Red Queen

The Substrate Wars

Book 1

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For all of the other kids who escaped by reading.

Contents

Author's Note

Red Queen is a story about the yearning for freedom and agency in a world dominated by bureaucrats and propagandists. The world of *Red Queen* is just a decade or two away, and looks very much like the world we live in, just a few steps worse. In the tradition of Heinlein's *If This Goes On—,* I have extrapolated from current trends and imagined the politics that result. The authoritarian tendencies we see in modern western states will probably be reversed at some point—but what if they just keep getting worse? This is especially true of the US, with its 9/11-justified surveillance and interception of every citizen's email and message metadata, and a penal-industrial complex that imprisons about one in three black men at some point in their lives, often for victimless crimes like drug possession. A more serious terrorist incident might lead to even more restrictions on freedom and privacy. And that's where *Red Queen* begins.

Classic science fiction posits a future society and technology, then tells a story that shows how that new world might evolve. Human nature changes much more slowly than technology, and even amid the strange lands of the future, people remain people, with all their nobility, vices, insecurities, and dreams.

I've footnoted some of the topics in science, politics, and economics that are brought up. Check through the footnotes at the end for topics you may wish to know more about.

Prologue

> There is nothing in this world so permanent as a temporary emergency. —Robert Heinlein, *The Man Who Sold the Moon,* 1950

Just before midnight Saturday in the Coast Guard's Vessel Traffic Service watch room for New York Harbor, one of the hundreds of vessels being tracked began to deviate from its usual course. The computer noted the discrepancy and buzzed Petty Officer Assante's console. He looked at the transponder info: charter party boat, regular transit in and out from the Skyport Marina on the East River. The deviation from course that had signaled the alert: the blip had moved steadily up the river past its normal turn to dock. It was approaching the sensitive area near the UN buildings. Assante hailed them via radio; while waiting for a response, he reminded himself to leave early for once so he would at least see his wife for a few minutes before she slept. After getting no response to his second hail attempt, Assante sent an alert to the nearest patrol boat to check it out.

Seaman Curtis Jackson on the Coast Guard patrol boat received the alert to check out the vessel, which was slowly encroaching on a security zone. Probably too much partying, Jackson thought; they turned to come up behind the party barge and Jackson began surveying the decks with binoculars. Lights on, party music going, but no one outside, and the people visible through the larger view windows weren't moving as you'd expect. Which gave him a very bad feeling—

Inside the party barge, blood flowed from the machine-gunned

bodies of the passengers and crew, ran down the stairways, and pooled on the dance floor. One hijacker remained on board to steer toward the target and activate the device now planted belowdecks. His life had been long enough, he thought, and when they had asked for a martyr he had said yes. Striking a blow at the heart of the American beast would avenge their humiliation of Islam and its people. He noticed a patrol boat coming up fast behind, and decided the target was close enough—he pushed the red button on the box he carried.

The bomb was compact, one of the smallest fission devices made by the old Soviet Union and lost by the Ukrainian government during the chaos. It had made its way through several countries, changing hands at higher and higher prices, until it was purchased by Islamists and had its neutron-reflecting casing replaced with cobalt—which reduced the yield of the device but would spread far more radioactive fallout than a standard fission bomb. The conventional explosive casing was old and went off more weakly than it was designed to, and the uranium quadrants that were driven together to reach critical mass and ignite the chain reaction were a little off-center, but it was close enough: the reaction ignited and generated energy the equivalent of ten kilotons of TNT, and the neutron flux converted the added metal jacket to highly radioactive cobalt-60 dust. Hard X-rays from the reaction created an expanding ball of glowing ionized air. Then the expanding fireball cooled and began to rise into the classic mushroom cloud shape over the East River.

The blast wave tore apart hundreds of buildings near shore, throwing their bricks like missiles into Manhattan. All the windows and interior walls of the UN building blew out first, then the tower rocked backward, and began to melt and sag before toppling. Under the river, the Queens Midtown Tunnel collapsed and flooded. Most of the major hospitals along the river were blasted into rubble. Grand Central Station's roof fell in. The Chrysler Building's aluminum cap began to burn and melt as the upper tower collapsed onto Lexington

Avenue. The New York Public Library caught fire and burned for days. Streets were filled with smoldering rubble three stories deep. Fires fed by broken gas lines consumed block after block.

In Times Square, thousands of people were still walking the streets or in restaurants and bars after Broadway plays had let out. They were jolted first by a dazzling flash in the eastern sky, then the lights went out. The blast wave passed over their heads, shaking loose cornices and showering the sidewalks with debris and shattered glass, and those outside were deafened by the roar. This far from the blast, most people inside buildings survived, but the gentle rain of fallout that began as they tried to make their way west to escape would take many of their lives.

Hundreds of thousands of people on the east side of Manhattan and west side of Brooklyn and Queens died in the first minutes. More succumbed to burns and radiation in the next few hours. In the less-damaged areas, people tried to help the injured and get supplies for what might be days of waiting for rescue—but those who stayed outdoors for more than a few minutes did not know they would sicken and die in agony within days or years from exposure to the radioactive dust. Civil defense preparedness was nil, and convoys from far suburbs driving in to help had to turn back when their radiation detectors showed lethal levels in Manhattan and points east as the dust settled in the prevailing wind.

Part One: Co-Evolution

Chapter One: Activities Week

ALife Simulation, Model 1: Organism 33

Its sensors showed no dangers visible and the scent of Green to the left. Those inputs, fed into its neural network, resulted in outputs for its next action: turn left and move toward the scent. By this generation of its kind this was an instinctive response. Unfortunately it was eaten by a predator before it reached the food three squares away, but some of its species reproduced for the next round.

A-Life Lab

> Life is a process which can be abstracted away from any particular medium. —John von Neumann

It was late September on the California coast, and warmer than it had been all summer. The campus was humming with the new term, bicycles everywhere and students streaming to morning classes. Justin Smith pedaled past the Quad, noting the booths set up there for Activities Fair, and parked his bike in the rack in front of Gates Hall, the rough limestone Computer Science building donated by a successful college dropout.

When he reached the Artificial Life lab he could hear Prof. Wilson and Justin's research partner Rasna Kapoor talking. Justin already knew from checking the overnight simulation run from home that something was amiss, and he had a good idea what it was: "We need to check the sex routine. I tweaked it yesterday and from the looks of the stats, I'd guess I made a locking error."

Justin put his backpack down and hovered over the two at the console. In front of them was the impressive machine running the simulation: impressive in size, but the box was a standard cabinet with some blinking lights (the communications ports) and a streamlined "*Evolve*" logo on the front to look good in photos. Most of the cabinet was actually empty.

Prof. Wilson looked up and pointed at the graph on screen. "That would explain this rapid decline in fitness and the turnover spike."

Rasna clicked the mouse and brought up some code. "Here? This is the problem with multiprocessors, even though it almost never happens, 'almost never' isn't good enough when it happens millions of times."

Justin took the third chair and sighed. "That's what I changed. Yup, see this? I accidentally commented out the locking of the new organism list, so two processors could think they had sole possession of a new organism pointer before it was removed from the stack. Both processors then tried to write into the slots in the structure at the same time and created a horrible mutant child out of parts from two different ones. The environment may be in hardware, but we still have buggy software in the new-generation processing."

Prof. Wilson sat back. "Moving the environment simulation to the DARPA chip sped things up, but now we're bottlenecked in mating and new organisms. Finding bugs faster than ever." He stroked his bushy mustache. "How much time did we lose? If we reload the last generation before you made the change, and restart from there?"

Rasna scanned the directory. "Looks like yesterday at 6:14 PM is the last stored state before the change. We only lost a thousand generations."

Justin went to work at his desk fixing his mistake, recompiled the code, and restored the last good state before his bug had damaged so many organisms. "There. It's restarted."

Turning to Rasna, Prof. Wilson said, "Did you happen to chat up the quantum computing guys about putting up the simulator on their machine? I've been meaning to talk to Friedman about it but he's hard to reach." The latest quantum machine there was supposed to show many orders of magnitude speedups for some kinds of search problems—with the government funding it to find faster ways to crack the tougher encryption methods that remained secure even from the NSA.

"I haven't yet. I usually run into Steve Duong every few days, but not

recently." Steve was already well-known around campus as the first grad student admitted solely on the basis of his online course performance, starting with advanced math and physics at 12 in a backwater village in Vietnam's highlands. Recruited at fifteen and put to work in the quantum computation project, he had already been featured in news stories and university PR releases.

"I should probably give Friedman a call first to follow protocol. Steve is really the principal investigator over there, but Friedman is officially running the project so we should discuss a joint paper."

Prof. Wilson got up to leave. "But, on to more bureaucratic concerns. I'll be back in my office. Got some documents to read on the damn hearing."

Rasna's eyes narrowed. "You know, every single person I talk to thinks it's ridiculous. You were just stating a hypothesis which has a lot of evidence supporting it. Why would anyone expect men and women on average to be exactly the same in any characteristic?"

Wilson gave her a weary smile. "You don't know any of the people objecting, because they come from a different tribe. They are not on the science side of campus, and they don't talk to anyone not like themselves. I've seen this Title IX nonsense get worse every year since they first came after me ten years ago, and now almost anyone can make a complaint about anything they claim is offensive and get a hearing."

Justin snorted. "I'm offended by their constant offense. It's to the point where the science is stifled by politics, and you have to watch everything you say or somebody will report you to the thought police."

"Careful, Justin, even saying that now is an offense against the feelings

of our social justice colleagues. Your attitude is… *unconstructive.* Like any movement that started out fighting real injustice, it lives on as a tribe even though they already won the equality we dreamed of back in my day. But 'this, too, shall pass.' Just wait patiently and some other religious belief system will grow up to take over from them. The real problem is the evolved human tendency to tribalism."

"So what do you think will happen at the hearing?"

"I'll make a statement about campus freedom of inquiry, the fact my comments were made as part of a speculative panel exploring evolutionary psychology and where it is and isn't proving useful to understanding human behavior, and point out that these five students came as a group apparently looking to be offended so they could file a complaint. All five are from departments known to have little respect for the scientific method or open inquiry, which I will subtly point out. Then the Title IX coordinator will say something mushy about respecting everyone's right to feel comfortable on campus, and probably the committee will vote to affirm the charge."

"But what happens? Do you get a demerit, or what?"

"At worst a reprimand on my file! Scary. That is, nothing but another symbolic scalp for their trophy case. Luckily I'm tenured and that still means something, though not as much as it once did, or this hearing wouldn't be happening."

The Grey Tribe

In his mountain cottage on the other side of the world, Michael McCulloch, leader of the underground Grey Tribe,[1] noted in the news: an old friend was in trouble. Halfway through the article, he decided: *It's time to contact the Prof.* Professor Wilson's fame from the incident a decade ago—when the university Safety Office confiscated a poster from his office door, leading to a firestorm of publicity about bureaucratic overreach—meant it was very possible he was in danger of being sacrificed to make the political point that enemies of the new regime who had stymied them in the past would be punished harshly now. Michael wanted Wilson to know he had friends, even if they were outlaw friends. Michael had become a dangerous person to have known, and it was possible even someone as far back in his life as Wilson would have his message traffic examined. He'd send an anonymized multi-hop message to a temporary pirate email forwarder… nothing that anyone else could understand, but enough clues to allow Wilson to get in touch, if he dared.

He turned back to scanning the daily digest of items caught by his custom filters. The global stock and bond market crash after the New York terrorist bomb had been followed by a decade of wartime shortage economies, and only a few places in Asia and Europe were anything like recovered. Even his country of refuge, Switzerland, had very high prices and a stagnant economy, but he was relatively safe here in his well-connected cottage, acting as the nerve center of the Grey Tribe and its affiliated bands of geeks and outlaws. Early on in the wars, the Swiss had sensibly decided to enforce countermeasures to protect their Internet from spies and incursions. From here, he could listen to uncensored sources that were blocked from the US, and coordinate encrypted communications between all of those skeptical of the Unity Party government of the US and its tightening control over communications and media.

The Quad

> We have now sunk to a depth at which restatement of the obvious is the first duty of intelligent men. —George Orwell

Justin was wrapping up work and getting ready to leave for the gym when he got a text from his friend Wendy: "Drop by the quad? I'm at the hanging tree."

Justin texted back: "I'll be there in 5."

He detoured through the Quad and pushed his bike along the pedestrian path between the rows of festively-decorated booths. After Housing Week and the settling of new students into dorms and frats, Activities Fair was a one-stop mall for enticing the new students to get involved in the dozens of campus social and interest groups. These activities were one thing the online colleges couldn't offer—real human contact with other students who were just as geeky about something as you were.

He could hear a burst of brassy music from the Pep Band booth, mixed with *a cappella* harmonies from the Keytones down the way. The frats and sororities—there was little distinction left since they had been encouraged to accept any sex or gender preference as a condition of being recognized—had their own area and were passing out party schedules. Students stopped to talk with booth volunteers in clusters he had to work around. The religious groups were still active, though having to accept all students made for some mischief, as when the Muslim Students ended up with a non-believing chair. The LGBT group had a large booth and lots of happy people working it; next to them the Buddhists in their mindfulness seemed to offer much less fun. The gamers had several offshoot groups, still divided by platform, and the Redshirts (fans of a long-cancelled TV space opera, *Starspark*) were still notably geekier than most, though of

course many of their more well-rounded members had duties elsewhere in the Fair.

Organizing for All had a triple-sized booth with a lot of students staffing it, all in blue tee shirts with the red sunrise logo. Since the Youth Service requirement, the Youth Corps fed new members to the supposedly independent Organizing for All, which continued to do service work on a volunteer basis, always with a reminder of who to vote for in return. Justin had spent his summer in the Youth Corps when he was 18, in Brooklyn decontaminating soil from the cobalt bomb attack. He considered it a well-meaning but wasteful effort crippled by obtuse bureaucracy—much, he suspected, like the conscripted armed forces used to be. Days of labor in hot protective suits, shoveling the top layer of soil into wheelbarrows for removal, all to allow for the return of community gardens under the President's new local growing program. Nights spent with other kids from all around the country in their tent village, with Youth Corps Network movies interspersed with videos on the value of group effort and the joy of shared sacrifice for the good of others. The furtive sexual encounters were impossible to stop, so he learned to ignore the nighttime noises —and more than once made noises of his own.

Justin pondered detouring as he approached the Organizing for All booth; he could see Tyler Sheppard out front speechifying for a knot of younger students. Tyler was an old adversary from his grad dorm, where he insisted it was his right to use as many washers as he wanted even if that meant all of them, and his reputation for gaming the system to get what he wanted was campus-wide. Tyler had led several campaigns to have students brought up on charges for hate speech and sexism, including one successful effort to get a student expelled for posting a list of women he had slept with, with star ratings—anonymized, but not enough to keep people from gossiping and guessing, a fun game unless you're the person people are gossiping about. Justin was ambivalent about that episode, but to expel a 19-

year-old for a lapse in judgment seemed excessive.

Justin decided to go straight through and risk an unpleasant encounter with Tyler. He was almost by when Tyler saw him, turning to point and direct his audience's attention to Justin: "And here's Justin Smith, one of our computer jocks who thinks social justice isn't important. His thesis advisor is up on charges today for his sexist remarks. Let's see if Justin will talk to us…."

Justin smiled back at him. "You know Prof. Wilson is no sexist. The complaint is bullshit. Why don't you tell these folks what happened to your last girlfriend?"

Tyler didn't take the bait, but responded toward the crowd, "More women would go into computer science if it weren't for guys like Justin here. But we're doing our best to make every department a safe place for women and everyone who has been excluded by white privilege and the patriarchy…."

Justin moved on, and found Wendy leaning against the trunk of the so-called hanging tree, the old live oak with one thick branch at just the right height for a noose, though so far as anyone knew, no one had ever been hanged there. She was dressed in a simple black yoga outfit, her hair a not-entirely-natural cascade of varied gold and copper, and her coffee-colored skin contrasted with her California-white teeth. The tortoise-shell glasses made her look like Hollywood's idea of a hot librarian.

Justin leaned the bike against the tree. "Got hassled by Tyler along the way. He's an asshole."

"He's an asshole, for sure."

"He says Wilson's going down at that hearing. Trying to get me mad.

Not falling for it."

"Everybody knows it's just theater. Satisfy the politicals, keep the Feds happy, keep the deans afraid of Organizing for All. Wilson is just collateral damage."

"Well, it's ugly. The Chinese look better all the time."

Wendy turned her head to scan the crowd, then looked back toward him seductively. "You know this is one of the things I like about you. So noble and clueless. You should get with the program like everybody else or you'll end up in some militia in the mountains."

"It's not like I haven't thought about it. But it would wreck my thesis."

"And what will you do after you finish your Ph.D.? There are no jobs."

"Wilson can get me a post-doc. If he gets the new round of DARPA funding."

"You know that's not exactly the lifestyle to which I'd like to become accustomed."

"We've been over this. You know I think you're beautiful, and smart, and I love that we can talk like this. But you need to give up on that particular fantasy. I can't think of you that way. And you can't bear my children. And you have a dick."

"Which could be remedied. I just don't think it's that important. The right guy will want me as I am."

"You're not exactly all-natural. But I know what you mean—I really, really wish I could be interested in you that way. I'm lucky to have you as a friend. You know I'm all for gay people and happiness for

everyone. But all I can do is be *fond* of you."

"'I Can't Make You Love Me.' But I can tease you about it."

"So why aren't you over with your people? LGBTQ-et-cetera or Students for Equality?"

"They're not *my people*. I don't need their condescending, do-gooding, privileged-ass help."

Hearing Prep

Back in his office, Prof. Wilson sat down to force himself to look through the file folder containing papers related to the upcoming hearing; the complaints from the student activists, the University's formal notice of Title IX investigation and hearing, the filings from other interested parties. His response to the charges had been written and submitted weeks ago, but he would have to testify and possibly answer questions from the committee, which meant he had better refresh his memory on all the points made by all the parties.

Trying to read the first document, his mind wandered and his eyes went to the poster above his desk. In the overdramatic style in favor in its day, the poster showed a ruggedly-handsome man dressed in tight black pants and a form-fitting leather jacket brandishing an assault-rifle-style energy weapon with a determined look on his face and the caption, "I AIM TO DISOBEY." This was Matt Raley, heroic captain of the *Starspark* and secret leader of the reborn Rebel Alliance, who had a few catchphrases like that covering every situation that came up. They were used often on the ship's five-year mission to recontact the colonies lost during the Rebellion, which had been crushed at great cost. The destruction and loss of interstellar ships left the frontier to fend for itself for a century until the home worlds recovered. In every episode the ship would orbit a lost colony planet and send an away team to check out the state of the colony—they had always survived, somehow, though often mutated into a dictatorship or orgiastic party planet. The latter allowed for much semi-naked dancing, which was good for ratings.

A decade earlier, this poster had hung on the outside of his office door—most doors along the corridor, offices or not, had a variety of posters, photos, charts, graphs, and bumper stickers on them, expressing what those who used that room thought was funny, interesting, or cool. Candidates and causes were well represented, and no one

thought much of this free expression.

Until one day a newly-appointed Chief of Campus Safety received an anonymous complaint suggesting that the *Starspark* poster created a sense of threat and, with its oversized gun, violated the new written policy against any representation of violence or tools of violence. The Chief of Security came by herself to check it out while he was elsewhere, and took the poster, leaving a notice of violation in its place.

He had asked for it back and pointed out that every student knew it was a fictional character and a fictional gun from a popular TV show, and could not possibly be mistaken for a real threat of violence—Captain Raley was inclined to disobey a fictional dictatorship! The Safety Office gathered its Threat Assessment Team and pondered a disciplinary hearing. Word got out, and the media had a field day making fun of the administration and its busybody zero-tolerance policies. His story and interviews with him were broadcast around the world. Science fiction writers and some of the stars of the show came to his defense. Finally the Safety Office had quietly closed the matter and returned the poster after he agreed to keep it inside his office, where it remained, a symbol of one professor's victory over brain-dead bureaucracy.

It occurred to him now that in the years following the poster incident, there had been a steady decline in the number of posters and political cartoons in the corridor. He hadn't noticed it happening, but today most doors were empty of all but class folders and information sheets.

The administration had left him alone for a decade. Now here was a new battle because he had mentioned some of the interesting research into innate sex differences, evolved along with humanity's march to higher intelligence and division of labor. In past years the students who wanted such discussions silenced would have been persuaded not to pursue such a complaint, but something had changed. He went

back to read their written complaints again…

After an hour of reading, his screen showed an email notification with the subject: "From an Old Friend." He stopped to take a look:

> Old friend –
>
> I have heard of difficulties. You remember how Andres used to stink up the lab with his clove e-cigarettes? Do you remember who used to put garlic in them? If you need anything, get in touch.
>
> Go to a place named after the movie you called "a critique of the European Project," minus the first and last letter. Fetch the tool with a name that rhymes with your cat's name when I knew you. Follow the instructions and enter the color of your favorite coffee cup plus your cat's name as key. Post your cat photos to Pictagram account CuteCats4All.
>
> Best of luck and send as many cat pictures as you need to.

Wilson wondered if he should just delete the email and pretend it never came. If they were watching him, it was too late—it had already been stored and scanned in HomeSec's servers. Most likely it was too obscure to draw attention, but since it could only be from the leader of the underground Grey Tribe, his former star grad student Michael McCulloch, even their suspicion that he had been contacted could bring more surveillance.

He thought more. There was nothing in the email that even semantic scanners could connect with Michael; only an AI with deep knowledge of his records would find a connection to an old grad student, and he was sure they were not that good, yet. A suspicious human would immediately pick up on the invitation to clandestine communications, but doubtful there were enough smart humans in HomeSec to be doing that kind of thing for all of his email.

So perhaps it was safe enough to set up the reply. He went to "ardo" (which a search revealed was an open-source website in Belgium—the movie clue was *Zardoz.*) His long-dead cat was named Victor, so he looked around and found a tool named PicTor, which seemed to have been added yesterday. It had an app for his brand of phone. He switched to his phone and found the app there for downloading and installed it.

A few minutes later, he pondered the text message he would type in and send, encrypted and hidden in the digital noise of one of his cat photos, to his outlaw student, Michael….

Justin and Samantha

The next day Justin walked over to the Student Union cafeteria for lunch, since he had forgotten to pick up his usual brown bag lunch from the fridge at home. The Union was a brutalist concrete block from the 1970s, and the concrete was spalling off the walls and stairways in places. The thick plate glass of the windows had been replaced by plywood in large areas. Many of the outside light fixtures had been pulled from the walls by vandals and hung useless; blowing trash filled the stairwells down to the lower level landing, where water pooled because of the clogged drains. Prosperous people in prosperous times had built the buildings, but maintenance was an easy target when budgetary survival was at stake, and times were hard. Students had tried to clean up what they could themselves, but they had given up over time.

In the cafeteria, he looked at the line for entrees and decided to save time by picking up a foil-wrapped ready-made burrito, which the sign assured him was organic and gluten-free. Water and a cup of coffee were enough extras—the burrito had veggies inside, right?

He put his phone on the checkout box and touched the screen to authorize the $78 charge. At least the food was generally decent. Some parts of the country were short of fresh produce since shipping had become so expensive and unreliable, but California still ate well.

He looked around for place to sit—many of the plastic chairs were broken and the ones that weren't were taken. He considered heading back to the lab to eat at his desk as usual—but then he noticed a clumsy but strikingly pretty woman—or girl, she was probably a grad student but her elfin features made her look much younger. Apparently clumsy, because she had just turned abruptly and lost her drink over the side of the tray; it fell to the floor and splashed an exclamation point of ice and cola that reached the feet of a group sitting at a

table.

He put his tray down at the nearest table and went over to where she stood, cursing quietly. “Let’s go get some napkins or ask for a towel to clean that up.” The students at the table had started to wipe up the spill near them with their napkins, so he ran to the staffed counter and they gave him some industrial grade paper towels. He handed her a wad and used the rest to sop up the mess. Quickly they met in the middle and she laughed as their towels competed to get the last liquid.

“Well, that was a mess. That cola stuff makes good floor cleaner,” he said, gesturing to the filthy paper towel in his hand. He noticed her eyes were ice blue and her hair was shoulder-length and auburn. He went on, “Sit here and I’ll get you another drink.”

“Just water this time. I shouldn’t drink diet coke anyway.” She took the unbroken chair at the table they were near. By the time he got back, she was checking her phone but had waited for him before eating.

“I’m Justin, by the way. Justin Smith.”

“Samantha, Samantha West. And I don’t usually drop things.”

“The physical world is stubborn—can’t waive the laws of physics because you decide to turn. Your drink doesn’t. Want to turn, that is.” Justin started opening the foil on his burrito.

“I don’t study law—I’m in Economics. Working in rational expectations theory with Prof. Yu. We expect the drink will rationally act to avoid being spilled.”

“You may be too into your theory. I’m doing A-Life—Artificial Life—

simulated evolution with Prof. Wilson. We'd say that the drink species would experience selection pressure to evolve toward spillage-avoidance behaviors, if they were alive. Which they aren't."

The conversation moved from topic to topic as they ate. Samantha had a habit of moving her food around with the fork a bit before actually picking it up. She seemed to want every bite managed and neat.

"So what do you do outside of studying?" he said, raising an eyebrow theatrically.

She matched his gesture by looking theatrically taken aback. "I am a virgin and study late into the night. No one has penetrated my social membranes. I am pure."

"So am I, mostly, but not by choice. It's a reality that it's hard to find anyone who wants to spend time together." He looked comically forlorn, playing for sympathy.

"Well, I actually have a boyfriend. Dylan, we met hanging out with the Students for Liberty." When he looked surprised, she went on, "Yes, we are still active, though Activities has shoved us back into the smallest, dingiest office they had. Behind the Science Fiction Society and their rooms of musty old books. You can get sick breathing all the fumes from their ancient paperbacks crumbling from the acid. Anyway, I went to a few meetings, met Dylan and the leader, Ben Ramirez—who I know is going to be famous some day—and started hanging out. Before I knew it, I was Secretary."

"Clawed your way to near the top?"

"Which is also near the bottom, since we only have fourteen official members. Most of them useless. The Unity Party has scared people

out of any 'subversive' political activity. I wasn't too worried since I'm in Economics! We have saner people in my field. Except for the labor economists, and there are more of those every day."

"I have stayed out of activities. Too busy. Don't like conformism. The OfAs give me the creeps. My Youth Service time was hellish."

"I totally agree. Students for Liberty is just a tiny voice against the tide of political sellouts who know it's a lot easier to get a job in government service than anywhere else, and you don't get picked if you're not a Unity droid," Samantha sighed. "But I might have to be a little less principled when I start looking for a job. Economics research is mostly funded by government, even when it's in academia. Most research places still have some insulation from the commissars in DC, but I won't be showing Students for Liberty on my resume. It's like asking to have your application lost."

They were nearly done but had stopped eating. The last few morsels remained as they talked, unwilling to let lunch be over.

She looked at him carefully. "Ben is inspiring. You really ought to come meet him. Dylan, not so much; I thought he was great when we started going together, but he's more controlling than I can stand sometimes. Texting me to find out what I'm doing, planning things for us without asking, that kind of thing."

"Sounds like a bad boyfriend."

"Well, he can be sweet and thoughtful. But not as much as he was. And I'm tired of being a part of his wardrobe instead of a person. I'm giving it more time—he says he's just stressed. Thesis grind, mathematics I don't understand—manifolds? But I am aware it probably won't last… but come to our office Thursday at 7 for our dinner meeting. Get your tray downstairs and come up to the third floor,

north hall, all the way in back. Meet the gang."

"If it means I get to see you… and about that…."

"Time enough to get to know each other. Most likely you smell bad or hang your toilet paper the wrong way."

Justin raised his arm and sniffed his armpit. "Not yet. Got another few days!"

Samantha laughed, then stood up and piled the trash on her tray. "You really have the most refined and charming way about you. And you have yet to pass the toilet paper test—over or under?"

"I'm an 'over.' It's the only way." He stood up and prepared to leave.

"Well, first stage criteria: passed. Let's see how stage two goes Thursday."

He opened his phone's address book. "Samantha. Can I call you Sam?"

"Sam's okay when you know me. Never Sammy."

"Your number?" She took his phone and typed it in for him.

At the door to the outside, Justin stopped and they faced each other. "I'll text you," he said. "And send you my contact info."

"Just what a girl wants to hear," she said, giving him one more smile and a glance back as she walked away, hair gleaming copper in the afternoon sun.

Chapter Two: Justice for All

ALife Simulation, Model 2: Organism 670

He was born hungry and knowing nothing but what his instincts told him—move away from predators, find and eat foods that smelled good but not those that didn't, find and mate with a she who smelled and looked healthy and well-fed. As he moved about and saw and smelled the world, he found foods that smelled good and yet hurt him when eaten, and learned to avoid those by sight—the purple berries evoked a strong reaction of distaste and memory of the days spent recovering his energy; he did not know it, but another species had evolved which spread the seeds of purple berries in its feces and had co-evolved the chemistry to neutralize its poison, so the berries were a weapon against his species. The world was hazy but he could see further than his ancestors who didn't have his marvelously-evolved compound eyes. He avoided predators and learned to combine sensory cues—sight and smell and hearing—to evade them before he could be seen. He encountered a fit female of his species and after a mutual fitness evaluation they mated—they touched organs and their code was intermingled. And quickly their world ended again, for them, and their children went on to dominate their species, which survived for eons before being wiped out by a more successful breed.

Disciplinary Hearing

> Doublethink means the power of holding two contradictory beliefs in one's mind simultaneously, and accepting both of them. — George Orwell, Nineteen Eighty-Four, 1949

The hearing room was a standard meeting room in the administration building; walnut paneling, indirect lighting, comfy chairs around three long tables set up as three sides of a square. The fourth side had a raised platform with a desk and three chairs for the Chair and staff. Since complaints against faculty were not public proceedings, there was no need for extra seating for spectators.

The members of the Disciplinary Committee were faculty and deans who had been appointed to this special subcommittee of the Academic Senate, the full faculty acting as a whole who theoretically had great influence in the policies of the school. In practice, the administration ran things, with occasional interference from the faraway trustees, and increasingly followed policy directives from the Feds, notably Title IX, which was originally intended to guarantee that schools receiving federal money did not discriminate by race or sex.

Wilson noticed his friend from Biology, Lindemann. He tried to get his attention but Lindemann was deep in conversation; he finally looked up and noticed Wilson and came over.

"Walter, sorry this is happening. I hear the result is wired in, people in the Title IX Office put on the pressure."

"None of my fine words or the supporting letters meant anything?"

"You know we are all sympathetic, but the times as they are, we have to keep the 'Red Guards'[2] happy or we will have some serious bad luck when support funding is handed out. And we're barely surviving as it

is."

"I understand. The usual censure, I suppose?"

"Of course. Everyone's handing those out like traffic tickets, so it no longer means much. But it gives us a way to satisfy them without actually harming faculty."

"There's that. I guess it was inevitable that they'd come after me for something—you know me."

"Indeed I do. So let's get this mummery over with. And keep your head down for a year or two."

Wilson felt a little calmer. This was just a performance, with the result preordained; he could make a few points to salvage his dignity and it would all be over. As in most places in most times, justice was no longer about finding and punishing criminals, but a show intended to provide the desired symbolism for the people who supported the true rulers. If innocent people were punished it was just more collateral damage—more broken eggs for the omelette of Unity.

The hearing opened with an explanation of the offenses ("harassment on the basis of sex" and "speech intended to intimidate or harm.") There was an elaborate recap of the disciplinary procedure to date—the Investigative Officer's report, his rebuttal, the attempt at mediation, the refusal of the settlement offer. On principle he had refused the offer to plead guilty and accept a censure on his record, which would have spared everyone this travesty of a hearing, but he wanted them to have to live by their corruption.

He was given the microphone for his statement. A glass of water at hand, he started in; never a great speaker, he tried to make himself meet some of his fellow professor's eyes as he part-read, part-ad-

libbed: "I address you as a seeker for truth who may not always be aware of the need to soften the truth, or be tactful in seeking it, and for this I apologize to the students who were offended."

"But the ideas I expressed were *hypotheses*—the very heart of the scientific method, where discussion of how the world *might* work is unbounded by dogma and fashionable ideology. Paraphrasing our own faculty rules, 'the purpose of discipline is to preserve conditions hospitable to pursuit of free inquiry and exchange of ideas.' The panel on Evolutionary Psychology and Social Science was exactly the kind of interdisciplinary dialog required to generate new ideas and new ways of testing them. Discussing some ideas like evolved group differences seems to be inherently offensive to some students because of their ideology. I did not say—and no one on that panel would say—that any individual person should ever be assumed to have more or less of any characteristic simply because of their race or sex, and certainly no discrimination against group members because of group differences could ever be justified. Yet the complainants seem to see any discussion of sex differences as too dangerous to be allowed. I would point out that 'Darwin's Dangerous Idea' of evolution was deemed heretical and socially dangerous, yet over time was inescapably found to be correct, overturning much of biology and threatening religious dogma. Freedom of inquiry can only be maintained if even ideas some find offensive can be discussed in the open university and subjected to the tests of experiment and scholarship. And this complaint should be dismissed as antithetical to that goal."

He decided not to read the rest—all of the committee members had in theory read all of the statements in advance. He wasn't going to change any minds and he suspected most members were secretly with him, but could not risk voting against Unity.

The Investigative Officer, a Professor of Labor Economics who he had never met until this incident, took the mike. "We value inquiry and

the free exchange of ideas on this campus. But we also value safety of students and a supportive climate free of aggression or intimidation. No student should be made to feel unwelcome or inferior because of a community member's actions, even if unwitting. Professor Wilson is reputed to be a fine teacher and a widely-admired scholar in his field. But that does not excuse the insensitivity shown to the students, who he openly suggested might be less capable of higher mathematics or less able to focus on abstractions because of their sex. And that created a climate of harassment that our policies do not allow."

Then the Title IX Coordinator took the mike. "Under Title IX, every educational institution that accepts Federal funds is required to maintain equal opportunity regardless of race, sex, and sexual or gender orientation. Equal opportunity does not exist unless an atmosphere of safety and support for all students is maintained. We can charge an institution, even one so august as this one, with a violation if we feel their disciplinary policies are not maintaining a safe space for all. We take no position on any particular case, but we do observe patterns and practices, and if they have a disparate impact on some classes of students and the environment necessary for their success, we will not hesitate to file charges and push them through the courts as necessary to get a change in institutional attitude."

An older male faculty member he didn't know took the mike next. "It seems to me that this case is going to generate more bad publicity in some circles, since Prof. Wilson became a cause célèbre for some of the opposition types ten years ago. I suspect all of that—and this school's embarrassing retreat when they became a laughingstock—will get dredged up again and make this look like more of the same. I understand we need to demonstrate our resolve against sexism, but we're in a bad position."

A woman from the Women's and Gender Studies department was up next. "Prof. Wilson has many friends in my department. I'm sure I

speak for others when I say I don't believe he meant to intimidate the students, but they were clearly offended and made to feel demeaned and unwanted by some of the things he said. I believe we should have zero tolerance for sexism, racism, and any kind of genetic determinism, and I hope that if a censure is decided on, he will take it as an opportunity to educate himself on how to explain his ideas without creating a climate hostile to women."

The Chair read a short statement written by a Tyler Sheppard representing the Students for Equality and signed by four hundred students. "We commend the Board of Discipline for demonstrating to all students that faculty must speak responsibly. Hate speech no matter how disguised as scholarly speculation has no place in a safe community for students from every background. Students should be able to enjoy any campus activity without fear they will be attacked or oppressed by the privileged. There is no room for hate on this campus…."

There were a few more speakers, but everyone seemed to know there was no point in real discussion. The Chair announced the question on the floor: should Prof. Wilson be censured? The roll call was mostly against him, with some contrarian sorts holding out—but in the end, he was guilty, 15-6. The Chair spoke again: "The ruling of the Disciplinary Committee is that Prof. Wilson shall be censured and that its formal disapproval of his behavior will be entered into his record. The official document of the decision will be sent to Prof. Wilson, and he has fourteen days after receipt to appeal to the Chancellor or accept the penalty. This meeting is adjourned."

Students for Liberty

Thursday dinner; Justin picked up a tray with roast chicken and broccoli in the Student Union cafeteria and found the elevators out-of-order again, so he walked up three flights to the top floor where student activities were located. He passed the Science Fiction Society library and noted a smell of something—mold, decaying paper?—and a few students talking in their lounge. He stopped to look inside. The walls were plastered with posters and notices many layers deep, fit for an archaeologist's study; it looked like there was something from every pop-culture science fiction production since the building opened in the 1970s. A prominent *Star Wars* poster was front and center and apparently was respected enough to remain uncovered by later postings. *Starspark* appeared in several places but had not been so respected; on one poster, Captain Raley sported a mustache and beard added in black marker, so he looked like his evil mirror-universe twin from the episode "Doppelgängers."

He heard voices coming from the last open door in the hall, and entered to find six people eating and talking around a table covered with books and flyers. Samantha was there, and he recognized Ben Ramirez. The blond, bearded, wiry guy snuggled up with Sam on the loveseat was presumably the Dylan she was seeing. *Handsome but a douche*, he thought, but he would try to give him a chance. The other students kept talking while Sam gestured him over to a seat on her other side. "Glad you could make it. Everybody, this is a grad student I'm trying to recruit—Justin, uh, Smith is it?" He nodded. "He's intrigued enough to show up. Let's not bore him to death like we did the last one."

"That's what he looked like after we got done with him," said a pink-cheeked girl with blond ringlets, pointing at a cardboard Halloween skeleton tacked to the wall. "I'm Amy."

Introductions continued, and Ben Ramirez spoke last: "Thanks for checking us out. We know we're not popular and you take a risk of being labelled antisocial if you are seen with us. So we don't expect our members to be public about it."

"I don't have much to lose and I don't worry too much about what people think of me anyway. It's not like we can stop any of what's going on. But I did want to see what you guys are about."

"An open mind is all we ask. There aren't many left who have one. Thinking for yourself is dangerous; talking about it can get you expelled." His eyes were probing.

"I have already figured out how to watch what I say to avoid trouble. I spent a summer in Youth Corps—I can manage to say something that isn't false but doesn't set them off. It's a useful skill to have anyway, used to use it on my parents."

"Good. Those who remember the whole Bill of Rights and freedom of speech as it used to be are mostly older. But a lot of young people are like us—we know something is horribly wrong but we hide it to get along. No sense being mobbed for speaking up; someday we'll get a chance to speak and restore some of what we used to have."

"So what's the point of Students for Liberty, if you can't speak up?"

"Publicly? We stick to the safe topics and point out only the most glaring excesses that few would defend. Like that show trial where they stuck it to Prof. Wilson for speaking forbidden thoughts. The administration tolerates our continuing existence as part of the colorful tapestry of diversity that is student life. I doubt if they would let us start a chapter today, but we were here before the OfA, before the State of Emergency, and before Unity took over the two parties. So long as we don't appear to be effective, they won't come after us.

And in the meantime, we can continue to think for ourselves."

"Seems like… a waste of time."

"For every student who shows up at a meeting, there are ten who read our leaflets and posts, and a hundred who know we exist and what we represent, even if they make fun of us to their friends."

"A beacon of liberty in a lost world? But what can you do that actually changes things?"

"Wait and educate and talk to people. Wait for the time when action makes sense. Next year, or the year after that. Elections don't offer much hope since they control the ballots and the counting, but in the past fascist regimes have always run their economies into the ground and been overthrown, in war or revolution. We peacefully wait, and talk."

Dylan spoke up: "And at least here we can speak freely. No one's going to bother placing bugs or having an informant attend meetings. So you can let off steam safely."

Sam added, "Besides, we like being rebels. The social justice warriors thought they were cool and special because only they knew all of the right answers. Now that they are in charge, they're not special, not cool, and starting to look like the oppressors they hated. There aren't many of us, but we're the people who have the answers now. And we would never abuse our power, because what we want isn't power, it's *freedom*."

Justin raised his eyebrows at that: "All revolutions end badly. Guillotines and jails. Gulags and warlords. How do you know overthrowing this crowd won't just let worse people rule?"

Samantha looked thoughtful. "We don't. We just do our best. At the moment it's a moot point—but you should read *Systems of Survival,* Jane Jacobs' book. We need her Guardian Class on our side. We need the military and police to disobey orders that are unconstitutional. We need a population that stands up for its rights. We need a free press and an end to unlimited surveillance. We need a governing class that respects freedom and limits its interference in daily life and commerce."

"All very theoretical." He wanted to agree, but he thought they were just another debating society, useless and a waste of energies that might actually change something.

Discussion continued. He finished his meal and stayed a half hour longer, but then excused himself. Ben Ramirez followed him out and said, "I hope we didn't scare you off. You may not want to be a public member, but can I put you on our interest list?"

"Sure. I'm interested, I just don't think I have the time to participate much."

"Listen, I wasn't going to say anything in front of the others, but I actually do have some connections with the opposition. There are rebels in the mountains and the Grey Tribe, which really exists. There's a chance we could be called on to do something that matters when the time comes."

"Let me know when that happens."

"You realize that if I knew anything, I couldn't be telling you about it, not yet—despite what I said, I wouldn't be surprised if an informant visited us to report anything subversive. Tell me why I should trust you, and we'll talk."

"Fair enough. Ask anybody, I have no connections at all. And I'm pissed off with what they're doing to Prof. Wilson. I hope to stay in touch with Samantha—I admit she's really why I came to your meeting."

"Ah, well, she does that to guys. If you want to get involved, do it because you care about freedom, not because you're after her. But I can understand wanting both."

Professor Wilson

Prof. Wilson's office was small, but had a glorious full-width window overlooking the Quad, and in the distance, the blue of the ocean. When it was as clear as it was today, he could also see the coastal mountains to the east with bright green patches where recent rains had filled in old fire scars with luxurious new growth. A scattering of deciduous trees from back east planted in the Quad before they had gone out of fashion lent autumn colors to the view.

Rasna Kapoor sat in the guest chair in front of his desk while they went over her research plans. She pulled out one last document. "Did you get a chance to look over the statistical summaries from the last few months? Number of new species way up. More complex neural structures. Evidence of learned behaviors. The beginnings of chemical communication… alarm signals and more."

"I skimmed it. I appreciate all the work you've done; the charts alone must have taken you weeks. I think we can get several papers out of the various learned behaviors and population dynamics in predator-prey cycles. Not to mention bulking up your thesis quite a bit."

"It took a lot of work to make the graphs both pretty and understandable, to the point I couldn't tell any longer if they were clear. So I ran them by Justin, who's usually much more interested in the programming. But he was a good beta reader."

"Another thing to sex up your thesis and some of our papers—use the model renderer to make some 'portraits' of successful species. Like a gallery in a museum, from various angles, in various life-stages. In battle!"

"That would be nice to do. I'll try one to see how much time it would take; when we are doing PR for the papers those would be great for

the media reports. But I may not have time. In theory I will be done by June… right?"

Wilson smiled. "Certainly. But you know how adding that little extra PR zest brings in more attention for your work, which makes DARPA happy, which brings more funding, which keeps us going. Maybe I can get Justin interested in doing the gallery. In any case, carry on and we'll have our next formal meeting in two weeks."

"Okay, Professor." Calling him "Professor" was a hard habit to break, and while other profs might encourage going to first names after a research team had been active for awhile, Wilson did not. He did not especially like his old-fashioned first name, Walter, or its short form Walt, so he let students keep the formalities.

Rasna left. It was late afternoon and the sun was low in the sky, with that golden color from traveling through so much Pacific atmosphere. The sun made the pictures on his desk glow—his long-dead partner Bill in front of their San Francisco Victorian; a shot of them together riding in a gondola in Venice, with the gondolier smiling back at the camera; a family portrait from his childhood in St. Louis, he in his little suit and skinny tie for church, his sister in a dress, his mom and dad formally dressed as well. His sister was still living on a co-op farm in Vermont, but they rarely spoke, and she no longer wore dresses. Neither of them had had children, so he had no nieces or nephews.

He remembered his college days. He had known he was gay since he was 12, and furtively read everything he could find about it; the *Encyclopedia Britannica* articles were grim, presenting a picture of mental disease and resistance to treatment. But in his voracious reading he had often stumbled upon less conventional portraits of gay men, and by the time he was in high school, the counterculture on the coasts included out gay people. He vividly remembered the first

time a newsmagazine put an out gay man on its cover; he remembered Joe Haldeman's *Forever War,* with its time-dilated interstellar soldier reaching a future where nearly everyone was gay; and like other gay men of his era, he thirsted after any appearance of gay people as admirable characters in fiction or film.

He had fallen for a boy in high school who was smart and had a precociously thick mustache. In the Midwest, in that era, coming out could have gone very badly for him, but his teachers and fellow students were sympathetic. He talked it out with the object of his affection, Joe, who wasn't especially interested but was a close enough friend to listen to his wild ideas of how one day they could get married. They had both gone off to MIT but rarely saw each other there, and Joe had ended up going to medical school in San Francisco, where his residency at San Francisco General eventually had him tending to thousands of gay men with AIDS.

Walter Wilson had stayed on in Cambridge. He had come out gradually while at MIT, calling the "gay hotline" from his lab late one night when everyone else was gone. It was hard to imagine now, but then most gay people were tortured by conflict and the years of hiding their true feelings, and the hotline often dealt with students who were suicidal or too afraid to ever tell the truth to anyone they knew. On that first call, he had stumbled through his story and managed to speak to the nice guy on the line, who turned out to be a post-doc in his department, and in a week had gathered enough courage to meet him at the Gay Student Association's office in a repurposed squash court.

He'd quickly realized that these were his people—he could be himself, a tad too precise, insisting on his full name, and fascinated by mustaches, and these people still liked him. Their wit was sparklier, their dress more daring, their politics more varied than any group he had ever been with. Soon he found himself painting banners for Boston's

Gay Pride Parade and marched with the group. Word got around, and back at his dorm no one seemed especially surprised; only one boy he thought of as a friend turned his back on him.

He wondered how the dream of the mid-1970s—of freedom to be yourself, say what you thought, marry who you wanted, be the best *you* you could be—ended up in this sour conformity of thought and repression of free speech. He had supported gay civil rights all along, and the victories started to mount up—decriminalization, first, then increasing civil rights and employment benefits, and eventually gay marriage. But at the same time, the humanities departments of most universities were taken over by post-modern, left-wing faculty who thought of their role as promoting social justice—promoting change in society to remedy the oppression suffered by gays, minorities and non-Western cultures. In turn, these academics wrote the textbooks and trained the new crop of bureaucrats, as well as the reporting staff and editors of most publications and media, in this glorious new idea of reordering society into a perfectly egalitarian and cruelty-free new world where everyone would have enough without competition or hardship.

He was busy having a life—he had gone on to grad school at Harvard, where he met his partner Bill, and they had moved west to San Francisco like many others, when houses were still cheap. They had put a lot of effort into redoing their old Victorian in the Castro neighborhood of San Francisco while Bill started a career in investment banking and Walter taught. He remembered occasional fights and the usual problems with other men and money and the increasingly sexualized street life of the Castro; down the hill a block, a school playground served as trysting place for hundreds of men every night. Buena Vista Park, up the hill, had its vegetation so eroded by cruising sex addicts that the original sand of the hill was showing through.

His memories of that time were mostly good. Until, very suddenly it seemed, everyone was talking about the mystery cancer that was killing people in months. The hospitals were filling with desperately sick men, and most of them died in weeks. Neither of them had been involved in the sex scene much, but friends who also had been cautious took ill and died. And then Bill had a blue spot, and then three, then he was covered with them, and there was pneumonia, and too many visits to the hospital, and then he was gone. Nothing of *him* left, just a husk of skin and bones.

He was numb and on autopilot for a few years after that; he took a tenure-track job at the more prestigious university down the coast and put San Francisco and what remained of his old friends—not many—behind him. His routine saved him from too much ruminating. And when he also tested positive for the virus, it seemed like an anticlimax. He stayed healthy, and when his t-cells began to drop a few years later, he started taking the antiretrovirals that were at last becoming available. So he had never had to shuffle down the street with a cane, a shadow of his former self, hoping no one he knew saw him as a frail old man…

But still he had to take his daily wonder pill, many generations improved from the early days, and he felt he was aging faster somehow even though the antiretrovirals kept the virus level undetectable. He had known men in the same situation who had suddenly had HIV encephalitis or had all their joints crumble, the result of mysterious side-effects of the years of the medications or the sneaky way the virus hid behind the blood-brain barrier. So he felt lucky to have had his relatively healthy life, even if alone. *Predator-prey*, he thought. *Parasite-host. HIV-human*.

And there had been other men in his life. Mostly, friendly affairs with guys not leading to any change in their settled lives—though one drama student had moved in with him, then rather dramatically

moved out a few years later. He missed having someone beside him on the couch for an after-dinner movie. He used to love to massage Bill's feet and enjoy the sounds of appreciation he made as they snuggled.

He decided he wasn't in any mood to do more work and got ready to leave, when the phone buzzed. Hardly anyone made voice calls any more, and it was almost six; he answered it. "Walter Wilson."

"Professor Wilson. This is Andrew Gao. I'm an investigator with the local field office of Homeland Security. One of our investigations has brought up your name, and we'd like to drop by to ask you some questions. At a time of your convenience, but tomorrow around 10 AM works for us."

"What's this about?" He checked his calendar. "I have to teach until 10:30 and I'll be back in my office by 10:45. If you'd like to come then, I will be here. Do you know my office?"

"We do, thanks. And it's about one of your former students, Michael McCulloch, who I'm sure you know has been on our radar for some years now. We don't expect you to do a document search or anything —we searched the university's servers for evidence years ago. But we want to ask you about him personally, just your memories."

"Okay. I remember him well, he was my best student while he was here. I was shocked when he went outlaw."

"I'm sure you were, Professor. Everyone always is. Okay, we'll be there tomorrow at 10:45. Shouldn't take too long."

"Thank you for giving me some warning." Which they really didn't have to; since the State of Emergency was still in place all these years later, authorities could in practice question or search anyone at any

time, as well as monitor their phone calls and Internet use. Warrants were automatically generated and approved in the millions by rule-based AI judges, and they were never turned down unless someone forgot to check a box on the app.

And still he wondered, where had it all gone wrong? And was Home-Sec coming after him because they knew he had communicated with Michael last week? He hoped it was only coincidence.

Chapter Three: Justin and Samantha

ALife Simulation, Model 3: Organism 13901

She had lived a long time and had many children—fortunately by this time children did not eat their parents, even when they were hungry. Her species was complex and long-lived, and no longer did every generation start fresh in a new world; the old parents and the old world remained as it was, the children were born into it after an evolved gestation in an evolved uterine organ, and born incomplete. The predators were fewer but more clever; they had learned to hide and stalk their prey, but luckily for her species there were several successful but dumb alternate prey species which the predators found easy to catch. And so her species thrived and evolved to have fewer but better-cared-for children, who would live long enough to learn much more than their genetically-coded instincts at birth.

She was tired and worn but happy to go on helping with her grandchildren until the day she died. Her people salvaged her materials, of course.

Justin and Samantha

> Puritanism: The haunting fear that someone, somewhere, may be happy. —H. L. Mencken, 1949

Justin had texted Samantha and asked her to dinner, but Sam would not agree to any dates while she was still seeing Dylan—who was the jealous type, and was working on campus that evening. They agreed to meet in town by the old train station to walk along University Drive and talk. Not quite a date, and by seeing each other off-campus it almost seemed like they were hiding something. Which they were.

They passed a stretch of empty storefronts. Sam said, "I remember coming here as a kid. So many expensive stores and shiny objects. Books, jewelry, furniture and art from around the world. Guess no one has the money for luxuries."

"Those luxuries were just signs of inequality. 'Everything is awesome' now that we have made sure there aren't any obscenely rich people to make anyone else feel bad."

"I do miss the beauty."

"Still a lot of beautiful things around. Like you."

Sam rolled her eyes. "I won't be objectified in that manner."

"In what manner would you prefer to be objectified?"

"Less obviously." She laughed. "And you do quite well on the looks scale yourself, mister."

"Thank you. You see, *I* am secure enough to take an honest compliment."

"You don't seem to lack for security. Good family back home? Where is home?"

Justin explained he had grown up in an inland suburb, had two brothers, and his dad had been an auto mechanic. His mother had been a schoolteacher, then a full-time mom for awhile, homeschooling the children until high school age. "And that's why I'm so independent. She let me study what I wanted so long as I could pass the state tests on the core subjects. I read everything I could get my hands on. I didn't realize how limited the regular schools' reading was until I went to public high school. Where they put me into the honors classes, but it was still behind what I already knew."

Samantha turned toward him and said, "My parents had me in private schools in West LA. Advanced but sometimes a little loopy. And then a fancy liberal arts college in Pomona. It was all very pleasant but I can't say I picked up any street-smarts."

They slowed as the street dead-ended at the railroad tracks, and Justin said, "Public high school taught me to keep my head down and not speak up. Which came in handy when I went off to my Youth Corps summer in New York. You learn to get along with less mannered folks."

"My Youth Corps summer was spent at a public clinic trying to digitize their old paper records. Not hard, not interesting, not really necessary, I think. Make-work. Daddy made a few calls and made sure my assignment would be close enough to let me stay at home."

They came to a bench and sat down.

Justin said, "The streetlights are newer LEDs, but they still don't work. Copper thieves, maybe."

"I enjoy the darkness. The surveillance cams have less light to work with." She pointed at the nearest camera pointing down at them from a lightpole.

"Maybe they're infrared. They can still ID us. So no funny stuff."

And then he leaned in and kissed her.

Homeland Security

Delayed a bit by post-class questioners, Prof. Wilson got back to his office with just ten minutes before the scheduled arrival of the HomeSec investigators. He had already done a quick check of the books and papers around the office, hiding anything that might trigger unnecessary questions. He minimized the windows showing on his computer's screen, leaving the background photo of Andromeda galaxy and a few icons.

He refilled his coffee mug and waited. Paranoid thoughts ran through his mind—they had cracked the encryption of his correspondence with Michael. They were going to arrest him and send him to one of those black facilities where they held people until they gave in. They —

He heard a rustling in the hall and a knock on his open door. "Come in."

"Professor Wilson. Andrew Gao." A trim Asian man in sports jacket and tie, Gao shook Wilson's hand and went on, "This is Agent Michelle Taylor, my assistant. She'll handle the recording."

Wilson shook Taylor's hand and gestured to the chairs. "Can I get you anything?"

"No, thanks," said Gao. "We got coffee on the way." Michelle Taylor was a stocky black woman, 30-something, in a subdued khaki outfit. She set up a multi recorder on Wilson's desk; its 360-degree lens and microphones would capture and upload every detail. "Okay, it's going," she said.

"So I've been going over my memories of Michael McCulloch. What

would you like to know about?"

"We assume you know that he is a designated Person of Interest to Homeland Security, and you are required by law to report any contact with him or information about his whereabouts. It is a felony to endanger national security by aiding anyone affiliated with a listed terrorist organization."

"I know that. He stayed around for a year of post-doc work in 2013, but then went to work at some startup in the Bay Area. That was the last I heard from him—we didn't keep in touch. Startups are intense, he probably didn't have time to do anything else."

"You have seen the stories about the group he's running—Grey Tribe. A few years ago he was indicted in absentia for assisting terrorist organizations in circumventing surveillance measures. His organization was added to the list of terrorist organizations last year. It is now a crime to knowingly assist him. Are you sure you have told us about every communication from him?"

"I'm sure. I would have remembered—we were friends, I thought, and I was hurt when he stopped responding to email. I chalked it up to busy-ness. I did hear his stealth startup did well, but then stories about it stopped and I have no idea what became of it, or him."

"What can you tell us about his family and friends?"

"Not very much. He came from North Carolina, parents worked at the university there. He visited them at Christmas once but otherwise didn't mention them. A brother somewhere, he dropped by the lab once. I remember he had a girlfriend for awhile, but I don't remember her name. Redhead, quiet. She came to a few beer Fridays when we still had those, but nothing stands out."

"Why would you think he would betray his government and aid the enemy?"

Prof. Wilson pondered his view of the *Starspark* poster just above Gao's head while he considered his answer. I AIM TO DISOBEY. He thought, *betray his government and restore his country's freedoms.* "He talked a lot about the NSA and the Snowden revelations. He said the NSA's capture of everyone's communications was mindless mission creep by people who just wanted bigger and bigger budgets. Nothing out of the ordinary at the time."

"But no hints of taking action? When do you think he became a cryptography expert?"

I'm not sure he ever did. What looks like wizardry to the government can be pretty basic stuff. "He seemed interested in the topic. Our work here involves encoding, similar to genetic coding in life forms, but nothing cryptography-related. He knew what every computer science person knows about it. His later work might have involved that—the startup was doing something about an app for secure communications over untrustworthy networks."

Gao scribbled on his notepad and said, "Did he receive any unusual visitors or talk about knowing people in Anonymous or Wikileaks?"

"No, I would have remembered. He seemed most impressed by Snowden and thought he should be given a medal and then maybe pardoned before being strung up, but he was no activist at the time. Just brilliant at programming simulations and understanding the system."

"Any personal memories or impressions? We're just trying to understand what makes him tick."

And I'm quite sure I don't want to help you. "He had been into *World of Warcraft* and became some sort of general leading hundreds of people there. He had a very responsible attitude—a sense of humor but serious about doing the right thing. Conscientious, honest, dependable. I can't imagine him doing anything to hurt people."

"But he has. The organizations he's helped have provided information about our agents to enemy forces. I can't tell you how many agents we have lost as a result, but he has worked against our national interest."

I wonder how much of that is true. Maybe a little. "I can only tell you what he was like when I knew him. He's methodical and patient. It doesn't surprise me that you can't catch him."

"Well, thank you, Professor. We will be in touch if we have any further questions. You are hereby warned that this conversation and our contact with you is a protected secret under the law and any disclosure of it to others is a felony. If any of your statements proves to be untrue, you have lied to Federal officers, also a felony. If you have communication with or receive new information about Michael McCulloch or the Grey Tribe and fail to report it immediately—"

"It's a felony! I think I see the pattern."

Agent Taylor spoke for the first time. "We need to know everything we can that can help us stop him. Help us find him. It's getting serious and he won't be treated well if one of the other powers catches him first. Your government doesn't murder and poison people."

True. They just disappear and come back slightly different. If they come back. "I'll keep that in mind and be sure to let you know if I hear anything. But it's been years, so I think that unlikely."

The investigators left. Prof. Wilson closed his office door and thought

about the answer he had received from Michael, encoded in a picture of two Abyssinian kittens: "We are building a secure network for communications, and an 'underground railroad' to get people to safe locations when they're in trouble. If you ever need help or a way out, let me know."

* * * * *

Back in his office downtown, Andrew Gao read his email. One memo from DC had come in:

To: Field Investigator Andrew Gao
From: DirSpecOps James McDonald
Re: Neutral Armor

Have reviewed your recorded interview with Wilson. His interaction with Pictagram suspicious. Analyst now says probability of contact with subject over 90% based on lack of previous activity there.

You will need to break him down without causing him to go public. He's marked as too hot to handle because of previous notoriety, story is irresistible for media overseas. I have put our IT team to work checking his files for anything we can go after him on. Somewhere on his computers we will find an image of someone who looks under 18, which is enough for a child porn charge. When we are sure we have something, I'll let you know and you can introduce him to our 'Citizen Watch' program.

Good work. Expect to contact him again in a week or two. Full arrest team not warranted but be ready to detain and medicate if necessary. Best to leave him in place if he'll cooperate.

Chapter Four: Quantum Computing Lab

ALife Simulation, Model 4: Organism 330671

When he was born, others of his kind helped him survive, because he was small and could not move far on his own. His mother gave him food and held him, and others of the band also came to hold and feed him. He grew and learned, and eventually learned to find food himself, with his mother by his side. He learned to fashion tools and weapons out of plant material and rocks; he only had to see another make a tool to be able to make it himself, for his brain was unusually large and well-organized.

One day one of the pack hooted of danger, panicking the foragers, but no one could see what the danger was, and soon they went back to foraging. And it was then the predator attacked, killing him with one blow of its claws. But his clever sisters and brothers lived on and had many children.

Quantum Lab

DARPA had funded advanced computer research for many years, with additional secret support from the NSA, since every new development that could keep them ahead in breaking codes was important. One of their latest programs was the Quantum Intelligence Project, or QIP, which was funding development of larger quantum computers. Development had been slow, and at first it was hard to demonstrate any useful speedups in quantum computers, but recent spectacular successes in rapid factoring and simulated annealing had led to an increase in funding for the university's Quantum Computing Lab.

The lab's Director, Prof. Ray Bubna, was doing a walkthrough of the computer room. At one end, flanked by Dewar flasks holding liquid nitrogen for cooling the superconducting magnetic coils of the device, stood the new and larger quantum computer: "Vortex-5," as it was labelled for PR photos. It was a featureless black cabinet about as tall and wide as a person. Prof. Bubna conferred with lab staff around a workbench: "We have a lot of groups also funded by DARPA interested in getting their complex software up on the new machine to demonstrate that it's not just for simple factoring and traveling-salesman demos."

Steve Duong, the postdoc who had actually done the design work for the Vortex-class processors, said, "It's a bit early. We've just finished testing and are running the old benchmarks. Finishing that will take another week or two."

"I've heard from Prof. Wilson that they would be interested in porting their simulation," said Prof. Friedman, Steve Duong's boss in theory but mostly tasked with keeping the funding rolling in and managing the politics. "It's big but not too big, and the locality of their calculations matches what we can do easily. They will do all the software

work."

Steve was unhappy. "This comes on top of Ft. Meade's idea of taking two weeks for themselves to mess around without letting us see what they are doing."

Friedman nodded. "It's not unreasonable, since they are thinking of building one for themselves. They paid, they get to use. We put it together, but for the 'user community.' We don't get to hoard the time for ourselves."

Emerson Wilding, the post-doc staff member who actually built and maintained the hardware, broke in: "We do need to hold back enough time for maintenance, testing, and tinkering. Preferably mornings. Like two hours a day, with overrides when there is trouble."

Steve nodded. "At least. And the software needs a lot of refinement before it's ready for outsiders to use. I still haven't rewritten the manual."

Friedman had the last word; "Just slap something together. They know it's experimental, and we'll be here to lead them through the toy examples and get them up and running. They're used to unfinished systems."

Steve Duong

Steve Duong went back to his office—really a cubicle with a window overlooking the lab floor—and considered what to do about what he had already discovered about the new machine. Like the Vortex-4, the Vortex-5 was a topological quantum computer based on braided anyons: two-dimensional quasiparticles created out of the quantum states of an electron gas kept at a temperature near absolute zero while held between two etched gallium arsenide plates. Exterior superconducting coils created a strong magnetic field that induced fractional quantum Hall effects in the gas, and the chilled electrons formed a two-dimensional array of braided non-abelian anyons. These were the more stable substitutes for the quantum particles used in other quantum computers, and the manufacture of the large gallium arsenide plates was much simpler than the dense microcircuitry of conventional computer chips.

But the new machine had eight times as many rows and columns as its predecessor, so its array of anyons held sixty-four times as many quantum elements, or qubits. It was physically much larger as well, with each plate over two meters long and wide. And from preliminary results, there were things going on during computations that had never been seen with smaller devices.

He didn't really like the idea of other people coming in to run complex software on it before he had had time to chase down some of the hints of anomalous behavior he had already seen, but there was no resisting it. The simple tests had gone well and the funding agencies would want to see different types of users experimenting as quickly as possible. The NSA would be slow to send out its team from Ft. Meade, so they would probably end up pushed back to January. Perhaps helping Prof. Wilson's team port their system to the Vortex-5 would be a safe way to both assist and do some research pushing the limits of the device.

He thought back to his childhood in the village, and how his father had told him someday he would go where no one had ever gone and see what no one had ever seen, because his grandmother (who had died before he was born) had said she knew it would be so. His father had bought him a tablet computer, and after school every day he was expected to sit outside studying at the only café that had wifi. And so he did—he found the whole world waiting to be read, and soon everyone in the village either made fun of him or supported him.

He had discovered MIT's online courses in math and computer science, and then enrolled in Athena University where he absorbed course after course, passing the tests easily and moving faster through them than anyone had before. He went home tired every night and after dinner worked from stored files late into the evening. He brought up a programming system on his tablet and started to write programs. Before long, Athena had featured him as a star student, and reporters emailed him wanting to write his story.

One of the professors whose lectures he had most enjoyed, Prof. Friedman, contacted him and told him his university had arranged admission and a graduate fellowship if he would be willing to move to California and study at their university. He was seen as a rising star, and had finished enough undergraduate coursework for a degree—and he was still only fifteen.

So he had arrived at the university still a little weak on spoken English, but otherwise more prepared than most. Prof. Friedman had helped him get settled and invited him over to his house for dinner several times a week, and being around the professor's family helped a little when he was missing his own. He had tried to stay in touch with his family by phone and online, but his messages often went unanswered, and he started to forget. Aside from the annual trip back home, he thought of them less and less.

Socially he had little in common with his much older fellow grad students. He mostly stayed to himself, and more than once had overheard someone whisper "Aspergers" when they though he couldn't hear. But then they even more often whispered "genius." He did not mind racing ahead on one track while others plodded on many.

He got to work on his computer and began by loading the array with the initial states to perform a complex optimization problem. The loading and reading of the state of each quantum element was itself a quantum process: a quasiparticle created in the gallium arsenide circuit elements was created and flipped; the state it ended up in determined the state of its corresponding anyon quasiparticle out in the electron cloud, thus indirectly setting it as desired. Later the anyon state was read by collapsing its reader quasiparticle and noting the voltage pulse. Normally the initial state was set up and the quasi-logic gates programmed, then the computation ran freely until a check of the results flag indicated completion; then the "answer" was read by reading the states of the array in the part of it programmed to hold the results of computation. He decided it would be interesting to read the entire array after each step of computation, which could be done by altering the program to halt after each state change of a toggle qubit. It would be very slow (it took many orders of magnitude longer to read and store the state of the array than to run it one step) but the results of intermediate states might shed light on the mysterious extra data showing up in the non-answer parts of the array. It didn't seem to have anything to do with what the logic gates were producing; it should have been whatever was left when processing settled in that area. But it wasn't.

Justin Meets Steve

Prof. Wilson and Justin met with Prof. Friedman to discuss the proposal to port their A-Life simulator to the Vortex-5, and then write a joint experience paper which would serve as advertising for both groups' research as well as their mutual sponsors. The meeting had gone well, and as they were leaving, Friedman suggested they drop in on the lab to discuss the project with Steve Duong, who would be working with them to get the system rewritten as needed to run on the new machine.

Down a floor at the other end of the building, they found the Quantum Computing Lab, and were directed to Steve's office. Steve was staring at his screen and seemed to take a moment before noticing their knock on the doorframe. He looked up at them blankly before saying, "Yes? What is it?"

Prof. Wilson took the lead and introduced them. "So," he continued, "We're to start working on porting our simulation to your machine as soon as possible. Justin here knows our software inside out. Friedman says you'll be our resource person in learning your interface and understanding how to cut up the problem."

"Oh, yes. I was told to expect you." Steve looked around and picked up a ring-bound manual from a stack. "This is the obsolete manual for the Vortex-4, but much is the same so it will get you started—sorry we haven't had time to document the upgraded programming interface. And here's a collection of theory papers so you'll have an idea of what's actually happening. It's quite different from a Von Neumann[3] machine in some ways, and the best algorithms for simulation use it more like a programmable gate array. It's all wrapped in a conventional programming environment with special commands for loading and reading results; the tricky part is setting up the initial state data and gate logic."

Justin took the stack of manuals. "This should keep me busy tonight. Is there a desk I could use when I come in?"

Steve pointed down the row of cubicles. "Sure. That office is empty for the moment and it's already set up. I'll let our lab manager know you'll be using it. Two weeks?"

Prof. Wilson and Justin exchanged glances, and Wilson spoke. "Prof. Friedman didn't set a definite time limit."

"There's a lot of demand for time on the new machine. You are the first users we've had, but we expect to have too many requests. Don't be surprised if others start to muscle into your time after a few weeks, some of them from remote locations. And we still have to take it down and do checks fairly frequently. There's a persistent problem in the electron cooling pump which we haven't been able to diagnose yet."

Justin said, "I won't be on the machine itself for some time, I expect. Just wrapping my head around the different way of thinking and rewriting the critical sections to use your commands will take a week."

Good, Steve thought. "I'll be here running tests and tuning algorithms full time, so you can use me as needed to help get started."

Chancellor's Memo

It was the evening before Halloween, and already a few students on the streets were in costume in the early darkness, headed to parties or events. Prof. Wilson was in his office looking through email when a new one came in: from the Chancellor's Office.

His appeal of the Disciplinary Committee's decision to censure him was denied. The letter graciously went on to say that while his appeal had made a good case for open inquiry, the Committee had been correct to find that he had unnecessarily intimidated members of the community in violation of Title IX obligations, and in the interest of a campus which felt safe for everyone, censure was justified. The Chancellor hoped he would see this as an opportunity to improve his understanding of the importance of tailoring his discourse so that all members of the community would feel welcome and valued.

"Just a Little Anomaly"

Steve Duong looked over the screens full of charts and data analysis from the last test of the Vortex-5. He had set a "deep learning" program loose on the enormous amount of data produced by saving the state of the two-dimensional qubit array at every step of the computation; if there was an interesting pattern inherent in the data, the deep learning program might puzzle it out without any human help. It did find patterns, but most of those were directly related to the computation. But a few seemed to originate from parts of the array not involved in the programmed logic. And those patterns, examined separately, formed a pattern of their own. What did this *mean?*

Several ideas connected in his head. The concept of a quasiparticle, broadly extended. The apparently dead-end work on the fabric of space as a quantum cellular automaton. The phenomenon of eerie action-at-a-distance of entangled particles, which could be separated by large distances yet still be in some sense *aware* of each other's state. But no hidden variables, and the many-worlds hypothesis… The mathematics churned in his imagination and led him to the brink—and over. What if—?

Chapter Five: Blackmail

ALife Simulation, Model 5: Organism 6810711

She had nurtured her children carefully, and watched them closely as they played. The village had been fenced many generations ago and predators no longer came near, but the children still played games where one would pretend to be the monster and the others would run screaming to hide behind bushes, or gather to defend themselves as a group with sticks from the forest floor. Her mate was often away hunting with the other males of the band, but they returned with heavy loads of meat and salvaged materials. She often spent time gathering plants and berries—and destroying the non-edible ones so that others would be safe. Sometimes at the end of the day there was time to sit around the fire and swap stories of the hunt or who had been seen with who before going to bed, and sometimes the band living on the lands toward sunrise was talked about—when would they attack again? Should they be attacked first?

HomeSec Threat

Prof. Wilson had not allowed the Chancellor's decision to bother him. *Forget it, Jake. It's Chinatown.* The kabuki theater of academic discipline was required to bow to commands from the Feds, but was not as yet truly punitive, and would have no effect on him for the time being.

The project to port their A-Life simulation to the Vortex-5 was underway; Justin had spent the last three days going over his changes to the code with Steve Duong, who pronounced them likely to work, but only experience would tell if further fine-tuning would be needed. It was time to start loading and testing on the real machine, which they planned to do tomorrow.

Justin sat in his guest chair and talked about some of the work. "Steve talked about the many-worlds hypothesis—that perhaps many universes containing this same computer have different patterns of data and all of them are running simultaneously and somehow communicating. Or perhaps the quantum states of the machine are creating one vast quasiparticle which is reaching out to the fabric of the universe to farm out some of the possibilities of the computation. I asked him if they really understood what the machine was doing, and he said 'Not entirely!'"

"That seems par for the course with quantum devices. Yet they get answers and speed up some problems more than can be explained without something more going on." Wilson tapped on the stack of papers. "I haven't had time to do more than scan these, but there's some fascinating stuff. I haven't been following recent work in quantum computing. There are some otherworldly ideas here."

"This is why I didn't go into physics. Heavy-duty math and conceptual mazes, when you leave the normal scale of Newtonian existence.

But I don't really need to understand it, if it can simulate a hundred times faster than our hardware."

"If you don't understand it, why would you trust the results?"

"I'll try it on simple runs we've already done and check if the output matches. Which reminds me, he said there are interesting further speedups possible if you give up on 'right' answers—accept 'pretty close' answers and it can leap ahead faster. And our environmental simulation could be a little fuzzy without affecting the validity of the results."

"Something to consider later, maybe. For now just duplicate what we have done, then do some runs way beyond what we have done. Store all the results and if we can't get machine time, we'll have lots to analyze while we wait for more."

"Okay, I'll—" Justin was interrupted by Prof. Wilson's phone buzzing. Wilson raised his eyebrows and motioned for Justin to stay.

"Walter Wilson."

"Prof. Wilson, it's Andrew Gao with Homeland Security. I hope you have been well."

Wilson quietly put the phone on speaker and gestured to Justin to keep silent. He hadn't fully thought it through, but he had been intending to talk to Justin about the messages he had exchanged with the outlaw Michael McCulloch. This might be the time to start sharing his problem with a collaborator who was more than likely sympathetic. And he might need a witness. "Yes, I have, thank you. I haven't heard from Michael."

"We found a pattern of encrypted message exchanges through a

Pictagram photo stream featuring cats, on a server outside our jurisdiction. You started this exchange after receiving an untraceable email suggesting you do so. While we can't break the encryption, our analyst tells us you have communicated with him. I don't think there is much point in denying it."

"Well, I am denying it. I like cats. I stumble on sites I enjoy from time to time."

"We are going to operate under the assumption that you have a link to Michael McCulloch. There being sufficient evidence to show you have aided a terrorist organization, we have examined your work and personal files and gone through several years of metadata."

"That must have taken a lot of time and been really boring."

"Mostly automated now—the AIs can figure out what something is very quickly and filter out most of it—but I digress. We discovered nine photos of what appear to us to be underaged males in sexually suggestive poses. While we could probably successfully charge you with aiding a terrorist organization, the evidence for a child porn conviction is much more solid. And so that's what we'll do."

"That's outrageous. I've never been interested in children."

"The 'child' can appear to be 16 or 17, Professor. In any case, you will be convicted. I should point out that tenure will not protect you—the California legislature made sexual felonies by educators a special class, so you can be stripped of both your job and your pension rights. And forced to register your every move with the state from now on. And not be allowed contact with children, or a residence within a mile of a school or park."

Prof. Wilson almost enjoyed the stunned expression on Justin's face.

But he had seen this movie on the Classic Movies Channel, and knew what was coming. "So this terrible thing you would do to me. You won't do it if I do what you want."

"Very good, Professor. My superiors knew you would understand immediately. Our goal is not to hurt you, but to locate and neutralize Michael McCulloch. He is a danger to our country's security and we can compel your cooperation if necessary. Which it appears to be."

"What exactly would I have to do? And for how long?"

"Show us the means and keys you use to exchange messages. Cooperate by sending the messages we ask you. We will coach you on what to say—you will include personal information necessary to insure he believes they come from you. Our goal will be to get him to reveal some key details that our computers can use to locate him."

"And when you have found him?"

"We release you with a letter of service. We keep our word—you'll be free to go about your life, so long as you avoid contact with terrorists."

"How long do I have to think this over?"

"Not long. We didn't arrest you as a courtesy—my boss thinks you will do the right thing. But we can at any time, which would be bad for your reputation. Why don't I call you tomorrow to get your answer."

"Very well. I'll think about it. And Mr. Gao—I have to say I'm ashamed that our government could stoop so low as to blackmail innocent people to force them to do things."

"You weren't innocent as soon as you failed to report the contact. You

know the law."

As soon as Gao hung up, Justin spoke. "What! In Hell!"

"That was my reaction. I was going to tell you soon that I had heard from my infamous former student, now head of the mysterious Grey Tribe. I thought it was safe enough to talk via encrypted public channels, but apparently not. These HomeSec guys showed up a week later asking about him."

"So what are you going to do? You could run—leave the country, go to a neutral place like Sweden."

"Michael offered to get me out via some 'underground railroad' if I was in danger. But then I'd still lose my job and my life here, which I enjoy. I'm inclined to stand my ground. Fighting them legally is almost impossible now since they've found so many ways to punish lawyers and judges who stand up to the government. But if I appear to cooperate but slip in false 'personal' comments to clue Michael in that I've been compromised, he might escape and they might give up on using me."

Justin looked intently at Prof Wilson. "You know that I will help out any way I can. We will help out—I've been talking to some people in Students for Liberty. I can ask for their help."

"Don't do that, at least now. There's nothing they can do—they would only create more trouble. If I'm lucky, this will all blow over when Michael realizes I've been compromised and stops replying. No, for now, just keep quiet."

Wendy and Justin

Justin made his way over to the Student Union for the dinner meeting of the Students for Liberty. He and Samantha had been texting each other since their non-date, and it was getting harder to pretend they weren't interested in really seeing each other. He picked up his dinner tray and went back to the elevators; Wendy Fields was waiting there, dressed in a retro-60s red flight attendant's outfit.

"You're always so stylish. Where did you find that?" Justin nodded toward the dress.

"This was actually my aunt's. She had a closet full of things that fit me when she died."

"Oh, I'm sorry to hear that."

"Don't be. She had a fabulous life and even though she was much less petite when she got older, she saved all her career clothes to remind her how much fun she had. She was one of those ladies who never had anything nice as a child and got a real charge out of having great clothes; they made her feel special. We had that in common."

"I wonder where you're going that that would be appropriate for…."

"FinCom. Finance Committee meeting, for civilians. Don't look so surprised; I'm a designer, but minoring in business and accounting, and the group needs a bit of style to spice it up." She emphasized that with a toss of her now-flaxen hair. "We know who's paying for what and why some groups get their funding cut."

"I'm headed to Students for Liberty. I've kind of got a thing for Samantha West…."

"Watch yourself. Those guys are always on the list to get squeezed. Last time we were discussing cutting down their space. And as for Samantha—she is very sharp. Don't get cut. And that boyfriend of hers—Dylan—is trouble."

"I have no beef with him. Samantha sounds like she's ready to break up with him anyway."

"But is he ready to break up with her? Rumor has it his last girlfriend had to file a restraining order."

"She told me about that. Much overblown by gossips. He seems a little controlling, but she wouldn't put up with abuse. She's probably better at defending herself than I am!"

"Could be true, Justin. But don't provoke him. Dylan is slick, but for guys like that, it's all about the image. Make him look bad and he'll blow up."

"Yes, Mother." He checked his phone. "I should go. I need to alert people to what Prof. Wilson's going through. More than just the censure, real threats from the government." He pushed the up button again.

"You won't help him by getting the toothless rebels involved."

"And I was thinking of asking the Redshirts, too."

"That's great. Reactionaries and geeks." The elevator doors opened and they went in. "Everyone's tired of the State of Emergency and the power-tripping politicals, but you can't do anything but hurt yourself by opposing them in public." The doors opened, but she kept talking as they walked. "I am not the joining kind. I make a statement just by being myself. I do wish you luck—one of these days someone will put

a stop to all the messing with people's lives they do. But be sure it's the right moment. And be sure you have a way out. I'd hate to see you disappeared."

Students for Liberty: the Ask

The meeting had already started when he got to the Students for Liberty office. The seating arrangement was the same as before, with the same people, and only one new face. He pulled up a chair next to Sam, with Dylan's raised eyebrow the only notice anyone seemed to take of his arrival.

Ben Ramirez was speaking: "…and we have some alum support. Which is more than we get from student government now." He looked over toward Justin. "And I see we have a return of Justin, who we hope is considering joining us."

Justin cleared his throat and started into his speech, not really knowing what he planned to say. "I'm still thinking about that. But actually I came tonight because I wanted to ask all of you for help. At some future time when I have some idea what you might be able to help with. It's Prof. Wilson—not only did the censure go through, but he's being threatened by the government. Because he knew the leader of the Grey Tribe."

Several people tried to speak at once; Dylan won: "The Grey Tribe is real? I thought they were just wishful thinking."

Ben looked serious. "I know they exist and coordinate the resistance, such as it is. It's mostly about technical support, the geek crypto community making it safe to talk to each other when HomeSec and the NSA listen to everything now."

"They exist." Justin wondered how much to tell them. "Their leader was Prof. Wilson's best student ten years ago, Michael McCulloch. Homeland Security thinks Prof. Wilson can help them find him. I'm trying to round up support in case he needs it."

"I don't think we can do anything useful," Ben said. "This is a talk and education group. As much as we'd like to help somehow, our skills are limited to leafletting and panel discussions. We can't—as a student organization—go up against the law or do anything that would make the school look bad."

"Well, I'm asking for your personal help. Be ready to support the Professor."

"You've made your plea and all of us are free to consider it, unofficially. As an organization we may be able to write a letter or appear at a meeting, so if that's the level of action, we can do that."

Samantha spoke up. "I move we resolve to support the Professor in fighting for his Constitutional rights."

"Seconded." Dylan held his hand up.

Ben looked around. "Any debate? No? Ayes and nays?" One feeble nay, amidst all the ayes. "Ayes have it. There, Justin, you have our moral support."

Ben and Justin

After the meeting broke up, Justin picked up his tray and went out into the hall, where several people were still talking. Ben motioned him over to an alcove. "Sorry I had to cut you off in there. What you are talking about is way too 'hot'—too dangerous to speak of in a room full of people. Did you notice the new girl? First appearance tonight, claims to be an undergrad but not one of us knows her. It could be you are already under surveillance—the state and country are bankrupt, but there is always more money for security. That's exactly what a plant looks like. And we might be bugged, too. Cameras the size of pinheads sending everything back via spread-spectrum radio."

"Paranoid? I guess sometimes they really are out to get you."

"Probably she's what she says she is and nobody's watching us. But be careful; this is the kind of stuff that gets you targeted. And as for your problem, I told you I know more than I can let on to the general membership. Samantha and Dylan and I are the 'Central Committee'—I tell them more about what's really going on than the others. I became a Grey Tribe leaf node last year. I'll talk to a few people online who may be able to really help you guys out, but it takes awhile for messages to get passed along to the leaders. Like the McCulloch guy, Grey Leader. We can get him backchannel messages."

"Let me talk to Prof. Wilson about it. That might be a real help. But only if there's no way HomeSec ever finds out."

"No guarantees, but they won't hear it from me." Ben turned to leave. "This is kind of exciting. I've been reading about the American revolution since I was a kid, and I've always wanted to crusade for Constitutional rights. My father was a history buff and wished he had been there, and I caught the bug. But it's as dangerous now as it was

in 1773 when they threw all that tea into Boston Harbor. The bad guys can send you to the 'Velvet Gulag' if you embarrass them. Don't get caught."

Samantha and Dylan

Downstairs he ran into Samantha and Dylan coming back from leaving their trays in the cafeteria. "Sorry," Samantha said. "I know you were looking for more support. I hope Ben explained the problem."

"He did. And besides, who knows? A strongly-worded letter may get HomeSec to back off…."

Dylan grinned. "We can write a ripping good letter. If logic and reason work, they'll surely see the light."

"Hah, yes." Justin moved to walk on. "Well, I have more people to talk to. I think the Redshirts will still remember the Prof's role in that *Starspark* poster debacle."

Samantha grabbed his arm. "They do—Prof. Wilson is still their honorary advisor. Just don't tell them as much as you told us. It's dangerous to even hear it."

The Red Queen's Race

Alice never could quite make out, in thinking it over afterwards, how it was that they began: all she remembers is, that they were running hand in hand, and the Queen went so fast that it was all she could do to keep up with her: and still the Queen kept crying 'Faster! Faster!' but Alice felt she COULD NOT go faster, though she had not breath left to say so.

The most curious part of the thing was, that the trees and the other things round them never changed their places at all: however fast they went, they never seemed to pass anything. 'I wonder if all the things move along with us?' thought poor puzzled Alice. And the Queen seemed to guess her thoughts, for she cried, 'Faster! Don't try to talk!'

Not that Alice had any idea of doing THAT. She felt as if she would never be able to talk again, she was getting so much out of breath: and still the Queen cried 'Faster! Faster!' and dragged her along. 'Are we nearly there?' Alice managed to pant out at last.

'Nearly there!' the Queen repeated. 'Why, we passed it ten minutes ago! Faster!' And they ran on for a time in silence, with the wind whistling in Alice's ears, and almost blowing her hair off her head, she fancied.

'Now! Now!' cried the Queen. 'Faster! Faster!' And they went so fast that at last they seemed to skim through the air, hardly touching the ground with their feet, till suddenly, just as Alice was getting quite exhausted, they stopped, and she found herself sitting on the ground, breathless and giddy.

The Queen propped her up against a tree, and said kindly, 'You may rest a little now.'

Alice looked round her in great surprise. 'Why, I do believe we've been under this tree the whole time! Everything's just as it was!'

'Of course it is,' said the Queen, 'what would you have it?'

'Well, in OUR country,' said Alice, still panting a little, 'you'd generally get to somewhere else—if you ran very fast for a long time, as we've been doing.'

'A slow sort of country!' said the Queen. 'Now, HERE, you see, it takes all the running YOU can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!'

—Lewis Carroll, *Through the Looking-Glass*

Part Two: The Arms Race

Chapter Six: Campaigning

Redshirts: Zach

Justin sought out the leader of the Redshirts, Zach Lee Donner (he was insistent about his middle name, and that had made him memorable—both for the name and his insistence.) Justin emailed and texted him, and set up a meeting at the statue in the quad; they'd never talked, but Justin knew his face from public events.

"So what's this about? Prof. Wilson needs help?" Zach was a short, wide, muscular man built for stability and strength; his crew cut would have fit in on the first season of *Starspark*.

"He's in trouble and he doesn't want people to know about it because he only thinks it will cause more trouble. The government is after him to help them find his former student, Michael McCulloch, who's now leader of the Grey Tribe. They're making threats."

"The Prof is our honorary faculty advisor, ever since that incident with the poster where he showed he was one of us. He hasn't really been involved in years but he comes to the occasional party. Of course we'd help him if there's anything we can do. The bad guys are a lot tougher now, though."

"I realize we have to be careful and quiet. I've been rounding up allies who can be counted on in case a moment does come when we can do

something useful." Justin paused to look Zach in the eyes and decided to trust him. "He doesn't know I'm doing this—he'd hate to think of anyone else getting hurt to help him. But I figured it can't hurt to be prepared. He may not understand how bad things could get for him."

"So what do you think we might be able to do?"

"There might be a chance to shame the government with publicity. The Internet made him famous over the poster incident; the hook to the new story can remind people of how much worse things are now. We'd be taking a risk, but they can't go after hundreds of students who demonstrate on his behalf."

"Or can they? Remember what happened to the group at Harvard distributing copies of the Constitution last year. Gone, disbanded, expelled, blackballed."

"So we'd all be taking a risk. But that was a few students. We can get half the campus on our side if we try."

"I can't give you much encouragement, but I'll quietly test some people out and see what their reaction is. We mostly live in a fantasy world of heroics and courageous action—real action is a much tougher sell. Fans of the show have the heart, but do they really have the guts? Let's wait and see what happens and in the meantime I'll be making a list of the willing. I know some of us will be."

HomeSec Memo

To: Field Investigator Andrew Gao
From: DirSpecOps James McDonald
Re: Neutral Armor

Field report on student meetings reviewed. Approved all suggested targets for intercepts: Justin Smith, Ben Ramirez, Samantha West, Dylan Foster. Note no action to be taken unless concrete evidence of contact with Grey Tribe or planning activity for unlawful actions.

Tyler Sheppard

Justin was crossing the street between the quad and the Student Union when he spotted Tyler Sheppard waiting for him on the other side. Tyler hailed him: "Justin, hey! I've been meaning to talk to you…."

Justin joined him on the sidewalk. "What about?"

"I'm sorry I picked on you the other day at the Fair. In my performance mode, entertaining the audience. I know you're an okay guy, and I really do feel bad about what happened to Wilson. Everyone knows he's just old-fashioned and didn't mean any harm."

"If 'everyone knows' that, how come everyone let him be railroaded?"

"As my dad says, don't be the nail that sticks up and you won't get hammered. My dad learned how to get along with Unity when he was a venture capitalist, funding renewable energy companies. The only way to get approvals and start projects was to cooperate with them on publicity and give them credit. When he didn't, nothing went right; when he did, permits appeared on time and things got done."

"That seems unfair to the little guys who didn't have your dad's pull. Won't they stop trying, or start working harder on getting friends in government instead of doing better work?"

"Probably. But Unity is doing a lot to bring the oppressed into the system and giving them a boost. Competing with the Chinese means we need everyone involved, all the time, and pulling the same direction. Unity is making that happen. My dad's solar projects are powering this campus right now."

"So as long as it works," Justin said, "ignore the woman behind the

curtain?"

"Who got us through the emergency. And got the two parties together to get things done."

"They say she's going to go for a third term. No one opposes her. Things are going so well we don't have time to change horses."

"Who else could hold everyone together the way she has? Anyway, I just wanted to say it wasn't personal."

"I appreciate that," Justin said. "I have to disagree with your politics, but then maybe I'm old-fashioned myself."

"I'll be running for the Unity regional board next year. I hope you'll support me—you will when you see my opponent. I can make things better if I have your support."

Justin smiled at that. "I will be paying attention when the time comes, certainly."

Back Channels

Justin stopped in to see Prof. Wilson. He explained Ben's offer to convey a message to Michael McCulloch. "—And so I wanted to check with you to see what you thought about sending him a warning to play along without revealing anything."

"How do we know such a message won't be intercepted? How do we know HomeSec doesn't have spies in the Grey Tribe?"

"We don't. But McCulloch is free now, so they haven't been able to get him if they are somehow reading some of the Grey Tribe's message traffic. Our message can't help them locate him, though they might use it to come after you. Which I guess means it ought to appear not to come from us."

"It's been two weeks since I agreed to cooperate and gave them control of my phone and the code keys. I've heard nothing and it makes me nervous. Maybe they are sending him messages and he's not answering, so I don't need to do anything. Maybe it is taking them this long to think up what to say—they haven't asked me for personalizing material, which is what they said they needed my help with. If they don't get material from me, I can't spin something clever to warn him. He may fall for whatever they have in mind to get him to reveal too much."

"So spin a message I can have Zach deliver that will do the same thing —something only he would understand means you are compromised and he should stop answering."

"Let me see what I can come up with. I'll let you know when I have something."

Justin left, and Prof. Wilson thought of what Michael would know

that he could refer to without tipping off the source or the meaning to anyone else. *Worlds of Warcraft* came to mind—Prof. Wilson had tried it briefly at Michael's urging. He might recognize his old character's name…

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Forward to: Grey Leader
From: Astaroth's Ghost

Warden has won this round. I am out for
now, return to game delayed. Trolls active.
Do not accept substitutes.
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* * * * *

Ben's transmission of the warning message up the tree to Michael McCulloch did not get any reply, but that did not surprise him. There would be no way to tell if it had done any good.

Chapter Seven: Breakthrough

ALife Simulation, Model 6: Organism 230019738

In the flat plain along the river, one of the first cities grew. Gorak in one of the nearby villages had learned to plant grain as a boy and now that he had children to help him, it was not impossible to plant a large area in a few days using the plow. The children would follow behind and plant the seeds while he worked hard pulling the plow through the soil. The plow was at least better than a hoe, but he was sure it would go faster and the plants would grow more quickly if he could somehow strap the plow to an ox to pull it through the dirt, instead of painstakingly trying to pull it through the soil by hand. The furrows he made were never all that deep or extensive enough to keep down the weeds. He tried a different harness every year and at last got one furrow plowed using his least-reluctant ox, then a whole field, before the harness broke and planting season ended. Most of his neighbors thought it was not worth the trouble, but they stopped teasing him when the field he had plowed with the ox yielded far more grain at harvest time. The chief's tax collector came by and took more of his grain than usual, but he still came out ahead, and meanwhile word of his plow and ox harness had spread up and down the valley….

Quantum Lab: Breakthrough

Justin had been busy for that week rewriting critical parts of his A-Life simulation code to use the Vortex-5's programming model. He'd bring a piece of the problem to Steve Duong for his opinion, and his answer was usually some form of *that won't work,* and then Steve would sketch out for him how to go about it. The whiteboard in Justin's temporary office was covered with boxes, arrows, and arrays. So far he had succeeded in getting the environmental simulation to run without any life forms: objects moved, heat and scents flowed, and light rays propagated as they were supposed to.

Steve had been hard at work on what Justin assumed were tests of the machine. There was a lot of muttering and drawing on his whiteboard. He was beginning to understand that Steve was "special" in the sense people used when there was something not quite right about a person; he would stop in the middle of a conversation and stare off for a moment before resuming. But he was clearly brilliant and focused. He ate ramen noodles at his desk and did not appear to ever leave—at least Justin always left before he did. His grooming was bad even for a physics guy—shaggy hair, patchy stubble, sometimes an odd smell. But Justin wasn't dating him, and he had run into worse—guys you couldn't stand to be near because they smelled so bad.

It was getting late, but before Justin left he knocked on the doorjamb of Steve's office. "Got a quick question for you."

Steve was unusually absorbed in his screens. "Come here—look at this," and he pointed to a window showing an exotic forest scene.

"That's beautiful. Where is it?"

"A planet orbiting 61 Pegasi. Real-time. See the fronds moving?"

Justin tried to process the statement. "Real-time? Don't you mean simulation?"

"No. We're looking *through* the Vortex-5's braided array. I've been working on some discoveries. Some breakthroughs, actually. And I need to tell someone, because it's beginning to scare me."

Justin pulled up a chair. "So you have somehow captured a view of it —how far is it?"

"Fifty light-years."

"How is that possible? No telescope could have that resolution. We can barely detect planets at that range."

"The photons are captured there, not here. It's a closeup view."

"So this view is what's happening there 50 years ago?"

"No, it's what's happening *right now.* No time delay. The photons cross a defined plane in midair on the planet and come out of a defined plane just outside the front plate of the electron gas chamber. Instantaneously."

Justin was fascinated and at the same time wondered what could possibly have gone wrong in Steve's head. Yet on the screen there was a convincing picture of familiar yet alien life, moving gently in the wind wherever it was. "So you have a cam looking through this 'window'? Show me the window."

"I have stayed away from the machine in case something went wrong. But let's go look." Steve led them to the machine, where he undid a loose screw on the front access plate and moved it aside. "See?"

Justin did see. In 3-D and high resolution, now that his two eyes were receiving streams of photons directly from a planet around another star, as if looking through a window.

Whiteboard

Steve told him about the anomalous data appearing in the unused parts of the array during computations, and the logical leaps he had made to explain it. The sun had set, but Steve's whiteboard began to fill up as Steve talked and drew.

Steve drew a checkerboard grid with dots in some of the squares. "A cellular automaton[4] is a regular grid of cells which can have a small number of states. The next state of each cell is set by a rule that looks at the current state of the cell and its adjoining neighbors. Surprisingly complex behavior can result from simple rules and very few states. John Horton Conway's game of Life[5] was the popular example."

"I've played with it. It had self-reproducing patterns, and so got the name 'Life.'"

"Theories of a cellular automaton basis for the universe run into several problems. Mapping the cellular grid to location in space would seem to introduce nonuniform directionality: objects could travel at the "speed of light" only in special directions. Disturbances in Life can only travel at full speed aligned with the grid, or at lesser speeds in any other direction. And if cells can only change state in response to cells they are directly connected with, how does something like quantum entanglement occur?"

Justin just raised his eyebrows. "I remember Life had gliders, right? Moving on diagonals. Cyclical patterns that move."

"Yes. A lot of people tried to map that onto a quantum physics that operated deterministically on a cellular scale so small it could reproduce quantum phenomena. Like string-theory-eleventh-dimension small. Where particles were traveling patterns."

"And so what became of those ideas?"

"There was a brief flurry of interest. Some Italians developed a cellular automaton that seemed to reproduce Schrödinger's equations in one dimension. Like a lot of the string theories, though, it was hard to find testable consequences; these theories were tailored to exactly reproduce the standard model's behavior in all the conditions we can normally test. And getting to scales below that experimentally where there might be differences proved difficult." He went back to drawing on the board. "I had a another idea. Suppose that the connectedness of the cellular automata grid is not mapped to spatial location; in fact, location is some sort of emergent property of long-lived patterns formed by the operation of the automaton, so that a particle is just a pattern whose location is determined by its ability to interact with other particles—which will tend to be 'near' in space, but not always. Suppose, for example, each cell of the cellular grid is connected to *all* other cells, anywhere in the universe, and the computation of its next state is a function of its current state plus the states of every cell it *addresses*."

Justin thought about this for a bit. "Doesn't that mean each particle would have to know the coordinates of every particle it interacts with? Wouldn't that be an enormous number of bits? Where is all this data stored?"

"That's the elegant part. It's the connections between particles that determine the fabric of space itself. You have to stop thinking of it as a physical array of cells in space. They are all connected to each other, all the time; it's not a computer. The patterns determine the particles; the particles only talk to particles they interact with. But they could potentially talk to any other particle. They simply don't, as the automaton normally operates. Unless I tell them to."

"'Tell them to?' How exactly do you do that?"

"We're creating quasiparticles in the electron gas between the plates. Those quasiparticles, in turn, form an array which acts as one giant quasiparticle. Which I can program from my console. And that quasiparticle can recruit any and all particles in this and nearby universes into its computations, and ask them to change states as directed. It turns out the quantum computations we were doing only scratch the surface of what is possible—infinite storage, infinite computation—"

"You *ask* the particles? You're the particle whisperer?"

"Well, I set up the array to do certain things, and it asks the particles, but yes."

"I can't see it."

"Of course you can't. You were evolved in a Newtonian world of 'normal' space and time and physical objects. There is no analogue in your brain."

"Well, I see some problems. What about relativity? Everything we know tells us nothing can travel faster than light—not even information. If something could, we would have seen evidence of it."

"This phenomenon would not happen in nature. The braided array that creates the quasi-particle could not occur without intelligent assistance. The organized array, the cold, the magnetic fields, and especially the external control and programming are required. So it turns out there are exceptions to some of the basic laws of physics, but they never occur naturally; only high technology and unlikely organization can create conditions where exceptions occur. The normal laws of physics are emergent properties of a much rougher underlying process, and can be subverted by 'addressing the

substrate.' We have found a way to route around the operation of the laws of the universe we know."

Travelling Without Moving

The evening became night, and still they talked. Steve pulled out extra ramen and they ate that for dinner, still talking and drawing. Justin pointed at the scene still displayed on Steve's screen, which was going dark as apparently that place approached its own night. "How does this viewing window work, exactly?"

"You ask the device to scan particles near a plane in space bounded by a rectangle. If a particle is approaching the plane, its connections to local particles on the other side of the plane are replaced by connections with particles on our side of our plane. It's set now to allow through only photons, and only one-way on one side. If you were on the planet, the backside of the window would appear to be a perfectly black square hanging in the air."

"So what stops other particles from going through?"

"I'm only asking for photons. If I asked for other particles, they could come through also."

"So if you asked nicely, you could set up a door we could walk through, and end up there?"

"That is on my list of experiments. Send a camera in one-way. Then live animals."

Justin was again wondering if Steve was sane. Not because this wasn't obviously a breakthrough, but that he'd done it in secret, in a few weeks, and already he planned to test *animals.* Some hazards seemed obvious. "What makes you think this planet isn't teeming with microbes, or dangerous life forms, or aliens, even? Isn't it just a little premature to risk something coming through to our side, or deadly germs? How do you know the atmosphere supports life as we know

it?"

"That took weeks of work. It turns out one of the limitations on using the device is the difficulty of programming it—I could give it relative coordinates and ask it about particles within a radius of that spot, but my first experiments returned little data since I was unsure of the coordinate system. I finally found some smarter ways to locate things, by asking it to find a pattern of local particles that matched criteria I set—that also took a lot of experimenting, and I had to add a tailored query language. Using selected criteria, I detected the Sun and then had some idea of how the relative coordinates worked—good thing I had the viewing turned off for that. I have it down now so I can give it any Earth surface coordinate and open the window within a few feet of it. I added on this joystick to give me fine control over positioning and the directionality—the problem is similar to controlling a remote camera."

Steve used the joystick to move the scene closer, then panned left, where one large "tree" blocked the view. "So I can clumsily control position from the console, and get fine control from the joystick. And I found this planet using a very complicated query: give me a gas with such-and-such range of composition, temperature, and pressure, with solid surface below, water vapor, carbon dioxide, sunlight near Sol spectrum, and so forth. This is the nearest. Looked around the area, nothing but plants so far. And we send animals first to be sure. It's unlikely any microbes would be danger to us—they haven't evolved to be parasites to our kind of life. It's possible there's something poisonous in the air or plants, but that's a testable question. Thus the animals. We don't let anything come the other way until we know a lot more."

"Okay, another basic this-is-impossible question. Isn't that planet hurtling through space at some enormous relative speed to ours? How is it this is rock steady?"

"The whole thing is based on local particles. The local particle frame of reference is steady. The device is addressing particles, not locations or speeds."

"What about conservation of energy? How can it be that we move objects instantly without using a lot of energy?"

"The objects don't accelerate; their idea of what they are near changes. No energy required."

"Okay, suppose I set up your window to open high above us and start pouring water through it. I can run a generator using the falling water and extract energy as it returns to this gravitational potential. Where does that energy come from?"

"The universe. Everywhere. Nowhere. The quantum foam. Yes, you can use the device to generate as much energy as you want. You could open a port to the inside of the Sun. When the gateway is open, the universe just deals with it."

The Rebel Alliance

The sky to the east was beginning to glow when Justin decided it was time to get some sleep. "We need to go home. I have to ask you—you're keeping this secret because you think it's too dangerous, and I agree. So why are you telling me?"

"I had to tell someone. You're here, you're smart, and I think you can be trusted to help me with it. I want to explore the device and use it as a tool to understand the universe and give us backup in case this planet ever becomes uninhabitable."

"But in the wrong hands, it could destroy us all—"

"Yes. The ultimate surveillance tool, bomb delivery system, and assassination weapon. Allowing easy murder, theft, and cheap energy production. Anyone after power would do anything to get it, and use it to commit crimes and control people, limited only by their imagination. I can see that, and you can see that. And if I can discover it, someone else using the same kind of hardware eventually will, so even if I erased my work and forgot it all, the knowledge will eventually get loose. And so it is my responsibility to try to use it for good and to keep it from those who would use it to hurt people."

"Who could be trusted with that kind of power? Us?"

"If not us, who?—My dad told stories from his childhood about the American soldiers and the Viet Cong. There were cruel Americans, but on the whole they were good people. The Communists—and our own soldiers—were not so good. Those days were long ago, and the government there now is not so different from the government here. But you are the kind of decent American he remembered, and I have heard of what your Prof. Wilson has been going through, and what you are trying to do."

"So far we've done nothing to help him."

"But you are willing to talk about it and take the chance of being singled out and destroyed. We know how those things work. It is foolish and noble to stand up for what is right when bad people rule. It will be foolish and noble to take responsibility for the device when more than likely they'll come after it and try to destroy us."

Chapter Eight: Desaparecidos

Rebel Meeting

Justin had texted the people he thought he could trust as the nucleus of what he was beginning to think of as The Rebel Alliance: his lab partner Rasna Kapoor, Ben Ramirez and Samantha of the Students for Liberty, and Zach of the Redshirts, calling for a meeting at an off-campus cafe. He didn't want Steve Duong to be known as a conspirator just yet, and Prof. Wilson was as much as possible to be kept out of it until the threat to him was over.

Samantha and Dylan were late. Ben started it off: "First, I have some bad news. One of our less careful members started handing out leaflets, nothing unusual, just describing us and where we meet. Fifty feet outside the Free Speech Zone, and she was arrested by the campus cops and expelled yesterday. I spoke to her and her mother—they hustled her home to Fresno last night. They've pulled her financial aid and as much as told her she's blackballed anywhere she might go."

"That's an escalation, isn't it?" Justin said. "They've only warned people before, right?"

"That's right, unless someone has refused to move when asked. This is the first time they didn't ask."

Justin addressed everyone around the table. "Well, that fits a pattern. As I told you all earlier, Homeland Security is leaning on Prof. Wilson, and it's a lot more serious than I let on. We have to expect pressure will be put on the administration to keep us from doing anything. They're likely to have us under surveillance soon, if not

already. That's why I had you come here."

Samantha and Dylan came through the cafe door, looking unhappy, and Sam said, "Sorry we're late. Still trying to find out more about Amy's arrest. No one seems to know anything."

Ben was angry. "That was a warning to the rest of us. Shut up or lose your career."

"Things will get worse before they get better," Justin said. "I guess I should tell you all that Prof. Wilson has been in touch with Michael McCulloch, the leader of the Grey Tribe, and they caught him at it. They've threatened him with arrest and prosecution. We need to have some plan of action in case that happens. And we have some tools they don't know about that might help us beat them. But I have to warn you all, it's very, very dangerous—we could lose everything and end up in the Gulag ourselves."

"'Our lives, our fortunes, and our sacred honor.' Isn't that the price of freedom?" Ben went on: "I couldn't respect myself if I did nothing. But anyone not committed should leave now. We'll be talking about plans and it's better you not know what they are if you don't want to take the risk. So leave now if you want out. We will understand." He looked at each of them around the table.

No one moved.

"Even this meeting is risky," Justin said. "I studied up on the clandestine cell system—I got the idea from *The Moon is a Harsh Mistress,* but it's something every secret organization has used to limit the damage spies and defectors can do. The basic idea is each member is in a cell of three or four, and communicates only as needed with the leader of the cell. Each cell member, in turn, can lead another cell, and so on down the levels to more and more members. But capture of

one means only a few are compromised, and information is only available to the few who require it."

"I can address that," Ben said. "I've heard that the Grey Tribe communication system is organized that way. Messages are passed up and down the tree without any central location where they can be intercepted, and even Grey Leader has no idea who or where the members are."

"Compartmentalization, it's called." Justin "Since we're meeting, we all know too much, but from now on new members will come via recruitment by a single cell leader. And we have to assume all of our calls, texts, and email are being scanned. It's not safe to talk by any means but face-to-face."

HomeSec Memo

To: Field Investigator Andrew Gao
From: DirSpecOps James McDonald
Re: Neutral Armor

The analysts have reviewed the recording of the student meeting. Quick thinking on setting up the bugs in the cafe on very short notice.

The situation is getting out of control. While the students have no specifically illegal plans, this sort of talk comes close to requiring us to act. We are not getting any useful responses from McCulloch and suggest you have Wilson quietly arrested and medicated for further debriefing. Team should pick him up early in the morning at home. Track and monitor all communications by students Ben Ramirez and Justin Smith very closely until further notice. If you see any evidence Ben Ramirez is sending covert messages to the Grey Tribe network, arrest him as well.

Love Triangle

It was mid-November, with warm but short days and cool nights. Samantha had texted Justin that she was free to go out since Dylan was busy, and so they met at the bus stop and hopped the shuttle into town.

They got off and walked to a cheap Thai place. They ordered and the soups came. The aroma of coconut milk and cilantro rose from Justin's soup and the pepper started to clear his sinuses. "I love this soup. When it's cold especially."

Sam used her spoon to try it. "Almost too rich. But tasty."

"Watch out for the pieces of galanga. You can't actually eat them."

"I realized that when I tried to chew one."

Justin looked around—no one was close enough to hear them talking over the buzz of background noise. "We're making progress on the cell system. You're in my cell, so I get to tell you what you need to hear."

"If you know what's good for you, you'll tell me everything."

"You know what I mean—about the project. Security! In theory I'm not supposed to tell you who my other two members are, but that probably doesn't matter until the organization has grown a lot."

"I have recruited two people from Students for Liberty and one from the Redshirts. If I told you who, I'd have to kill you." She looked pleased with the idea.

"If we are only recruiting from people we already know, we're not

going to reach other students very quickly. Have your recruits recruited?"

"One has her three. The others are slow, and I'm not sure they are serious. Time excuses, social lives…"

"The revolution does not make time for fun." He imagined himself with Lenin's glasses.

"I think most of us were brought up to be passive. Parents and schools planned everything for us, scheduled us up, watched us every second to make sure we weren't kidnapped or raped. When you're in the habit of doing what everyone else wants you to do, it's hard to strike out and do something different, in secret."

"So it's part of your job as cell leader to support them. And nag them, and be another voice telling them what to do. But this time for the cause of freedom. So they can do what they want to, eventually."

"If we make it. And if they don't get sacrificed in the process."

"Independence requires taking graduated risks and learning what is and isn't a good bet. This is a good bet. I can't even tell you why yet, but I can tell you I know we can make a difference. I know we have a good chance to win."

"And I trust you enough to follow you. Not blindly, but because I can see what kind of person you are. And that gives me confidence."

A feeling of warmth spread through him, and it was more than just the effects of the spicy soup.

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Outside the restaurant, Dylan Foster observed them through the window. He had started checking Samantha's text messages and emails after she had told him her phone's passcode a few months ago when he needed to borrow it for a call. On reading the texts planning this dinner, he decided to blow off his night class to check it out. He knew Justin was dangerously interested, and while he couldn't tell for sure what was going on from the bland texts between them, they were meeting more and more often. They seemed to be smiling at each other far too much.

Justin and Steve: Prof. Wilson Gone

Prof. Wilson did not come in for several days. His administration calendar showed sick time; emails to him got an out-of-office reply. Justin went by his house and rang the bell; no answer. Justin noticed a car cruising slowly down the block while he waited at the front door. He decided he should pretend to be unconcerned and go about his business, if they had taken the professor in for questioning. Appearing to be disturbed would only keep them on his tail, if that was a tail.

More days passed, then weeks. A woman from Human Resources came by the A-Life lab and explained to Rasna that Prof. Wilson was very ill and would be out on disability for some time longer; it would be wise to make alternate arrangements for faculty advising. Notices went out in email.

In his visits to the Quantum Lab, Justin quietly stopped working on the simulation code and helped Steve develop better software for controlling the device. The user interface for searching for locations meeting specific conditions improved, the coordinate database grew as they discovered more locations, and the joystick turned into a 3-D control that offered knobs to control the size and transparency of the window. Additional refinements allowed the local window to be anywhere, not just a fixed distance from the plates, and they explored the vast storage and computational power which could be summoned up.

"Is there a chance we could get this to find a certain strand of DNA? Like, a missing person's?" Justin asked.

"It's theoretically possible, but how would you describe the terms of the search? It's not like you can give it a nail clipping and let it find the similar molecules. We have no way—yet—to scan or describe that level of chemical complexity. We're pushing our limits finding certain

isotopes in certain combinations and concentrations."

"Just wondering what's become of Prof. Wilson."

"We could spy on the local office of Homeland Security. Listen in on conversations."

"Is there a way we can detect sound on the other side of the window without actually poking a microphone through?"

As it turned out, there was. The position of air molecules just on the other side of the gateway could be directly queried and pressure waves detected; the sound generated from that data was as clear as from a microphone. This took days to code up; the result was sound from the console's speakers and sound files which might prove to be useful. They looked for and found Andrew Gao's office downtown and set up a tiny gateway a few inches from the ceiling to record video and sound near his desk.

Meanwhile, they discussed how to test the gateway further when the lab was often visited by Professors Bubna and Friedman, as well as parties of VIPs from funding agencies. They decided to confine active gateway experiments to nighttime, and to close off that end of the lab with a portable divider, blocking the view from the hall windows. These changes went unremarked on, and their experiments continued.

"So why can't we bring Friedman and Bubna in on this?" Justin asked.

"I owe Prof. Friedman a great debt—he has been like family to me—but he is looking for grant money and a name for himself. And I could not endanger him and his family by involving them in this. It is better that they not know. As for Bubna, perhaps, later. He is a good man, and single. But for now we are better off telling no one else."

"How about Sam?" Justin was seeing more and more of her, as Dylan's thesis work became obsessive and he stopped monitoring her every move. In a way they got to know each other better without the experience of sex, which Sam had ruled out until she had broken up with Dylan—who she thought would take it badly, and so she held off while he was so hard at work. Justin thought this possibly unnecessary but a sign of her integrity, and simmered quietly as they met like some courting couple from the last century.

"If you trust Sam with the most dangerous secret in history, then, sure, show her what we're doing."

"When you put it like that, it seems unwise. Maybe I can bring her by and show her what I'm doing without really telling her everything. I am her cell leader, so it's not breaking discipline."

"'See, Sam, here's another planet viewed in realtime!' I think that would be too much."

"Well, she's asked how things are going and why I spend so much time here at night. Giving her a look might keep her from being more curious."

"That sounds better. Try not to tell her we plan to steal the machine and abscond with it to another planet. Meanwhile picking up hundreds of outlaws and stealing gold from government vaults. Then launch a rebellion to take down the worst governments from our safe position off-world."

"Shh! Don't even talk about those things." They had worked out a plan weeks ago; when the technical development allowed, they would bring in some of the others and try to contact the Grey Tribe to get Michael McCulloch on board as well. Through him, they could

recruit those hundreds with little to lose and a willingness to risk a lot. "I know I'm being watched. They could be using a laser on the windows to listen in."

"That would be funny, when our eavesdropping is so much better. I don't think they have bothered with anything that elaborate. As far as they know, you just grind away at research here."

"Which reminds me again to point out the irony of our stealing a government-funded machine to undermine the government. DARPA will not be happy."

"Our next grant request will be tough."

"I guess bridges are made to be burned. Which reminds me, how is the plan to order up more parts for a duplicate device going?"

"I've spoken to Bubna, asking innocently how we'd go about that if we got funding. It turns out the NSA and an even-more-secret-agency have ordered up several more. You'd think they would wait until they had run more of their own tests, but they didn't like the lead time of six months—so what if it turns out to be wasted money."

"So if we find those parts in the fab, we can steal them."

"If they are done in time. More work for us, trying to spy on the fabs to find out their schedules and where they store the work-in-progress."

"This is why we need more people and more devices to execute even the basics of the plan."

"That is true. But for now it is all up to us." Steve went back to slurping on his ramen and tweaking some stubborn code.

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The next night, Justin brought proper food for dinner. They ate at the console desk and Justin said, "I've had a deep thought."

"Forty-two! No, I mean, what?"

"If, as you say, the device can tap into unlimited storage and computation on the substrate by marshaling as many particles as it needs to assist, what would stop us from uploading an AI—or ourselves, suitably encoded—to it? Has it occurred to you that the reason why we haven't seen any evidence of advanced alien civilizations might be that they develop to the point of finding a similarly-capable quantum computer, then upload themselves? Could they be happily living vast, simulated lives far faster than we can imagine? Leaving the universe apparently empty?"

"Yes, that occurred to me about day two. Some of the 'noise' I found in the unused areas of the array during computation may have been the result of organized activity of that sort."

"If so, what if we somehow disturb them or damage their computations by mucking with the particles they are using? Wouldn't they be like gods, able to see and do anything, anywhere as the mood strikes them?"

"My guess would be that such collisions are very rare and the density of computations directed by intelligence is very low compared to that used by natural activity. And as for gods, there is no reason why an intelligence running on the substrate wouldn't be able to observe and meddle with matter at will, though why they would bother when they have a rich internal society to deal with, I don't know."

"Maybe they once did—like the Greek gods!—but some authority rides herd on the substrate civilizations and makes them keep hands-off."

"I don't know—all of these questions would be excellent advanced research topics. For now, we have no way to digitize people's brain states, and our AIs are too feeble to use more capacity than we provide with conventional machines—they are more like glorified search engines with associative memories and crude reasoning. True self-aware AIs are still far away. But this would give them the power that they would need to leave us far behind. And if alien civilizations have done that, then they are already there. We see no evidence of interference."

"Maybe it would be wise to upload ourselves first, before enabling Skynet."

"No one knows if the human brain could be expanded somehow by adding more and faster connections. It seems evolved and organized to handle only the senses it has. It may be very difficult to take an adult human and turn him into a super-human directed by the personality and memories that make him who he is."

"Sounds like a challenge."

"Probably a challenge for the next generation. We have yet to save ourselves from murderous bureaucracies. And planetary destruction."

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It was Steve who brought up deeper topics the next day. "This is not right."

"What is not right?" Everything on screen looked normal to Justin.

"The universe we know is regular and predictable, with laws of physics we have found reliable down to the quantum level. This is not supposed to be possible; it's like there was a mistake in the universe that allows this escape hatch. This flaw. As if it were a simulation and we have found a bug in its software."

"That's what you told me the first night. Science is what *is*—we observe things that don't fit what we know, we have to come up with new laws that do. Even if something *shouldn't* be true, we have to work with what *is.* If it gets messy and irregular, that usually means some simpler system we can't see is behind it. As with chemistry, which sorted the zillion wildly different chemical compounds into regular structures made of a limited number of atoms by fairly simple rules. And those atoms turned out to be made of even simpler and fewer parts. And so on."

"Yes, but. Suppose this universe is itself a simulation run on the substrate we're addressing. What we are doing is escaping the simulation—like one of your simulated organisms discovering how to trigger a program exception and get itself promoted to local godhood, able to smite predators at will. We are accessing the substrate directly, against the rules. If there is a Simulator running this simulation, won't it be noticed? By opening gateways to other planets, could it be like sending up a flare that even a sleeping God would see?"

"If so, too late."

"Perhaps that is an answer to your question about alien civilizations. Maybe a giant foot comes out of the sky and squashes any civilization that dares to meddle with the substrate."

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The next day, Justin reviewed all of the files recorded since they had set up the recording window above Andrew Gao's desk. He skipped through them as quickly as he could; intriguing bits and pieces, but nothing about Prof. Wilson or the Grey Tribe. Frustrated, he started to think of other places they could listen, but without understanding Homeland Security's inner workings, it would be hard to identify likely spots, and he didn't have time or a safe way to search for information that they wouldn't be monitoring. He vowed to do more if something didn't turn up on the recordings in the next few days.

But as they days went by, he forgot more and more to set up the listening window after they had run other experiments, and when he did, nothing interesting turned up in the recordings.

Prof. Wilson: Secure Facility

Walter Wilson had lost track of the days that he had been in this place. He had been rousted out of his sleep before dawn one day by men—and one woman—who had somehow entered his house without making a sound. They were outfitted like a SWAT team and had their pistols drawn, but the closest was pointing a taser at him. Groggily he packed a bag with a few clothes and critical medications and did what they asked. Then one of them injected his arm with something, and everything went away in seconds.

When he woke up a little, he was in the back of a van strapped into a seat. He could see a little out the front window, but they were on a highway he didn't recognize. One of the men noticed him moving and said, "Hey, Prof. You back with us a little?" He gestured to someone behind him, and the needle stuck him again. Blackness.

Much later, he came to on a bed in a small white room. He was restrained—straps held him down. He went in and out of consciousness for some hours before someone came to feed and bathe him.

For the first few days, the routine was always the same: someone woke him and brought him breakfast. He was given a few minutes to eat, then taken to a room where a handsome young man, impeccably dressed, asked him questions and got him to tell stories about Michael McCulloch. As the days wore on he ran out of memories about Michael. The young man asked about other people—past students, current students and faculty. He wondered why he was being so cooperative, but it just seemed easier to make the young man happy by giving him what he wanted. He felt bad that he had run out of things to say.

Gradually the sessions shortened, and other people asked him the same questions. He tried to make his answers interesting by varying

the wording. Finally they stopped asking him questions, and he only saw the young man one other time, when an important visitor was shown to the questioning room. He was a serious older man, and seemed unhappy with him.

Then the days began to pass more quickly, as he was left alone except for people bringing food and cleaning the room. A burly male nurse gave him pills and encouraged him to exercise on the stationary bike next to the bed, and the TV showed scenery he might have been passing through had he been biking in various national parks. He thought that was a nice gesture. But still his head was so cloudy….

Chapter Nine: Demo Days

Quantum Lab: Demo

Justin got to the quantum lab to find Steve in one of the storage rooms staring into a cage holding three mice. Steve noticed him, and said, "I got these from the bio supply. She wanted our account number and I made up a number one up from the lab's real number. Told her it was a new project."

"We could have just caught some squirrels in the quad." Justin eyed the mice. "These guys are kinda cute."

"I've also got a camera on a pole and some rocks to toss through."

"Sounds like we're ready for real science. And this is the time to start bringing in other people who need to know about this if we're ever going to get all the work done. Sam, Rasna, and Prof. Bubna, at least. Ben Ramirez—without him we have no connection to the Grey Tribe. Those four we absolutely need."

"I'm ready to try matter transfers tonight. We'd need some time to round up those people, and I'd rather not wait until tomorrow."

"I can get Sam over here in an hour—we were thinking of getting together for dinner anyway."

"Then I guess have her observe. I would explain what's going to happen in advance so she isn't surprised."

"I'll do that." He had already been dropping hints and talking about

remote viewing capabilities; Sam seemed politely interested but apparently missed the full significance of that phrase.

Justin texted Sam and asked, "Can you meet me at Student Union in an hour? We'll get food."

She responded quickly: "Sure. Thesis Man is going to be at his office until late."

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Samantha arrived at the door of the cafeteria a few minutes late. Justin said, "Let's just get some water and sit for a minute. We're supposed to pick up food here then go to the quantum lab for a demo." They got water and sat at a table by the doors.

"Sorry," she said, "grading final projects for the course I'm TA-ing. End-of-term crunch coming next week, then the holiday break."

"Wouldn't the break be the ideal time to break up? With you-know-who? He can mope while he's on vacation."

She looked thoughtful. "You may be right. His deadline is next week, and if I tell him after that, he can recover at his parent's place in St. Barts. I was invited, but made up a reason I couldn't go. The Caribbean at Christmas! His parents are really great people, but no."

"It would be nice if you were free to publicly display affection." He touched her little finger with his.

"Not to mention privately. I know you want to, and so do I."

"So it's a plan. —And there's another plan I need to tell you about. Steve and I have been working on that remote viewing I was telling

you about. I haven't told you very much because—"

"Security, I know."

"More than just that. Steve has made a discovery. Not just any breakthrough, but *the* breakthrough. Of the century, or even the millennium."

"Okay, I get it—it's big! Get on with it." She tapped her glass impatiently.

"To start out, 'remote' is light-years away. And by 'viewing,' I mean a window you can look through in real-time. And tonight we are going to test using it as a gateway—sending objects to a planet 50 light-years away."

Her head tilted and she looked at him for some time. "What? That's… hard to believe. Steve runs a computer lab. What does that have to do with—?"

"The quantum computer is the key to it all. It lets us do incredible things—see anywhere, go anywhere, compute anything. The main limit is our ability to program it. It will change the world, and let us leave it. Steve made a breakthrough in physics—I guess we will call it substrate physics, now, not quantum physics—and worked out how to get the machine to do just about anything he asks."

"I am suddenly getting scared. Who else knows about this?"

"Nobody, just me and Steve. Steve did not want to bring in Prof. Friedman yet—I think he doesn't trust him to handle it right. And Prof. Wilson is who-knows-where in the Gulag. We're going to bring in Ben Ramirez and Prof. Bubna soon—we'll need them. We have a plan."

"A cunning plan. Where have I heard that before? Do I get to hear it?"

"World—no, Galactic!—conquest. Freedom and dignity for all. Cookies."

"I may have a few quibbles with your plan, but not with the cookies part."

They talked for a few more minutes, then made their way out and walked across the street towards the quantum lab.

* * * * *

Justin and Sam ate dinner in Justin's office while Steve stood in the doorway and talked. "You realize you can't tell anyone about any of this, right?"

Sam looked annoyed. "I do understand how dangerous it is to try to keep this a secret. You know if they find out, you'll be taken away and never seen again. Slave scientists. National security orders."

"And what's our alternative?" Justin said. "Make it public? Have every country lobbing bombs through gateways and spying on everything?"

"They do that well enough now." Sam crossed her arms.

Justin grabbed her hand. "But this would be far more effective, and deniable. The perfect weapon for sneak attacks and assassinations. At least now the surveillance is mostly electronic, and you can work around it with some effort. This would be much worse. And if we reveal it only to a responsible US agency—let's say DARPA—we give them a hot potato and they will end up handing it over to the scum running Homeland Security. Same consequences but enabling one

country to roll over the others. Despite it being our country, I don't feel at this time that that would be a good outcome for anyone."

"I'm not liking it, but I'm finding it hard to disagree."

"The logic compels us to hide it and use it for good. Very, very carefully. And keep anyone from following us in finding it."

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For the demo, they opened the Vortex-5's front panel and watched from behind the console. Steve keyed in a command line, and the machine disappeared behind a perfect mirror reflecting a view of them watching. "Just a cool trick—world's most high-tech mirror. Photons reflected from our side."

"What would happen if I stuck my hand in?" Sam said.

"Nothing—only photons get reflected back. Might have some odd physiological effects, so I wouldn't try it…. Next, some geography…" The gateway changed to show a view from high up of a sinuous wall on a hilly landscape. "Great Wall of China. Before noon tomorrow there—no, it's not a time machine, it's just across the International Date Line."

"So I could toss a bomb through and create an incident?"

"No, it's set to let only photons through, and only one-way. Next: a test of the search engine; I've set it to find a dense concentration of Au, gold that is, over 100 kilograms…." The gateway showed a wall of stacked gold bars. "Backing up a little." The wall of gold fell away until they could see the walls of vault it was sitting in. "A bank in New York."

Sam looked thoughtful. “I’m surprised it’s not Ft. Knox, but who knows if there’s actually any gold there anymore. It may all be in China.”

Steve continued to click and type. “Some stored locations. The Oval Office.” The gateway was pitch black. “Whoops, that’s inside the closet next to it.” He used the fine control and the view slid to show a view from above of a dark room and a cleared desk. “Keeping the gateway size small there and it’s dark anyway.”

Justin added, “We should start recording there, and get the chief of staff’s desk as well. Might come in handy.”

Steve moved along. “We’ll get to that, but we have more to show. What we’ve christened as New Earth.” The view changed to the landscape of alien trees and ferns. The light there was gray and looked like it might be raining. “If I changed the setting, we could step through right now.”

Justin looked around. “Were we going to try sending the camera in?”

“We could do that now. I wish we had a robot so we could direct it from a distance. I’ve never changed the settings to allow matter across, and it would be wise to take precautions.”

“I’ll do it wearing safety glasses,” Justin said, “and use the extender pole from behind the console. If it’s a big explosion it won’t matter, but you two could go out into the hall and wait until I give the okay.” Justin went to get the pole and screwed the camera to one end while Steve typed in new settings. Air began to move toward the gateway as the unequal pressure forced a breeze into it.

Safety glasses and apron on, Justin shooed them out.

It was anticlimactic. He kept as much of himself behind the desk as he could, and extended the camera on the end of the pole toward the gateway. The camera was displaying what it saw on the console, and the view didn't change as it slid through the gateway plane without resistance—the same landscape, but viewed directly. He pulled it back. "All clear. Nothing happened. I guess it must have gone through and come back without a problem." And the camera still functioned as if it had not been sent 50 light-years away and back in a few seconds. The only difference was that it came back *wet.*

"Oops," Steve said. "That was unexpected. First transfer of alien water full of microorganisms back to us. I hope it's safe."

It was late, and they decided to postpone the animal test until tomorrow, when they would have had a chance to round up Ben Ramirez and Prof. Bubna. Steve was assigned to break the news to Bubna, while Sam and Justin would talk to Ben.

Prof. Wilson

Jim McDonald, Director of the Homeland Security's Advanced Threat Assessment Task Force, sometimes wondered how he had ended up with the job. After two tours in Iraq and an uneventful career stateside, his early retirement plans had been disrupted by the bombing of New York and the State of Emergency. They had made him an offer too good to refuse, and friends looked out for him. He was getting the highest salary of his life, plus his military pension, plus another pension which would kick in when he finally retired from this job. He did enjoy most of it, but there were times when he had to do things that left a bad taste in his mouth.

As now. He was again visiting the secure facility in Maryland where the highest-value detainees were held and questioned. The facility had grown in size every year, and it outgrew the former military hospital building that had been repurposed for its use. Prof. Wilson was held in the new wing, as white and clean as the old hospital had been worn and dirty.

He spoke to the officer in charge as they viewed Wilson through the one-way glass panel inset in his room's door. "He looks malnourished."

The officer, a clean-cut young man in hospital scrubs, looked down at the pad in his hands. "Weight 74 kilos this morning, just a bit less than when we got him. He's eating and exercising."

"I would imagine being constantly on the drugs has an effect."

The officer nodded. "They affect neural control and mood. Safe in the short-term, but long-term there is a chance of permanent damage. If no one is questioning him further, we'd recommend taking him off them."

"Do that. I'll deal with Immerman." Immerman was McDonald's liaison with the White House; what used to be called a political officer or commissar, in authoritarian regimes. There was an Immerman in every important security office, reporting and relaying orders from on high on matters that came to the White House's attention. "And get him a pad computer with some books. We want him alert and writing. We didn't get very much that was useful from him under drugs—might as well see if he starts revealing more when he's fully functioning. Send anything interesting to my office."

The officer made a note. "I've added the order at your direction."

There was a rumble of conversation from down the hall as a group of doctors approached. They were lead by a small Asian woman in a tailored lab coat. "Mr. McDonald," she said. "I've been looking forward to meeting you."

"And you must be Dr. Zhang. I've read your file—very impressive work."

"Call me Grace. This is rounds, so we can't stop long. But Ms. Immerman has told me she believes it is appropriate for this detainee to receive our implant."

"She has discussed it with me. I am concerned that the implant is still experimental, and we have a lot invested in this subject—we need to reinsert him and get more intelligence. I'm not sure I trust your implant just yet. And I find it hard to believe he won't know we've planted a device in his head."

"It doesn't interfere with functioning. It reports the compressed signals of critical sensory nerves passively—in only one case out of over fifty was the patient aware of anything unusual, and that was

because of incorrect sensor placement. And the control functions are very subtle, stimulating pleasure and pain imperceptibly. Reinforcement can be provided at a level below conscious thought. Fear can be induced while the patient rationalizes a reason for it."

"So what good is that to us? How is he going to know to do as we say if he's not even aware of what the consequences are?"

"The monitoring software will gently nudge him in the right direction. When we are in contact with him, oppositional thoughts will be recognized and discouraged. Cooperative thoughts will make him feel better. It doesn't take long for the conditioning to take effect."

"I'm more in the threaten and cajole school, myself. But those are my orders." He motioned to the officer in charge. "The doctor is authorized to operate on this patient as soon as possible. I want a report every day on his condition."

Telling Ben

Justin rode his bike to Ben's office in the engineering building, thinking to intercept him there rather than risk a text. He found him there, but he shared the office with two other grad students, so Justin pulled him out to the hall, where they found a safe alcove.

"Any word on Prof. Wilson?" Ben asked.

"I think we can be sure he's been arrested—I've been by his house a few times and there's always some signs of surveillance. We started recruiting people to make a public stink to stop them from coming after him, but now we can't do much because they're covering it up with the illness story. Not sure how they did it, but the administration thinks he's on sick leave, and we're supposed to look for alternate advising, which means he's not expected back soon. So tell your people he's in trouble but for now just wait for instructions."

"Will do. I have fifteen people in my tree, and it's still growing slowly."

"Good. We'll let them know when there's something they can do to help," Justin said. "And I've been meaning to suggest we ask your Grey Tribe contacts for some help with more secure communication. Like throwaway phones using their apps. I'm pretty sure HomeSec intercepts all our phone communications."

"I'll ask. You have to be invited—so we'd need those cheap cellphones even to start the setup protocol. I have stopped using the Grey Tribe messaging app on mine, so I'll have to send the encoded photos from a library computer or something. I'd need to send a message asking for restoration to a different device, but I have to have the device data and email address."

"Another project for me, then—buy a lot of cheap phones at a dis-

count store and make up identities to activate them. Fun."

"Just keep track of what fake identity goes with what phone, and set up email accounts accordingly. Give me the list and I'll forward it to my contact." Ben checked the time on his phone. "Are we done here? I have to teach a class soon."

"No, there's more. Steve Duong and I have been keeping a secret, and it's a big secret. Steve has made a breakthrough—a beyond-Nobel breakthrough, if it ever gets recognized. His quantum computer can do a lot more than compute…." Justin went on, sketching the possibilities: instant interstellar travel, ultimate surveillance, use as a weapon, and free energy. "An end to shortages, the beginning of human expansion off Earth. But the end of human freedom, in the wrong hands."

Ben listened in silence, then broke in: "I knew you guys were up to something, but I had no idea. This isn't some kind of joke? You're sure about this?"

Justin explained how Steve had stumbled on anomalies and made the breakthrough. "We're having a demo tonight and running our first test with a live animal. After dinner, around 7. Sam and Prof. Bubna will also be there."

"Bubna? Is he safe?"

"We don't know yet. But we need his help to get hold of more parts for more devices, so Steve is supposed to get his cooperation."

"Steve is not the ideal salesman."

"But he knows Bubna, and he thinks he will be good. We don't have much choice, we need his expertise."

"I'm going to be late, but who cares." Ben paused. "This is the most dangerous idea I've ever heard of. But I've wondered if I would ever get a chance to make a real difference. I was thinking of going to law school, but then I realized no one is allowed to be a crusading civil liberties lawyer under this regime. So I still think you may be crazy, but I'm in. 'Let justice be done though the heavens fall!'"

They talked for a few more minutes. Ben tapped his head and said, "I've got a million questions and ideas, but time's up. I probably won't make any sense at all in class, but I need to go. Nobody to sub for me," and left.

Animal Test

As they were preparing for the evening test, Justin asked Steve, "How'd it go with Prof. Bubna?"

"I caught him in his office and laid out the story. He was angry at first —not consulted, not asked! But I told him what has really happened to Wilson, and he calmed down. He's very interested in seeing for himself. He agrees that Prof. Friedman would feel like he had to ask his contacts what to do, and that would mean disaster. He tried to sell me on destroying the data and forgetting about it, as the safest thing for us. But he agreed it is only a matter of time, and having the secret-agency people discover it would be much worse for everyone. I was right about him…."

"So do you think he's safe to handle it?"

"Can't be sure, but I think so."

* * * * *

The conspirators gathered in the quantum lab again after dinner for the animal test. Prof. Bubna looked around warily, apparently feeling odd that his lab had been taken over by outlaw grad students and used for unapproved experiments. Justin introduced him, and he seemed to relax a bit with Samantha. Justin thought, *she's soothing if she likes you, at least.* Rasna struck up a conversation with Steve; Justin recalled something about their dating briefly.

Ben came in last. Steve opened the front panel and set up the console. For the newcomers' benefit, he quickly went through his favorite Earth locations. Then he set it for the planet at 61 Pegasi.

"We've taken to calling it New Earth," he said. The view was again

sunny and lush. “Almost a perfect duplicate of Earth, perhaps a little younger. And with two smaller moons instead of one large one.”

Bubna spoke up. “How extensive a survey have you done?”

“Not very,” Steve responded. “We’ve looked around this area mostly. Some slow-moving small animals but no obvious dangers. We can map the planet using the device, but haven’t had time yet—we need more people to do all these things! And we’re about to see if it’s even safe to cross the gateway, using our little friend here.” He held up a mouse wriggling in a mesh bag.

“I guess it would be wise to be sure it is safe for an animal before planning to use it ourselves,” Bubna said.

Steve typed at the console. “I’m resetting the parameters to allow solid objects to cross the gateway plane. The air pressure there is slightly lower, so expect a slight breeze from here to there.” He hit the return key, and something changed—not visibly, but in the quality of sound in the room. The air did seem to move a bit toward the machine. “I haven’t figured out yet how to set the parameters to keep a pressure difference from pushing air through. Not a huge problem for this site, but it will be, even on Earth itself, like at higher elevations.”

Samantha said, “Can you hear that? A kind of rustling?” They listened. There was a faint sound, not leaves but something like them, rustling in the light breeze they could see through the gateway.

“Well, time for our friend here to try it out,” Justin said, taking the bagged mouse from Steve and fastening the bag to the end of the pole with a metal tie. He again stood behind the console and slowly pushed the end of the pole through the gateway as they all watched the mouse.

Closer and closer, and moving even more slowly. As the mouse crossed the plane, a high-pitched squeal filled the room; the mouse convulsed and then went still, and silent.

"That didn't sound good," Steve said.

Justin brought the pole slowly back into the room. The limp body of the mouse accused them; no one needed to check that it was dead.

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The mood was grim.While the rest spoke quietly with each other, Steve and Justin went to the back of the lab to discuss the problem. Justin said, "It didn't die from the atmosphere or being on the planet. It died crossing the gateway plane."

"That's what it looked like. Even a poison in the atmosphere would have taken longer to affect it."

"The camera came through without a problem. What's different about an animal?"

"Maybe neurons are especially sensitive to transition issues. Wires, solid objects, no problem, but neurons transferred through might have their firings interrupted or something. If you think in particle terms, all sorts of local fields are being mediated by short-lived particles, to a level we don't understand yet. I have the transit plane tolerance set to about the size of a nucleon; maybe it should be much finer, so detachment and attachment occur much more quickly. Let me fiddle with it…"

Justin watched him review and change some of the parameters to the transition program. Thinking it would take awhile, he went back to break it to the others. Samantha and Rasna looked unhappy, talking

to Bubna, while Ben stood silently listening. "Listen," Justin said, "Steve thinks neural transmissions might be disrupted by crossing, but he thinks he can adjust the program to keep them more continuous…"

"And… done!" Steve said, turning to them. "I had already thought of this but forgot to change the parameters. I bet that fixes it." He looked over to the dead mouse on the table. "Sorry, little guy. Or girl."

Steve loaded the new program to the device and reopened the gateway. They tried again with another mouse. This time, the mouse kept wriggling, didn't squeak, and came back as apparently alive as ever. Justin suggested a longer-term test, so they put the mouse back in the cage with the others, then used the pole to lower the cage and its inhabitants to the ground of New Earth. They left the mice there with the camera recording it all, and shut down the lab for the night.

The next day, Steve and Justin were relieved to see the mice had made it through the planet's night, uneaten and healthy. The recordings showed them moving about, then sleeping, then waking, with no appearances by local animals. Justin retrieved them and added new food to the cage before returning them to the back storage room. Steve commented, "It is probably a bad idea for any complex nervous system to transit the gateway at a high rate of speed which could overload the program. I should put that in the notes…."

Prof. Wilson

Walter Wilson was getting used to the routine. They woke him early, fed him, and took him to a lab where he was strapped to a chair and watched movies. Some were full-length films, some short clips. Sometimes he wept for no reason, and other times he was thrilled and excited by the stories. They were surprisingly involving, and he found himself looking forward to the sessions.

Then they fed him again and let him exercise. And after that he was left alone for the rest of the day. They had stopped forcing him to take so many pills, and his head had cleared enough in a few days to start to feel bored. He asked for books and wrote in the notebooks they had given him, but since he had no idea who might end up reading them, he stuck to thoughts on his projects and lists of things to be done when they let him get back to work.

The days passed. He remembered someone had told him while he was fuzzy that he would be released soon. “Soon” seemed to be a long time.

Part Three: Appendices

Coming in Substrate Wars, Book 2

I have started work on the rest of the Substrate Wars series, but finishing those depends on getting a reasonably warm reception and good readership for this one. So if you enjoyed this book and want to see more, please take the time and review this book at Amazon and other online sites and recommend it to your friends. It's very important and much appreciated.

In the next installment, Earth governments strike and New Earth defends itself. Steve Duong, Justin Smith, Samantha West, and Ben Ramirez take on the world, with help from some new friends. And new enemies appear—those mysterious Chinese spies are just the tip of a power-hungry iceberg.

In the meantime, follow news on my progress and postings by signing up for email notification at substratewars.com.

Notes on Politics

What is fascism?

From Wikipedia, where the definition focuses on the 1930s fascisms seen in Italy, Germany, and Spain:

> Fascists sought to unify their nation through an authoritarian state that promoted the mass mobilization of the national community and were characterized by having leadership that initiated a revolutionary political movement aiming to reorganize the nation along principles according to fascist ideology.[6]

The Wikipedia definition goes on to list other characteristics, notably that fascism of that day "replaced socialism's focus on class conflict with a focus on conflict between nations and races."

As Mark Twain noted, "History doesn't repeat itself, but it does rhyme." The fascism of Substrate Wars is built on exploiting tribal divisions, but not between states so as much as between races and the sexes, and between an anointed class of academic and government-class progressives ("the Clerisy") and the private economy. The scapegoating of some groups and relentless attacks on them as manipulators who are harming the oppressed and stealing from the common people is aimed at different groups, but the basic mecha-

nism remains.

We see this today in schizophrenic demonization of the wealthy "one-percenters" at the same time there is continuing support by many of the same politicians of Wall Street's artificially high share of the economy. The Federal Reserve's efforts to limit the stock market crash of 2000 and the 9/11 panic produced a real estate bubble and ensuing debt crisis, but instead of reforming the systemic problems that caused the crash and paying down the bad debts, the world's central banks and politicians have tried to artificially reflate the economy with even more debt, and as of this writing the US debt has climbed to $18 trillion. When actuarially sound and realistic accounting is applied to pension and Medicare obligations of state and federal governments, future taxes to pay the debts down at more realistic interest rates would have to rise to over 50% of incomes, closing on 100% in some states, a level so high it would depress actual tax revenues collected. Meaning some sort of debt repudiation—either hyperinflating it away or default—is likely.

And in the US, the two parties are deeply entrenched in local and state politics and election supervision, and the law is written to discourage any new parties or independent candidates. The increasing partisan warfare has set people of good will who largely agree on most matters against each other, with the worst behavior of each party presented as entertainment to partisans of the other. The hatred and obsessive preoccupation with demonization of the other party disguises an important fact: if it were not for that party you hate so much, full of stupid, evil, and ignorant people you disdain, your party would become as corrupt as it is in those states where one party dominates. And the chances of governments run by one party investigating and reforming themselves is low. Some pundits admire China, where one party rules and Gets Things Done; but corruption is an enormous problem there, and will likely bring them down eventually. So, partisans, be grateful for those jerks in the other party—*they keep*

your people honest.

I have many friends who work for government agencies—teachers, scientists, managers. They tell me they work hard and do valuable work, and I know they are conscientious and well-meaning. But when they spend much of their time in meetings and fighting other parts of the bureaucracy; when they write thousands of pages of reports and laws that no one reads; when their function is not essential to defense, law enforcement, or some other core function only government can handle, it's a tax-funded, permanent bureaucracy that squeezes out private alternatives and ensures that competition can never improve efficiency. I salute my hard-working friends who are public servants—but most of their time is actually spent serving the interests of the state and not the people.

In the sectors of the economy that aren't run or heavily regulated by governments, efficiencies constantly increase as competition and innovation combine. In sectors run by politicized regulation or directly by governments, innovation is very slow and relative costs of services continue to rise. Examples: education, medical services, defense, social services. Student loan debt is breaking the backs of young people; college administrators are higher-paid than ever, and there are more of them. Hospitals expand and merge and pay administrators huge salaries while charging astronomical fees for simple services. Military contracting is padded and turned into pork for Congressional districts. The space shuttle boosters blew up because they had to be made in segments to allow the contracts to be spread across districts. *These are all consequences of politicized decisionmaking processes.*

A notable example is universal public schooling. No one thinks education is a bad idea, and local public and private schools competed in the US until the mid-1800s. Then states began to take more control, aiming to raise standards and make the curriculum more

uniform, on a Prussian model which viewed children as raw material to be molded into good workers and citizens with allegiance to the state.

The public education system evolved, and local control was reduced. Families found themselves taxed heavily to pay for the public system, which was "free" to them, and naturally chose not to pay twice to get education that was more directly tailored to their children's needs or family desires. Thus an important link between parental concern and schools was broken—schools, like all other institutions, ultimately serve the concerns of those who fund them, not their clients. In many school districts now, parents are given lip service but opposed whenever they try to support reforms.

And schools beholden to politicians and unions of their workers can be both expensive and truly awful. The worst result of this is that children are now learning very little history, economics, or science, and rigor has suffered. The least damaging solution is vouchers—give every student the money now being spent on their education to spend on any school their parents deem fit that passes reasonable standards. Public schools would have to compete with private and charter schools, and all would benefit—except possibly overpaid public school administrators. Resistance to this idea is fierce, of course.

So that was a key mistake which allowed the population to be programmed with the idea that more government is the solution for every problem. Fixing it will take time, and the system will most likely crash before rebooting.

And as recent graduates of this political indoctrination system have taken most of the positions in government, academia, and mass media, the commitment to truth has suffered. An entire society has been dumbed down.

Visit substratewars.com or jebkinnison.com for more material on politics, economics, education, and civilization.

Notes on Science

If you're a theoretical physicist, you'll note I am taking liberties with the science. But only a little—and the plot is very much real science. Steve Duong discovers something unexpected, creates a new hypothesis which explains his anomalous results, then confirms his hypothesis by further experimentation. I don't personally believe we live in a universe where giant quasiparticles can talk to every other particle in the universe and ask them to attach to new partners, but *it could be so.* We are always just one experiment away from a revolution in understanding. And it will likely be something equally unexpected that allows us to travel to the stars.

I have the Grey Tribe communicating by using encrypted messages embedded in public web site photo streams. For a similar app available now, see Crypstagram.[7] There are several messaging apps that are encrypted currently, for example Whatsapp.[8] But in this future State of Emergency, standard encryption of messages and email has been outlawed, and phone companies and apps are not allowed to secure user data against surveillance. There are high officials in the US government at this writing asking that all phones be searchable for law enforcement purposes, and we can expect more efforts to outlaw encryption. "When encryption is outlawed, only outlaws will have encryption!"

On the attempts to find a cellular automaton model that explains

quantum physics, this is the abstract of one interesting paper: "Quantum Field as a Quantum Cellular Automaton I: The Dirac free evolution in one dimension":

> It is shown how a quantum cellular automaton can describe very precisely the Dirac evolution, without requiring Lorentz covariance. The automaton is derived with the only assumptions of minimal dimension and parity and time-reversal invariance. The automaton extends the Dirac field theory to the Planck and ultrarelativistic scales. The Dirac equation is recovered in the usual particle physics scale of inertial mass and momenta. In this first paper the simplest case of one space dimension is analyzed. We provide a technique to derive an analytical approximation of the evolution of the automaton in terms of a momentum-dependent Schrödinger equation. Such approximation works very well in all regimes, including ultrarelativistic and Planckian, for the typical smooth quantum states of field theory with limited bandwidth in momentum. Finally we discuss some thought experiments for falsifying the existence of the automaton at the Planck scale.[9]

Real quantum computing is still in its infancy. Efforts so far have been plagued by noise and the small number of qubits available—the current state of the art is 4! Researchers—and especially outside evaluations—find it hard to tell whether current quantum computers are actually doing quantum computation. This is an area where many discoveries are likely to clarify quantum phenomenon, and perhaps, as in this story, open up completely new vistas on how the universe is organized.

If you are already familiar with the basics of quantum phenomena and want to learn more about quantum computing, the Wikipedia articles[10] on the field are excellent places to start.

Artificial Life is a kind of computational model of the biology of life as we know it. Starting with very simple worlds,[11] models have become more and more sophisticated to the point where significant discoveries about emergent features are being made. Larger, faster

simulations feature co-evolving organisms in ecosystems and environments that have been molded by biological processes. Wikipedia is a good place to start learning about the field.[12]

The abstract of a current paper, "Indefinitely Scalable Computing = Artificial Life Engineering," by David H. Ackley and Trent R. Smallon, on the state of research and ideas on applying ALife concepts to general computer architecture:

> The traditional CPU/RAM computer architecture is increasingly unscalable, presenting a challenge for the industry—and is too fragile to be securable even at its current scale, presenting a challenge for society as well. This paper argues that new architectures and computational models, designed around software-based artificial life, can offer radical solutions to both problems. The challenge for the soft alife research community is to harness the dynamics of life and complexity in service of robust, scalable computations—and in many ways, we can keep doing what we are doing, if we use indefinitely scalable computational models to do so. This paper reviews the argument for robustness in scalability, delivers that challenge to the soft alife community, and summarizes recent progress in architecture and program design for indefinitely scalable computing via artificial life engineering.[13]

The Red Queen hypothesis is one of the key concepts of modern evolutionary biology.[14]

Quotes from Golden Age Science Fiction

I learned much of what I know by reading science fiction. For my younger readers, many of the quoted titles and authors below will be unfamiliar, but they are still worth seeking out and reading from a time when anything seemed possible. The long tradition of social tolerance and advanced thinking in science fiction has been under attack by ignorant academics who want to turn all entertainment into propaganda for their idea of progressive thought. Read widely and route around the schools and libraries who want to program your thinking by restricting what they offer you to read.

These quotes seemed especially suited to the themes of this story:

Gully Foyle is my name
And Terra is my nation
Deep space is my dwelling place
The stars my destination
—Alfred Bester, *The Stars My Destination,* 1956

In brightest day, in blackest night,
No evil shall escape my sight.
Let those who worship evil's might,
Beware my power, Green Lantern's light!
—Alfred Bester, writing for *Green Lantern*, c. 1945

Every law that was ever written opened up a new way to graft.
—Robert Heinlein, *Red Planet,* 1949

How anybody expects a man to stay in business with every two-bit wowser in the country claiming a veto over what we can say and can't say and what we can show and what we can't show—it's enough to make you throw up. The whole principle is wrong; it's like demanding that grown men live on skim milk because the baby can't eat steak.
—Robert Heinlein, *The Man Who Sold the Moon*, 1950

Reason is poor propaganda when opposed by the yammering, unceasing lies of shrewd and evil and self-serving men.
—Robert Heinlein, *Assignment in Eternity,* 1953

I also think there are prices too high to pay to save the United States. Conscription is one of them. Conscription is slavery, and I don't think that any people or nation has a right to save itself at the price of slavery for anyone, no matter what name it is called. We have had the draft for twenty years now; I think this is shameful. If a country can't save itself through the volunteer service of its own free people, then I say : Let the damned thing go down the drain!
—Robert Heinlein, speech at World Science Fiction Convention, 1961

I believe in—I am proud to belong to—the United States. Despite shortcomings, from lynchings to bad faith in high places, our nation has had the most decent and kindly internal practices and foreign policies to be found anywhere in history.

And finally, I believe in my whole race. Yellow, white, black, red, brown—in the honesty, courage, intelligence, durability … and goodness … of the overwhelming majority of my brothers and sisters everywhere on this planet. I am proud to be a human being. I believe that we have come this far by the skin of our teeth, that we always

make it just by the skin of our teeth—but that we will always make it … survive … endure. I believe that this hairless embryo with the aching, oversize brain case and the opposable thumb, this animal barely up from the apes, will endure—will endure longer than his home planet, will spread out to the other planets, to the stars, and beyond, carrying with him his honesty, his insatiable curiosity, his unlimited courage—and his noble essential decency. This I believe with all my heart.
—Robert Heinlein, "This I Believe," 1952

The future is better than the past. Despite the crepehangers, romanticists, and anti-intellectuals, the world steadily grows better because the human mind, applying itself to environment, makes it better. With hands...with tools...with horse sense and science and engineering.
—Robert Heinlein, *The Door Into Summer*, 1957

"…They have no art and only the most primitive of science, yet such is their violent nature that even with so little knowledge they are now energetically using it to exterminate each other, tribe against tribe. Their driving will is such that they may succeed. But if by some unlucky chance they fail, they will inevitably, in time, reach other stars. It is this possibility which must be calculated: how soon they will reach us, if they live, and what their potentialities will be then."

The voice continued to us: "This is the indictment against you—your own savagery, combined with superior intelligence. What have you to say in your defense?"….

"—you say we have no art. Have you seen the Parthenon?"

"Blown up in one of your wars."

"Better see it before you rotate us—or you'll be missing something.

Have you read our poetry? 'Our revels now are ended: these our actors, as I foretold you, were all spirits, and are melted into air, into thin air: And, like the baseless fabric of this vision, the cloud-capped towers, the gorgeous palaces, the solemn temples, the great globe itself... Itself—yea—all which it ... Inherit—shall dissolve—"

I broke down. I heard Peewee sobbing beside me. I don't know why I picked that one-but they say the subconscious mind never does things "accidentally." I guess it had to be that one.

"As it well may," commented the merciless voice.
—Robert Heinlein, *Have Space Suit—Will Travel,* 1958

"My mother said violence never solves anything." "So?" Mr. Dubois looked at her bleakly. "I'm sure the city fathers of Carthage would be glad to know that."
—Robert Heinlein, *Starship Troopers,* 1959

Must be a yearning deep in human heart to stop other people from doing as they please. Rules, laws—always for other fellow. A murky part of us, something we had before we came down out of trees, and failed to shuck when we stood up. Because not one of those people said: Please pass this so that I won't be able to do something I know I should stop. Nyet, tovarishchee, was always something they hated to see neighbors doing. Stop them for their own good.
— Robert Heinlein, *The Moon is a Harsh Mistress,* 1966

I began to sense faintly that secrecy is the keystone of all tyranny. Not force, but secrecy...censorship. When any government, or any church for that matter, undertakes to say to its subjects, "This you may not read, this you must not see, this you are forbidden to know," the end result is tyranny and oppression, no matter how holy the motives. Mighty little force is needed to control a man whose mind has been hoodwinked; contrariwise, no amount of force can control a free

man, a man whose mind is free. No, not the rack, not fission bombs, not anything — you can't conquer a free man; the most you can do is kill him.
—Robert Heinlein, *If This Goes On—,* 1940

First they junked the concept of "justice." Examined semantically "justice" has no referent—there is no observable phenomenon in the space-time-matter continuum to which one can point, and say, "This is justice." Science can deal only with that which can be observed and measured. Justice is not such a matter; therefore it can never have the same meaning to one as to another; any "noises" said about it will only add to confusion.

But damage, physical or economic, can be pointed to and measured. Citizens were forbidden by the Covenant to damage another. Any act not leading to damage, physical or economic, to some particular person, they declared to be lawful.
—Robert Heinlein, *Coventry,* 1940

Sure, ninety percent of science fiction is crud. That's because ninety percent of everything is crud.
—Theodore Sturgeon, 1951

Here, too, was the guide, the beacon, for such times as humanity might be in danger; here was the Guardian of Whom all humans knew—not an exterior force, nor an awesome Watcher in the sky, but a laughing thing with a human heart and a reverence for its human origins, smelling of sweat and new-turned earth rather than suffused with the pale odor of sanctity.
—Theodore Sturgeon, *More Than Human,* 1953

Earth keeps a solemn festival at the meadows of Hack and Sack, through whose blue arch came first death, and then life.
—Theodore Sturgeon, "The Incubi of Parallel X," Planet Stories, 1951

The fall of Empire, gentlemen, is a massive thing, however, and not easily fought. It is dictated by a rising bureaucracy, a receding initiative, a freezing of caste, a damming of curiosity—a hundred other factors. It has been going on, as I have said, for centuries, and it is too majestic and massive a movement to stop.
—Isaac Asimov, *Foundation,* 1951

Quotes about Government

Some ideas are so stupid that only an intellectual could believe them. —Either George Orwell or Michael Levine

The whole aim of practical politics is to keep the populace alarmed (and hence clamourous to be led to safety) by menacing it with an endless series of hobgoblins, all of them imaginary. —H.L. Mencken

Love your country, but never trust its government. —Robert A. Heinlein

The most dangerous man to any government is the man who is able to think things out for himself, without regard to the prevailing superstitions and taboos. Almost inevitably he comes to the conclusion that the government he lives under is dishonest, insane and intolerable, and so, if he is romantic, he tries to change it. And even if he is not romantic personally he is very apt to spread discontent among those who are. —H.L. Mencken, from "The Smart Set" (December 1919)

Of such sort are the young wizards who now sweat to save the plain people from the degradations of capitalism, which is to say, from the degradations of working hard, saving their money, and paying their way. This is what the New Deal and its Planned Economy come to in practice—a series of furious and irrational raids upon the taxpayer,

planned casually by professional do-gooders lolling in smoking cars, and executed by professional politicians bent only upon building up an irresistible machine. This is the *Führer's* inspired substitute for constitutional government and common sense. —H.L. Mencken, "The New Deal," 1935

[The aim of public education is not] to fill the young of the species with knowledge and awaken their intelligence. ... Nothing could be further from the truth. The aim ... is simply to reduce as many individuals as possible to the same safe level, to breed and train a standardized citizenry, to put down dissent and originality. That is its aim in the United States... and that is its aim everywhere else. —H.L. Mencken, *The American Mercury,* April 1924

How did we evolve from a country whose founding statesmen were adamant about the dangers of armed, standing government forces—a country that enshrined the Fourth Amendment in the Bill of Rights and revered and protected the age-old notion that the home is a place of privacy and sanctuary—to a country where it has become acceptable for armed government agents dressed in battle garb to storm private homes in the middle of the night—not to apprehend violent fugitives or thwart terrorist attacks, but to enforce laws against nonviolent, consensual activities? —Radley Balko, *Rise of the Warrior Cop: The Militarization of America's Police Forces,* 2013

Socialism, like the ancient ideas from which it springs, confuses the distinction between government and society. As a result of this, every time we object to a thing being done by government, the socialists conclude that we object to its being done at all. We disapprove of state education. Then the socialists say that we are opposed to any education. We object to a state religion. Then the socialists say that we want no religion at all. And so on, and so on. It is as if the socialists were to accuse us of not wanting persons to eat because we do not want the state to raise grain. —Frédéric Bastiat, *The Law,* 1850

[The socialists declare] that the State owes subsistence, well-being, and education to all its citizens; that it should be generous, charitable, involved in everything, devoted to everybody; ...that it should intervene directly to relieve all suffering, satisfy and anticipate all wants, furnish capital to all enterprises, enlightenment to all minds, balm for all wounds, asylums for all the unfortunate, and even aid to the point of shedding French blood, for all oppressed people on the face of the earth.

Who would not like to see all these benefits flow forth upon the world from the law, as from an inexhaustible source? … But is it possible? … Whence does [the State] draw those resources that it is urged to dispense by way of benefits to individuals? Is it not from the individuals themselves? How, then, can these resources be increased by passing through the hands of a parasitic and voracious intermediary?

...Finally…we shall see the entire people transformed into petitioners. Landed property, agriculture, industry, commerce, shipping, industrial companies, all will bestir themselves to claim favors from the State. The public treasury will be literally pillaged. Everyone will have good reasons to prove that legal fraternity should be interpreted in this sense: "Let me have the benefits, and let others pay the costs." Everyone's effort will be directed toward snatching a scrap of fraternal privilege from the legislature. The suffering classes, although having the greatest claim, will not always have the greatest success. —Frédéric Bastiat, *Justice and Fraternity,* 1848

The world in which we Westerners live today has grave faults and dangers, but when compared to the countries and times in which democracy is smothered it has a tremendous advantage: everyone can know everything about everything. Information today is the “fourth estate.” In an authoritarian state it is not like this. There is only one Truth, proclaimed from above. The newspapers are all alike; they all

repeat the same one truth. Propaganda is substituted for information. It is clear that under these conditions it becomes possible (though not always easy: it is never quite easy to do deep violence to human nature) to erase quite large chunks of reality. —Primo Levi

The more men know, the smaller the share of all that knowledge becomes that any one mind can absorb. The more civilized we become, the more relatively ignorant must each individual be of the facts on which the working of his civilization depends. The very division of knowledge increases the necessary ignorance of the individual of most of this knowledge. —F.A. Hayek, *The Constitution of Liberty,* 1960

Once definitely done with our adolescent longing for the Absolute, we would find this world valuable after all, and poignantly valuable precisely because it is not eternal. Doomed to extinction, our loves, our work, our friendships, our tastes are all painfully precious. We look about us, on the streets and in the subways, and discover that we are beautiful because we are mortal, priceless because we are so rare in the universe and so fleeting. Whatever we are, whatever we make of ourselves: that is all we will ever have—and that, in its profound simplicity, is the meaning of life. —Philip Appleman, *The Labyrinth: God, Darwin, and the Meaning of Life*, 2014

Further Reading

Online Resources

You'll find updates on the next book in the series at SubstrateWars.com, where you can sign up for email notification of the latest news on the books and postings on science and technology and topics from my other books.

Email me at JebKinnison@gmail.com if you have questions or comments. I try to answer every email.

Please visit the updated list of online resources at SubstrateWars.com.

Prof. Wilson's *Starspark* poster episode is based on the real-life *Firefly* poster episode at the University of Wisconsin-Stout, where FIRE was able to assist in getting the administration to back down.

FIRE (The Foundation for Individual Rights in Education at www.thefire.org) has been fighting for campus freedom of speech and thought for many years. If you're a student and have a problem with an administration that tries to stifle speech or too easily accedes to the demands of Social Justice Warriors to limit debate on important issues, they're the people to talk to.

And it so happens that the fictional Students for Liberty (StudentsForLiberty.org) is mirrored in real life. Join while it's still legal!

Reason.com is the online presence of *Reason* magazine, the magazine of "free minds and free markets," presenting news and essays free of the talking points of political parties. They're not even sure they agree with libertarians! Call them classical liberals….

The Foundation for Economic Education (FEE at fee.org) is one of

the oldest free-market organizations in the United States. Their site is well worth your time.

The Cato Institute at www.cato.org is a "public policy research organization—a think tank–dedicated to the principles of individual liberty, limited government, free markets and peace."

Recommended Books

In recent years, classic science fiction ideas have been echoed in so much popular entertainment that many seem familiar. But the original mind-stretching quality is poorly duplicated in movies like the Matrix series, and for really expansive looks at the future, you can't beat some of these originals. And meanwhile, the decline of legacy publishing and its dominance by academics has produced a crop of "socially relevant" science fiction that is short on optimism and technical imagination, and values story less than political content. So try some of these to get an idea of true diversity.…

The best Heinlein juveniles, perfect for that 10- to 16-year-old who likes adventure:

Have Spacesuit, Will Travel
Tunnel in the Sky
Citizen of the Galaxy

For more mature adolescents (and adults, too):

Door Into Summer
Starship Troopers
The Moon is a Harsh Mistress

Alice Mary Norton, writing as Andre Norton, wrote numerous adventure science fiction books of interest to younger readers that are still good reading, and cheap in Kindle form: see, for example, *The Andre Norton Megapack: 15 Classic Novels and Short Stories.*

Other selected adult science fiction classics that are still relevant:

Foundation, Isaac Asimov
The Stars My Destination, Alfred Bester

Shards of Honor (Vorkosigan Saga Book 2), Lois McMaster Bujold
Childhood's End, Arthur C. Clarke
The City and the Stars, Arthur C. Clarke
Neuromancer, William Gibson
The Forever War, Joe Haldemann
Dune, Frank Herbert
Ringworld, Larry Niven
The Mote in God's Eye, Larry Niven and Jerry Pournelle
Snow Crash, Neal Stephenson
Lord of Light, Roger Zelazny

… That should be enough to get a new reader started. And also explore Greg Bear, Harlan Ellison, C.J. Cherryh, David Gerrold, Philip K. Dick, Dan Simmons, Neal Asher, Iain Banks, Walter Jon Williams, Vernor and Joan Vinge….—there are too many great writers to list!

For more recommended books, go to jebkinnison.com/curriculum/.

About the Author

I grew up in the Midwest. I read everything I could in the school and town library, and discovered science fiction in second grade, starting with Tom Swift books and quickly moving to Heinlein juveniles and adult science fiction.

When I was twelve, I discovered the collection of city telephone books in my local library. I pretended I was doing a paper and called Isaac Asimov; we spoke for a long time, and he sent me a postcard encouraging me to write. So thank you, Isaac, wherever you are, for being so kind and generous with your time. Robert Silverberg had no time for that kind of nonsense…

I studied computer and cognitive science at MIT, and wrote programs modeling the behavior of simulated stock traders and the population dynamics of economic agents. Later I did supercomputer work at a think tank that developed parts of the early Internet (where the engineer who decided on '@' as the separator for email addresses worked down the hall.) Since then I have had several careers—real estate development, financial advising, and counselling.

I retired from financial advising a few years ago and have done some work in energy conservation (ask me about two-stage evaporative coolers!) and relationship issues. My books on attachment theory have done well enough to try fiction again, and the Substrate Wars series is the result.

I recently visited the Mormon genealogical web site, which shows me as a descendant of Eleanor of Aquitaine, Edward I Plantagenet (King of England!), William the Conqueror (who you might remember from such historical events as the Norman Conquest of 1066), and Rollo the Viking. It appears that my ancestors in between lost track of their money, lands, and power, so I was brought up in "reduced

circumstances."

Visit my web site at JebKinnison.com for more: rail guns, Nazi scientists, the wreck of the Edmund Fitzgerald, the 1980s AI bubble, and current research in relationships, attachment types, diet, and health.

Visit the Substrate Wars website at SubstrateWars.com for more on upcoming books, physics, and the politics of the future.

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I'm also grateful to the readers who wrote me about my first two books on relationship issues and expressed their appreciation.

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[1] "[The] Grey Tribe [is] typified by libertarian political beliefs, Dawkins-style atheism, vague annoyance that the question of gay rights even comes up, eating paleo, drinking Soylent, calling in rides on Uber, reading lots of blogs… [and] getting conspicuously upset about the War on Drugs and the NSA…" —Scott Alexander, "I Can Tolerate Anything Except the Outgroup," SlateStarCodex.com.
http://slatestarcodex.com/2014/09/30/i-can-tolerate-anything-except-the-outgroup/

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