

# Manna

## Chapter 1

by [Marshall Brain](#)

Depending on how you want to think about it, it was funny or inevitable or symbolic that the robotic takeover did not start at MIT, NASA, Microsoft or Ford. It started at a Burger-G restaurant in Cary, NC on May 17, 2010. It seemed like such a simple thing at the time, but May 17 marked a pivotal moment in human history.

Burger-G was a fast food chain that had come out of nowhere starting with its first restaurant in 2001. The Burger-G chain had an attitude and a style that said "hip" and "fun" to a wide swath of the American middle class. The chain was able to grow with surprising speed based on its popularity and the public persona of the young founder, Joe Garcia. By 2010 the chain had 1,000 outlets in the U.S. and showed no signs of slowing down. If the trend continued, Burger-G would soon be one of the "Top 5" fast food restaurants in the U.S.

The "robot" installed at this first Burger-G restaurant looked nothing like the robots of popular culture. It was not hominid like C-3PO or futuristic like R2-D2 or industrial like an assembly line robot. Instead it was simply a PC sitting in the back corner of the restaurant running a piece of software. The software was called "Manna", version 1.0\*.

Manna's job was to manage the store, and it did this in a most interesting way. Think about a normal fast food restaurant circa 2000. There was a group of employees who worked at the store, typically 50 people in a normal restaurant who rotated in and out on a weekly schedule. The people did everything from making the burgers to taking the orders to cleaning the tables and taking out the trash. All of these employees reported to the store manager and a couple of assistant managers. The managers hired the employees, scheduled them and told them what to do each day. This was a completely normal arrangement. In 2000, there were millions of businesses that operated in this way.

Circa 2000, the fast food industry had a problem, and Burger-G was no different. The problem was the quality of the fast food experience. Some restaurants were run perfectly. They had courteous and thoughtful crew members, clean restrooms, great customer service and high accuracy on the orders. Other restaurants were chaotic and uncomfortable to customers. Since one bad experience could turn a customer off to an entire chain of restaurants, these poorly-managed stores were the Achilles heel of any chain.

To solve the problem, Burger-G contracted with a software consultant and commissioned a piece of software. The goal of the software was to replace the managers and tell the employees what to do in a more controllable way. Manna version 1.0 was born.

Manna was connected to the cash registers, so it knew how many people were flowing through the restaurant. The software could therefore predict with uncanny accuracy when the trash cans would fill up, the toilets would get dirty and the tables needed wiping down. The software was also attached to the time clock, so it knew who was working in the restaurant. Manna also had "help buttons" throughout the restaurant. Small signs on the buttons told

customers to push them if they needed help or saw a problem. There was a button in the restroom that a customer could press if the restroom had a problem. There was a button on each trashcan. There was a button near each cash register, one in the kiddie area and so on. These buttons let customers give Manna a heads up when something went wrong.

At any given moment Manna had a list of things that it needed to do. There were orders coming in from the cash registers, so Manna directed employees to prepare those meals. There were also toilets to be scrubbed on a regular basis, floors to mop, tables to wipe, sidewalks to sweep, buns to defrost, inventory to rotate, windows to wash and so on. Manna kept track of the hundreds of tasks that needed to get done, and assigned each task to an employee one at a time.

Manna told employees what to do simply by talking to them. Employees each put on a headset when they punched in. Manna had a voice synthesizer, and with its synthesized voice Manna told everyone exactly what to do through their headsets. Constantly. Manna micro-managed minimum wage employees to create perfect performance.

The software would speak to the employees individually and tell each one exactly what to do. For example, "Bob, we need to load more patties. Please walk toward the freezer."

Or, "Jane, when you are through with this customer, please close your register. Then we will clean the women's restroom."

And so on. The employees were told exactly what to do, and they did it quite happily. It was a major relief actually, because the software told them precisely what to do step by step.

For example, when Jane entered the restroom, Manna used a simple position tracking system built into her headset to know that she had arrived. Manna then told her the first step.

Manna: "Place the 'wet floor' warning cone outside the door please."

When Jane completed the task, she would speak the word "OK" into her headset and Manna moved to the next step in the restroom cleaning procedure.

Manna: "Please block the door open with the door stop."

Jane: "OK."

Manna: "Please retrieve the bucket and mop from the supply closet."

Jane: "OK."

And so on.

Once the restroom was clean, Manna would direct Jane to put everything away. Manna would make sure that she carefully washed her hands. Then Manna would immediately start Jane working on a new task. Meanwhile, Manna might send Lisa to the restroom to inspect it and make sure that Jane had done a thorough job. Manna would ask Lisa to check the toilets,

the floor, the sink and the mirrors. If Jane missed anything, Lisa would report it.

I grew up in Cary, NC. That was a long time ago, but when I was a kid I lived right in the middle of Cary with my parents. My father was a pilot for a big airline. My mother was a stay-at-home mom and I had a younger sister. We lived in a typical four bedroom suburban home in a nice neighborhood with a swimming pool in the backyard. I was a 15 year-old teenager working at the Burger-G on May 17 when the first Manna system came online.

I can remember putting on the headset for the first time and the computer talking to me and telling me what to do. It was creepy at first, but that feeling really only lasted a day or so. Then you were used to it, and the job really did get easier. Manna never pushed you around, never yelled at you. The girls liked it because Manna didn't hit on them either. Manna simply asked you to do something, you did it, you said, "OK", and Manna asked you to do the next step. Each step was easy. You could go through the whole day on autopilot, and Manna made sure that you were constantly doing something. At the end of the shift Manna always said the same thing. "You are done for today. Thank you for your help." Then you took off your headset and put it back on the rack to recharge. The first few minutes off the headset were always disorienting -- there had been this voice in your head telling you exactly what to do in minute detail for six or eight hours. You had to turn your brain back on to get out of the restaurant.

To me, Manna was OK. The job at Burger-G was mindless, and Manna made it easy by telling you exactly what to do. You could even get Manna to play music through your headphones, in the background. Manna had a set of "stations" that you could choose from. That was a bonus. And Manna kept you busy the entire day. Every single minute, you had something that Manna was telling you to do. If you simply turned off your brain and went with the flow of Manna, the day went by very fast.

My father, on the other hand, did not like Manna at all from the very first day he saw me wearing the headset in the restaurant. He and Mom had come in for lunch and to say hi. I knew they were coming, so I had timed my break so I could sit down with them for a few minutes. When I sat down, my father noticed the headset.

"So", he said, "they have you working the drive-thru I see. Is that a step up or a step down?"

"It's not the drive-thru," I replied, "it's a new system they've installed called Manna. It manages the store."

"How so?"

"It tells me what to do through the headset."

"Who, the manager?"

"No, it's a computer."

He looked at me for a long time, "A computer is telling you what to do on the job? What

does the manager do?"

"The computer is the manager. Manna, manager, get it?"

"You mean that a computer is telling you what to do all day?", he asked.

"Yeah."

"Like what?"

I gave him an example, "Before you got here, I was taking out the trash. Manna told me how to do it."

"What did it say?"

"It tells you exactly what to do. Like, It told me to get four new bags from the rack. When I did that it told me to go to trash can #1. Once I got there it told me to open the cabinet and pull out the trash can. Once I did that it told me to check the floor for any debris. Then it told me to tie up the bag and put it to the side, on the left. Then it told me to put a new bag in the can. Then it told me to attach the bag to the rim. Then it told me to put the can back in and close the cabinet. Then it told me to wipe down the cabinet and make sure it's spotless. Then it told me to push the help button on the can to make sure it is working. Then it told me to move to trash can #2. Like that."

He looked at me for a long time again before he said, "Good Lord, you are nothing but a piece of a robot. What is it saying to you now?"

"It just told me I have three minutes left on my break. And it told me to smile and say hello to the guests. How's this? Hi!" And I gave him a big toothy grin.

"Yesterday the people controlled the computers. Now the computers control the people. You are the eyes and hands for this robot. And all so that Joe Garcia can make \$20 million per year. Do you know what will happen if this spreads?"

"No, I don't. And I think Mr. G makes more than \$20 million a year. But right now I've got two minutes left, and Manna is telling me that I need to move back to station 3 to get ready for the next run. See ya." I waved at Mom. Dad just stared at me.

The tests in our Burger-G store were surprisingly successful. There were Burger-G corporate guys in the restaurant watching us, fixing bugs in the software, making sure Manna was covering all the bases, and they were pleased. It took about 3 months to work all the kinks out, and as they did the Manna software totally changed the restaurant. Worker performance nearly doubled. So did customer satisfaction. So did the consistency of the customer's experience. Trash cans never overfilled. Bathrooms were remarkably clean. Employees always washed their hands when they needed to. Food was ready faster. The meals we handed out were nearly 100 percent accurate because Manna made us check to make sure every item in the bag was exactly what the customer ordered. The store never ran out of supplies -- there were always plenty of napkins in the dispenser and the ketchup container

was always full. There were enough employees in the store for the busy times, because Manna could accurately track trends and staff appropriately.

In addition, Burger-G saved a ton of money. In 2010, Burger-G had just over 1,000 stores in the United States. Manna worked so well that Burger-G deployed it nationwide in 2011. By 2012 Burger-G had cut more than 3,000 of its higher-paid store employees -- mostly assistant managers and managers. That one change saved the company nearly \$100 million per year, and all that money came straight to the bottom line for the restaurant chain. Shareholders were ecstatic. Mr. G gave himself another big raise to celebrate. In addition, Manna had optimized store staffing and had gotten a significant productivity boost out of the employees in the store. That saved another \$150 million. \$250 million made a huge difference in the fast food industry.

So, the first real wave of robots did not replace all the factory workers as everyone imagined. The robots replaced middle management and significantly improved the performance of minimum wage employees. All of the fast food chains watched the Burger-G experiment with Manna closely, and by 2012 they started installing Manna systems as well. By 2014 or so, nearly every business in America that had a significant pool of minimum-wage employees was installing Manna software or something similar. They had to do it in order to compete.

In other words, Manna spread through the American corporate landscape like wildfire. And my dad was right. It was when all of these new Manna systems began talking to each other that things started to get uncomfortable.

# Manna

## Chapter 2

by [Marshall Brain](#)

Once Burger-G proved that Manna worked, the idea spread like wildfire. Every restaurant chain used Manna. Every retail store, whether it was a discount store, a home improvement store, a toy store, or an office supply store, had Manna systems. You saw people wearing headsets on construction sites, in airports, at amusement parks, in hospitals, in movie theaters, at the grocery store... They were everywhere.

I can remember sitting down one day with my friend Brian at lunch. He was working at the giant discount supercenter in Raleigh, and they had just switched over to Manna. He was stunned.

"It doesn't matter if you are a hard worker or a slacker -- once you put on the headset, you are going to be working every minute of the day or you are gone. The system has already fired five people."

"What's it have you do all day?" There were something like 50 people working in the

supercenter at any given time -- it was a 200,000 square foot store.

"Manna has you moving through the store aisle by aisle. I bet I am walking six or eight miles a day right now. I am constantly straightening merchandise on the shelves. Manna knows where I am, and it knows where everything is on the shelves, so it asks me item by item to straighten them. Manna wants everything on the shelves looking perfect. It is also big on restocking. So it will ask me, 'How many rolls of masking tape are on the shelf?' Whenever anything gets low, it has me go to the back and bring stuff out to the shelves. It knows what is selling through the cash registers, so it knows exactly when to restock everything and it makes sure that every single item in the store is fully stocked."

"That doesn't sound so unusual." I said.

"It's not unusual, except that Manna is telling you exactly what to do every second of every day. If it asks you to go to the back and get merchandise, it tells you exactly where to walk to go get it. And here is the weirdest part -- I never see another employee the entire day. The way it makes me walk, I never run into anyone else. I can go for a full shift and never see another employee. Even our breaks are staggered. Everyone takes their breaks alone. We all arrive at staggered times. It's like Manna is trying to totally eliminate human interaction on the job."

"That's spooky. Why would it do that?" I asked.

Brian looked down, "I'm guessing that talking with co-workers wastes time, and Manna is eliminating the waste everywhere it can."

"What else does it have you doing?" I asked.

"I am constantly checking for spills and other problems in the aisles -- Manna uses us as its eyes to constantly look for problems. I am also looking for customers in the aisles and asking them how I can help -- customer service is huge to Manna, as long as it takes less than 30 seconds. And Manna always has us looking for shoplifters. All day long we are walking back and forth up and down the aisles straightening things, asking people if they need help and looking for shoplifters. And like I said, you never run into another employee. There's no chatting. I never see Amy anymore. Or Kevin. The minute you put on the headset you are working, and you work alone without stop until you take the headset off at the end of the shift."

"Wow." That's all I could think to say.

Brian asked, "Does Manna count you down during your breaks at Burger-G?"

"Yes, every minute you get a reminder."

Even your breaks were supervised. I had never thought about it, but all the breaks at Burger-G were staggered as well.

When Mom and I went to shop in Brian's store, you could feel the difference that Manna

made. Every two or three minutes an employee would walk past you no matter where you were in the store. The merchandise on the shelves was always neat, and everything was stocked. The floors were spotless. Shopping carts never stacked up in the parking lot. If you needed help, you knew that all you had to do was stand there and an employee would walk by in a minute or so.

As the Manna software evolved, it gained more and more responsibility. From the start Manna was able to schedule employee hours. Manna printed a piece of paper for each employee to put on the refrigerator -- it told you your hours for the week. In version 2.0 they went further. They connected Manna to the telephone network and the public email network. So Manna was able to begin calling and emailing employees and reminding them to show up on time. If an employee didn't show up, Manna could call in a replacement. If the store became unexpectedly crowded, Manna could call in reinforcements.

In version 3.0, the software gained the ability to fire employees as well. I had a friend who got fired that way. He came into the store late for his shift, and it was his third time being late. He punched in and put on his headset. He walked over to the eye scan station to log in. He said Manna sounded normal, and had him working normally for about half an hour. Then Manna asked him to walk to Zone 7 at the back of the store. A Burger-G security guy was standing there with three sheets of paper. The security guy was wearing the solid black security uniform, the opaque sunglasses and a headset integrated into the helmet. He looked back and there was another security guy standing near the door. Manna said to him, "Steven J. Canis, employee number 4378561, your employment at Burger-G store number 152 is hereby terminated in accordance with employee manual paragraph 12.1, failure to appear at work on time." Manna read him the three pages of termination information paragraph by paragraph and asked him to confirm each paragraph. He could not return to that Burger-G store for a year. He could not reapply to Burger-G for five years. Stuff like that. Manna made him sign the papers and the security guys escorted him out of the store to his car. The security guys never said a word, but Manna was talking to him during the entire walk, telling him to look down, to make no gestures, to speak to no one. The last thing Manna said to him was, "Remove your headset and hand it to the security officer on your left. Goodbye."

It didn't take long for word to get around. Pretty much, if you knew you were going to be late and you had been late before, you called Manna on your cell phone and quit. Manna emailed the forms to you, had you phone in when you got them so it could read them to you, and you signed them. It really cut down on people being late.

By version 4.0, Manna gained the ability to outsource. Let's say that Manna decided it was time to repaint the lines in the parking lot. Manna would make this decision using customer surveys and by periodically asking employees questions about the parking lot, the paint inside the store, the exterior of the store, the roof, etc. An inspector from Burger-G corporate would also come once a month and feed information about the store and grounds into the Manna system.

When Manna made the decision to repaint the stripes in the parking lot, it would call several companies and get bids. Manna did not do this on the phone, obviously. It did it electronically through the Internet. By this time, most companies were hooked into the Manna network, even if the company did not use Manna to manage employees. The two

pieces of software -- the Manna software running the Burger-G restaurant and the Manna software running the parking lot maintenance company -- would bid and negotiate through the Internet.

Because everything was done by machine, the restaurant's Manna system could send out a request for bids to all the parking lot maintenance companies in the area. Those companies would send bids back through the network. The restaurant's Manna system would then connect with hundreds of other Manna systems to check references and get feedback on past experiences with each vendor. Based on the bid prices and the feedback, Manna would select a vendor, negotiate terms, make a deposit and schedule the repainting job. The entire process from start to finish took less than 10 seconds.

As these communication networks between all the different Manna systems built up, things started to get uncomfortable for every worker. For example, the Manna software in each store knew about employee performance in microscopic detail -- how often the employee was on time or early, how quickly the employee did tasks, how quickly the employee answered the phone and responded to email, how the customers rated the employee and so on. When an employee left a store and tried to get a new job somewhere else, any other Manna system could request the employee's performance record. If an employee had "issues" -- late, slow, disorganized, unkempt -- it became nearly impossible for that employee to get another job. Nearly every company with minimum wage employees used Manna software or something similar, and performance records on employees were a major commodity freely exchanged between corporations. A marginal employee got blacklisted in the system very quickly.

That ability to blacklist employees is where things got ugly, because it gave Manna far too much power. Manna was everywhere, and it was managing about a half of the workers in the United States through headsets, cell phones and email. Manna moved in and took over a big chunk of the government as well. There came a point where tens of millions of humans did nothing at work unless told to do so by a Manna system.

You can imagine what would happen. Manna fires you because you don't show up for work a couple times. Now you try to go get a job somewhere else. No other Manna system is going to hire you. There had always been an implicit threat in the American economy -- "if you do not have a job, you cannot make any money and you will therefore become homeless." Manna simply took that threat and turned the screws. If you did not do what Manna told you to, it would fire you. Then you would not be able to get a job anywhere else. It gave Manna huge leverage.

For example, Manna could call in reinforcements as it needed them. You would get a call from Manna and it would say, "Your Burger-G restaurant is experiencing unexpected customer volume. Can you help?" The word "help" meant, "Can you be here in less than 10 minutes?" You could say yes or no. The problem was that if you said "no" too many times, you got fired. And when you got fired, it meant you were blacklisted in the system.

Once you figured that out, you were pretty much forced to say "yes". That meant that the printed schedules started to become pretty much irrelevant. Manna would call you when it wanted to call you. Then it started calling you to other restaurants. If things got slow in the



restaurant, Manna would send you home, then call you back in later if things got busy again. You really could not say "no" very often, meaning that Manna could interrupt your life at any time.

Version 4.0 of Manna was also the first version to enforce average task times, and that was even worse. Manna would ask you to clean the restrooms. But now Manna had industry-average times for restroom cleaning stored in the software, as well as "target times". If it took you too long to mop the floor or clean the sinks, Manna would say to you, "lagging". When you said, "OK" to mark task completion for Manna, Manna would say, "Your time was 4 minutes 10 seconds. Industry average time is 3 minutes 30 seconds. Please focus on each task." Anyone who lagged consistently was fired.

At the supercenter, Brian said that Manna was now tracking how fast employees walked from point A to point B in the store, and if you did not walk fast enough Manna would warn you about it. It was just like working on an assembly line, where they could speed up the line to make people work faster. But now the assembly line was everywhere, and if you didn't keep up you knew that you would be blacklisted nationwide.

The most surprising part of the Manna system, however, was the effect it had on wages. As Manna spread to so many businesses, your choice was to work for Manna or to be unemployed. When you started to work for Manna, it paid you minimum wage. There was no reason for it to pay you any more -- your choice was minimum wage or zero. There was no way to ask Manna for a raise. You could quit, but when you quit you would be applying to another business that used Manna. It was going to give you minimum wage too.

This was the societal power of Manna, and the basic equation was pretty simple. You could take the job for minimum wage, or you could be unemployed making zero. At any moment Manna could replace you with another warm body, and that meant that you did what you were told for minimum wage or you got fired. Manna, and the corporations that used it, knew that that was the equation. There were plenty of unemployed people who would take your spot as soon as you left.

The effect of Manna was to stratify out all the minimum wage workers in America. At the bottom you had the people who were unemployable. They had screwed up and been blacklisted by Manna. They were back living with their parents or sleeping on the sofa with a friend. You could get yourself un-blacklisted, but if you got blacklisted more than a couple times, you were dead.

Then there were all the unemployed people. Between Manna improving efficiency and forcing out the managers, plus overseas outsourcing taking out white collar jobs, plus machines like the automated checkout lines and burger flippers coming on line and so on, there were plenty of people who were unemployed. Unemployed people went around all day applying to jobs. But in a sense, that was pointless. All of the interconnected Manna systems knew every single person in the job pool. Manna also knew the performance of every single person who had ever worked in the system. You were in an incredibly bad spot if you were unemployed.

Then there were all the people being managed by Manna. They all made minimum wage. If

you were wearing a headset at work you were making minimum wage and everyone knew it. And everyone knew that if you did not do what Manna told you to do, as fast as Manna told you to do it, you would be unemployed and making nothing.

And then there was everyone else -- the doctors, lawyers, accountants, office workers, executives, politicians. The executives and politicians made a ton of money and they were never going to be wearing headsets. Joe Garcia at Burger-G was making \$100 million per year and flaunting it like a rock star.

And Manna was starting to move in on some of the white collar work force. The basic idea was to break every job down into a series of steps that Manna could manage. No one had ever realized it before, but just about every job had parts that could be subdivided out.

HMOs and hospitals, for example, were starting to put headsets on the doctors and surgeons. It helped lower malpractice problems by making sure that the surgeon followed every step in a surgical procedure. The hospitals could also hyper-specialize the surgeons. For example, one surgeon might do nothing but open the chest for heart surgery. Another would do the arterial grafts. Another would come in to inspect the work and close the patient back up. What this then meant, over time, was that the HMO could train technicians to do the opening and closing procedures at much lower cost. Eventually, every part of the subdivided surgery could be performed by a super-specialized technician. Manna kept every procedure on an exact track that virtually eliminated errors. Manna would schedule 5 or 10 routine surgeries at a time. Technicians would do everything, with one actual surgeon overseeing things and handling any emergencies. They all wore headsets, and Manna controlled every minute of their working lives.

That same hyper-specialization approach could apply to lots of white collar jobs. Lawyers, for example. You could take any routine legal problem and subdivide it -- uncontested divorces, real estate transactions, most standard contracts, and so on. It was surprising where you started to see headsets popping up, and whenever you saw them you knew that the people were locked in, that they were working every minute of every day and that wages were falling.

By 2020 I was getting out of school. I had a BA in education and a master's degree in educational administration. My plan was to teach in high school for two or three years so that I had experience "in the trenches", and then move into an administrative or government position. I was ready to start teaching and I was looking forward to it. Education was one area that, so far, had been largely untouched by Manna, so in that sense I was lucky. I was also lucky that there were jobs available, and I did not have a lot of problems finding an open position. That was a miracle.

2020 was an important year for me -- I had been working at Burger-G all through school to make spending money, and now I would have my first real job free from Manna.

But it turned out to be a pivotal year for America as a whole. It was a funny coincidence. 2020 was the year that computer vision came of age.

# Manna

## Chapter 3

by [Marshall Brain](#)

No one in 2010 really thought of the Manna software as a robot at all. To them, Manna was just a computer program running on a PC. When most normal people thought about robots, they thought about independent, autonomous, thinking robots like the ones they saw in science fiction films. C-3PO and R2-D2 were powerful robotic images, and people would not believe they were looking at a robot until robots looked like C-3PO.

The mechanical chassis for a C-3PO type robot had been around since the turn of the century. Honda did the trailblazing with its ASIMO robot, and once Honda had proven the concept many other manufacturers followed Honda's lead. ASIMO could walk up and down stairs, kick a ball and so on, and it looked completely natural. The problem was that ASIMO needed a human operator pushing a joystick to tell it what to do.

The thing that held robots back was vision. Nearly everything a person does is aided by vision -- so much so that we take vision completely for granted. But if you close your eyes and try to do anything, you realize just how important vision is.

For example, when you enter a room where the light is dim, you think in your head, "I need to turn on the lights." You use your eyes to look on the wall for a light switch. When you find it you use your eyes to guide your hand to the switch. You then use your eyes to figure out what kind of switch it is. Is it a toggle switch? A push-button switch? A dimmer switch with a knob? A dimmer switch with a slider? None of the above? Once you figure it out, you use your eyes to guide your fingers to manipulate the switch in the appropriate way. Or maybe you look at the wall and there is no switch to be found. Now you start looking for a lamp in the room. Is it a touch lamp? Or is the switch on the base of the lamp? Maybe the switch is near the bulb, and you have to push it or twist it or pull a chain... Your vision guides you every step of the way. It is nearly impossible to do anything in a complex environment without vision. And turning on a lamp is a very simple thing. It gets a lot more complicated when you are trying to run through a forest, ride your bicycle down a busy a street or find your way to a particular address in a large subdivision.

Without vision, robots could not move around or manipulate objects. All of the other hardware was there. Legs and balance systems to allow bipedal motion had been in place for decades. Robotic fingers and hands with very fine motor control were easy to create. AI software to set goals and make decisions was getting more powerful every day. Everything was there but the vision system.

You could see that society was ready for the robots to arrive. The first real robotic system installed in a human position of trust was in the airline industry. The terrorist attack on the World Trade Center in 2001 had been a wakeup call. In 2008 there

was a run of six airline accidents, all attributed to pilot or ATC error, which made everyone nervous. Then in 2012 the unthinkable happened. Two airline pilots, both sleeper agents for an Asian terrorist organization, flew their planes into massive U.S. targets almost simultaneously and killed nearly 50,000 people. One hit a basketball arena full of spectators, and the other ripped through the Democratic national convention in Las Vegas. That was the end of human pilots in the cockpit.

As it turned out, the transition to robotic planes was remarkably easy. Airplanes were already controlled by autopilots while enroute. Radar systems on the ground and in the planes were already taking off and landing the planes automatically. An airplane did not need a vision system -- its "vision" was radar, and radar had been around for more than half a century. There was also a secondary backup system that gave airplanes a form of consciousness. Airplanes could detect their exact location using GPS systems. These GPS systems were married to very detailed digital maps of the ground and the airspace over the ground. The maps told the airplane where every single building and structure was on the ground. So even if the autopilot failed and told the plane to go somewhere unsafe, a "conscious" plane would refuse to fly there. It was, quite literally, impossible for a conscious plane to fly into a building -- the plane "knew" that flying into a building was "wrong." If the autopilot went insane, the conscious plane shut it off and radioed for help. If all the engines failed or fell off, the plane knew what was on the ground in the vicinity and did its best to crash into an unpopulated area.

By 2015, there were no human airline pilots and no human air traffic controllers in the system. Everything about flying through the air was automated. The cockpit was stripped out of airplanes and the space became a lounge or a seating area. With human beings out of the loop, the safety record of the airline industry improved and people came to trust the airlines again. No one cared at all that there was no human pilot in the cockpit -- people actually trusted machines more than human beings.

The first breakthrough in true computer vision came in 2016. In 2014, the newest video game consoles came out, and they had extremely powerful CPUs able to process 10 trillion operations per second. By adding 100 gigabytes of RAM to the console and then networking 1,000 of these video game consoles together, a university research team created a machine able to process 10 quadrillion operations per second on 100 trillion bytes of RAM. They had created a \$500,000 machine with processing power approaching that of a human brain. They called the system the VBrain. With that much processing power and memory on tap, the researchers were finally able to start creating real vision processing algorithms.

Within a year they had two demonstration projects that got a lot of media attention. The first was an autonomous humanoid robot that, given an apartment number, could walk through a city, find the building, ride the elevator (or walk up the steps) and knock on that apartment door. The second was a car that could drive itself door-to-door in rush hour traffic without any human intervention. By combining the walking robot and the self-driving car in 2018, the researchers demonstrated a completely robotic delivery system for a pizza restaurant. In a widely reported publicity stunt, the research team ordered a pizza and had it delivered by robot to

their lab 25 minutes later.

A network of 1,000 video game consoles was not exactly portable, so the demonstration robots that this research team created did not have the brain onboard. The robots talked to the VBrain through wireless connections. However, this research team had proven that machine vision was possible and workable in some of the most complex and real-world tasks imaginable.

The more significant breakthrough came in 2023. Researchers at a chip company had followed the work on the VBrain, and they realized that the 64-bit floating point operations in the video game console were not the optimal unit of calculation for a vision processing machine. Instead, very simple 8-bit integer calculations could handle the problem. This realization made massively parallel chip designs for vision very easy to manufacture. The chip company released its first vision processing module -- a 10 petaop custom vision processor made up of 10 massively parallel chips -- late in 2023. The OEM price for the module was \$8,000.

That module opened the floodgates. Within a year, hundreds of manufacturers were showing prototype robots. There were delivery robots, cleaning robots, cooking robots, construction robots, baggage handling robots, welding robots, landscaping robots, truck-driving robots, retail robots, taxi robots, security robots, etc.

Take something as simple as painting a room. You could stick one of the new painting robots in the room with 5 gallons of paint. Two hours later the entire room was perfectly painted. You didn't have to cover the furniture or even move the furniture. The robot did everything, and the job was perfect. Not one drop of paint was spilled, not one streak could be seen on the molding. Every line, every corner, every painted surface was faultless. There were also new robots to frame a house, side it, stack bricks and put on the roof.

The automotive industry demonstrated cars with the vision and control systems built right into the vehicle. The new robotic cars could drive themselves door to door, drop off the passengers and then drive down the block to park themselves. It meant you could read or watch TV on your way to work, and the car did all the driving. There was no reason to have a "driver's seat" and a steering wheel in these new vehicles, so the interior of a car became much more functional -- the front seat could face the back of the car, and it could fold out into a bed. The automated cars promised to reduce traffic congestion, dramatically improve highway safety and make the drive to work much more comfortable. There were also automated taxis and robotic trucks.

In the retail and fast food industries, the number of prototype robots boggled the mind. Robots could empty a customer's cart, scan the tags on the products and put them into bags. Robots could stock items on the shelves. Robots could sweep the floors and clean the restrooms. Within two years, Burger-G was demonstrating and debugging a completely robotic Burger-G restaurant at the same location where they had first deployed Manna. Instead of telling human employees what to do,

Manna told the robots what to do.

All of the hardware and general intelligence for these robots had been in place for a decade. What was missing was vision. As soon as the inexpensive vision module became available, the number of robots in the marketplace exploded.

The effect that the robotic explosion had on the employment landscape was startling. By 2030, most large retailers were replacing human employees with robots as fast as they could. The robots stocked the shelves, swept the floors, helped customers with questions and carried the customers' purchases out to their cars. Every fast food restaurant was doing the same thing. Construction sites started to switch to robots for every repetitive task: framing, siding, roofing, painting, etc. Robotic cars and trucks took to the highways and accident rates started to decline. It was easy to see that the completely robotic airport, amusement park, grocery store and factory were on the way.

The switchover to robots was proceeding with remarkable speed, and for some reason it seemed like no one had really thought about the effects of the transition. All of these people being replaced by the robots needed some form of income to survive, but the job pool was shrinking. The American "service economy" was what replaced the "factory economy", and America now had about half of its workers wrapped up in low-paying service sector jobs. These were the jobs perfectly suited for the new robots. The question was, what would happen to the half of the population being displaced from their service sector jobs?

# Manna

## Chapter 4

by [Marshall Brain](#)

Burt wanted to go outside and take a walk. Weather permitting, we tried to walk every evening. We left the cafeteria and departed through the main door along with a stream of other people.

The building we exited was another one of the terrafoam projects. Terrafoam was a super-low-cost building material, and all of the welfare dorms were made out of it. They took a clay-like mud, aerated it into a thick foam, formed it into large panels and fired it like a brick with a mobile furnace. It was cheap and it allowed them to erect large buildings quickly. The robots had put up the building next to ours in a week.

The government had finally figured out that giving choices to people on welfare was not such a great idea, and it was also expensive. Instead of giving people a welfare check, they started putting welfare recipients directly into government housing and serving them meals in a cafeteria. If the government could drive the cost of that

housing and food down, it minimized the amount of money they had to spend per welfare recipient.

As the robots took over in the workplace, the number of welfare recipients grew rapidly. Manna replaced tens of millions of minimum wage workers with robots, and terrafoam housing became the warehouse of choice for them. Terrafoam buildings were not pretty, but they were incredibly inexpensive to build and were designed for maximum occupancy. They clustered the buildings on trash land well away from urban centers so no one had to look at them. It was a lot like an old-style college dorm. Each person got a 5 foot by 10 foot room with a bed and a TV -- the world's best pacifier. During the day the bed was a couch and people sat on the bedspread, which also served as a sheet and the blanket. At night the bed was a bed. When I arrived they had just started putting in bunk beds to double the number of people in each building. Burt was not excited to see me when I arrived -- he had had a private room for 10 years, and my arrival was the end of that. At least he was polite about it.

At the end of the very long hallway of rooms there was the communal bathroom. This was my least favorite part of the terrafoam experience. The bathroom consisted of a bunch of sinks, a bunch of shower stalls, a bunch of toilets. Given the location of our room, it was about a 200 foot walk down to the bathroom. When you had to go at night, it almost seemed easier to wet the bed and let the robots deal with it in the morning. By the time you walked all the way down and back, you were completely awake.

There were no windows anywhere in the building. It was a cost-cutting measure, but it also helped to make every room identical. The ceiling height was 7 feet throughout, so it felt very small all the time. LED lights everywhere -- our room was absolutely identical to every other room in the building and had a single, bare two-foot LED panel bolted to the ceiling. There was the same panel every ten feet in the hallways. Absolutely everything in the entire building was brown. Brown walls, brown bedspreads, brown ceilings, brown floors. Even the bathroom and every fixture in it was completely brown.

Downstairs there was the cafeteria staffed by robots. The robots were not bad -- the food was acceptable. They also kept the bathrooms, hallways and rooms spotless. Every day at 7AM, 12 PM and 6 PM the breakfast, lunch and dinner meal shifts began. There were six 15-minute shifts per meal to save on cafeteria space. Burt and I had the third shift. You sat down, food was served, you ate, you talked for 5 minutes while you drank your "coffee" and you left so the next shift could come in. With 24,000 people coming in per shift, there was no time for standing in a cafeteria-style line. Everyone had an assigned seat, and an army of robots served you right at your table.

Because no one had a window, they could really pack people into these buildings. Each terrafoam dorm building had a four-acre foot print. It was a perfect 417 foot by 417 foot by 417 foot solid brown cube. Each cube originally held exactly 76,800 people. Doubling this to 153,600 people in each building was unthinkable, but they were doing it anyway. On the other hand, you had to marvel at the efficiency. At that

density, they could house every welfare recipient in the entire country in less than 1,500 of these buildings. By spacing the buildings 100 feet apart, they could house 200,000,000 people in a space of less than 20 square miles if they had wanted to. At that density, they could put everyone in the country without a job into a space less than five miles square in size, put a fence around it and forget about us. If they accidentally dropped a nuclear bomb or two on us, we would all be gone and they wouldn't have to worry about us anymore.

America in 2050 was no different from a third world nation. With the arrival of robots, tens of millions of people lost their minimum wage jobs and the wealth concentrated so quickly. The rich controlled America's bureaucracy, military, businesses and natural resources, and the unemployed masses lived in terrafoam, cut off from any opportunity to change their situation. There was the facade of "free elections," but only candidates supported by the rich could ever get on the ballot. The government was completely controlled by the rich, as were the robotic security forces, the military and the intelligence organizations. American democracy had morphed into a third world dictatorship ruled by the wealthy elite.

Ultimately, you would expect that there would be riots across America. But the people could not riot. The terrorist scares at the beginning of the century had caused a number of important changes. By 2030, there were video security cameras and microphones covering and recording nearly every square inch of public space in America. There were taps on all phone conversations and Internet messages sniffing for terrorist clues. If anyone thought about starting a protest rally or a riot, or discussed any form of civil disobedience with anyone else, he was branded a terrorist and preemptively put in jail. Combine that with robotic security forces, and riots are impossible.

The only solution for most people, as they became unemployed, was government handouts. Terrafoam housing was what the government handed out.

My situation was atypical really, because I was able to stay out of Terrafoam much longer than most people. I had been lucky enough to be a teacher, and in 2030 I made the transition to administrator. That allowed me to hang on a good long time. But as the department of education became more and more robotic, I was squeezed out.

It was a funny experience. Manna informed me on Friday afternoon that I was to be fired. But the Manna network also knew that my bank account was close to zero and there was no way I would be able to make the next rent payment. The Manna network also knew that there were no job prospects for me, since it knew the employment status of everyone. Like most people, nearly everything I owned was leased. I wouldn't be able to make the payments on any of that either. I was unmarried and all of my relatives were in Terrafoam already. Manna knew that. No one I knew in the city had offered to take me on as a guest, so that was out and Manna knew it.

So Manna put it all together and took the liberty to unplug me. As I finished the



dismissal interview and left the building, I had two robotic escorts. The robot on my right addressed me as a robotic bus pulled up. The bus looked to be about half full.

"Jacob Lewis105, you are now unemployed. Do you have other means of employment?"

Of course it knew the answer, but this formality could not be avoided. "No."

"Do you have guest status with any resident?" The robot asked.

"No."

"Do you have means of support unknown to me?"

I suppose I could have stashed a cache of gold under my mattress, and this question allowed me to declare it. Such a cache would, of course, be grounds for arrest, so I was screwed either way. "No." I was without any means of support.

"In accordance with ordinance 605.12b, you have been assigned room 140352 in building 16, resident quant C. This assignment provides you with suitable housing and nourishment to sustain your life. Please board the bus."

That was how you ended up in Terrafoam. The system knew you had no means of support, so it "gave" you one. You could leave terrafoam once you regained a means of support, but there really was no way to do that unless Manna gave it to you.

Was it prison? Yes. But there were no walls. The food was good. The robots were as nice and respectful as they could be. You could walk outside wherever and whenever you wanted to. But there was an invisible edge. When you walked too far away from your building and approached that edge, two robots would approach you. I had tried it many times.

"Time to turn around Jacob Lewis105. There is construction in the next zone and, for your safety, we cannot allow you to proceed." There were a hundred reasons the robots gave for making you turn around. Construction, blasting, contamination, flash flooding, train derailments, possible thunder storms, animal migrations and so on. They could be quite creative in their reasons. It was all part of their politeness. If you turned around you were fine. If you made any move in any direction other than the one suggested, you were immediately injected and woke up back in your room. I had only tried it twice.

It was a nice day. The sun was shining and the temperature was mild, so a lot of people were out milling around. Burt and I had decided to walk down along the river as far as the robots would let us. I was wearing the same coverall everyone else was, and I unbuttoned the top two buttons because the sun made it warm.

"Today's your one year anniversary in terrafoam. How's it feel?" Burt asked.

"I'm thinking that there has to be a way out of here." I said.

"I know what you are saying. I try not to think about it. But it's not that unusual. Over the course of history, billions of people have lived this way. Think back to when you were living in suburbia. Your parents had a 3,000 square foot house and the pool at the turn of the century. You were living it up. Unfortunately, at that moment in history, there were billions of people around the world living in poverty -- they were living off a dollar or two per day. Meanwhile, your family had 300 dollars a day. Did you do anything about it? Billions and Billions of people living in third-world countries, squatting together in the dirt, crapping in ditches. They would walk down by the river just like we are doing right now and say to each other, 'There must be a way out.' They could see that they were lost -- totally wasted human potential trapped in a terrible situation. Their kids and their kids' kids forever would live like this because there was absolutely no way out. Did anyone stop to help them? Did you stop to help them? No. You were too busy splashing in the pool. Those billions of people lived and died in incredible poverty and no one cared."

Burt could really get on your nerves like that. This was not the first time I had heard this soliloquy. It was depressing, and true, but after the third or fourth time it got old. Of course, he had been in terrafoam for just over 10 years. I guess he'd had a lot more time to stew about it.

And he was right. No one helped the billions of people living in poverty at the turn of the century. And no one would help us now. The world simply did not work that way. If you are living a comfortable life in a comfortable neighborhood with a swimming pool in the backyard, what do you care about anyone else? You are immune to their problems, so you keep on splashing and swimming. It never occurs to you to help them, because it is so abstract.

"There has to be a way out of here," I repeated.

"Are you insane? You can't redesign society. No one can." Burt laughed out loud as he said it. "Let's see, if I'm a rich person living in a gorgeous, walled city in incredible luxury, let's see, would I want to change things???? Hmmm. Hmmm. This is a tough question. That's why you are insane. You are never going to change anything. We will live and die here. The rich have no need for us anymore, and they certainly are not going to spread their wealth around to us. Hell, why didn't you give your swimming pool up at the turn of the century to help the people starving and dying in Africa? Or even other Americans living in poverty?" Burt was enjoying his cynicism.

"It wouldn't have helped anything. One swimming pool would not have helped anyone in Africa. That was the problem -- even if you, as a person, wanted to help, there was no way to help. That's why we need to redesign society. Society should not allow one little group of people to live like royalty while 80% of the people on the planet are starving to death or living on welfare. Why would we create a society like

that? What good is it to have people with billions of dollars, while the majority of people starve?" I asked.

"Society has always been like that. You lived like that 50 years ago. Did you care?" Burt asked back.

"No, I didn't. But I should have. We shouldn't design a society like that -- it's like the Nazi's designing the death camps." I said.

Burt replied quickly, "Tell that to the Nazis. Tell that to the people living like royalty today. They would give you a thousand reasons why they deserve what they've got. They worked hard. Blah blah blah. They would also gladly tell us why we, and all the other poor people and welfare recipients, don't deserve anything. It's exactly the same logic that allowed you to have a swimming pool while half the world starved to death. It makes no sense, unless you are the one with the swimming pool. Then it makes great sense to you. And the people with the swimming pools have the power to enforce it, so that's how it is."

"But that's stupid." I said, "What possible justification is there for a whole population of people to be living on welfare or to be living in dirt shacks and starving?"

"Did you think about that when you were swimming? Of course not. That is not human nature. Out of sight, out of mind. You could not see the people starving, so you did not think about them. You didn't care in the least." Burt said.

I replied, "We could change it now. Robots are doing all the work. Human beings -- all human beings -- could now be on perpetual vacation. That's what bugs me. If society had been designed for it somehow, we could all be on vacation instead of on welfare. Everyone on the planet could be living in luxury. Instead, they are planning to kill us off. Did you hear that women were trying to drink the water out of the river? Some people think they're putting contraceptives in the water."

"Yes. I also heard that the river water makes you incredibly sick. The robots don't even try to stop them." Burt said.

"They need to boil the water."

"In what???" Burt looked over at me. Then he looked ahead at the river. Then he looked at me again. "OK, OK. So what would be better? How would you create a different society, rather than living like this?"

"I have no idea. And even if I did, it wouldn't change anything."

We walked on in silence for about half a mile. Three robots approached us. One of them said, "Time to turn around Jacob Lewis105 and Burton Forrester416. There is a rabid dog in the next zone and, for your safety, we cannot allow you to proceed."

"Thank you," I said, and we turned around. The robots followed at a respectful

distance for 50 paces and then dispersed.

"A rabid dog? I've never heard that one." Burt said. We walked all the way back to the building in silence. We took the elevator up to the 14th floor, walked down the main corridor, then down our corridor to our room.

I walked in thinking my own thoughts, and then jumped back three feet when I noticed them. I nearly knocked Burt over, except that he was as surprised as I was at the sight of the two women sitting on his bunk. They were watching the television and turned to us as we entered with smiles on their faces.

"Who are you?" I asked, stating the obvious question. The two women stood. They were dressed casually but in very nice clothing. They both wore jewelry -- something I had not seen for a year. Burt and I were the same age, and these women appeared younger, although it is so hard to tell these days. They certainly were not terrafoam residents. And both were carrying thick books. They appeared to be either phone books from a bygone era, or large catalogs like Sears used to have long ago. I had not seen a book like that for 20 years at least.

"I'll second that, " was Burt's reaction.

"We are so sorry to startle you," said the woman on the left. "We know this is unexpected, but we are here to talk to Jacob Lewis105. Are either of you him?"

"I am Jacob Lewis105," I said. "How did you get in here? I am amazed that the robots allowed it."

"That will become clear within the next hour. Would it be possible for us to speak to you alone, Mr. Lewis105?"

"I guess. Burt, can I have the room for a little bit?"

Burt said, "I'll go down and talk to Mike. Come get me if you need me."

They sat back down on the bunk, which really was no easy task given the space available. They looked so tremendously out of place in the room to begin with. They offered me a seat as well.

"Jacob Lewis105, what we are going to tell you today may be quite surprising to you, but it is all true. It will take approximately 30 minutes and then, with your permission, you will be able to exit the terrafoam system today. May we begin?"

# Manna

## Chapter 5

by [Marshall Brain](#)

I reached out to shake hands with the woman on my left. "Call me Jake," I said.

She took my hand and said, "I am Linda." I turned to greet the woman on my right and she said, "And I am Cynthia."

Linda started right in, "Cynthia and I are here to talk to you about the Australia Project. This is for you." She handed me the thick book she had been holding. On the cover it said, "Australia Project Catalog", with a picture of a happy group of people on the beach, and along the right hand side there was a row of pictures showing a house, a shirt, a meal on a table and several electronic products. I started to flip through the catalog.

"Have you ever heard of the Australia Project?" Cynthia asked.

But I was still looking at the catalog. It was a giant paper catalog, printed in full color. The paper was thin, and the book had to have over 3,000 pages in it. It was a lot like an old-fashioned Sears catalog -- pages and pages of products. As I flipped through it, there were hundreds of pages showing different styles of clothing. Hundreds of pages showing different meals. Hundreds of pages showing all different kinds of vacation resorts. Thousands of pages of "consumer products", for lack of a better word: Electronics, appliances, furniture, tools, you name it.

"Is this paper?" I asked. A catalog like this containing this much paper was obscene. It was amazing to me that anyone still printed paper catalogs.

Linda said, "It's like paper. We call it LC, or laminar carbohydrate. The terrafoam robots won't let us bring anything metal or electronic into the terrafoam system, so this is the best thing we have to show you what the Australia Project is about."

"Have you ever heard of the Australia Project?" Cynthia repeated.

"No, I haven't," I said as I continued to flip.

"In 2015, your father purchased two shares of 4GC, Inc. in your name. These shares entitle you and one other person to come live as citizens of the Australia Project. You may leave the terrafoam system with us today if you choose to." Linda said.

I stopped flipping and looked at her. "I can leave the terrafoam system today? What does that mean?" I asked. She had my undivided attention.

"It means that you can walk out of this building with us today, fly to Australia and begin a new life as a citizen of the Australia Project." Linda said.

"How is that possible? Why would the robots allow it? Are you telling me the robots will just let me hop on a bus and drive away?" I asked.

"More or less. You do have to sign out of the system." Linda said.

"Excuse me if I laugh out loud. And I don't mean to be rude. But if that's the case, then why haven't I been able to simply walk away? I've been trying to find a way out of here for a year." I pointed out.

"The robots won't let you walk away because, if they did, you would end up as a homeless person on some city street. Without a job, you are by default homeless in the American economy. None of the wealthy people want to look at homeless people, so you are warehoused here and forced to stay here." Linda said.

"In terrafoam, you are out of sight and out of mind, as they say," Cynthia added. "Since we are providing the transportation, and we are taking you to another country, the robots are happy to see you go. It means one less mouth for them to feed."

Linda said. "If you would allow us, we would like to spend ten minutes telling you about the Australia Project. What we are talking about will make much more sense to you at that point, and it will be much easier for you to make the decision."

"The decision?" I asked.

"The decision whether you want to leave with us or not." Linda said.

"I'm all ears." I replied.

Linda began describing.

"The Australia Project is what we call a fourth generation civilization. Prior to the Australia Project, civilization has been through three phases. There was the hunt/gather phase, the agrarian phase, and then the industrial phase. What you are experiencing here in the terrafoam system is the ultimate destination for many of the industrialized nations of the world. In your case, in America, robots created a massive concentration of wealth that, eventually, imprisoned millions of people."

Cynthia added, "What you are experiencing in America is the worst that the robots have to offer. Robots control the humans, rather than vice versa."

Linda continued, "The Australia Project was born in 2012 specifically to solve these problems and create a new form of human civilization. It is a fourth generation civilization conceived of by Eric Renson. Eric was an American who was heavily involved in what was then called the open software movement. As an American, he had seen Manna in its earliest phases. He could envision what Manna, combined with the coming robots, would mean to America and Western civilization as a whole."

"He at first tried to fight it, but realized that was impossible. Instead, he eventually came up with a completely new way to think about human societies. In the Australia

Project, humans get the best that the robots have to offer, rather than the worst. He took the open source model of free software, added the robots and brought the model to the material world. The revolutionary idea in open source software is the fact that no one owns the code. Because there is no owner, the code is free to everyone."

Cynthia picked up the thread. "Eric's key concept was extremely simple. What he realized is that, in a robotic civilization, everything can be free."

"How is that possible?" I asked.

"It works like this. Let's say that you own a large piece of land. Say something the size of your state of California. This land contains natural resources. There is the sand on the beaches, from which you can make glass and silicon chips. There are iron, gold and aluminum ores in the soil, which you can mine, refine and form into any shape. There are oil and coal deposits under the ground. There is carbon, nitrogen, hydrogen and oxygen in the air and in the water. If you were to own California, all of these resources are 'free.' That is, since you own them, you don't have to pay anyone for them and they are there for the taking."

"If you have a source of energy and if you also own smart robots, the robots can turn these resources into anything you want for free. Robots can grow free food for you in the soil. Robots can manufacture things like steel, glass, fiberglass insulation and so on to create free buildings. Robots can weave fabric from cotton or synthetics and make free clothing. In the case of this catalog you are holding, nanoscale robots chain together glucose molecules to form laminar carbohydrates. As long as you have smart robots, along with energy and free resources, everything is free."

Linda chimed in, "This was Eric's core idea -- everything can be free in a robotic world. Then he took it one step further. He said that everything should be free. Furthermore, he believed that every human being should get an equal share of all of these free products that the robots are producing. He took the American phrase 'all men are created equal' quite literally."

I said, "That sounds great. In fact, that sounds perfect. But Eric does not own California. Rich people own all of the land and all of the resources in the United States, and they are going to give none of it to anyone. They expect to be paid for what is 'theirs'."

"Yes, that is true. That ownership model is, ultimately, why you are here in the terrafoam system. If a small group of people own all of the resources and have complete control of them, then everyone else is at their mercy." Linda said. "The key to Eric's brilliance is the fact that he found a way around this problem."

"Eric realized that ownership, in the Western sense, is the problem. His solution was to turn ownership upside down. Eric used the corporate ownership model to create

a civilization that accomplishes his goals."

"Eric formed a corporation called 4GC, Inc. He sold shares in this corporation for \$1,000 each to one billion people. You will learn about all of this during your orientation. He put lots of rules around the shares to avoid abuse - for example, one person can access only one share of stock. The upshot is that, by selling one billion shares of stock in 4GC, Inc., Eric accumulated one trillion dollars in the corporation."

"With that money, he started to build his new civilization. The first thing he needed was land -- resources. He approached several governments, and eventually formed a partnership with the government of Australia. He was able to buy 1.5 million square miles of the Australian outback for \$250 billion. Eric then began buying other resources he needed -- factories, mines, companies around the world. He also began building new factories in Australia, all of them completely automated, to build robots. With his \$1 trillion, he needed to buy all of the resources necessary for one billion people to be completely self-sufficient. He was able to accomplish that goal in Australia for about \$600 billion."

"The amazing part," Cynthia pointed out, "is that, once he had done all that and started the major work in Australia, the citizens of Australia decided to merge with the project. The entire continent of Australia -- all 2 billion or so acres of it -- became the Australia Project."

Linda continued, "Eric also started with several core principles that govern life for people living in the Australia Project. One of those principles, as I mentioned, is that everyone is equal. Each person gets an equal share of the resources that the corporation owns. Another is complete recyclability. The resources owned by the project are finite, and by making everything completely recyclable, they are reused over and over and never diminish. The LC for this catalog, for example, is manufactured entirely from carbon, hydrogen and oxygen in the air. If you burn it, it returns to the air. The same thing happens if you drop it on the ground and it decomposes. Every object, every product that the robots make for us is completely recyclable in the same way. Whether the object is made from carbohydrates, carbon polymers, aluminum, glass... it is all completely reusable. All that you need is energy and robots to break any object back down to its core elements and then form it into something new."

"Another one of Eric's core principles is that no one owns anything. It is quite likely that, when you lived in America, you leased everything. You never owned anything, but someone else did and you had to pay for every single thing you used. That's another form of resource ownership that concentrates wealth. In Australia, you own nothing, but neither does anyone else. Whatever you have is yours until you die, and then it gets recycled. Or you can give it back to be recycled whenever you want. There are lots of people who do that constantly with clothes. They wear something new every single day, and the old clothes are recycled."

"That's what I do. I like to be up-to-the-minute on fashions," said Cynthia.



"Another core principle is that nothing is anonymous. Eric grew up during the rise of the Internet, and the rise of global terrorism, and one thing he realized is that anonymity allows incredible abuse. It does not matter if you are sending anonymous, untraceable emails that destroy someone's career, or if you are anonymously releasing computer viruses, or if you are anonymously blowing up buildings. Anonymity breeds abuse. In Australia, if you walk from your home to a park, your path is logged. You cannot anonymously pass by someone else's home. If someone looks up your path that day to see who walked by, that fact is also logged. So you know who knows your path. And so on. This system, of course, makes it completely impossible to commit an anonymous crime. So there is no anonymous crime. Anyone who commits a crime is immediately detained and disciplined."

"There has not been a murder in years. It is impossible to do it anonymously, and everyone knows what happens when you murder someone else. People do commit crimes occasionally. Mostly it is kids who have not completed their education." Cynthia said. "They are disciplined and the problem goes away. You'll learn all about this in the orientation."

"Can I ask you something?" I asked.

"Absolutely. That's why we are here." Linda said.

"You are telling me that you live in a society where everything is free. And everyone is equal. Everything is completely recycled, so I take it there is no pollution..." I said.

"True," Linda said. "Zero pollution, because of total reuse. To have pollution, it would mean that you are spewing something into the environment rather than reusing it. There can be no pollution in our society because of Eric's core principle on reuse."

"And there is no crime?" I said.

"There is minimal crime," Linda corrected me. "People will make mistakes, even in a perfect world, especially while they are learning. Mistakes are a part of learning, and everyone accepts that. But as soon as the mistake is committed, that person is detained and retrained. The core principal is 'do no harm.' The legal system is set up to detect and correct harm automatically. Re-education is usually all the discipline needed, because at the root most crime is a misunderstanding of the rules of society."

"And everything is not free in the way you are probably thinking." Cynthia said.

"That's what I wanted to ask about. If everything is free, then what's to stop me from demanding a 100,000 foot house on a thousand acres of land and a driveway paved in gold bricks? It makes no sense, because obviously everyone cannot demand that. And how can anything be free? That is hard to believe in the first place." I said.

"Everything is free AND everyone is equal." Linda said. "That's exactly how you phrased it, and you were right. You, Jacob, get equal access to the free resources, and so does everyone else. That's done through a system of credits. You get a thousand credits every week and you can spend them in any way you like. So does everyone else. This catalog is designed to give you a taste of what you can buy with your credits. This is a small subset of the full catalog you will use once you arrive. You simply ask for something, the robots deliver it, and your account gets debited."

"Let me show you." said Cynthia. She opened her catalog to a page, and pointed to one of the pictures. It was clothing. "This is what I am wearing." she said. "See - it is 6 credits. In a typical week I only spend about 70 or so credits on clothes. That's why I like to wear something new every day."

"The robots did manufacture Cynthia's outfit for free. They took recycled resources, added energy and robotic labor and created what she is wearing. It cost nothing to make it. She paid credits simply to keep track of how many resources she is using."

"Where did the energy come from?" I asked.

"The sun. The Australia Project is powered mostly by the sun and the wind, and the wind comes from the sun if you think about it."

"Where did the robots come from?"

"The same place Cynthia's outfit came from. It's the same thing. Robots take recycled resources, add energy and robotic labor and make new robots. The robots are free, the energy is free, the resources are all completely recycled and we own them, so they are free. Everything is free."

"The credits simply make sure that everyone gets equal access to the resources. There is a finite amount of power that can be generated on any given day, for example. Things like that. The credits make sure everyone gets an equal share of the total pool of resources."

"Holy smoke." I said. I was looking through the catalog again. Page after page after page of products. There were thousands of different types of housing, for example. And they all seemed to fall in the range of 100 to 500 credits per week. Clothing cost nothing. Food cost nothing.

"I'm not getting this." I said. "I'm not sure I could spend a thousand credits if this catalog is right."

"Many people don't spend a thousand credits." she said. "If you are working on a project you might, but that's about it."

"So how do I earn the credits?" I asked.

"Earn?" Linda asked back.

"No no no..." said Cynthia.

"Do you give me a job? The reason I am here is because I have no job," I said.

"No. You see, it's all free. By being a shareholder, you already own your share of the resources. The robots make products from the free resources you and everyone else already owns. There is no forced labor like there is in America. You do what you want, and you get 1,000 credits per week. We are all on an endless vacation."

"So why are you here?"

"What do you mean?"

"How did the robots get you to come here to talk to me?"

"We choose to do this. This is what we want to do. Just seeing the look on your face now, and seeing all the looks you'll have as you go through orientation, makes this an incredibly fun thing to do. I mean, we remember exactly what it was like sitting where you are sitting right now. It's a joyous experience to introduce people to the Australia Project. Cynthia and I have done this once a year for four years now. It's a different kind of vacation for us." Linda said.

"This sounds totally unbelievable. But you said at the beginning that this is all true." I said.

"It is all true." Linda said. "I didn't completely believe it either. But it is all true. And it gets better every day."

"You said that I could leave the terrafoam system today. Did you mean that? Can we leave now?" I asked.

"There are two minor things we have to cover first."

"There's always a catch." I said. I had a sinking feeling.

"No. It is not a catch. The first thing is that you have two shares in 4GC, Inc. Your father probably purchased one for you and one for your wife. You can use only one of these shares. Is there someone else you would like to bring with you? Obviously you are not married. But is there a friend or a relative you would like to give your other share to?"

"Can I bring Burt?"

"Who is he?"

"My roommate. The guy I came in with?"

"Certainly. You can bring Burt. Can you find him now?"

"That's easy. He is two doors down. What's the other catch?"

"You have to agree to the core principles." Linda said.

She pulled a sheet out of my catalog and handed it to me. It only had about 50 words on it. The title was, "The nine core Principles of 4GC."

"By signing this sheet of LC," Linda said, "You agree to abide by Eric's core principles for 4GC. The only way for the Australia Project to work is for everyone to abide by the core principles. They will go over these principles in detail in the orientation, but this is the high level. Within a week you will be able to recite these from memory. Do you agree with these principles?"

I read down through the principles. Each one was very short:

1. Everyone is equal
2. Everything is reused
3. Nothing is anonymous
4. Nothing is owned
5. Tell the truth
6. Do no harm
7. Obey the rules
8. Live your life
9. Better and better

"That's it?" I asked. "You must be kidding."

"That's it. You will be surprised how all-encompassing those 27 words can be." Linda said. "That's what the orientation will help you with."

"Can I ask two questions?" I asked.

"Surely."

"How can I do anything besides living my life?"

"Well, you are living your life now..." Linda said, "and personally I have to tell you that it leaves a lot to be desired! Those three words are very important. Live Your Life means that you are able get the most out of your life, as opposed to the least. Instead of dying in Terrafoam, or dying in some job that you hate, you live your life in the Australia Project in freedom and prosperity. Live Your Life means that you are in control -- again, the emphasis on freedom of choice. You decide what you want to do, and then you are able to do it. You reach your full potential. Live Your Life is the idea of thinking about your life as a whole, as something that you get to design and

control. Does that make sense?"

"More sense than you can imagine."

"What is your other question?" she asked.

"Better and better?"

Linda replied, "That is a declaration of innovation. The goal is to make things continuously better and better for everyone in the Australia Project through constant innovation. We are constantly looking for problems, identifying them and solving them. We are constantly looking for and implementing new ideas. Things get better and better every day. Terrafoam is, by contrast, 'Worse and worse.'"

"Sign me up!" I said.

She handed me a marker from her pocket and I signed the LC. "Now press your thumb on the square to authenticate it," She said. A black thumbprint appeared in the box when I lifted my finger.

"Congratulations!" They both said in unison.

"Can I go get Burt?"

"Yes. If you don't mind, you can sit with us as we explain 4GC to him, and then we will leave."

I found Burt in Mike's room, brought him down, and in 20 minutes he had signed on as well. He was as incredulous as I was. We went down the elevator and as we walked through the first floor of the building, Linda spoke to the robot that approached her. Burt and I put on headsets and signed out of the Terrafoam system with her. We walked about a quarter mile to a waiting bus.

When we got on, the bus was nearly full. It was easy to tell who was who. Every terrafoam resident was wearing a brown coverall like me, while all the escorts were dressed like rainbows. Everyone was looking through the catalogs and talking.

Linda and I sat down on one side. Burt and Cynthia sat down on the other, and the bus pulled away. Like everyone else I was looking through the catalog, reading and asking Linda questions during the whole drive. We were on the bus for about three hours, but it seemed to go by in 10 minutes.

This had all seemed something like a dream, but it started to become very real when we arrived at our destination. It was an immense airport, with dozens of jets waiting at the gates. There were dozens of buses dropping off passengers, and hundreds of people moving through the facility. Every jet was painted bright green and marked with a blue 4GC logo on the tail, and all of the buildings were painted

the same way.

We got off the bus and it really hit me as we walked into the first part of the building. "This is our first stop," said Linda. "We've got to get you out of those dreadful coveralls." She and Cynthia guided Burt and me into a room on our right, which opened up into an immense store. It was filled with racks and racks of every conceivable kind of clothing."

"Once you get to Australia, the way you order clothing will be nothing like this. But this is what you are used to right now, so it is easier. Let's pick you out some decent clothes."

Linda and Cynthia picked out clothes for Burt and me. The robot sized us, and we went to the dressing room and changed. Just that one thing -- putting on real clothing for the first time in a year -- made such an impact on me.

It was when we walked out of the store and got on the plane, however, that I knew for sure we were not in Kansas any more...

# Manna

## Chapter 6

by [Marshall Brain](#)

Linda and Cynthia seemed to know exactly where we were going. We simply walked through the airport, then through a wide door with a large group of other people. It was as though we were heading into an auditorium, but instead we were on the plane.

This airplane was immense. It had to be able to hold a thousand people at least, and the entire cabin was appointed with the most opulent first class features I had ever encountered. Every seat was a recliner that was also able to fold out into a bed. They were arranged in pairs, 14 across at the point where we entered, and there were at least 5 other doors that I could see with people streaming in. Linda took us to a pair of seats and said, "This pair is for us. You take the far seat." Cynthia and Burt sat in the next pair over.

There was something odd going on, so I asked Linda, "How did we get here?" Thinking back, I had realized something. There was not a single sign anywhere in the building. There were no announcements over any sort of PA system. Linda had never talked to anyone besides Cynthia, Burt and me. The seats did not even have numbers on them. Yet she had walked straight through the building, onto the plane, straight to our seats and we sat down. So did everyone else.

"That is one of the many things that you will learn during the orientation." She said.

"Now make yourself comfortable. It's a bit of a flight."

"Can I put my seat back?" I asked. I had seen that several other people had already turned their seats into beds.

"Sure." She said. She did not touch anything, but the seat unfolded automatically and I had myself a very comfortable single-size bed. She opened a drawer and handed me a blanket.

I lay down, and I fell asleep immediately. It had been an incredibly long day...

\* \* \* \* \*

I felt someone squeezing my hand as I came back to consciousness. I opened my mind, and then my eyes, and it took several seconds for things in my head to snap back into place so that I could realize what was going on.

We were still on the plane. Linda was still beside me, and she was the one squeezing my hand. I looked at her and she looked at me. My seat was raising itself slowly. All of that was normal. What was abnormal was the walls of the plane.

I had not really paid attention to it before, but this plane had no windows. Instead, the walls, ceiling and floor had turned completely transparent. Or so it seemed. I reached down and touched the floor and apparently it was some kind of screen. The entire interior of the plane was covered with this screen material, and it was displaying a view that made the plane appear transparent. Overhead there was a brilliant blue sky with a few puffy clouds. Beside us in the distance were other planes. Below was a remarkable city and we were flying right over it.

The scene was absolutely amazing. An entire section of the landscape was covered with the structure of the city, but it was entirely different from a U.S. city. In the U.S. there would be rows of buildings intersected by a grid of roads jammed with cars. Here the structure was designed with an entirely different intention. The amount of glass was the most impressive part. You could see huge glass bubbles with lakes and parks inside of them. Tall buildings that looked like apartment towers with an amazing variety of shapes sprouted everywhere through the glass.

Up ahead I could see the airport. It was immense, with dozens of planes parked next to terminal buildings. To the far right of it were several immensely tall black structures. With the plane transparent like it was, I could see how tall they were, and apparently they did not have tops. I asked Linda, and I was not the only one pointing to them.

"Those are the space elevators," she said, "You can ride them if you want. They are just starting to be fully operational. There's even an orbiting hotel and you can stay there for several days if you like. It's a very popular spot for couples, but lots of people go simply for the novelty of it."

"How can you have space elevators built and operational already? Last I heard they were still 50 years off in the U.S." I asked.

"Things have slowed down a good bit in the U.S. I'm afraid." She replied. "The economy retracted quite a bit when so many people ended up in Terrafoam. Then you have the combined problems of egos, politics and lawyers in the U.S. There are immensely rich people in the U.S., but they all seem to have large egos. They would rather compete and bash each other than cooperate. They are constantly suing one another. And none of them wants to have anything to do with taxes. With all that happening, it is very hard to get people together to work on big projects. It makes it much harder to innovate in the U.S. You will find that things are streamlined here, and we are innovating at an incredible pace. It's all part of getting better and better."

As if to illustrate her point, the plane was now landing vertically. There was no runway, nor any need for one. We settled next to the terminal building and the walls became opaque and normal once again. I suppose the walls could display anything, but they had become beige. The floor looked like polished marble once again.

We stepped out of the plane through the wide doors into the concourse with about a thousand other people from the flight, and walked a short distance. Here we stood in one of about 100 short lines. 100 "cars" would pull up, their overhead doors would flip open automatically, two or four people would get in, the doors would all close automatically, and those 100 cars would depart. A new set of 100 cars would arrive and the cycle would repeat. We stood in line for less than two minutes and we were on our way. Inside the car, Linda and I faced Burt and Cynthia sitting across from each other in very nice reclining seats not unlike those on the plane. The interior was roomy and well-lit, but there were no windows.

"We are only going 24.3 miles," Linda said, "So this will only take 4.25 minutes."

Since the car had no windows, it was impossible to tell what was happening. But I could feel the car accelerate briskly. Three or four minutes later I could feel it decelerate. The door popped open and we stepped out, through an archway and into the lobby of an enormous building.

From the lobby to the roof there was an open atrium at least 70 stories tall. The roof overhead was glass. Around the sides of the atrium were balconies with plants streaming down, and then off the balconies were thousands of rooms. It gave you an incredible feeling of light and volume, and with the plants it was beautiful.

"This is where you'll both be staying during the orientation," Linda said to Burt and me. We walked a short distance and stepped into one of the glass elevators that ran up one of the corners of the atrium. There were no buttons inside the elevator, but it stopped on a floor and we got out. We walked a short distance to a door that had Burt's name on it. The door opened and Burt and Cynthia walked in. Linda and I walked to the next room, which had my name on it, and entered.

It was an amazing suite. As the door opened, I looked across a remarkably nice



living room and out through a floor-to-ceiling window that showed a panoramic view of the landscape. To my left was a small kitchen, to my right a short hallway which opened into a bedroom. I walked toward the window to absorb the view. About a quarter mile away was a line of glass buildings, apparently identical to the one I was standing in. On the ground between me and that line of buildings were forests, gardens, parks, lakes, trails, streams. I could see people riding bicycles, kayaking in a river, walking. Off to one side I could see what appeared to be an amusement park and a stadium.

I looked around the apartment. It was hard to believe, but yesterday I was living in Terrafoam with no way out. Now I was living in what appeared to be a 600 square foot suite at a 5-star luxury hotel. Everything in the room was perfect. There was a basket of fruit and munchies sitting on the coffee table, and fresh flowers on the credenza. I opened the card in the flowers, "Here's to your life! Love, Linda"

Linda said, "The orientation is going to start in about an hour. Why don't you take a shower and change your clothes. I'll relax here." She sank into one of the chairs in the living room and closed her eyes.

When I was through with my shower, I found my closet filled with clothes that all appeared to fit perfectly. I picked an outfit and put it on. Walking into the living room I smelled food, which was a good thing because I was starving.

"How do I look?" I asked.

"Fabulous!" she said. "Very trendy. I got something for us" It was a extraordinary meal, although I had no idea where it came from.

"Today is going to be an interesting day for you," she said. "It will also feel a little odd. You've got the time zone change. You are in a completely different country. There are many new things for you to absorb. I just want you to relax and let the day flow. If you get tired, let me know. But I doubt you will get tired today. You had a good sleep on the plane. Let's get going."

We took the elevator down, past the lobby and then below it. We got off and entered a large auditorium with hundreds of other people streaming in as well. Linda led us to a pair of seats and Burt and Cynthia were already there. The presentation started about three minutes after we arrived.

The first presentation was remarkable, and it kicked off a series of events over two days. These events combined video, sound, live speakers, musical performances, tours, and testimonials to create an extremely powerful production. It was one of the most inspirational things I had ever seen or heard. I learned a number of details. For example, I learned where we were located on the continent of Australia. I learned that we would be living here for six weeks during the orientation process. I learned that currently about 400,000 new residents were arriving in Australia every day. I learned about the daily schedule over the six week period. In orientation we would be learning about the credit system, housing, the robot culture, picking products -

everything from food to clothing to vacation packages - interacting with other residents, volunteer opportunities, physical fitness, careers, the legal system, voting, etc. It would be a very busy six weeks.

The first two days acted as a general overview of the Australia project as a whole, but spent a good bit of time covering three things -- the history of the Australia project, the economy of the project and the core principle of "living your life."

Distilling two days of presentations down into a few sentences, here's what I learned. As best I could tell, the basic idea behind the Australia project was to create heaven on earth, or at least the closest facsimile of heaven possible. Heaven was different for different people, so your task was to define heaven for yourself and make it happen. As long as your view of heaven did not unduly impinge on anyone else's view, or require that you consume massive amounts of resources at the expense of someone else, you could bring your version of heaven to reality for yourself. It was stated in the presentation much more eloquently than that, but that was the gist of it.

There was a very good explanation of why we needed the orientation process. We would be entering a society very different from any society we had ever experienced before. This society offered a huge array of options, and those options grew constantly. The society was well-balanced, with a huge pool of people interacting in very human and humane ways, and there was no desire to throw off that balance by letting a bunch of new people in who did not know how to participate. To live our lives, we would be doing it in the context of this society, and everyone wanted us making a smooth entry. There were apparently no penalties for mistakes. If the entry was not smooth, we would be re-oriented.

One part of the presentation featured a speaker who absolutely blew me away. He was the best motivational speaker I had ever heard. He asked us to think about a set of basic, personal questions. Like: What am I passionate about? What do I most enjoy doing? What have I always wanted to try but had never gotten around to? How did I want to spend my time? In what sort of environment did I enjoy living? What kind of people did I like having around me? What kinds of hobbies did I enjoy? How far did I want to take them? Were there any that I would want to do constantly for a period of time?

For the first time in my life, in other words, I was told I had nearly total freedom to do anything I could imagine. All I had to do was figure out what to imagine. The goal of the orientation process was to make me aware of all of the possibilities and how to put them together into my view of heaven.

The presentation ran through a number of examples. Essentially, everyone in Australia is living on a gigantic, luxury cruise ship. The trip is already paid for, for life, and you are free to do whatever you like with your time. The robots are doing all the work, and you get to partake freely of their output. In other words, for the first time ever, everyone is truly equal and everyone is truly free.

Some people on a cruise ship like this would want to spend their time lying by the pool tanning and sipping margaritas. They are free to do that. Some people would want to spend a lot of time raising their children. They are free to do that. Some would want to be bass fishing all day. That's OK too.

But there would be a tremendous number of people who would want to fulfill life-long dreams -- they would see the unlimited free time of a life-long cruise as an amazing opportunity. Anyone with creativity would start creating.

For example, anyone with an artistic bent would start creating art, because they now have the time and the freedom to do it. Let's say that you are, or have always wanted to be, a musician. You would get yourself the instruments and equipment you need to make music. It's all available - just ask the robots and it is delivered to your door. There are thousands of options in the catalog. You would have the time and freedom to expand your talent. You could take classes, practice, hook up with other musicians, form a band and start performing.

In the same way, writers would start writing the books that they have always dreamed of writing. Inventors would work on their inventions, using materials and equipment provided by the robots. Scholars would do their scholarly research, finally free to study whatever they like, using the infinite intellectual resources available on the network. Scientists would start pursuing their scientific goals using research facilities provided by the robots. Dancers would get together and dance, and then perform. People who want to create films would pool their talents together and create them, or do them solo. The robots would provide equipment and studio space and let them have at it. Athletes would train and compete. Programmers would write the programs they have always dreamed about. Designers would design whatever they felt like, and then the robots would build it. There are people who are experts in their various fields -- engine design, scrap booking, fusion reactors, needlepoint -- and they would love to pass their knowledge on to other people. They would write books, make videos or have live lectures and workshops for people to attend. People interested in the martial arts would practice them every day. People interested in video games would play them every day. People interested in gardening would garden every day. The majority of people have a talent and, if they had the time, they would cultivate that talent and use it. The huge cruise ship known as Australia is the perfect place for every human being to reach his or her full potential.

It was fascinating to think about this and contrast it with the life I had known. In the U.S., everyone had to work, and in most cases "work" meant doing something that a rich person wanted so that the rich person could get richer. Thinking back to the jobs available at the turn of the century -- you could work scrubbing toilets in a hotel, or you could flip burgers in a fast food restaurant, or you could restock shelves and check people out at a retail store, etc. -- No one wanted to do any of these jobs. No one, as a child, ever aspired to scrub toilets or flip burgers or restock merchandise. But you had to earn money to live your life, and these were the jobs being offered to tens of millions of people. People had no choice but to take them, and in the process a rich person became richer. Then robots replaced those workers, and they

ended up in Terrafoam.

In an economy like that, there were all sorts of musicians who wanted to do nothing but practice, write music and perform. There were programmers who wanted to do nothing but program their own creations. There were scientists who wanted to do cutting-edge research. These people did not care about money. They simply wanted to do what they do best. Getting paid for it was a necessary evil for these folks -- they had to have a day job to pay the bills, and then when they got home from work at night they would indulge their real talents and their passions.

In Australia, these people could completely fulfill themselves, and humanity would be much better off because of their contributions. Creative people want to -- need to -- create. That is their passion. Instead of millions of talented people working in jobs that had nothing to do with their dreams, simply to make ends meet, in Australia they could follow their dreams.

The goal in Australia is to encourage and nurture creativity and innovation. This allowed, for example, there to be a nearly infinite array of clothing designs to choose from. A fashion designer -- any person whose passion and/or lifelong dream involved designing clothes -- would create a design and submit it to the catalog. If the design was worn by only three people, that was fine. The robots custom-made three copies of the design and delivered them. Or a design could be wildly popular and worn by millions. In that case, the designer gained a great deal of notoriety, won accolades and awards, and so on. This designer would appear in design shows and people would breathlessly await new designs. At the same time, another designer could have a very small group of passionate followers. Both designers had the chance to do their thing, and any new designer could break out into the mainstream at any moment simply by drawing something that caught the public's attention. It meant an amazing level of creativity and innovation in every product category -- food, housing, architecture, vacation resorts, restaurants, furniture. Whether it was basic research or final consumer products, innovation was everywhere. The innovators had the ability to take their research/inventions/ideas as far as they could.

The space elevators were a good example of a larger-scale process. Millions of people had said that they would gladly take a trip to a weightless hotel in orbit, and they were willing to contribute their credits up front to make it possible. With the credits available, the robots allocated the resources for research and design. Scientists, engineers and designers interested in the project worked on it simply to have a part in it and make it a reality. Then the robots built the space elevators to meet the demand.

When you thought about it, this made a lot of sense. For example, the American moon shot was one of the most innovative programs ever seen in the United States. Thousands of scientists, engineers and designers came together and worked 18-hours-a-day to make the moon shot happen. Did they do it for the money? No. None of them became millionaires. They did it because they loved it and believed in the idea. Einstein did not create the theory of relativity for the money. The Wright

Brothers did not create the airplane for the money. Creative people create for the joy of it.

In other words, Australia was a permanent vacation resort for some of the residents. For creative people, Australia was an amazing intellectual playground. This meant that innovation was progressing at an astonishing rate.

Each day, robots cleaned my apartment, changed the sheets and so on. It was just like a luxury hotel. Food and drinks got delivered as requested. If I wanted room service Linda would order it. If I wanted to cook for myself, I could do that. If I wanted to eat out, Linda and I would go to a restaurant -- there were thousands of them, all different kinds, scattered throughout the habitat. We would decide what we were in the mood for and she would take us right to the restaurant. Sometimes we could walk or ride a bike. Other times we took a "car" like the one that delivered us from the airport. The food and drinks were all essentially free because the robots were growing and processing all the food from free resources. This concept of "free" was just like on a cruise ship. Once you bought your ticket, everything was free on the cruise. This cruise just happened to last a lifetime.

At the end of the second day of orientation, we were told that day three would cover the Vertebrane system. Details on this system were sketchy, but I knew it had something to do with accessing the network and ordering things.

On the third day, Linda woke me as usual with her arrival. It was a very nice way to wake up in the morning.

"By tomorrow you should be adjusted to the time zone and waking up on your own." She said.

"What's on the schedule for today?" I asked.

"We are actually going to spend some time together today." Linda said. "We are going to talk about the Vertebrane system."

"I am full of questions about it." I said. Obviously this system was important, because it seemed like the tool you used to request almost anything from the robots. "How does it work? For that matter, how do I access it?"

"Sit down and let me show you something." said Linda. "It will help you to understand."

We sat down on the couch together.

"Did you know that this window is adjustable?" she asked.

"No." I replied. In the bedroom, the floor-to-ceiling window actually had drapes. They were part of the décor. But in the living room the window was a seamless floor-to-ceiling sheet of crystal clear glass. There was no frame or border of any kind. There

was no obvious control for adjusting it.

Linda said, "It can be frosted." And the window frosted. "Or it can be opaque." It turned black, and the lighting in the room came up to compensate. "I can take the lighting down or bring it up," She said as the lights adjusted. "It can even look like stained glass," She said, and the window took on a modern stained glass design. "Or paisley wallpaper." And it became what appeared to be a solid wall-papered wall instead of a sheet of glass. Then it became the familiar clear window again.

"How are you doing that?" I asked. She had touched nothing. She hadn't really moved. She was speaking, but the window often changed as she was speaking the sentence, almost as though it were following her thoughts rather than her words.

"I'm using the Vertebane system. Ask me anything." Linda said.

"OK, What size shoes do I wear?" I asked.

"We don't have shoe sizes here. Each shoe is custom made for the wearer. Next." She said. "Try to ask me a factual question."

"How tall is the Empire State Building?" I asked.

"1,472 feet to the tip of the antenna. 1,250 feet if you don't include the antenna. Next." She said.

"In metric?" I asked.

"448 meters and 391 meters. Next." She said.

"In light years?" I asked.

"About 1.5 light microseconds." She answered. "Next."

"How do I know that you are right?" I asked.

"Take my word for it. Or ask me something that you can verify right here." She said.

"How wide is this room?" I asked.

"16.5 of your shoes. Check it." She answered.

I checked it by pacing off the room. She was correct. "Lucky guess." I said.

"Next." She said.

"Will we ever bake cookies together?" I asked.

"I cannot predict the future." She said. "But I would say that the probability of that

event is high."

I looked at her and she looked at me for a moment.

"Ask me something that is impossible for me to know." She said.

I thought about it. Burt had a tattoo on his butt. I knew about it because I had seen it several times in the showers in Terrafoam, but there is no way Linda would know.

"What is tattooed on Burt's butt?" I asked.

She paused for a moment. "The name Angie in a heart." She said. "On the left cheek."

I paused for a long time.

"How are you doing this?" I asked.

"That is what we are going to talk about today..."

# Manna

## Chapter 7

by [Marshall Brain](#)

Linda looked at me and started to explain, "The Vertebrane system lets me access the entire information network here in the Australia project. It is like a network connection, a telephone, a TV, a computer and several other devices all rolled into one. You asked me what was tattooed on Burt's butt. I used the Vertebrane system to get the answer."

"Yes." I said, "But how did you get the answer?"

"Let's say you were holding a telephone in your hand. How would you get the answer?" Linda asked.

"I guess I would call Burt and ask him." I replied.

"Right. But Burt doesn't have a phone, so I called Cynthia and I asked her. She asked Burt. If I thought the answer was on the network, I could do a search instead."

"But how did you do it? You never moved. You never picked up a phone. You didn't

do anything -- how did you call Cynthia?"

"This is the interesting part about the Vertebrane system. I am going to explain it to you, but I want you to relax while I do it. Different people take this differently. That's why I am sitting here with you privately, telling you about it one-on-one. There's just no way to talk about it in a big group during orientation, because everyone reacts differently to it. I want you to understand that the Vertebrane system is a good system. It is the most advanced communication and networking system ever created. But it freaks some people out when they hear about it. My job is to help you get past that." Linda was looking at me with an expression that was one of serenity. She just wanted to talk to me about this thing, whatever it was.

"I won't freak out." I said. "Just answer me one thing. Where is this system? How do you access it? This has been a question since I got here. In this room there is no computer, no TV, no telephone. I would expect my room to be filled with electronic devices, but I have not seen a single device since I got here."

"That was the problem that people started to notice. The more advanced everything got, the more devices you needed. Think about the state of electronics in the U.S. -- computer, TV, telephone, PDA, GPS, stereo system, portable music players, video players, video recorders, cameras... At some point the number of devices becomes insane. Sure you can integrate some of them together, but then there are compromises. Plus there are the problems of screen sizes, multiple screens, batteries..." Linda explained. "The Australia Project, with its level of innovation, was producing more and more devices in myriad forms and it was becoming quite unwieldy."

"So how did you solve the problem?" I asked.

"We decided it would be easier to build in all of these devices." Linda answered.

"Build them in where?"

"Inside of us." Linda replied. "I know that sounds foreign, because you've never thought of 'devices' in this way before. You have always thought of devices being outside your body. When they are outside, though, they are always getting in the way. You have to carry them, you have to put them in pockets. You lose them. You have to hold them in your hand to use them, and you only have two hands. If you build them in, all of those problems go away."

"That actually makes sense." I said. "The whole idea of using a hand to hold a phone to your head seems awkward. But I have a couple of questions. First of all, where are the devices? I mean, you don't look lumpy or anything. Are they in your torso?"

"No, they are not in my torso." Linda smiled.



"And how do you push the buttons or read the screens?" I asked.

"That's one of the most interesting parts about the Vertebrane system." Linda said.

"What?" I asked.

"Pushing the buttons and reading the screens." Linda replied.

"So how do you do it?" I asked

"Think about it this way. What's the biggest problem with screens?" Linda asked.

"I don't know. What, they are never big enough?" I replied.

"Very good. That's the biggest problem with screens. We can make screens as big as buildings now, but they are really hard to take with you. In any sort of portable device, the screen is always too small. And what if you are walking?" Linda asked.

"Yes, that's a problem. You can't see the screen if you are walking because it jiggles too much. And you run into things when you look down at it." I answered.

"Exactly. So here is the simple solution -- what if you painted the image right onto the retina?" Linda asked.

"That sounds like it would work." I replied. "How do you do it?"

"It turns out you can't do it." Linda said. "It just doesn't work. You can try putting some sort of retinal projector in a pair of glasses or something, but it gets extremely cumbersome. When you are running the glasses still bounce a little and it is distracting. And there is still no way to push the buttons."

"So how do you solve the problem?"

Linda took a deep breath, "I want you to imagine something, and think about how your body works. What if you tapped right into the optic nerves? What if you pumped images straight into the visual cortex of the brain, overlaid on top of the scene coming in through your eyes?"

"You can do that? You can tap right into the optical nerves?" I was nearly speechless.

"Yes, we can do that. We can also tap into the auditory nerves coming from the ears, along with taste and smell nerves from the tongue and nose. We can pump artificial sensory perceptions right into these main sensory nerve bundles as they enter the brain." Linda explained.

"Holy smoke. What about touch?" I asked.

"We handle touch as well. The way we do that is to hook right into the spinal cord. That lets us pick up all touch sensations, and also gain control of all the muscles as well." Linda said.

"What?"

"I know it sounds farfetched. But we actually put shunts into every nerve pathway heading to the brain. And we do that whether it is a sensory nerve fiber heading toward the brain or a muscle control fiber heading out." She explained.

"How do you do that?"

"For the spinal cord, what they do is they replace three of the upper cervical vertebrae in your spine. Right about here." She touched the back of my neck, and then showed me where on the back of her neck. "That's where the computer system is embedded -- in the three new vertebrae they install. There's also the power module and the wireless transmitter."

"Inside of you right now?" I asked.

"Right here." She held the back of her neck.

"Why is there no scar?" I asked, looking at her neck.

"The surgical procedures in the Australia Project are just as innovative as everything else." She said.

"Where does the power come from? Do you have to recharge yourself every night?" I asked, only half joking.

"No. There's a fuel cell in the third vertebra, and it uses glucose in the blood for power. It has a nice side benefit -- it helps you keep your weight down. That's one reason why there are no fat people in the Australia Project."

"Oh my God. I knew there had to be a reason for that. I figured that there were forced feeding limitations or something. No one could ever go on a luxury cruise and stay thin."

"No, the Vertebrane system actually takes care of your weight for you. But that's a bonus. It has nothing to do with the real goal of the Vertebrane system." Linda said.

"So let me see if I have this straight. You are saying that surgeons replace three of the upper vertebrae in your spine." I said.

"Yes." She said. "Actually it is robotic surgeons, but yes." She said.

"And they sever the spinal cord and essentially reroute it into a computer in one of

those new vertebrae." I said.

"Yes. Very good." She confirmed.

"And they also tap into the major sensory nerves, like the optical nerves and the auditory nerves." I said.

"Exactly." She replied.

"You are blowing my mind." I said. I had to close my eyes for a minute. "Is that how you are wired right now?"

"Yes, that is how I am wired. And let me tell you, it is fantastic." She said.

"How does it feel?" I asked.

"It is very freeing." She said.

"How so?" I asked.

"Let's say that I want to talk to Cynthia. I can call her and talk to her. Or I can send her a letter. To call her, I just think through it to connect. Then it is just like we are talking to each other normally. I hear her voice as though it is in my ear. What's happening is that when she thinks about talking, the Vertebrane system intercepts the signals and sends them to the network wirelessly. They are transmitted to me, and my computer sends the words she is speaking into my auditory nerves, overlaid on the ambient sound around me. Or I can turn the ambient sound off if I want to. That's great if you are in a noisy place."

"So you can turn your ears off?" I asked. "That would be cool. There are lots of times I have wanted to close my ears just like I close my eyes."

"There are a lot of people who meditate by turning off everything. They turn off sight, sound, touch, taste and smell. Their brains are completely disconnected from the world. It is like you are floating in a complete isolation chamber. I don't like it myself unless I am trying to fall asleep, but lots of people swear by it."

"What else can you do?" I asked.

"Everyone listens to music this way. It streams from the network straight into your auditory nerves. The sound is perfect. You can make it as loud or as soft as you like. And it can always play in the background. You just turn it down when a call comes in." She said.

"I never thought about that." I said.

"Another thing that Vertebrane can do is translate for you. If you are taking a call from a person who speaks in a different language, the system simply translates

what they say into English and sends the translated version in on your auditory nerve instead of the original version. That way, everyone in the Australia Project can talk to everyone else. Language is never a problem."

"How smart is it?" I asked.

"It is amazing actually. For example, let's say you are in a room with a lot of people, and someone is talking too loudly and making it hard to hear. You can ask the system to cut him out, and his voice disappears from the audio track you are hearing."

"What else can it do?" I asked.

"The visual side is where it is the most amazing. It has different modes. Remember when we were in the airport and you asked me 'How did we get here?'" She asked.

"Yes." I said. "But now I can see where this is heading."

"Right. I simply ask the system where I am supposed to be for the flight, and when. In my interface, the way the system tells me where to go is by painting big arrows on the walls. No one else can see them, but when I look at the world, I see arrows painted on the walls. And I like lots of arrows so I never get confused. Then when we got inside the plane and the seats were nearby, they glowed. That's how I knew where our seats were. You can set up the interface in nearly any way. Some people like arrows on the walls. Some like lines painted on the floor. Some like a big golden retriever who walks in front of you and then you follow. And it can be anything -- golden retriever, elf, dragon, floating orb, whatever. Some people go for a voice interface, where the voice tells you to turn left or right."

"As soon as you mention voices, you know what I am going to ask." I said. There was a chill running up my spine.

"Yes I do. Let me be very clear on this -- this is not Manna, or anything close to it. There is a huge difference between Vertebrane and Manna. Manna tells you to scrub a toilet, and you have no choice. Manna times you as you scrub it and shocks you through the shock collar when you don't do it fast enough. That is insane -- it is no different from slavery, with a computer system owned by rich people as the master." She said.

"I agree." I replied.

"In the Vertebrane system, you are always in control. You can ask for help -- directions for example -- and the system helps you. You can ask a question and the system will answer it. You ask the system to play a movie or make a call or whatever. You can even ask the system to disconnect your brain from sensory input so you can get a good night's sleep, and then wake you up at 7. The system will do that. You are always in control of Vertebrane, rather than vice versa." She

explained.

"That is good to know. And actually this is sounding very cool." I said. "How do I watch a movie if I have Vertebrane?"

"There are a couple different kinds of movies now. There's old-style screen movies, and people still watch a lot of those because they are classics. With Vertebrane you can sit down or lie down and the movie plays through your vision system. You disconnect your eyes and all you see is the movie in that case. Or you can have kind of a picture-in-picture thing, where the movie is overlaid within the scene that your eyes are naturally seeing. That way you can go for a walk and watch the movie while you are walking. But all the new movies are immersive now. You not only see the scenes, but you also taste, touch and feel them. You are completely immersed in the movie. Many of these movies are interactive, and when they do that they're kind of a merge between a movie and virtual space." She said.

"Virtual space?" I asked.

"Immersive environments. Artificial worlds. Whatever you want to call it. We call it VS here" She said.

"How does virtual space work?" I asked.

"Virtual space is an offshoot of gaming." She said. "You saw it in the U.S. to some degree -- games got more and more realistic on the screen. Now imagine a game world where it's not about screens and stereo speakers. Instead, you are completely immersed in the game world. It includes sight, sound, touch, taste and smell, and it is totally realistic. You essentially disconnect your brain from your real body and plug it into a virtual body in the game's virtual world. Then people started creating virtual worlds simply for the sake of creating them. You can experience just about anything in virtual space now, and you can do it alone or with a million friends. You can be Neil Armstrong landing on the moon, or a cowboy in the old west or whatever."

"What else can Vertebrane do?" I asked.

"You access the network through it. Basically you can access any fact, image, movie, song. You can also experience what someone else is experiencing -- a person streams all their sensory data to you, and you both experience it simultaneously. It can be one person sharing the experience, or a thousand. Or you can publish an experience and other people can play it whenever they want. Vertebrane also exercises for you. And it records your entire life to the network, so you can go back and review things that have happened in the past and replay them. It can do all sorts of things."

"Wait a minute. Your entire life?" I asked.

"Yes. Basically your entire sensory feed, along with all your muscle actions, get

recorded every minute of every day. Then if you want to go back and relive something, you can. It's like a complete diary of your entire life." She explained.

"Is that public?" I asked.

"No. Well, sort of. There are the refs, but they are the only thing accessing it besides you, unless you publish something." She said.

"The refs?" I asked.

"The referees. They monitor things and prevent problems." She clarified.

"How so?" I asked.

"They are like referees in any sport. They watch things, and flag you if you break the rules or are about to break the rules." She said.

"They watch everything?"

"The refs are robots. They watch your sensory feed as it is coming in and look for rule violations. For example, let's say you start screaming obscenities at someone in public. The refs would flag that and detain you. It's against the rules to scream at someone in public, mainly because no one wants to be around when it happens."

"That makes sense. Did you say they can flag you if you are about to break a rule?" I asked.

"Yes." She said.

"How can they know you are about to break a rule?" I asked.

"Let's say you have picked up a bat, you are running toward someone and your muscles are getting the bat in position to swing it. A ref would look at that and say, 'there's a good chance someone is going to get hurt here.' The ref would shut down the person with the bat."

"Shut down?"

"It just disconnects your brain from your muscles and the ref takes control. Then you are detained to review the situation and retrain." She said.

"That must really cut down on crime." I said.

"You cannot imagine. And there is always a complete record after any crime is committed, so there is no question about innocence or guilt. Prosecution is trivial if you are guilty, and exoneration is instant if you are not. It's a little creepy the first time a ref warns you about something. It is sort of like a lifeguard yelling at you at the pool for something you thought was OK. It's embarrassing, at least to me. But

then the ref explains the rule, you can ask questions about it and then you move on."

"How often do the refs flag you?" I asked.

"It can be pretty often in the beginning, but I haven't heard from a ref in over a year I'd say. It's been a long time."

"Where do the rules come from?" I asked.

"We make them. Everyone is involved. They'll spend almost a week on that during orientation -- it's a big part of living here."

"And what were you saying about exercise? How can a computer system help with exercise?" I asked.

"This sounds a little weird, but here's how it works. The biggest problem with strenuous exercise is that it's no fun. It hurts. But strenuous exercise really helps on the health side. People in the Australia Project are now living 30 years longer than people in the U.S., and exercise is a part of that. Athletes are OK with the pain, but most normal people have no desire to be in pain for an hour or more. So... someone figured out a solution. What you do is disconnect your brain from sensory input and watch a movie or talk to people or handle mail or read a book or whatever for an hour. During that time, the Vertebrane system exercises your body for you. It takes your body through a complete aerobic workout that's a lot more strenuous than most people would tolerate on their own. You don't feel a thing, but your body stays in great shape."

"You are kidding me."

"No, I am not kidding. It is fantastic to have a body that is working at peak athletic performance. You've got to feel it to believe it. I am in fantastic shape. Here, feel my arm muscles." She offered me her arm, and she was surprisingly lean and muscular. I'd never really paid any attention to it, but she was in great shape.

"Let me see if I've got this straight. You disconnect your brain, and you -- your brain -- can do whatever you want on the network. Call, read, play games, whatever. Meantime a computer controls your body. So your body is essentially a robot. Is that right?" I asked.

"Yes, that's right. Your Vertebrane system is driving your body. Meanwhile your brain is off doing whatever." She explained.

"So who am I talking to now? Am I talking to Linda's brain, or to the Vertebrane computer?" I asked.

"Ah. I see where you are going. You are talking to me. It's against the rules to have Vertebrane drive your body like that when you are with someone else. That would

be way too confusing. If I am with you, I am driving my body. The refs would flag it otherwise."

"That's reassuring." I said.

"When we are together, you are always talking to me, myself and I. No artificial additives. What else would you like to know?" She asked.

"My God, I could ask you questions all day. It would probably be easier to simply get it myself and try the Vertebrane system out."

"I'm glad to hear you say that!" she said. "We can have it done today."

"Today? Are you kidding?"

"No. It's minor surgery. You can be out in an hour and you won't feel a thing." She said.

"What??? How can replacing three vertebrae and having every major nerve fiber severed be painless?" I asked.

"Well, think about it. First, medicine is highly advanced here. But second, any pain signals start routing through the Vertebrane system once it's installed, and Vertebrane can mask any pain. There's no such thing as unnecessary pain once you have Vertebrane installed. You'll never have a headache again."

"If we can do it today, let's go for it. I have got to try this out." I had once been a game fanatic, and just the thought of an immersive game was enough to sign me up.

We went to the clinic. Linda held my hand as they put me under, and when I woke up...

# Manna

## Chapter 8

by [Marshall Brain](#)

I woke up as if I had taken a light nap. No grogginess really. Everything was completely normal. Linda was sitting in a chair nearby with her eyes closed. She was reading her email or walking around in virtual space, for all I knew.

"Did they do anything?" I asked.

She opened her eyes. "Yes, of course. They put in the whole Vertebrane system."



She said.

"Where is it? Nothing is different."

"It's there," She said. "It defaults to pass-through mode. Now you have to learn how to use it. That will take a day or two. I'll take you over so you can start training."

It turned out to be incredibly easy to use. And once you learned the basics, it could do an amazing range of things. Just like Linda had said, you could use the Vertabrane system to talk to people anywhere in the Australia Project, to get answers to any question from the network, to play totally immersive games. You could meet with people in VS, and some of the meeting places were quite bizarre. You could meet in weightlessness in a space station. You could meet underwater. You could meet while walking under the canopy of a redwood forest. Linda's favorite "place" to meet was flying through the air, like Superman. In her Virtual Space, you could fly in the traditional arms-forward Superman pose, or you could stick your arms out and use them like wings to control your flight. Or you could ride on a flying carpet. The flying sensation was remarkable.

You also ordered everything through the Vertabrane system. You could try on clothes, see and taste food, try out products, choose housing and vacation options. It made shopping incredibly easy, and you knew exactly what you were going to get.

The funny thing was that Vertabrane was like every other technology I had ever used. During the first couple of days it was miraculous. Each new feature was surprising and amazing. But after a week or two you got used to it and it became a part of your life. Think about any technology -- the telephone, the automobile, the airplane, the refrigerator, the home computer... These were all miracles the first day people saw them and used them, but a week later they were passé. By the end of orientation I didn't even know Vertabrane was there -- it seemed completely normal to me.

One thing I did think about more and more was the security of this whole system. Computers had been plagued with bugs and viruses since the beginning, but the Australia Project seemed to suffer from none of these problems. One day I asked Linda about it.

"What's to stop someone from taking over the system and turning us into an army of zombies?" I asked.

"I'm no engineer," Linda said, "But here's the best explanation I've heard. Why can't someone take over your brain?"

"What do you mean?"

"Why has no one ever been able to take over billions of human brains and create an army of zombies that way?"

"Well, it's inside of me. How would they take it over?" I replied.

"Why can't they just upload a program into your brain, and that program takes over your brain and turns you into a zombie a minute later? Why does that never happen?" She asked.

"Because there is no way to 'upload' a program into my brain. And my brain does not execute programs anyway. It is not a computer." I replied.

"Yes." She said. "Everything you learn comes in through your eyes and ears. It passes through your conscious mind one piece at a time, and your conscious mind evaluates it. Then your conscious mind 'executes' the things you learn consciously, thinking about each one. If someone were to try to teach you to cut off your own arm, your conscious mind would reject that as ridiculous when the lesson came in, and your brain would certainly never cause you to cut off your arm except in the most extreme situations. The Vertabrane system is operating in the same way. It is learning things, not running programs. It acts consciously rather than being 'programmed', and it has a far more rigid moral code than most human beings do. The Vertabrane system never blindly 'executes' a program, so it cannot be taken over. That's true of all of the robots here. The Australia Project would have collapsed long ago if this were just a bunch of computers blindly executing code that humans had written. That is how things were in the beginning, or course, but we advanced beyond it fairly quickly."

Once Vertabrane was installed, orientation became much easier. Everything happened in VS and we covered a huge amount of material over the remaining five weeks -- the economic system, government, voting, housing, credits, travel, crime, punishment, rules, interpersonal interactions, referees, education, ordering things, designing new things, news, awards, social responsibilities and so on. There were lessons on the nine core principles, what they meant and the effects they had on the community as a whole. There was a lot of emphasis placed on treating other people with respect, and understanding the basic humanity of the people around you.

It was very interesting to compare this new world to the world I had known all through my life. The biggest difference, of course, was the economic system. It had effects on everything -- the psychology of people living in Australia, the way people worked with each other, what people bought and why, the level of innovation, the way resources were allocated, etc. One of the more interesting features of the economy from a psychological standpoint was the fact that no one had more than you did, or less, and everyone knew it. That removed entire layers of negative emotions. The fact that you could have pretty much anything you wanted, anytime you wanted it, meant that you placed far less importance on material things. You would expect that, given essentially free access to everything, people would go nuts. Actually, the opposite happened. Suddenly there was no condition of "want" or "envy," so people had no need to show off.

This will sound surprising, but one of the bigger differences was the lack of advertising. The robots did not care whether you bought one style of clothing or

another, ate in one restaurant or another, lived in one kind of housing or another... It was all the same to them. Therefore, there was no need for advertising. If a fad caught on -- whether it was a song, a book, a style, a pair of shoes, a restaurant -- it all happened by word of mouth. And everyone knew that. If you tried something and it was good, you told your friends about it.

Innovation was incredibly interesting and important, and in orientation we discussed it extensively. I had never really thought of innovation as a part of society. Here it was actually something that people thought about and talked about as part of the "better and better" principle. But the reason for the discussion was surprising.

What became clear after several weeks is that a big part of the Australia Project was living, and understanding what living meant to you. Perhaps for the first time, a huge group of people had the freedom to decide exactly how they wanted to live their lives, and then make it happen. A big part of orientation was helping people realize that fundamental feature of the Australia Project, and help you work through the questions. It reminded me a little of the process of setting an animal raised in the zoo free in the wild. If you've been caged your entire life, actual freedom is a completely new experience.

Every single person in the Australia Project was different, and no one focused on one thing exclusively, but there were some general patterns. Some people chose to focus their lives on friends and family. For example, lots of people with children wanted to spend time with the kids. Many others had extensive networks of friends and spent much of their time with friends socializing in a variety of ways. Many people loved to travel, and spent a great deal of time traveling to different parts of the country and the world. Some people enjoyed art -- music, writing, painting, sculpture, dance, etc. -- and spent a great deal of their time at their art. Athletes spent their time training and competing. For each different person, a different type of lifestyle brought fulfillment.

A surprising number of people found fulfillment in creating new things -- inventors, scientists, engineers, entrepreneurs, designers, architects. In the Australia Project, these people could find true fulfillment. Because of the "better and better" principle, the Australia Project set quite a bit of its resources aside to help people interested in innovation. All "known" product categories were under constant improvement. All unknowns were being researched.

For example, take any "known" product -- shoes, clothes, food, housing, furniture, appliances, housing, restaurants, parks, etc. People were constantly coming up with new ideas to make them better and better. For example, if you came up with a new style of clothing, you would submit it and the robots would put it in the catalog. There was no way to know whether your new style would resonate with 100 people or a million, and the robots didn't care. The only way to find out was to let people have access to it. If someone had a new idea for a restaurant, the robots would simulate it and ask 1,000 people about their level of interest. If there was any interest at all, the robots would try one copy of the restaurant out. If it took off, they would make copies of it in different regions. In this way, restaurants were constantly

changing and improving. The same thing was true of housing -- there were thousands of housing styles, and you could move whenever you felt like it. If someone had a new way of doing things, the robots would try it out.

Another thing that helped innovation was the elimination of profit. In the Australia Project, the robots made everything and delivered it. The only "price" for anything you wanted was for the resources consumed. The robots could make one copy or a million copies of anything in the catalog, and they did not need to make a "profit" from any of it.

In a profit-driven society, a huge range of innovative products never saw the light of day because they could not make a profit. A technology or a product had to have enough people using it to cover the costs of the people working on the product, the advertising, the legal bills, the rent, etc. That meant that a lot of people had to be using a product in order to bring the price down to a reasonable level. In the Australia Project, that restriction was eliminated. There were no advertising costs for example. Production and resources were free. Anything that anyone could conceive could be produced, and it would reach its natural audience. The size of the audience did not matter. This meant a much wider range of products and services.

There was a relatively small but highly regarded segment of the population that got its fulfillment from fundamental scientific research. This is the kind of research that figured out things like fusion power, the origin of the universe and new materials. Throughout history, these people had never worked for monetary reward as their primary incentive. They worked instead for the joy of scientific discovery, and for peer recognition. This was the same kind of thing driving the open source movement at the turn of the century. The Australia Project encouraged the creative work of scientists, engineers, programmers, etc. by devoting a large block of the resources to them. They could work in groups or individually, and they could work in their personal areas of interest. Because the scientists and engineers had the resources and freedom to work on whatever they wanted, the creative process accelerated. The intellectual playground offered by the Australia Project was perfect for them.

In this way, each person in the Australia Project was able to seek and find a truly fulfilling lifestyle. Those who wanted to lounge around all day did so. Those who wanted to answer the mysteries of the universe did that. If you decided you wanted to completely change your lifestyle at any point, you could do that too.

One of the more surprising divisions in the society was the difference between the Vites and the Peas. There was a very large group of people who, given a choice between the virtual world and the physical world, preferred to live their lives virtually. They were known as Vites. Burt, for example, became a Vite -- completely virtual. He lived his life almost entirely in the virtual world. Vertebrane took care of everything physical for him -- Eating, showering, using the bathroom, exercising. This freed Burt's brain to connect to the virtual world 24 hours a day.

Because of their lifestyle, Vites used practically no resources. All they needed was a

little space to live in, room to exercise, some simple, healthy foods and water. Nearly every minute of their lives was spent in virtual space. When I spent time with Burt, it was always in VS.

The other half of the population lived mostly in the physical world, and used Vertebrane as an accessory to their lives. We were known as Peas. Linda, Cynthia and I were Peas. Linda's preferred mode for getting together was in virtual space -- She was hooked on flying. But for the most part, Peas spent a majority of their time in the real world. They met people, traveled and lived their lives in the physical realm.

After orientation, I got to spend a fair amount of time with Burt in his virtual world. He showed me around his favorite places, as well as new spaces as they became available. The big news in the Vite community was "Vite racks". For a Vite, the human body was a distraction more than anything else. Vite racks gave Vites the chance to discard their bodies. The brain was all that remained, and it consumed just 2.5 liters of space on a rack. The big advantage of a Vite rack was longevity. Current research was showing that the brain could last decades longer if it was maintained and managed in the optimal conditions of a rack. When a Vite wanted to enter the physical world, he or she could have his or her brain loaded into a variety of robotic bodies. But Vites rarely if ever needed a physical presence. The research was probably 4 or 5 years away from perfection, but it was going to be a huge development once it was complete.

Personally, I found the whole idea of a Vite rack creepy. I kind of liked my body. In fact, I liked everything about the physical world that made up the Australia project. After looking through the thousands of housing options available and touring many of them, I settled on a lifestyle that surprised me. There was a community set up to mimic many of the features of the original town of Williamsburg. People worked together to build their own houses, grow their own food, make their own clothes, practice simple crafts and trade with one another. The people living in this town were wonderful -- honest, industrious, friendly, down-to-earth. The things we did together were simple and straightforward. I could still visit my friends in virtual space when I wanted to, but I often kept Vertebrane in pass-through mode for days at a time.

It was amazing to me that technology had brought us full circle like this. I was living in the most amazing civilization known to mankind. As a species we had conquered nearly every want or need of the human condition. Food, water, clothing and shelter, as well as every imaginable type of entertainment or endeavor, were available in such abundance that everyone had a nearly infinite supply. Technology had advanced to the point where I could take an elevator ride to space, and was nearly to the point where my brain could be removed from my body so I could live a completely virtual life.

But with all of this technology available, I choose to live my life by setting time back 300 years and living a very simple, completely physical lifestyle. I grew my own food and built my own simple house with my own hands. I was able to be a kind

grandfather to dozens of children in the village, to make clay pots in the sun and to grow flowers in my garden outside my bedroom window. I was as happy and fulfilled as I ever had been at any time in my entire life -- my life was perfect, because it was exactly the way I wanted it to be.

Giving each human being the freedom to reach this level of deeply personal contentment was a remarkable achievement.