as something of a relief. Stoney's ideas must have had their genesis in some secret war-time research project. He hadn't made a deal with the devil after all, but he'd broken the Official Secrets Act, and now he was paying the price.

Stoney flexed his body and knocked Quint backwards. Quint staggered, but didn't fall; he raised his arm menacingly, but there was no gun in his hand. Jack looked around to see where it had fallen, but he couldn't spot it anywhere. Stoney landed a kick squarely in Quint's testicles; barefoot, but Quint wailed with pain. A second kick sent him sprawling.

Stoney called out, “Luke? *Luke!* Would you come and give me a hand?”

A solidly built man with tattooed forearms emerged from Stoney's bedroom, yawning and tugging his braces into place. At the sight of Quint, he groaned. “Not again!”

Stoney said, “I'm sorry.”

Luke shrugged stoically. The two of them managed to grab hold of Quint, then they dragged him struggling out the door. Jack waited a few seconds, then searched the floor for the gun. But it wasn't anywhere in sight, and it hadn't slid under the furniture; none of the crevices where it might have ended up were so dark that it would have been lost in shadow. It was not in the room at all.

Jack went to the window and watched the three men cross the courtyard, half expecting to witness an assassination. But Stoney and his lover merely lifted Quint into the air between them, and tossed him into a shallow, rather slimy-looking pond.

Jack spent the ensuing days in a state of turmoil. He wasn't ready to confide in anyone until he could frame his suspicions clearly, and the events in Stoney's rooms were difficult to interpret unambiguously.

He couldn't state with absolute certainty that Quint's gun had vanished before his eyes. But surely the fact that Stoney was walking free proved that he was receiving supernatural protection? And Quint himself, confused and demoralised, had certainly had the appearance of a man who'd been demonically confounded at every turn.

If this was true, though, Stoney must have bought more with his soul than immunity from worldly authority. *The knowledge itself* had to be Satanic in origin, as the legend of Faustus described it. Tollers had been right, in his great essay "Mythopoesis": myths were remnants of man's pre-lapsarian capacity to apprehend, directly, the great truths of the world. Why else would they resonate in the imagination, and survive from generation to generation?

By Friday, a sense of urgency gripped him. He couldn't take his confusion back to Potter's Barn, back to Joyce and the boys. This had to be resolved, if only in his own mind, before he returned to his family.

With Wagner on the gramophone, he sat and meditated on the challenge he was facing. Stoney had to be thwarted, but how? Jack had always said that the Church of England — apparently so quaint and harmless, a Church of cake stalls and kindly spinsters — was like a fearsome army in the eyes of Satan. But even if his master was quaking in Hell, it would take more than a few stern words from a bicycling vicar to force Stoney to abandon his obscene plans.

But Stoney's intentions, in themselves, didn't matter. He'd been granted the power to dazzle and seduce, but not to force his will upon the populace. What mattered was how his plans were viewed by others. And the way to stop him was to open people's eyes to the true emptiness of his apparent cornucopia.

The more he thought and prayed about it, the more certain Jack became that he'd discerned the task required of him. No denunciation from the pulpits would suffice; people wouldn't turn down the fruits of Stoney's damnation on the mere say-so of the Church. Why would anyone reject such lustrous gifts, without a carefully reasoned argument?

Jack had been humiliated once, defeated once, trying to expose the barrenness of materialism. But might that not have been a form of preparation? He'd been badly mauled by Anscombe, but she'd made an infinitely gentler enemy than the one he now confronted. He had suffered from her taunts — but what was *suffering*, if not the chisel God used to shape his children into their true selves?

His role was clear, now. He would find Stoney's intellectual Achilles heel, and expose it to the world.

He would debate him.

3

Robert gazed at the blackboard for a full minute, then started laughing with delight. "That's so beautiful!"

"Isn't it?" Helen put down the chalk and joined him on the couch. "Any more symmetry, and nothing would happen: the universe would be full of crystalline blankness. Any less, and it would all be uncorrelated noise."

Over the months, in a series of tutorials, Helen had led him through a small part of the century of physics that had separated them at their first meeting, down to the purely algebraic structures that lay beneath spacetime and matter. Mathematics catalogued everything that was not self-contradictory; within that vast inventory, physics was an island of structures rich enough to contain their own beholders.

Robert sat and mentally reviewed everything he'd learnt, trying to apprehend as much as he could in a

single image. As he did, a part of him waited fearfully for a sense of disappointment, a sense of anticlimax. *He might never see more deeply into the nature of the world. In this direction, at least, there was nothing more to be discovered.*

But anticlimax was impossible. To become jaded with *this* was impossible. However familiar he became with the algebra of the universe, it would never grow less marvellous.

Finally he asked, “Are there other islands?” Not merely other histories, sharing the same underlying basis, but other realities entirely.

“I suspect so,” Helen replied. “People have mapped some possibilities. I don't know how that could ever be confirmed, though.”

Robert shook his head, sated. “I won't even think about that. I need to come down to Earth for a while.” He stretched his arms and leant back, still grinning.

Helen said, “Where's Luke today? He usually shows up by now, to drag you out into the sunshine.”

The question wiped the smile from Robert's face. “Apparently I make poor company. Being insufficiently fanatical about darts and football.”

“He's left you?” Helen reached over and squeezed his hand sympathetically. A little mockingly, too.

Robert was annoyed; she never said anything, but he always felt that she was judging him. “You think I should grow up, don't you? Find someone more like myself. Some kind of *soulmate*.” He'd meant the word to sound sardonic, but it emerged rather differently.

“It's your life,” she said.

A year before, that would have been a laughable claim, but it was almost the truth now. There was a *de facto* moratorium on prosecutions, while the recently acquired genetic and neurological evidence was being assessed by a parliamentary subcommittee. Robert had helped plant the seeds of the campaign, but he'd played no real part in it; other people had taken up the cause. In a matter of months, it was possible that Quint's cage would be smashed, at least for everyone in Britain.

The prospect filled him with a kind of vertigo. He might have broken the laws at every opportunity, but they had still moulded him. The cage might not have left him crippled, but he'd be lying to himself if he denied that he'd been stunted.

He said, “Is that what happened, in your past? I ended up in some … lifelong partnership?” As he spoke the words, his mouth went dry, and he was suddenly afraid that the answer would be yes. *With Chris. The life he'd missed out on was a life of happiness with Chris.*

“No.”

“Then … what?” he pleaded. “What did I do? How did I live?” He caught himself, suddenly self-conscious, but added, “You can't blame me for being curious.”

Helen said gently, “You don't want to know what you can't change. All of that is part of your own causal past now, as much as it is of mine.”

“If it's part of my own history,” Robert countered, “don't I deserve to know it? This man wasn't me, but he brought you to me.”

Helen considered this. “You accept that he was someone else? Not someone whose actions you're responsible for?”

“Of course.”

She said, “There was a trial, in 1952. For ‘Gross Indecency contrary to Section 11 of the Criminal Amendment Act of 1885.’ He wasn't imprisoned, but the court ordered hormone treatments.”

“*Hormone treatments?*” Robert laughed. “What — testosterone, to make him more of a man?”

“No, oestrogen. Which in men reduces the sex drive. There are side-effects, of course. Gynaecomorphism, among other things.”

Robert felt physically sick. *They'd chemically castrated him, with drugs that had made him sprout breasts.* Of all the bizarre abuse to which he'd been subjected, nothing had been as horrifying as that.

Helen continued, “The treatment lasted six months, and the effects were all temporary. But two years later, he took his own life. It was never clear exactly why.”

Robert absorbed this in silence. He didn't want to know anything more.

After a while, he said, “How do you bear it? Knowing that in some branch or other, every possible form of humiliation is being inflicted on someone?”

Helen said, “I don't *bear it*. I change it. That's why I'm here.”

Robert bowed his head. “I know. And I'm grateful that our histories collided. But … how many histories don't?” He struggled to find an example, though it was almost too painful to contemplate; since their first conversation, it was a topic he'd deliberately pushed to the back of his mind. “There's not just an unchangeable Auschwitz in each of our pasts, there are an astronomical number of others — along with an astronomical number of things that are even worse.”

Helen said bluntly, “That's not true.”

“What?” Robert looked up at her, startled.

She walked to the blackboard and erased it. “Auschwitz has happened, for both of us, and no one I'm aware of has ever prevented it — but that doesn't mean that *nobody* stops it, anywhere.” She began sketching a network of fine lines on the blackboard. “You and I are having this conversation in countless microhistories — sequences of events where various different things happen with subatomic particles throughout the universe — but that's irrelevant to us, we can't tell those strands apart, so we might as well treat them all as one history.” She pressed the chalk down hard to make a thick streak that covered everything she'd drawn. “The quantum decoherence people call this ‘coarse graining’. Summing over all these indistinguishable details is what gives rise to classical physics in the first place.

“Now, ‘the two of us’ would have first met in many perceivably different coarse-grained histories — and furthermore, you've since diverged by making different choices, and experiencing different external possibilities, after those events.” She sketched two intersecting ribbons of coarse-grained histories, and then showed each history diverging further.

“World War II and the Holocaust certainly happened in both of *our* pasts — but that's no proof that the total is so vast that it might as well be infinite. Remember, what stops us successfully intervening is the fact that we're reaching back to a point where some of the parallel interventions start to bite their own tail. So when we fail, it can't be counted twice: it's just confirming what we already know.”

Robert protested, “But what about all the versions of '30s Europe that don't happen to lie in either your past or mine? Just because we have no direct evidence for a Holocaust in those branches, that hardly makes it unlikely.”

Helen said, “Not unlikely *per se*, without intervention. But not fixed in stone either. We'll keep trying, refining the technology, until we can reach branches where there's no overlap with our own past in the '30s. And there must be other, separate ribbons of intervention that happen in histories we can never even know about.”

Robert was elated. He'd imagined himself clinging to a rock of improbable good fortune in an infinite sea of suffering — struggling to pretend, for the sake of his own sanity, that the rock was all there was. But what lay around him was not inevitably worse; it was merely unknown. In time, he might even play a part in ensuring that every last tragedy was *not* repeated across billions of worlds.

He reexamined the diagram. “Hang on. Intervention doesn't end divergence, though, does it? You reached *us*, a year ago, but in at least some of the histories spreading out from that moment, won't we still have suffered all kinds of disasters, and reacted in all kinds of self-defeating ways?”

“Yes,” Helen conceded, “but fewer than you might think. If you merely listed every sequence of events that superficially appeared to have a non-zero probability, you'd end up with a staggering catalogue of absurdist tragedies. But when you calculate everything more carefully, and take account of Planck-scale effects, it turns out to be nowhere near as bad. There are *no* coarse-grained histories where boulders assemble themselves out of dust and rain from the sky, or everyone in London or Madras goes mad and slaughters their children. Most macroscopic systems end up being quite robust — people included. Across histories, the range of natural disasters, human stupidity, and sheer bad luck isn't overwhelmingly greater than the range you're aware of from this history alone.”

Robert laughed. “And that's not bad enough?”

“Oh, it is. But that's the best thing about the form I've taken.”

“I'm sorry?”

Helen tipped her head and regarded him with an expression of disappointment. “You know, you're still not as quick on your feet as I'd expected.”

Robert's face burned, but then he realised what he'd missed, and his resentment vanished.

“*You don't diverge?* Your hardware is designed to end the process? Your environment, your surroundings, will still split you into different histories — but on a coarse-grained level, you don't contribute to the process yourself?”

“That's right.”

Robert was speechless. Even after a year, she could still toss him a hand grenade like this.

Helen said, “I can't help living in many worlds; that's beyond my control. But I do know that I'm one person. Faced with a choice that puts me on a knife-edge, I know I won't split and take every path.”

Robert hugged himself, suddenly cold. “Like I do. Like I have. Like all of us poor creatures of flesh.”

Helen came and sat beside him. “Even that's not irrevocable. Once you've taken this form — if that's what you choose — you can meet your other selves, reverse some of the scatter. Give some a chance to undo what they've done.”

This time, Robert grasped her meaning at once. “Gather myself together? Make myself whole?”

Helen shrugged. “If it's what you want. If you see it that way.”

He stared back at her, disoriented. Touching the bedrock of physics was one thing, but this possibility was too much to take in.

Someone knocked on the study door. The two of them exchanged wary glances, but it wasn't Quint, back for more punishment. It was a porter bearing a telegram.

When the man had left, Robert opened the envelope.

“Bad news?” Helen asked.

He shook his head. “Not a death in the family, if that's what you meant. It's from John Hamilton. He's challenging me to a debate. On the topic ‘Can A Machine Think?’”

“What, at some university function?”

“No. On the BBC. Four weeks from tomorrow.” He looked up. “Do you think I should do it?”

“Radio or television?”

Robert reread the message. “Television.”

Helen smiled. “Definitely. I'll give you some tips.”

“On the subject?”

“No! That would be cheating.” She eyed him appraisingly. “You can start by throwing out your electric razor. Get rid of the permanent five o'clock shadow.”

Robert was hurt. “Some people find that quite attractive.”

Helen replied firmly, “Trust me on this.”

The BBC sent a car to take Robert down to London. Helen sat beside him in the back seat.

“Are you nervous?” she asked.

“Nothing that an hour of throwing up won't cure.”

Hamilton had suggested a live broadcast, “to keep things interesting,” and the producer had agreed. Robert had never been on television; he'd taken part in a couple of radio discussions on the future of computing, back when the Mark I had first come into use, but even those had been taped.

Hamilton's choice of topic had surprised him at first, but in retrospect it seemed quite shrewd. A debate on the proposition that “Modern Science is the Devil's Work” would have brought howls of laughter from all but the most pious viewers, whereas the purely metaphorical claim that “Modern Science is a Faustian Pact” would have had the entire audience nodding sagely in agreement, while carrying no implications whatsoever. If you weren't going to take the whole dire fairy tale literally, everything was “a Faustian Pact” in some sufficiently watered-down sense: everything had a potential downside, and this was as pointless to assert as it was easy to demonstrate.

Robert had met considerable incredulity, though, when he'd explained to journalists where his own

research was leading. To date, the press had treated him as a kind of eccentric British Edison, churning out inventions of indisputable utility, and no one seemed to find it at all surprising or alarming that he was also, frankly, a bit of a loon. But Hamilton would have a chance to exploit, and reshape, that perception. If Robert insisted on defending his goal of creating machine intelligence, not as an amusing hobby that might have been chosen by a public relations firm to make him appear endearingly daft, but as both the ultimate vindication of materialist science and the logical endpoint of most of his life's work, Hamilton could use a victory tonight to cast doubt on everything Robert had done, and everything he symbolised. By asking, not at all rhetorically, "Where will this all end?", he was inviting Robert to step forward and hang himself with the answer.

The traffic was heavy for a Sunday evening, and they arrived at the Shepherd's Bush studios with only fifteen minutes until the broadcast. Hamilton had been collected by a separate car, from his family home near Oxford. As they crossed the studio Robert spotted him, conversing intensely with a dark-haired young man.

He whispered to Helen, "Do you know who that is, with Hamilton?"

She followed his gaze, then smiled cryptically. Robert said, "What? Do you recognise him from somewhere?"

"Yes, but I'll tell you later."

As the make-up woman applied powder, Helen ran through her long list of rules again. "Don't stare into the camera, or you'll look like you're peddling soap powder. But don't avert your eyes. You don't want to look shifty."

The make-up woman whispered to Robert, "Everyone's an expert."

"Annoying, isn't it?" he confided.

Michael Polanyi, an academic philosopher who was well-known to the public after presenting a series of radio talks, had agreed to moderate the debate. Polanyi popped into the make-up room, accompanied by the producer; they chatted with Robert for a couple of minutes, setting him at ease and reminding him of the procedure they'd be following.

They'd only just left him when the floor manager appeared. "We need you in the studio now, please, Professor." Robert followed her, and Helen pursued him part of the way. "Breathe slowly and deeply," she urged him.

"As if you'd know," he snapped.

Robert shook hands with Hamilton then took his seat on one side of the podium. Hamilton's young adviser had retreated into the shadows; Robert glanced back to see Helen watching from a similar position. It was like a duel: they both had seconds. The floor manager pointed out the studio monitor, and as Robert watched it was switched between the feeds from two cameras: a wide shot of the whole set, and a closer view of the podium, including the small blackboard on a stand beside it. He'd once asked Helen whether television had progressed to far greater levels of sophistication in her branch of the future, once the pioneering days were left behind, but the question had left her uncharacteristically tongue-tied.

The floor manager retreated behind the cameras, called for silence, then counted down from ten, mouthing the final numbers.

The broadcast began with an introduction from Polanyi: concise, witty, and non-partisan. Then Hamilton

stepped up to the podium. Robert watched him directly while the wide-angle view was being transmitted, so as not to appear rude or distracted. He only turned to the monitor when he was no longer visible himself.

“Can a machine think?” Hamilton began. “My intuition tells me: *no*. My heart tells me: *no*. I'm sure that most of you feel the same way. But that's not enough, is it? In this day and age, we aren't allowed to rely on our hearts for anything. We need something scientific. We need some kind of proof.

“Some years ago, I took part in a debate at Oxford University. The issue then was not whether machines might behave like people, but whether people themselves might *be* mere machines. Materialists, you see, claim that we are all just a collection of purposeless atoms, colliding at random. Everything we do, everything we feel, everything we say, comes down to some sequence of events that might as well be the spinning of cogs, or the opening and closing of electrical relays.

“To me, this was self-evidently false. What point could there be, I argued, in even conversing with a materialist? By his own admission, the words that came out of his mouth would be the result of nothing but a mindless, mechanical process! By his own theory, he could have no reason to think that those words would be the truth! Only believers in a transcendent human soul could claim any interest in the truth.”

Hamilton nodded slowly, a penitent's gesture. “I was wrong, and I was put in my place. This might be self-evident to *me*, and it might be self-evident to *you*, but it's certainly not what philosophers call an ‘analytical truth’: it's not actually a nonsense, a contradiction in terms, to believe that we are mere machines. There might, there just *might*, be some reason why the words that emerge from a materialist's mouth are truthful, despite their origins lying entirely in unthinking matter.

“There might.” Hamilton smiled wistfully. “I had to concede that possibility, because I only had my instinct, my gut feeling, to tell me otherwise.

“But the reason I only had my instinct to guide me was because I'd failed to learn of an event that had taken place many years before. A discovery made in 1930, by an Austrian mathematician named Kurt Gödel.”

Robert felt a shiver of excitement run down his spine. He'd been afraid that the whole contest would degenerate into theology, with Hamilton invoking Aquinas all night — or Aristotle, at best. But it looked as if his mysterious adviser had dragged him into the twentieth century, and they were going to have a chance to debate the real issues after all.

“What is it that we *know* Professor Stoney's computers can do, and do well?” Hamilton continued. “Arithmetic! In a fraction of a second, they can add up a million numbers. Once we've told them, very precisely, what calculations to perform, they'll complete them in the blink of an eye — even if those calculations would take you or me a lifetime.

“But do these machines *understand* what it is they're doing? Professor Stoney says, ‘Not yet. Not right now. Give them time. Rome wasn't built in a day.’” Hamilton nodded thoughtfully. “Perhaps that's fair. His computers are only a few years old. They're just babies. Why should they understand anything, so soon?

“But let's stop and think about this a bit more carefully. A computer, as it stands today, is simply a machine that does arithmetic, and Professor Stoney isn't proposing that they're going to sprout new kinds of brains all on their own. Nor is he proposing *giving* them anything really new. He can already let them look at the world with television cameras, turning the pictures into a stream of numbers describing the brightness of different points on the screen … on which the computer can then perform *arithmetic*. He

can already let them speak to us with a special kind of loudspeaker, to which the computer feeds a stream of numbers to describe how loud the sound should be … a stream of numbers produced by more *arithmetic*.

“So the world can come into the computer, as numbers, and words can emerge, as numbers too. All Professor Stoney hopes to add to his computers is a ‘cleverer’ way to do the arithmetic that takes the first set of numbers and churns out the second. It's that ‘clever arithmetic’, he tells us, that will make these machines think.”

Hamilton folded his arms and paused for a moment. “What are we to make of this? Can *doing arithmetic*, and nothing more, be enough to let a machine *understand* anything? My instinct certainly tells me no, but who am I that you should trust my instinct?

“So, let's narrow down the question of understanding, and to be scrupulously fair, let's put it in the most favourable light possible for Professor Stoney. If there's one thing a computer *ought* to be able to understand — as well as us, if not better — it's arithmetic itself. If a computer could think at all, it would surely be able to grasp the nature of its own best talent.

“The question, then, comes down to this: can you *describe* all of arithmetic, *using* nothing but arithmetic? Thirty years ago — long before Professor Stoney and his computers came along — Professor Gödel asked himself exactly that question.

“Now, you might be wondering how anyone could even *begin* to describe the rules of arithmetic, using nothing but arithmetic itself.” Hamilton turned to the blackboard, picked up the chalk, and wrote two lines:

If x+z = y+z
then x = y

“This is an important rule, but it's written in symbols, not numbers, because it has to be true for *every* number, every x, y and z. But Professor Gödel had a clever idea: why not use a code, like spies use, where every symbol is assigned a number?” Hamilton wrote:

The code for “a” is 1.
The code for “b” is 2.

“And so on. You can have a code for every letter of the alphabet, and for all the other symbols needed for arithmetic: plus signs, equals signs, that kind of thing. Telegrams are sent this way every day, with a code called the Baudot code, so there's really nothing strange or sinister about it.

“All the rules of arithmetic that we learnt at school can be written with a carefully chosen set of symbols, which can then be translated into numbers. Every question as to what does or does not *follow from* those rules can then be seen anew, as a question about numbers. If *this* line follows from *this* one,” Hamilton indicated the two lines of the cancellation rule, “we can see it in the relationship between their code numbers. We can judge each inference, and declare it valid or not, purely by doing arithmetic.

“So, given *any* proposition at all about arithmetic — such as the claim that ‘there are infinitely many prime numbers’ — we can restate the notion that we have a proof for that claim in terms of code numbers. If the code number for our claim is x, we can say ‘There is a number p, ending with the code number x, that passes our test for being the code number of a valid proof.’”

Hamilton took a visible breath.

“In 1930, Professor Gödel used this scheme to do something rather ingenious.” He wrote on the blackboard:

There DOES NOT EXIST a number p meeting the following condition:
p is the code number of a valid proof of this claim.

“Here is a claim about arithmetic, about numbers. It has to be either true or false. So let's start by supposing that it happens to be true. Then there *is no* number p that is the code number for a proof of this claim. So this is a true statement about arithmetic, but it can't be proved merely by *doing* arithmetic!”

Hamilton smiled. “If you don't catch on immediately, don't worry; when I first heard this argument from a young friend of mine, it took a while for the meaning to sink in. But remember: the only hope a computer has for understanding *anything* is by doing arithmetic, and we've just found a statement that *cannot* be proved with mere arithmetic.

“Is this statement really true, though? We mustn't jump to conclusions, we mustn't damn the machines too hastily. Suppose this claim is false! Since it claims there is no number p that is the code number of its own proof, to be false there would have to be such a number, after all. And that number would encode the ‘proof’ of an acknowledged falsehood!”

Hamilton spread his arms triumphantly. “You and I, like every schoolboy, know that you can't prove a falsehood from sound premises — and if the premises of arithmetic aren't sound, what is? So *we* know, as a matter of certainty, that this statement is true.

“Professor Gödel was the first to see this, but with a little help and perseverance, any educated person can follow in his footsteps. *A machine could never do that.* We might divulge to a machine our own knowledge of this fact, offering it as something to be taken on trust, but the machine could neither stumble on this truth for itself, nor truly comprehend it when we offered it as a gift.

“You and I *understand* arithmetic, in a way that no electronic calculator ever will. What hope has a machine, then, of moving beyond its own most favourable milieu and comprehending any wider truth?

“None at all, ladies and gentlemen. Though this detour into mathematics might have seemed arcane to you, it has served a very down-to-Earth purpose. It has proved — beyond refutation by even the most ardent materialist or the most pedantic philosopher — what we common folk knew all along: no machine will ever think.”

Hamilton took his seat. For a moment, Robert was simply exhilarated; coached or not, Hamilton had grasped the essential features of the incompleteness proof, and presented them to a lay audience. What might have been a night of shadow-boxing — with no blows connecting, and nothing for the audience to judge but two solo performances in separate arenas — had turned into a genuine clash of ideas.

As Polanyi introduced him and he walked to the podium, Robert realised that his usual shyness and self-consciousness had evaporated. He was filled with an altogether different kind of tension: he sensed more acutely than ever what was at stake.

When he reached the podium, he adopted the posture of someone about to begin a prepared speech, but then he caught himself, as if he'd forgotten something. “Bear with me for a moment.” He walked around to the far side of the blackboard and quickly wrote a few words on it, upside-down. Then he resumed his place.

“Can a machine think? Professor Hamilton would like us to believe that he's settled the issue once and for all, by coming up with a statement that *we* know is true, but a particular machine — programmed to explore the theorems of arithmetic in a certain rigid way — would never be able to produce. Well … we all have our limitations.” He flipped the blackboard over to reveal what he'd written on the opposite side:

If Robert Stoney speaks these words,

he will NOT be telling the truth.

He waited a few beats, then continued.

“What I'd like to explore, though, is not so much a question of limitations, as of opportunities. How exactly is it that we've all ended up with this mysterious ability to know that Gödel's statement is true? Where does this advantage, this great insight, come from? From our souls? From some immaterial entity that no machine could ever possess? Is that the only possible source, the only conceivable explanation? Or might it come from something a little less ethereal?

“As Professor Hamilton explained, we believe Gödel's statement is true because we trust the rules of arithmetic not to lead us into contradictions and falsehoods. But where does that trust come from? How does it arise?”

Robert turned the blackboard back to Hamilton's side, and pointed to the cancellation rule. “If x plus z equals y plus z, then x equals y. Why is this so *reasonable*? We might not learn to put it quite like this until we're in our teens, but if you showed a young child two boxes — without revealing their contents — added an equal number of shells, or stones, or pieces of fruit to both, and then let the child look inside to see that each box now contained the same number of items, it wouldn't take any formal education for the child to understand that the two boxes must have held the same number of things to begin with.

“The child knows, we all know, how a certain kind of object behaves. Our lives are steeped in direct experience of whole numbers: whole numbers of coins, stamps, pebbles, birds, cats, sheep, buses. If I tried to persuade a six-year-old that I could put three stones in a box, remove one of them, and be left with four … he'd simply laugh at me. Why? It's not merely that he's sure to have taken one thing away from three to get two, on many prior occasions. Even a child understands that some things that appear reliable will eventually fail: a toy that works perfectly, day after day, for a month or a year, can still break. But not arithmetic, not taking one from three. He can't even picture *that* failing. Once you've lived in the world, once you've seen how it works, the failure of arithmetic becomes unimaginable.

“Professor Hamilton suggests that this is down to our souls. But what would he say about a child reared in a world of water and mist, never in the company of more than one person at a time, never taught to count on his fingers and toes. I doubt that such a child would possess the same certainty that you and I have, as to the impossibility of arithmetic ever leading him astray. To banish whole numbers entirely from his world would require very strange surroundings, and a level of deprivation amounting to cruelty, but would that be enough to rob a child of his *soul*?

“A computer, programmed to pursue arithmetic as Professor Hamilton has described, is subject to far more deprivation than that child. If I'd been raised with my hands and feet tied, my head in a sack, and someone shouting orders at me, I doubt that I'd have much grasp of reality — and I'd still be better prepared for the task than such a computer. It's a great mercy that a machine treated that way wouldn't be able to think: if it could, the shackles we'd placed upon it would be criminally oppressive.

“But that's hardly the fault of the computer, or a revelation of some irreparable flaw in its nature. If we want to judge the potential of our machines with any degree of honesty, we have to play fair with them, not saddle them with restrictions that we'd never dream of imposing on ourselves. There really is no point comparing an eagle with a spanner, or a gazelle with a washing machine: it's our jets that fly and our cars that run, albeit in quite different ways than any animal.

“*Thought* is sure to be far harder to achieve than those other skills, and to do so we might need to mimic the natural world far more closely. But I believe that once a machine is endowed with facilities resembling the inborn tools for learning that we all have as our birthright, and is set free to learn the way a child learns, through experience, observation, trial and error, hunches and failures — instead of being handed a

list of instructions that it has no choice but to obey — we will finally be in a position to compare like with like.

"When that happens, and we can meet and talk and argue with these machines — about arithmetic, or any other topic — there'll be no need to take the word of Professor Gödel, or Professor Hamilton, or myself, for anything. We'll invite them down to the local pub, and interrogate them in person. And if we play fair with them, we'll use the same experience and judgment we use with any friend, or guest, or stranger, to decide for ourselves whether or not they can think."

The BBC put on a lavish assortment of wine and cheese in a small room off the studio. Robert ended up in a heated argument with Polanyi, who revealed himself to be firmly on the negative side, while Helen flirted shamelessly with Hamilton's young friend, who turned out to have a PhD in algebraic geometry from Cambridge; he must have completed the degree just before Robert had come back from Manchester. After exchanging some polite formalities with Hamilton, Robert kept his distance, sensing that any further contact would not be welcome.

An hour later, though, after getting lost in the maze of corridors on his way back from the toilets, Robert came across Hamilton sitting alone in the studio, weeping.

He almost backed away in silence, but Hamilton looked up and saw him. With their eyes locked, it was impossible to retreat.

Robert said, "It's your wife?" He'd heard that she'd been seriously ill, but the gossip had included a miraculous recovery. Some friend of the family had lain hands on her a year ago, and she'd gone into remission.

Hamilton said, "She's dying."

Robert approached and sat beside him. "From what?"

"Breast cancer. It's spread throughout her body. Into her bones, into her lungs, into her liver." He sobbed again, a helpless spasm, then caught himself angrily. "*Suffering is the chisel God uses to shape us.* What kind of idiot comes up with a line like that?"

Robert said, "I'll talk to a friend of mine, an oncologist at Guy's Hospital. He's doing a trial of a new genetic treatment."

Hamilton stared at him. "One of your *miracle cures*?"

"No, no. I mean, only very indirectly."

Hamilton said angrily, "She won't take your poison."

Robert almost snapped back: *She won't? Or you won't let her?* But it was an unfair question. In some marriages, the lines blurred. It was not for him to judge the way the two of them faced this together.

"They go away in order to be with us in a new way, even closer than before." Hamilton spoke the words like a defiant incantation, a declaration of faith that would ward off temptation, whether or not he entirely believed it.

Robert was silent for a while, then he said, "I lost someone close to me, when I was a boy. And I thought the same thing. I thought he was still with me, for a long time afterwards. Guiding me. Encouraging me." It was hard to get the words out; he hadn't spoken about this to anyone for almost thirty years. "I dreamed up a whole theory to explain it, in which 'souls' used quantum uncertainty to control the body during life,

and communicate with the living after death, without breaking any laws of physics. The kind of thing every science-minded seventeen-year-old probably stumbles on, and takes seriously for a couple of weeks, before realising how nonsensical it is. But I had a good reason not to see the flaws, so I clung to it for almost two years. Because I missed him so much, it took me that long to understand what I was doing, how I was deceiving myself."

Hamilton said pointedly, "If you'd not tried to explain it, you might never have lost him. He might still be with you now."

Robert thought about this. "I'm glad he's not, though. It wouldn't be fair on either of us."

Hamilton shuddered. "Then you can't have loved him very much, can you?" He put his head in his arms. "Just fuck off, now, will you."

Robert said, "What exactly would it take, to prove to you that I'm not in league with the devil?"

Hamilton turned red eyes on him and announced triumphantly, "Nothing will do that! I saw what happened to Quint's gun!"

Robert sighed. "That was a conjuring trick. Stage magic, not black magic."

"Oh yes? Show me how it's done, then. Teach me how to do it, so I can impress my friends."

"It's rather technical. It would take all night."

Hamilton laughed humourlessly. "You can't deceive me. I saw through you from the start."

"Do you think X-rays are Satanic? Penicillin?"

"Don't treat me like a fool. There's no comparison."

"*Why not?* Everything I've helped develop is part of the same continuum. I've read some of your writing on mediaeval culture, and you're always berating modern commentators for presenting it as unsophisticated. No one really thought the Earth was flat. No one really treated every novelty as witchcraft. So why view any of my work any differently than a fourteenth-century man would view twentieth-century medicine?"

Hamilton replied, "If a fourteenth-century man was suddenly faced with twentieth-century medicine, don't you think he'd be entitled to wonder how it had been revealed to his contemporaries?"

Robert shifted uneasily on his chair. Helen hadn't sworn him to secrecy, but he'd agreed with her view: it was better to wait, to spread the knowledge that would ground an understanding of what had happened, before revealing any details of the contact between branches.

But this man's wife was dying, needlessly. And Robert was tired of keeping secrets. Some wars required it, but others were better won with honesty.

He said, "I know you hate H.G. Wells. But what if he was right, about one little thing?"

Robert told him everything, glossing over the technicalities but leaving out nothing substantial. Hamilton listened without interrupting, gripped by a kind of unwilling fascination. His expression shifted from hostile to incredulous, but there were also hints of begrudging amazement, as if he could at least appreciate some of the beauty and complexity of the picture Robert was painting.

But when Robert had finished, Hamilton said merely, "You're a grand liar, Stoney. But what else should I

expect, from the King of Lies?”

Robert was in a sombre mood on the drive back to Cambridge. The encounter with Hamilton had depressed him, and the question of who'd swayed the nation in the debate seemed remote and abstract in comparison.

Helen had taken a house in the suburbs, rather than inviting scandal by cohabiting with him, though her frequent visits to his rooms seemed to have had almost the same effect. Robert walked her to the door.

“I think it went well, don't you?” she said.

“I suppose so.”

“I'm leaving tonight,” she added casually. “This is goodbye.”

“What?” Robert was staggered. “Everything's still up in the air! I still need you!”

She shook her head. “You have all the tools you need, all the clues. And plenty of local allies. There's nothing truly urgent I could tell you, now, that you couldn't find out just as quickly on your own.”

Robert pleaded with her, but her mind was made up. The driver beeped the horn; Robert gestured to him impatiently.

“You know, my breath's frosting visibly,” he said, “and you're producing nothing. You really ought to be more careful.”

She laughed. “It's a bit late to worry about that.”

“Where will you go? Back home? Or off to twist another branch?”

“Another branch. But there's something I'm planning to do on the way.”

“What's that?”

“Do you remember once, you wrote about an Oracle? A machine that could solve the halting problem?”

“Of course.” Given a device that could tell you in advance whether a given computer program would halt, or go on running forever, you'd be able to prove or disprove any theorem whatsoever about the integers: the Goldbach conjecture, Fermat's Last Theorem, anything. You'd simply show this “Oracle” a program that would loop through all the integers, testing every possible set of values and only halting if it came to a set that violated the conjecture. You'd never need to run the program itself; the Oracle's verdict on whether or not it halted would be enough.

Such a device might or might not be possible, but Robert had proved more than twenty years before that no ordinary computer, however ingeniously programmed, would suffice. If program H could always tell you in a finite time whether or not program X would halt, you could tack on a small addition to H to create program Z, which perversely and deliberately went into an infinite loop whenever it examined a program that halted. If Z examined itself, it would either halt eventually, or run forever. But either possibility contradicted the alleged powers of program H: if Z actually ran forever, it would be because H had claimed that it wouldn't, and *vice versa*. Program H could not exist.

“Time travel,” Helen said, “gives me a chance to become an Oracle. There's a way to exploit the inability to change your own past, a way to squeeze an infinite number of timelike paths — none of them closed, but some of them arbitrarily near to it — into a finite physical system. Once you do that, you can solve

the halting problem."

"How?" Robert's mind was racing. "And once you've done that … what about higher cardinalities? An Oracle for Oracles, able to test conjectures about the real numbers?"

Helen smiled enigmatically. "The first problem should only take you forty or fifty years to solve. As for the rest," she pulled away from him, moving into the darkness of the hallway, "what makes you think I know the answer myself?" She blew him a kiss, then vanished from sight.

Robert took a step towards her, but the hallway was empty.

He walked back to the car, sad and exalted, his heart pounding.

The driver asked wearily, "Where to now, sir?"

Robert said, "Further up, and further in."

4

The night after the funeral, Jack paced the house until three a.m. When would it be bearable? *When?* She'd shown more strength and courage, dying, than he felt within himself right now. But she'd share it with him, in the weeks to come. She'd share it with them all.

In bed, in the darkness, he tried to sense her presence around him. But it was forced, it was premature. It was one thing to have faith that she was watching over him, but quite another to expect to be spared every trace of grief, every trace of pain.

He waited for sleep. He needed to get some rest before dawn, or how would he face her children in the morning?

Gradually, he became aware of someone standing in the darkness at the foot of the bed. As he examined and reexamined the shadows, he formed a clear image of the apparition's face.

It was his own. Younger, happier, surer of himself.

Jack sat up. "What do you want?"

"I want you to come with me." The figure approached; Jack recoiled, and it halted.

"Come with you, where?" Jack demanded.

"To a place where she's waiting."

Jack shook his head. "No. I don't believe you. She said she'd come for me herself, when it was time. She said she'd guide me."

"She didn't understand, then," the apparition insisted gently. "She didn't know I could fetch you myself. Do you think I'd send her in my place? Do you think I'd shirk the task?"

Jack searched the smiling, supplicatory face. "Who are you?" *His own soul, in Heaven, remade?* Was this a gift God offered everyone? To meet, before death, the very thing you would become — if you so chose? So that even this would be an act of free will?

The apparition said, "Stoney persuaded me to let his friend treat Joyce. We lived on, together. More than a century has passed. And now we want you to join us."

Jack choked with horror. “No! This is a trick! *You're the Devil!*”

The thing replied mildly, “There is no Devil. And no God, either. Just people. But I promise you: people with the powers of gods are kinder than any god we ever imagined.”

Jack covered his face. “Leave me be.” He whispered fervent prayers, and waited. It was a test, a moment of vulnerability, but God wouldn't leave him naked like this, face-to-face with the Enemy, for longer than he could endure.

He uncovered his face. The thing was still with him.

It said, “Do you remember, when your faith came to you? The sense of a shield around you melting away, like armour you'd worn to keep God at bay?”

“Yes.” Jack acknowledged the truth defiantly; he wasn't frightened that this abomination could see into his past, into his heart.

“That took strength: to admit that you needed God. But it takes the same kind of strength, again, to understand that *some needs can never be met*. I can't promise you Heaven. We have no disease, we have no war, we have no poverty. But we have to find our own love, our own goodness. There is no final word of comfort. We only have each other.”

Jack didn't reply; this blasphemous fantasy wasn't even worth challenging. He said, “I know you're lying. Do you really imagine that I'd leave the boys alone here?”

“They'd go back to America, back to their father. How many years do you think you'd have with them, if you stay? They've already lost their mother. It would be easier for them now, a single clean break.”

Jack shouted angrily, “Get out of my house!”

The thing came closer, and sat on the bed. It put a hand on his shoulder. Jack sobbed, “Help me!” But he didn't know whose aid he was invoking any more.

“Do you remember the scene in *The Seat of Oak*? When the Harpy traps everyone in her cave underground, and tries to convince them that there is no Nescia? Only this drab underworld is real, she tells them. Everything else they think they've seen was just make-believe.” Jack's own young face smiled nostalgically. “And we had dear old Shrugweight reply: he didn't think much of this so-called ‘real world’ of hers. And even if she was right, since four little children could make up a better world, he'd rather go on pretending that their imaginary one was real.

“But we had it all upside down! The real world is richer, and stranger, and more beautiful than anything ever imagined. Milton, Dante, John the Divine are the ones who trapped you in a drab, grey underworld. That's where you are now. But if you give me your hand, I can pull you out.”

Jack's chest was bursting. *He couldn't lose his faith. He'd kept it through worse than this. He'd kept it through every torture and indignity God had inflicted on his wife's frail body. No one could take it from him now.* He crooned to himself, “In my time of trouble, He will find me.”

The cool hand tightened its grip on his shoulder. “You can be with her, now. Just say the word, and you will become a part of me. I will take you inside me, and you will see through my eyes, and we will travel back to the world where she still lives.”

Jack wept openly. “Leave me in peace! Just leave me to mourn her!”

The thing nodded sadly. “If that's what you want.”

“I do! *Go!*”

“When I'm sure.”

Suddenly, Jack thought back to the long rant Stoney had delivered in the studio. Every choice went every way, Stoney had claimed. No decision could ever be final.

“Now I know you're lying!” he shouted triumphantly. “If you believed everything Stoney told you, how could my choice ever mean a thing? I would always say yes to you, and I would always say no! It would all be the same!”

The apparition replied solemnly, “While I'm here with you, touching you, *you can't be divided*. Your choice will count.”

Jack wiped his eyes, and gazed into its face. It seemed to believe every word it was speaking. What if this truly was his metaphysical twin, speaking as honestly as he could, and not merely the Devil in a mask? Perhaps there was a grain of truth in Stoney's awful vision; perhaps this was another version of himself, a living person who honestly believed that the two of them shared a history.

Then it was a visitor sent by God, to humble him. To teach him compassion towards Stoney. To show Jack that he too, with a little less faith, and a little more pride, might have been damned forever.

Jack stretched out a hand and touched the face of this poor lost soul. *There, but for the grace of God, go I.*

He said, “I've made my choice. Now leave me.”

Author's note: where the lives of the fictional characters of this story parallel those of real historical figures, I've drawn on biographies by Andrew Hodges and A.N. Wilson. The self-dual formulation of general relativity was discovered by Abhay Ashtekar in 1986, and has since led to ground-breaking developments in quantum gravity, but the implications drawn from it here are fanciful.

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