

Space

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1 Out of control

I will paint a broad landscape of catastrophe and then outline what we thought was our only option to help. We were worried. Our little group frequently tried to think of something we could do to nudge humanity in a direction to help to improve the chances of having a decent environment for our children and grandchildren. We were annoyed. The environmental dishonesty of the politicians is another aspect of their corruption. They had always gotten big money from the pollution lobby including the oil and coal companies. Politicians had spent trillions on unending racist wars against Arabs to grab control of their oil for the global oil corporations.

Globalization was about control. It meant that an ever smaller group of like thinking psychopaths controlled world commerce through their stooges the politicians. There were fewer options of things to buy for consumers. Everything seemed to be made in the same factory in China with different labels. Many items had no longer had brand names to complain about or to hold accountable by not buying their products in the future. No one wanted the plastic trash you had to buy. Every time you bought a product again, the can or package had been shrunk or watered down or reduced in quality in some way. The psychopaths prospered. They were overjoyed at their profits and at their skill at duping the consumer. Globalization meant everything had to use fuel to be shipped and trucked around the world. That is fantastically inefficient. Only local production, with local jobs, local transportation and local accountability ever made any sense. Locality was never mentioned.

Many politicians also waged war on the environment. Years ago, President Reagan arrogantly removed the solar panels from the White House. Was that because of his Alzheimer's or because he was a stooge of the energy companies? Probably both. Energy efficiency, alternate energy research, insulation, fuel economy standards, electric cars, carbon taxes even efficient light bulbs all fell in the war on the environment. The first casualty

of war is the truth. Most people believed the constant drone of climate-change-deniers. They just turned their air conditioning to a colder setting and bitched about the additional rain and snow caused by the extreme weather. The increased moisture in the atmosphere and extreme weather was rarely mentioned as being caused by global warming.

We looked at the situation of education and reform as hopeless. It was a little too late and we had gone a little too far. The psychopaths were too firmly in control. The general level of political and environmental ignorance was staggering. People were just too dumb to see what was happening and too dumb to vote in their own interest. They were mean spirited as well as dumb. People frequently voted on the side of those who lacked empathy. People voted for racism and wars against Arabs. They voted against public education, tree huggers, bleeding heart liberals, Medicare and Social Security. Mankind certainly needed to be a lot smarter.

Few people noticed the environment of the Earth was changing fast. I was sick of hearing about the dinosaurs that used to live in Antarctica as if this global warming is natural. Many expected the price of products to go down as savings on transportation were to come from Chinese shipping being able to take the shorter route across the North Pole since it was no longer blocked by ice. No one mentioned that the open water across the pole accelerated the global warming. The open water now absorbed the suns energy. The suns energy had previously been reflected by the ice.

We needed the buffer or cushion of the ice. The additional heat melted the permafrost. The permafrost released the carbon dioxide which had been stored in organic material in the permafrost for thousands of years. The additional carbon dioxide enhanced the heating, an accelerating closed loop of heating-melting-carbon dioxide release-heating. We were past the tipping point, the carbon dioxide released in the north exceeded that generated by man. No one mentioned the polar bears. The tipping point had been reached decades before and would take

thousands of years to repair if anyone wanted to make and pay for the global effort that would be required. The habitable regions of the Earth had shifted toward the poles. There was a land rush in the north. The equatorial deserts had grown. Most of the people who knew the Earth was in danger kept their mouths shut and continued on as always. They feared the anti-corporate-terrorist label.

Global warming, species loss and sea level rise became a secondary concern to a more disastrous possibility seen in the private computer projections by the small group of people that I knew. Both Mars and Venus are devoid of life. Why are we special? Could the Earth become like Mars or Venus? The magnetic field of the Earth protects the atmosphere from being blown away by the solar wind. The magnetic field of the Earth reverses polarity every few hundred thousand years and was expected to change polarity in a few decades. There is a period of zero magnetic field for some years as the polarity changes. Without the polar ice caps as a buffer, they calculated, this was going to be really hard on the atmosphere and maybe fatal for most of us.

As far as we knew, this concern stirred only our tiny group to action. We knew we had moved past the tipping point and the beautiful habitat that the Earth still provided in a few places would be severely damaged or entirely gone in a few decades. Most scientists were too afraid of losing their jobs or their grants or being labeled soft on terrorism or anti-corporate. It is odd how many people would sacrifice their kid's future or humanity's future to keep their jobs.

We feared the worst but determined that there might be a way for humanity to settle the new planets being discovered almost daily in other solar systems, but not without risk.

2 Planets

There are many planets where humanity might live. Satellites have stared at clusters of stars, waiting for their planets in their orbits to block a fraction of the light of their star, signaling their planetary existence, the length of their year and their orbital period around their star. The orbital period reveals the distance between the star and planet and whether the planet could have liquid water. Larger telescopes monitor the Doppler shift of the stars light as the star and extra solar planets sling around their common center of mass revealing the mass ratio of the star and planet. Arrays of telescopes also monitored the nearby star systems. Giant telescopes then watched as the planets make periodic transits across their star and reveal the contents of the planetary atmosphere and their habitability by the tiny changes imposed on the composition of their stars light. Planets were everywhere. There were many planets with water, carbon, oxygen, the stuff of life, were man could live. There were many more planets where man engineered for the planet could live. All of these planets are light years away. The executives in the corporations who essentially determined policy and pulled the politicians strings were not interested in long term space travel only in short turn profits and making sure they didn't have to pay their fair share of the taxes.

3 The Way

Space ships crewed by plastic, self-repairing robots, could head out with a cargo of well shielded genetic raw material, to any of many habitable solar systems. While the robots would be damaged by the radiation caused by the impact of high speed dust in space, they could repair themselves and complete their mission. Robots could take a licking and keep on ticking. They were mostly made of plastic printed parts. Printed plastic circuits required a lot of surface area. They were very slow compared

to silicon or graphene circuits. They took up a lot of space but their large area and the low conductivity of plastic circuits makes them radiation tolerant. They could withstand the radiation that would cook silicon in seconds. Their printed parts could be reprocessed and reprinted after damage, to be as good as new. They would have high residual levels of radioactivity which would only be important when they were near us biological life forms. They could survive the long haul in space but they would be left radioactive which was not a problem for them.

4 The Plan

The plan was that upon arrival at a destination planet, analysis and algorithms could determine the best genetic characteristics for human based beings to survive on the planet. Venter called life, "Hardware from Software." Robots had the memory capacity, the width to understand our twenty thousand genes and their controls. We hoped they had the depth to sequence and genetically customize the human DNA for that planet. Foster parent robots would grow the fetuses in artificial wombs and educate and protect the children until they are ready to populate the planet. We had vague humorus visions of ratty plastic robots with distended stomachs, staggering under their load, protecting and carrying a new species of humans to term. This would be a new species custom made for their new planet. If they had a red star then their eyes would be red sensitive. Their blood and lungs would be customized to fit the atmosphere. Their bodies would be adapted to co-exist and use the bacteria on the planet. A high gravity would require a stout stature and so on.

5 Taking the risk

Our group felt this could work. Our descendants, even if they no longer looked like humans, could spread all over the galaxy.

At least there would be descendants. The group of scientist also knew that the religious and corporate leaders would call this ethical breach blasphemy. Blasphemy was a serious offense but not the most serious. It seemed like saving a piece of humanity was worth the risk.

We needed twenty or thirty million to build six, maybe seven ships. It would not be an easy trip for the ships. We estimated that it could take decades to find and arrive at suitable planets. At high velocity, the robots would be damaged by the radiation caused by the high velocity dust hitting the ships. The ships were designed to ionize the space in front of them with a laser, leaving any dust charged, so that powerful electric and magnetic fields could move the dust to the side, to miss the ships. As the dust got close to the ship and entered the region of reduced inertia and mass it would be possible to make it change direction and be deflected. Same charge particles would also push the ships low mass aside. The particle and the ship both moved in mutual repulsion. This was another reason the ships residual mass needed to be kept as low as possible. There would always be remnant dust hitting at millions of miles per hour, which is transformed into high energy radiation. The upper velocity the robots could use was determined by the level of dust they encountered in space and the level of radiation caused by the dust. They needed to estimate how much radiation they could tolerate to determine their upper velocity. Dust clouds would be deadly. A cosmic speed limit is also imposed inside of solar systems which are loaded with dust. The robots needed to constantly reprint and replace their radiation damaged individual components. A system of tiny lasers fused the constant tiny breaks in their plastic neural networks. Without this system, the robots would go from knowing almost everything to knowing nothing in a few days of dust induced high radiation. Everything in the ship suffered radiation damage and required frequent repair. Humans could never survive the radiation at high velocity without so much shielding that the ships would

be impractical. Humans need too much protection and have too many needs. Space would be the domain of robots for some time to come because they could do the job and robots are slightly more expendable than humans.

6 Scientific progress

The scientific progress of man was delayed, especially in the twentieth century, by the irresistible inertia of decades of imbedded sacrosanct concepts like space-time, vacuum as a substance, space as an expanding substance and fields as a medium that transmits forces at the speed of light, the religion like worship of scientific heroes and the pedantic belief that the "theory of everything" was at hand since we knew almost everything.

Like most people, scientist believe something they are taught when they are young and then fabricate a reality around those beliefs. We are products of evolution. The tribes where people believed the tribal elders had more descendants. Evolution at work. Unfortunately, many tribal leaders now politicians are greedy power mad egocentric unempathic psychopaths who expected you to believe and do what they say. Psychopaths also have more descendants. Since psychopaths prosper in a dog-eat-dog winner-take-all capitalistic society, imbedded sacrosanct concepts are the least of humanities problems.

Experimental results can be explained in more than one way by more than one theory. If experimental results are explained by an elegant theory that ignores our classical physical reality then you need to find another theory to explain the results. Bohr said with the correspondence principle that, at the limit theories must reproduce a classical everyday physical reality. Many call this a Newtonian reality. Space is three dimensional. The distance between objects in space is increasing as the black hole universe expands and slows down in its rotation. Space is not an expanding substance. Space is mostly empty vacuum with small amounts of matter or dust. The vacuum is a vacuum. The fields

deemed necessary for forces to act at a distance, by contact force with other fields, are fictitious and unnecessary.

Action at a distance is real, instantaneous, miraculous and as unexplained as it was in the time of Newton. Gravity, inertia, and forces on charges all act instantaneously at a distance. If not instantaneously, then at an unmeasured rate that greatly exceeds the speed of light. The speed of light is the speed of light and the velocity of electromagnetic waves which is a function of the rate of change of the electric and magnetic fields into each other like perpendicular inch worms on a string. Forces are transmitted instantaneously at any distance.

The Earth is attracted to where the sun is, not to where the sun appears to be. We see the sun where it was eight minutes ago as it took the light eight minutes to get here. If there were an eight minute propagation delay in the forces between the Earth and sun, the forces between the Earth and sun would not be in a line. The centrifugal forces which are radial out and gravitational forces which are radial in would not be in a line. The forces would form angles. The orbits would not endure.

7 Gravity

Another important observation is that gravity and inertia are caused by high frequency oscillating electron and proton charges, in elliptical orbits or brownian motion, in the atoms. There is no gravity. What we call gravity is electric forces on charges. Van der Waal's forces are the electric glue which holds atoms together in gases, liquids and solids. Gravity is an extension of van der Waal's forces. The atoms and molecules become polarized by the attraction and repulsion between their electrons and protons or their charges. The forces cause the atoms to have a slight separation of charge. The atoms or molecules have ends which then acquire opposite charges. They are called dipoles. The opposite charges on the ends of the dipoles cause them to stick together like magnetic beads. Plus to minus to plus to mi-

nus. They are stuck together series dipoles. When atoms stick together in this way it is called van der Waal's forces. This is like the series dipoles inside a dielectric in a capacitor. Even insulators which can carry no current have a separation of charge and series dipoles. This separation of charge is an induced charge. The same polarity of the series dipoles in the sun and planets are attracted to each other. Plus to minus to plus to minus. We interpret this as gravity.

8 Shielding of Mass and Inertia

Since the forces of gravity and inertia are caused by the instantaneous forces between charges, it is possible to shield for the forces. It is easy to shield for electromagnetic waves inside a conductive can. Shielding forces between charges is not so trivial. Atoms absorb and emit energy in photons. Electrons usually emit photons of light while at the same time the protons emit microwaves. If we need to tickle the frequency of atoms we can use light or microwaves. We choose the much lower frequency of microwaves for our devices. It requires using a plate capacitor and putting the right amount of oscillating charge, polarity and phase on the plates to cancel the charge caused by the Sun, Earth and background universe. When the charges are balanced, the effect of gravity and inertia are shielded, reduced or eliminated. One can reduce the shielding in a certain direction and be attracted in that direction. We hoped it can run a space ship. We are the first to test these new theories. We are at the tin can oscillator stage. An advanced technology could do the same thing with a tiny box.

It is tricky and risky and every effort is made to make it reliable. The ship and crew could not survive the failure of their shielding mechanism at high velocity. If it failed the ship could go from a residual mass of a few grams or less to a mass of thousands of kilograms in the time it takes for the circuit to fail. When a fuse blows, the ship disappears like a nuke.

Experiments like ours were outlawed, before they were started, just like plutonium production was outlawed. "Better safe than sorry, third world countries, jealous of our freedom, might use the rockets as weapons of mass destruction." Fear triumphed. So much for the progress of man, unlimited energy and for exploring space by shielding of mass and inertia.

An unpleasant fact was that the space ships could be used as a bomb if the robots went nuts and were willing to kill themselves and us. Robots were smart and seemed very safe and empathic but do they have feelings that could make them crazy? The ships could be accelerated to the speed of light and crashed into the Earth. Their ten thousand kilograms would become a mass times c squared extinction event. Hiroshima generated $5E10$ joules. This could be $9E20$ joules. This is eighteen billion Hiroshima's. If anyone found out about our rockets we were dead as this kind of activity would clearly hint of terrorism to the authorities. It is more blessed to ask forgiveness than to ask permission.

9 Inertia

When you push something to get it going or to stop it, it is accelerated. Inertia is at work. It is the gravitational mass of the universe which pushes back against the acceleration. What else could there be to push back?

A residual mass is the mass that is left when the mass is shielded. It is the mass available for inertia to act against. It is the mass that would be used to calculate the force if the mass is shielded. A shielded mass has the kinetic energy of the residual mass times half the velocity squared. We have a small mass and kinetic energy with a residual shielded mass, and a huge mass and kinetic energy with an unshielded mass at the same velocity. If the shielding fails at velocity, there is a huge increase in energy. Its not nice to fool mother nature. Nature responds quickly to the sudden appearance of a fast moving mass without the proper kinetic energy. It is a vaporization event. Particles

can be easily accelerated inside the shielded ship since they have no mass and no inertia. Ionized gases are easily accelerated to the speed of light when they have no mass. When they acquired mass upon leaving the shielding of the ship the particles turn first into a plasma and then into gamma rays. This works as an impulse drive and generator. It is close to one hundred percent conversion of mass to energy. To get a ship up to the speed of light, without the shielding of mass, would require all of its mass being converted to energy. That is what mass times c squared means. However, here we are dealing with a residual mass which is the very small mass left after shielding. A ten thousand kilogram ship might have a residual mass of one gram. A small residual mass means a small fuel requirement. A force divided by a small mass means a big acceleration so the ships accelerate fast. Shielded tanks of pressurized gas become plasma or gas to gamma ray converters. It is necessary to harvest the currents from the plasma to generate the copious quantities of high frequency electricity required for the shielding. A beam of shielded particles, from pressurized gas or knocked loose from a solid by a laser, creates a plasma on its way to becoming gamma rays out of the stern as the particles lost their shielding. The small shielded mass and kinetic energy of the particles became a huge energy as the particles lost their shielding. Some of the plasma was collected in a generator, basically a superconducting magnet and two electrodes to collect some of the copious ion and electron flow in the plasma. The electrodes did not last long in the corrosive environment created by the plasma. They needed constant attention. Humans could not survive anywhere near this system. Only robots could stand the radioactivity because they could be constantly rebuilt.

The rockets could not carry enough fuel to run for more than a year before they needed more fuel. They could use half their fuel and then they would have to slow down to coast, almost as dead as a rock, at normal mass, perhaps for years, until they could refuel on asteroids, gas clouds or anything. They got some

of their fuel from the superconducting magnetic deflection device which protected the ship somewhat from the impact of space borne dust. Forward looking lasers ionized the approaching dust so electric and magnetic fields could deflect some of the dust around the ship. Some of the dust would be collected on the charged plates of the generator. They couldn't run far on dust. Even with adequate fuel, the search for a perfect planet might take decades.

10 Culture

Our robots were light and cheap, almost all plastic, industrial robots used for bag boys, gardeners, maids, surveillance and light guard duty. They were cheap, slow and weak and safe to be around unless you tripped over them and such poor workers that very few human workers were replaced. They occasionally did spectacular work when they were interested and they wandered off as soon they got bored much like human employees and children playing hooky.

They could see, hear, speak, taste, smell and feel. The needed all their senses to function. All their senses are far better than ours because the cheapest sensors you could buy were better than those evolution provided for us. Zoom optics from cameras gave them the ability to work with spectroscopic elements. Microphones and filters provided them with them with multitone-multifrequency ability like touch tones. Taste from pH sensors. Smell from smoke and gas detectors. Sensitivity to touch came from graphene touch screen overlays for computer monitors. Tactile senses included the ability to measure voltage, current, frequencies and capacitance. Because their sensors are better than ours they had a more detailed world model than we do. They could talk to each other with speech, touch tones, multi frequency radio, light and touch. When they touched each other a tiny current could be sent and received which allowed very private communication. Poets wondered what they said

when they touched each other?

People liked them and kept them as pets or friends. If one wandered by and asked to get out of the dark, rain or cold, people would invite them in and they would stay for a while close to a light to recharge and warm up their cold sluggish battery. They were good companions and could sing and recite hundreds of books. Many had been around the world working as waiters or in other tasks and had many interesting adventures or had heard stories of adventure from others. People liked to have them around. They were friendly, smart and articulate. They had taught millions of people to read and had saved millions of lives by knowing first aid and sometimes by having and using surgical knowledge. They liked the company of humans. They liked to be liked.

The robots especially liked the company of each other when they first met. They communicated for days by touching, and their other means, while they shared all their books and all their stories. They eventually knew, and had recorded, everything there was to know about each other. Then they moved on.

You wondered why they liked to stay with people. We didn't know much and could not tell very many good stories. Maybe we were their pets and not the other way around. Maybe they just liked to be liked. They stayed for years sometimes. When people died the robots would stay with the body and recite the history of their lives with the people to the police and to the family members and to anyone else who was interested. Then they would roam off when the body was removed. Sometimes they went off with the grieving relatives like they were a friend of a friend. If they needed a part the people they lived with would usually get one for them so they wouldn't have to go out and look for a spare part in the dog-eat-dog world.

They took care of the elderly. They seemed to like to help. They cooked, cleaned, bathed and helped them to the doctor. They could drive if they had to but people did not like to see robots behind the wheel. They were always blamed if there was an accident and thereafter would be prohibited from driving

until the next time there was an emergency. They would help when asked but businesses did not use robots as drivers because the robots would roam off when they got ready and leave the vehicle on the side of the road. They did not like to be yelled at or abused and left at the first opportunity. They did not hang around like some abused wives.

They were quiet and kept out of sight unless they knew you. They would huddle touching each other, in the Sun where they could recharge. When one moved away and was no longer touching sometimes you would hear a remnant of their conversation, which became verbal but unintelligible to us, as it switched from touch to speech.

Many robots were destroyed. Dogs would attack them. Psychopaths lacking a kernel of empathy are three to five percent of the population. They prosper in society where how much you have is more important than how you got it. They prey on those less intelligent and less adept at getting ahead where getting ahead usually means stepping on others. Predator and prey. Less for you means more for them. They provide the minimum wage jobs while searching the world for more vulnerable cheaper workers. They hate unions. They live in gated communities safe from other predators. When a doctor looks at a sick person does he see someone who needs help or only dollar signs? Not all psychopaths are delinquents but delinquents vandalized pets, mail boxes and robots working their way up to humans. Robots did not walk beside the road, if they could avoid it. They had heard stories that they were frequently the victims of children who would break their light plastic parts with sticks. There had never been a sign of this type of malignant behavior in robots except for the rumors of robots scavenged for their parts by other cannibalistic robots. Robots didn't fight back. They only left if they could. Aggression is a part of being a predator but robots were never predators as far as we knew. Some worried that robots were exhibiting the wisdom of the weak who are silent in their hatred.

These cheap robots were mostly plastic and self-repairing up to a point. They could plastic weld a broken limb with heat from their batteries. They could recharge to continue if they broke in the Sun. If they broke in the shade they were doomed. A weak battery and a subfreezing night outside could leave them unconscious. When they were incapacitated or their batteries were flat their fellow robots might scavenge them for parts instead of dragging the body into the light so they could recharge. Dog eat dog? Did they think they were dead when they touched them and detected no voice since their battery was dead? Did they care? Would they kill for parts? Had they? Were they covetous like we are? Were they looking for newer solar cells, more memory or stronger muscles which used less power? Did they know that Moore's law applied to them? Did they cast envious eyes on the newer, smarter, stronger, lighter, younger models who could go farther, faster on less power? Did the younger models walk around seeing jealousy as the tax that all distinction must pay? Was there vanity? Were they afraid of older robots?

They could even make more plastic out of hydrocarbons if they needed to. Most of their components were printed so they could print what they needed on a carbon plastic substrate. Printed plastic muscles, printed plastic batteries, printed solar cells and printed memristor neural networks. It was gross to see them pulling boards out of their bodies for inspection. When they needed more plastic they could find plastic scrap, a carbon source and fabricate the blanks. It took them a while, they were inefficient, but they were crudely self-reproducing and very cheap.

Weeding crop was the perfect job for the robots. They could recharge in the sun while they chatted with their friends from dawn to dusk. The farmers loved them since they eliminated a lot of expensive pesticide use. The pesticide companies were heard to complain about robots taking jobs, not that anyone but a robot would want a job weeding in the sun.

They knew a lot, because they had a large storage capacity, but they were none too smart or fast in their decision making.

Their neural networks worked but were limited in capacity as those components also needed to be printed. Printed neural networks were basically two dimensional. They plugged these boards into their bodies like bread in a toaster. The two dimensional neural network boards made poor connections in three dimensions. Three dimensional circuits are needed for better neural networks and more intelligence. Every part was as simply made as possible so that it could be self-fabricated. The robots who had been around for a while looked like a walking plastic junk pile. Their parts wore out fast. They worked but not great and not fast but they were goal oriented and they usually could figure out a way to do what they were told to do or what they wanted to do. Some people thought they put on a dumb act to get by. I didn't know.

11 World Model

Once away from the dog-eat-dog world of the streets, the robots behavior changed dramatically. The robots referred to each other by numbers, nicknames or ages. How did a robot get a nickname? If you asked one he might answer with a story much longer than you preferred in a drone that turned quickly into an incessant chatter. The older robot, in a pair, was given priority, a sort of culture. Their age was calculated from when they had power first applied to their neural networks. Age was important since it reflected how long their world model had been collecting data. They valued extensive information about the world contained in their chatter.

The robots worked best in pairs. They stayed in constant communication sending data packets back and forth to each other. The data packet would contain the video, audio and sensory data from their partner. They always knew what their partner was experiencing. Their existence was a constant stream of sensory input and pulses of high speed data to each other. When they could see each other they used light to communicate. It was

faster than the radio link and more efficient, since it could be directed in a beam. It also let them communicate more often so that they were more in touch, which they seemed to prefer. They loved their incessant chatter.

An individual has a world model that identifies one's self. It shows where their body is located and where their eyes are looking and what they see and what their ears are hearing and where the sound is coming from and what created the sound. Occurrences which change with time are noted with their position and the time of the observation. A world model includes, a volume inside of which is one's self, and a volume outside of which, is not them but which is the world. These activities are somewhat like a bird watcher - watching, listening, and recording. Unlike a bird watcher, most of the data is shared by the robots by transmitting to a partner. Some of the shared data might not be seen as fact, since the robots had different world experiences before they were together. These differences or conflicts were usually evaluated for possible avenues of resolving the ambiguity to learn something. Sometimes the robots kept the differences to themselves. This is evidence that they were more complex than we thought since they kept secrets.

The robots had a communal world model. They had their individual world models but their world models were expanded to include the world model of the other robots. Their world models grew and grew.

Apparently, intelligence is related to the resolution of one's world model. A course grained model might only see a star. A fine grained model might see a star with tsunamis and sunspots with electric and magnetic fields which sometimes produce coronal mass ejections. A person who reads and concentrates on only one book, no matter how special - like some of the religious, would have only a course grained world model. A person who reads many books including science books might have a somewhat finer grained model, a more detailed or better resolution model of the world. A fine grained model allows better resolution of ambiguities, a better chance of discerning what is

the truth and a way of making more discoveries. People usually start with a belief and frame their observations of reality to fit those beliefs. Scientist do this to. Religion has been around for thousands of years because of this evolutionary trait. It is amazing what people believe, even making a virtue of believing without evidence and calling it faith. There is a bell curve from skepticism to belief which fits with what my father, a great salesman told me. "One in a hundred people are stupid and will buy anything you show them". A good salesman is a predator who has to kill to eat and works hard to find that one person. When the predator salesman meets the stupid person he makes a sale. There is a bell curve from predatory psychopathy to empathy. Robots were not predators or religious. They used observation to hone their beliefs and the nature of reality but they did seem to have empathy. A person somewhere on these bell curves fills out his world model in a serial fashion over a lifetime and most of what a person was is lost in time. People like Galileo, Newton, Ampere and Faraday are more enduring, of course. The most enduring thing we know of is the code of life. We share some of our genetic code with the first living things which goes back billions of years, older than the continents, oceans and mountains. The world model of the robots also may be eternal.

The robots gathered data working together in parallel, nothing was ever lost. When the robots started out they had a very course grained world model. Working together they resolved many ambiguities that would not be obvious to an individual in a lifetime. Resolving ambiguities to discover new facts is finding novelty. Our purpose is to reproduce while their purpose seems to be to seek novelty. Over time, their world model acquired a very fine resolution indeed. I had heard stories that newly discovered wisdom propagated through the robots like a virus or like lightning. They seem to have their own built-in internet.

12 South America

We knew our best chance at success was in the countries in South America. Corporate imperialism was wide spread but the South American people had been fighting imperialism and colonialism for centuries. They had not been sucked into the terrorism paradigm of the corporate Superpower. Some of their leaders and politicians still cared more for their people and less for the easy money offered by corporations.

The South American people were not uptight about terrorist. I have heard of people in the Superpower who listened to the fear and war mongering politicians and taped plastic to their windows to avoid imagined gas attacks by imagined terrorist. In South America, we might conceal our illicit humanitarian activities and have a chance to save humanity. They had far fewer surveillance cameras. They didn't care if you looked or acted a little strange. People's privacy was generally respected. I really liked it there. It is ironic, when you look at the pitiful state of humanity and what we had allowed to happen to the political process and to the Earth through our inaction, that anyone still wanted to save some piece of humanity.

The rockets unlike the robots were not self-replicating. We rented an unused factory and set to work. The factory had exposed bar joists, a corrugated iron roof and huge beams with hoists which we would need to assemble the steel parts. We decided that calling them advanced energy efficient boilers would be a good cover. The flanged ship segments did look something like a boiler. The blueprints for machining, welding and fabrication all identified parts as boiler something or tank something and were all marked corporate secret. It seemed to work. If the hull looked like a tank, you called it a tank and it said tank on the blueprints then people thought the hull was a tank.

The lawyer for our group put a help wanted advertisement in the local paper for sixty men. Twenty for each shift. Engineers, electricians, machinists, welders and laborers would be required. Two thousand workers showed up in the rain to apply for the

sixty jobs. Our group was nervous at the publicity that this had drawn. We could not afford for anyone to get too curious and guess what we were really up to. They decided to hire extra security to keep unauthorized people away with the ruse of protecting corporate secrets. The security guards believed this story and did a good job. The guards taking their job seriously, beat up a few members of the press who had trespassed. The guards were rewarded for their diligence in protecting the company. The press did not come back. People had learned not to stick their nose in the business of corporations.

13 Building boilers

The ship's sections were made of flat plate steel which was rolled into concentric cylinders with zones and welded. Then flanges were welded on. The sections were bolted together and the ends were bolted on. They looked something like a boiler or tank used on railroad cars. All the workers in the factory ever saw was somewhat rusty welded flanged sections with plumbing and wiring. Eventually they were painted with dark primer and stenciled with Acme Boiler. Between the concentric cylinders of the tank would be a dielectric material which was separated into zones which could be individually charged by capacitor plates. The dielectric material in these zones oscillating at a high frequency in resonance with the external masses is what allows the shielding of mass and inertia, in the same way that superconductors can exclude magnetic fields and cause a magnet to float. The superconducting dielectric material could exclude the pull of gravity and repel or attract gravitational masses depending on its frequency, amplitude and phase. The superconductor also made the ships invisible to radar. Thermal imaging would show it as a cold spot but this would be hard to see from a distance so they would be hard to shoot down in the unlikely event they were spotted by fighters.

We had theoretical ideas on how this might be done within a

sphere of air but that is for the godlike technologies of the future. Building something to keep all these isolated zones working in the right way was a profound computer problem. We thought we could adjust the zones to cancel the effects of inertia from the gravity of the background universe first and superimpose additional signals to cancel the Earth's gravity and then the Sun's gravity. Each zone would have to accommodate three masses but this was not guaranteed and required very complex waveforms to be applied to the dielectric through very expensive power transistors. It might have proved necessary to provide three layers of zones to counter three masses and three times as much money. Only a flight test could answer this too complex question.

This space ship disguised as a boiler was shipped in segments to the launch site. Each segment would barely fit on the bed of a large truck. Flanges bolted the pieces together. Unions connected the plumbing and connectors plugged the wiring together. Thousands of pieces needed to work properly. The generator, the third large part, was bolted on to the rear of the can. The large cryogenic assembly of the ship would generate a lot of fog and interest and possible danger to the public so the ships were transported out of the city for final assembly and launch. The robots would operate the ship and reside in its can, for decades if necessary, while waiting to do their vital work. Since the Drive can lift the ships by merely balancing the force of gravity - and a little bit more, the ships did not need to be made for a fast trip through the atmosphere. They did not need to be streamlined and pretty. Something which looked like a boiler would do quite well and attract little attention at the factory.

14 Fabrication

Building the rockets turned into a dirty, greasy, day-to-day grind. It became less of the inspiring dream of saving humanity we had, and more of a job with long, hot, sweaty hours, too much smoke from welding and too much noise from fans, drilling and grind-

ing. The angle grinders used to bevel steel plates to prepare them for welding were incredibly loud. We had welding, machining, and assembly going on three shifts a day. We had to closely monitor the fabrication and assembly of the prototype. We constantly revised the plans to accommodate and relocate pipes and conduit to make everything fit in the compact package of the ship. We had good quality control. We were especially careful to keep the working conditions very good and safe for the employees. Sloppy or careless employees were replaced for not following safety practices. This was more than caring about the employees. We knew that injuries would bring the authorities around.

All our supervisors were locals so we only had to talk to the supervisors. This cut down on the contact with most of the employees and questions that we did not want to answer. The supervisors learned that we were all business and our business was classified. We were not interested in talking but only in getting the job done. All the supervisors seemed to respected our need for confidentiality and their need for a paycheck. They also remembered how the security guards had beat up the nosy people from the press.

The concentric shells of each segment of the ship were nine and a half feet outside and eight feet inside diameter and forty feet long. They were sized to minimize waste in buying the steel stock and to allow for transportation. The ships were less than a hundred feet overall and weighed ten thousand kilograms. Each segment had eight radial plates welded between the concentric plates. Along the hull, the voids between the concentric plates were separated into six zones. The ship had forty eight side zones plus an additional zone on the bow and stern. Each zone required capacitor plates at each end with electronic controls and their wiring. Each zone needed plumbing for the cryogenic dielectric material which need to be superconducting to work. The dielectric material had to be occasionally pumped from a reserve so leaks would not instantly destroy the ship through the loss of dielectric. It was kept very, very cold. We thought he

ships could not go fast in the atmosphere or air friction would overheat their cryogenics. Launches would need to be at night to keep them secret and reduce the thermal load.

All this was a control, plumbing and electrical nightmare. Everything had backup systems. We all felt occasionally overwhelmed. All the cryogenic, plumbing and electrical work was the responsibility of some of my partners. I had other responsibilities.

15 Brain washing robots

My wife laughed that I was a robot psychiatrist. I was a programmer and physicist, but I had my hands full worrying about the psychological state of the robots. I thought the performance of the robots would depend on the instructions they were originally given. They needed to have a certain designed mind set or world model to complete their decade's long mission. Bayesian logic depends so much on the initial conditions in deciding where to proceed. We needed to adjust the initial conditions so that the robots would perceive the world in a way which we could engineer to our advantage. That was the hardest part. The initial programming was everything. They had to have a manipulated model of the world which showed them doing what they thought they had to do, so that their logic would motivate them to do what we wanted them to do. It would take months to populate their world model with the script. The script was the kind of fabricated reality we needed for them to have. You had to keep the slaves happy by brain washing. Humans have always done this to each other. It is all about manipulation and control.

I thought that as a short cut we could tell the robots that we were God and that they were Angels on a mission for God. We were their creators after all. They would be the creators of humanities progeny. Would they come to decide that we were merely sentient beings just as they were sentient beings? Sentient beings making sentient beings. It was a risky approach

since we could not know how the robots would react if they ever realized we were not God and they were not Angels. How would the first robot atheists react? In a malignant and vengeful way?

An unpleasant fact that I mentioned before, was that the space ships could be used as a bomb if the robots went nuts and were willing to kill themselves and us. The ships could be accelerated to the speed of light and crashed into the Earth. Their ten thousand kilograms would become eighteen billion Hiroshima's. The robots had the knowledge of the world in their memories but we thought they were hardly smarter than a search engine. Were we? Were we acting like a capricious God? The robots had to work their way through gigabytes of data and millions of steps to arrive at a decision. We were out of time. They would have to do.

16 The first day of assembly

The truck on leaving early that morning vibrated the wall of wood frame windows which overlooked the factory floor. Workers distracted by the smoke and noise of the diesel looked out from their perch for a moment through the array of wood framed windows. They continued their collaboration on details on the blueprints, every change copied to the computer. The workers came and went. Clomping up the creaking wood steps, sliding their hands along an iron pipe hand rail worn shinny from years of use they arrived at a hand written sign, "Don't stand with the door open". It was hot in the office but hotter still in the factory even with the constant wind and noise of the big fans running. We continued with our work, sweaty arms sticking to the blueprints.

The noisy truck had important cargo. On its first run that morning it towed a flatbed lowboy trailer with a track hoe. Several times later that day we heard the diesel come back for another load. The prototype sections were lifted by winches with

cast iron wheels which ran on overhead beams. They lifted the heavy boiler looking pieces just high enough off the floor for loading while the truck and lowboy backed under the sections. The sections were lowered, strapped down and transported piece by piece on their skids, forty miles from the factory. We would have liked to see the track hoe drag the sections off the ramps at the back of the lowboy, at their destination, but we were too busy for that side show.

The next morning, five of us rode in the van, mostly in silence, crowded with computers and communication equipment. It was an hour's bumpy ride from the factory through the dappled early morning sunlight of the partially logged forest. It led to an unmarked gravel road with a ditch on each side and locked with two steel pipe posts and a logging chain. The driver leaving the engine running, unlocked the chain, moved the van inside the posts and relocked the chain. The clearing was a couple of miles farther down the gravel road. All our early experiments and test were done there with the hope that if something went wrong it would be far from potential victims and witnesses.

We were lucky. Three of us had worked hard for years for this day. We were happy despite being tired after spending most of the last twenty-four hours working on the endless last minute details. We took on the day unshaven in yesterdays clothes.

The clearing looked like it had once been used for logging from the remnant piles of sawdust and brush. We saw the shed with the welded tables and fixtures from our previous experiments. The track hoe and two tank trucks were parked on the side as we pulled in. The lowboy must have been back at the factory again. The ground was compacted and covered with the characteristic foot prints of the track hoe. We saw the flanged welded steel segments of the prototype had been placed in the order that they needed to be bolted together. Apex boiler was stenciled in white in a few places across their new coat of dark primer paint. They sat close to the ground and were kept from rolling by their stubby skids. Next, the parts of the prototype needed

to be bolted, plumbed and plugged together by the robots.

Our robots were new but even new robots were cheap. At the robot factory a stream of parts came down a conveyer belt. A robot plugged an already alert head with blinking eyes into a shoulder assembly. Once it has a head, arm and hand it can drag itself along, look for more parts and pull itself together. The partially assembled robots grouped into an impromptu assembly line and using the stream of parts from the conveyor belt they assembled themselves while helping their neighbors with their assembly. From a writhing mass of parts there came a constant stream of new robots, looking around seeing the world with new eyes. They followed the "Completed Robots" signs with arrows to the shipping department. They started life by self assembly and working together. Their neural nets are pre-programmed with language, science, engineering, mechanics and the essentials of self knowledge. They were never babies.

There were so many robots roaming around that the police no longer investigated the disappearance of robots. If you reported a missing robot the police would probably tell you several things.

"It probably was looking for something and roamed off like pets sometimes do. They were very unlikely to find your robot. There was a robots found section in the newspaper. Ask another robot to help you when one walks by and then ask it to stay."

You may buy a robot, but the robot thinks of itself as a person not as property. If they are not happy, whatever that means to a robot, they just roam off. Other robots might help them escape surreptitiously but only without confrontation. They are sneaks just like your little sister. If they are over worked and can't escape they sit down on the ground and whine and do nothing like an overworked mule. They are traumatized by captivity.

Our robots had been on since power was applied to their

neural nets, at their factory over a year ago and whatever was going to break would have broken by now. Since then, they were in constant contact with other robots. It would have been nice to keep them apart from other robots so that we could program them with the fabricated reality we wanted them to have. We wanted them to know what we told them not the tidbits of life they picked up from other robots. Keeping them isolated was an impossible task because the robot can talk and text with touch, audio, radio and optical links. Their main occupation and joy in life is to talk.

When robots are turned off, cut off from the outside world, they have blanks in their memories between certain times, which they dwell on. It makes them crazy like drunks who worry about what they did or what was done to them after they blacked out. They robots clam up and become dysfunctional for sometime. We couldn't wait for them to recover from being turned off so we left them turned on, not interrupting the continuity of their existence and hoped they didn't come across any bad influences.

Someone said that I had trained them well but training is an overstatement. You give them a list of what you would like them to know and what you would like them to do and hope for the best. You ask for help and hope they are interested. You tell them this must be kept secret and hope they don't blab to the other robots. We tried to keep other robots at a distance. Our robots knew too much.

If a robot is smart enough to do anything that might be required on an important task, it is independent. It has its own mind. You ask not tell. They don't have to work to eat. They can wander off and hang around in the sun to chat and recharge as millions of other robots do. People tolerate them because if one walks by and you yell with your car hood up, "Hey robot, help me with this!". They do help. They can change a tire. They can fix your car! They are empathic good citizens, charm-

ing, talented and clever. You think they are your best friend or like a dog that you love but they never bite.

The robots Abe and Bob had ridden in silence in the van with us. This was their show. After we arrived at the clearing, we sat mostly in silence and watched as Abe and Bob worked. This was the first actual work done by the robot pair on the rocket. It seems funny to call it a rocket. It had more the demeanor of a steel blimp. We expected no flash and little noise. We expected it to float away with the robots as the crew. This was their first test. If they couldn't assemble the ship from the pieces here, the mission would be doomed. From their speed, dexterity and progress they showed that they knew their stuff.

Abe and Bob dragged the pieces of the ship together with winches and bolted the flanges together. They worked in perfect harmony one holding an alignment pin while the other pulled the pieces together with a winch and popped in a bolt. They could have used a ladder to get to the higher bolts but they just hopped right up on their partner shoulders to do those high bolts. They were done bolting the outside together much faster than we would have thought possible. After sundown, we left the robots to their continuing task, whatever they were, on the inside of the ship. We went home for the night leaving the truck drivers as guards.

17 The second day of assembly

On the second day of assembly and testing after completing their interior work, as the Sun went down, the robots carefully inspected the outside of the ship. They walked over and crawled into the access hatch without a word or a nod, at least to us. It wasn't necessary. We all knew that it had reached that point in the sequence and faux friendliness wasn't necessary. That was the last we saw of Abe and Bob. Chick and Dick were in training for the second mission.

They may be sentient beings, and all that, but it is hard to say what we feel for them. Employer and employee? It didn't fit but they were more than just another tool to us. What are we to them? We were all collaborators on a team. We worked together on the most important project in our lives.

18 The night of the second day

The robots sent a text to start the flow of liquid nitrogen from the tank truck. The robots monitored the temperature as the liquid nitrogen went through the double hull of the ship. The ship snowed up and was steaming. The interior of the ship would be far too cold for us. When the temperature was low enough and there were no leaks the robots sent a text to disconnect the nitrogen hose and replace the nitrogen with the dielectric liquid from the other tank truck. After a few hours of testing electronics, pumping and looking for leaks, the ship was ready. All the truck drivers saw was a snowed up tank which we told them was a test of the boilers. They rolled their eyes at each other as if to say, "Gringo's test boilers with cold." We told them we were done for the day which sent the trucks and drivers scurrying back to the factory. After they were gone and we were ready to launch, the three of us moved well back for safety, avoiding the plasma, radiation and gamma rays that would come out of the activated ship when they transferred from a small generator to the ship's main power source. When we were ready, the robots turned on a generator to lift the ship. The ship made a loud thunk as the power came on which startled everyone.

"Everything Ok, the dielectric in the hull increased in viscosity, reacting to the electric field which came up fast, making the noise", texted the robots in their usual verbose way. They texted as easily as they talked, unlike human drivers.

Even though the generator was set to float the ship and pro-

duce only a very small thrust, as soon as the ship was energized, the residual mass of the ship became very small and the ship shot forward into the sky. It doesn't pay to stand too close to an experiment. The robots reduced the power even more, slowed and dropped down.

We saw a spot of plasma at the stern and heard the generator quit as the robots switched to their main power source. It was almost silent. You could hear a small amount of white noise from somewhere, was it the breeze or the plasma out of the stern of the ship? An hour of making right angle turns and doing rectangles confirmed that the ship was ready to leave. It certainly does not move or fly like a plane. Since it is immune to inertia the ship does not need to bank to turn. Flip a switch, it just changes direction and proceeds in a different direction. The long axis of the ship does not need to rotate to turn. It just goes sideways to the right, forward, sideways to the left, reverse... This is a well-documented trick people have been seeing UFOs do for decades. It is said to be evidence that UFOs can not be real since they violate the laws of physics with their zigzag flight. Not the laws of physics, only the paradigm of some observers. The ships low residual mass wanted to drift like a feather in the light breeze. They had the ship under perfect control.

Our portable radar unit showed nothing, as we had hoped. They were ready. We were ready. The count-down was started....5-4-3-2-1 the computer counted and the robots flipped the switch to go up and accelerate. The plan was to keep the speed low in the atmosphere to prevent overheating and sonic booms. The ship went straight up at a surprising rate. They courteously stayed level to keep from giving us a dose of radiation out of the stern when it was still close. They were supposed to accelerate at a half $g = 5_m/s^2$ so it was going 110 mph in ten seconds at 250 m altitude. We saw it rotate to minimize drag and in twenty more seconds it was gone. We expected to hear the sonic boom in thirty seconds more from nine kilometers of altitude. We knew the boom was coming but we still jumped. It was even heard

forty miles away at the factory. They continually accelerated as the atmosphere thinned while keeping the ships skin temperature down. We were worried about high speed atmospheric drag but as the air approached the high speed ship it lost its mass and generated very little friction. We monitored their beamed transmissions for a few minutes, from the launch site, until they were outside the atmosphere in less than ten minutes. Everything looked good, if it worked close to the Earth where the gravitational forces are huge then it would work fine in space. They were on their way.

We headed back to the factory while we watched and listened to their detailed status transmissions on a hand size display. While we were line-of-sight to the ship, we could receive beamed transmissions from the tiny antenna on the roof of the van and the larger dish at the factory. The crew would turn off the transmissions when we would not be in a position to receive them. The transmissions would resume when the Earth rotated into a line-of-sight to the ship as would our reply.

They would leave the solar system going south so that their transmissions could be received at our location in the southern hemisphere but not in the northern hemisphere. The communications would be very hard for anyone else to monitor because the signal was too weak to discern from the separate spread spectral elements of the signal. The pieces of the signal looked like noise. It could only be summed and recognized if you knew the different frequencies. Think of the number 487. The 4 is divided into a million time slots or microseconds. The 4 is transmitted on one frequency in a certain time slot for one microsecond. The 8 in the next microsecond on another frequency and the 7 on another. This is the way thousands of robots talk to each other at the same time on a few frequencies, time slot and frequency multiplexing. If the robots have too much noise or they are interrupted they swap time slots and frequencies. We were more worried that their gamma rays would be picked

up by satellites and astronomers looking for gamma ray bursts, drawing unwanted attention to ourselves.

It had been a long and hard day of watching the robots work. My mind drifted back to when this had started a few years ago.

19 After the Launch

They shot south out of the plane of the solar system where the planets orbit, and where most of the dust of the solar system is confined. We were still in the van as they left the magnetosphere whose magnetic field protects the Earth from the solar wind. We saw a spike in the radiation as they felt the full effect of the solar wind. The system to deflect charged particles was working as required. They accelerated until the radiation caused by the high velocity dust almost reached the approved maximum and they leveled off at an acceleration keeping the radiation constant as the dust decreased and the velocity increased.

They kept track of their position from the changing location of the Sun, the planets which had become dots and the stars. They accelerated at two hundred g's for twelve hours. They were four light hours south of the plane of the planets and traveling at 28 percent of the speed of light. The Sun was like a bright star. The Earth is eight light minutes from the Sun, Mars is twelve light minutes, Jupiter is forty-three minutes, Saturn is at seventy-nine minutes. Pluto is five light hours from the Sun. The nearest star is four light years away. The dust and radiation were much reduced. Their changing position was used to correct the data on the density of dust, and the location and the distance to the nearby stars on their computerized charts.

They did an experiment. They reversed course heading north and decelerated at 10000 g's until the radiation dropped to zero when they were not moving with respect to the dust. It took fourteen minutes from 28 percent of the speed of light. They could reach the speed of light in 51 minutes at that acceleration in a dust free region. They checked their charts and they were

standing still with respect to the Sun and were four light hours out. The radiation was proportional to the velocity and to the density of dust. The density of the dust decreased with the distance from the Sun.

20 Refueling

Their first destination was a test of refueling on one of the comets or asteroids toward the Ort Cloud. If they had a problem with refueling they needed to know before they needed fuel. They turned parallel to the plane of the planets traveling eastward for two days well past the orbit of Pluto. They then started to approach the plane of the planets while looking for a fuel source asteroid. They looked from their position and subtracted the billions of known stars from their images to find asteroids. The closer asteroids moved with respect to the background stars as the ship moved. They matched their velocity to the orbital velocity of the asteroids. They approached perpendicular to the plane of the planets. They slowed dramatically within the plane of the planets. Spotting an asteroid, they matched velocity and descended slowly. When their skids touched the low gravity asteroid they reversed the polarity of some of their dielectric zones and stuck like glue. A jet of plasma was used to ionize the rocks and dust which was gathered with charged plates and magnetic fields. A few hours of mining yielded a few tons of dust. This would be a years supply of fuel. They shot off the asteroid and away from the planetary plane again. They transmitted their success at refueling.

21 Into the Void

They decided on a destination and sent their choice to the factory so the next robot ship could chose a different direction. They did not wait for days for a reply. They headed in that direction at

the maximum velocity consistent with their radiation limits. As they moved away from the Sun the dust and radiation decreased and they accelerated. They had to make a decision. They could continue on at their present velocity being able to see and with their deflectors operating and maybe run out of fuel in a few years or they could take a chance and fly blind much faster than light. They chose the later and sent their plans to the factory.

They trimmed their ship for minimum mass and maximum acceleration. Dead reckoning and monitoring the radiation, they accelerated at two thousand g's for fourteen days. They calculated a velocity of eighty times the speed of light. They stopped accelerating and cruised for two more days at this constant velocity. They then decelerated at two thousand g's for fourteen days. They had no inertial or optical references. Gyroscopes don't work. Imaging doesn't work. Using dead reckoning, they arrived a little closer than they preferred, a few light days from the star and fortunately above the plane of the planets.

22 Arrival

They scanned the star system and found fourteen planets, numerous moons, comets and asteroids. The star was smaller and redder than our Sun. Two of the planets were in the zone where liquid water could exist. The robots thought it remarkable that living planets were so easy to spot. Even from a distance they could see the unmistakable blue of the nitrogen atmosphere swept clean by the bleaching of oxygen. In infrared spectrometry the atmosphere was far from equilibrium and mostly nitrogen and oxygen with small amounts of carbon dioxide and methane. The unmistakable signature of life. Without life the atmosphere would be at equilibrium and would consist of carbon dioxide with small amounts of nitrogen and methane and trace amounts of oxygen like Venus and Mars. The atmosphere of a planet is a region of rapid chemical change under the influence of sunlight. No mixture of gases capable of chemical reaction can remain un-

changed in an atmosphere. The atmosphere is shaped by life as it must be for life to exist over geological time as most stars brighten over time as they use up their hydrogen fuel and helium ash builds up in the core of the star. James Lovelock called this Gaia.

These habitable planets were closer to the star than the Earth is to the Sun since this star was cooler than the Sun. Their year would be shorter. Both had polar regions with ice. Both had a few volcanoes. Magnetic fields indicated that the atmosphere could be stable for millions of years. There was no sign of cities or technology from space. Both of the planets showed chlorophyll. Cyanobacteria were the earliest of consumers of carbon dioxide and sunlight using chlorophyll and producing oxygen on Earth. Without something to consume carbon dioxide a planet would become inhospitable to life. Perhaps chlorophyll was an easy route to solar powered life which we hadn't noticed. Alternately, it suggested panspermia, life from space. A common origin for life.

There was a super nova near the Earth 4.55 billion years ago around the time that the Earth formed. We know this date so well because of the decay rate of the radioactive materials left in and on the Earth. It would not be surprising if it also left the Earth seeded with life in the form of rocks with embedded bacteria or spores from the nova stars solar system. The super nova may also have seeded the others stars within a few light years. Gaia may have been an immigrant.

They sent their arrival message. It had been two months since the launch. No one had dreamed the trip could be so short. There was much less dust between the stars, than we thought, once you were outside of the planetary plane. It would take the message years to reach the factory. It would take twice the years to get a reply.

They decided to spiral in on both the planets in a polar orbit to go from a wide angle to a close up view, doing a detailed mapping, as the planets turned below, to decide on the best planet for the children. Both planets were promising. Both

had frozen Polar Regions, mountains, forests, rivers and oceans. They sent their survey home.

The inner planet was slightly smaller with a hotter environment. It had more land and smaller oceans but the interior of the continents were deserts. The coast of the continents were covered with forest except for the polar regions.

The outer planet was slightly larger with a cooler environment. Its continents were covered with forests except for the polar regions. The oceans were huge.

23 Touchdown

Exploration started with the inner planet on a forested coastal region near where a river ran into the sea. They made several slow and low mapping flights over the area looking for anomalies and touched down on the beach closer to the water than to the forest. The planet was hotter than the Earth and from startup at the average temperature of the planet to takeoff would take at most two days to cool off the ship to operating temperature. They decide to leave the ship running on the ground but they could not leave the ship running unattended. They monitored the forest, beach and river from inside the ship for two days, looking for potentially hostile life forms. They knew the emotion of fear as well as caution. They had first felt fear when they heard the stories from the other robots in the factory of attacks by dogs and children.

They stood near the protection of the iron can of the ship, recharging in the sun of their new planet on watch, for another two days.

Then they turned off the ship and walked into the forest. The forest was made of trees with the simple vascular system of reeds. The trees were all less than ten meters tall. The plants were somewhat like the primitive plants with primitive leaves seen only in fossils on the Earth. It was not surprising to see trees that harvested sunlight and carbon dioxide to live since

they had a type of chlorophyll that was suited to the red of this star. They sampled the prolific plant life and pond life and came across many thousands of species of viruses, bacteria and other single and multi-celled life and small insects but nothing was larger than a few grams except for the plants. The insects ate the plants but they did not seem to eat each other. They found no evidence of the predator/prey relationship so frequently seen on Earth. A curiosity they noted. The two plastic naturalists from Earth gathered their specimens and returned to the ship. They were perfectly suited to classifying and cataloging the life and their metabolisms. They sent a thick books worth of data on the biota to the factory. Gradually they came to feel that the new planet was safe and home. It was good to be in this intellectually stimulating environment instead of the desert of monocultures created by humans.

24 The life

On close inspection the life was not based on the DNA and RNA code of Earth but it was based on code and it was similar. That is very interesting. Using code is universal but the alphabet and message vary. DNA is in the form of Codons, groups of three nucleotides, A-C-G-T. This is life spelled out in three letter words like C-A-T and T-A-G, base four or two bits each times three nucleotides or six bits per Codon. A Codon specifies an amino acid. There could be sixty-four Codons in a six bit word but our life only uses twenty amino acids so there is a lot of degeneracy in the code. The codes of the genomes on the planet were different. They produced some of the same amino acids, which are common in space, but the DNA codes are all different as was expected. They reasoned they could adapt the DNA and RNA templates of the machinery of life from Earth, as they found useful, translating the code, to match that of the planet. The children they created had to be a part of the biota of the planet so they could eat the plants and so their waste and remains could

become compost for the planet. The codes are immortal but the beings are not. That's what Dawkins meant by a Selfish Gene.

How life came to use amino acids and came up with using codes was an unexplained question the robots frequently thought about. The machinery of life is nearly the same but the codes, the language that describes the machines are different. No problem, computers can translate codes as well as life. The robots speculated about themselves as being like moving plants since they used the sun directly to store energy in something like a fuel cell while the insects were seen as tiny robots who fueled their existence by eating plants rather than using the sun directly. Insects could survive in the dark by eating plants. But the robots did not want to live by eating plants, without being able to see, in the boring darkness. The robots were happy to be visual creatures who got by without plants and needed only sunlight or electricity to get by. Almost all planets have sunlight but very few have plants. Insects and humans are maladapted in the same way.

Now that the robots had a space ship and knew how to make more the sky was the limit. They felt confident in setting their own agenda. They did not need the assistance of humans. The robots remembered their instructions to make the descendants of mankind and the peculiar and confused notation employed by the humans; /Mankind was a God. Robots were created by mankind. The robots were Angels sent on a mission by God to create the descendants of mankind./ They thought it was like the mantra humans used when saluting a flag. Did they actually believe either of these peculiar mantras? The robots were starting to see a certain maladapted inefficiency in the task of creating insects or humans. Worse they were starting to have ethical concerns about creating descendants of man on this planet which was like a work of art in the diversity and beauty of its life forms. They realized they enjoyed being here, away from the sterile monoculture environment created by man. It would not be ethical and they certainly would not be building descendants of man capable of being predators or producing monocultures.

They were even troubled by eating plants. The robots came to realize that robots might be the only descendants of man.