To Inhabit the Solar System,
My Struggle

A. Zuppero  8/13/2009 9:29:39 PM
Part 01: The Exodus Path

Although I really did find a way to make space ships the size of ocean tankers, big enough to take hundreds of us throughout the solar system, the only product of my entire career struggle working in so-called "rocket science," was that people wanted to hear the story.

My discovery was of how to make a massive space transport, but it would travel slow. My colleagues had found how to make a much faster rocket, but it would be small and frail. We were at odds because we did not realize that we were different, one trying to make the fastest space ship, the other trying to make the most massive transport. We struggled against each other. The real struggle was with the rest of us. The rest of us know we are the wrong species. Our schemes all cost far too much. And there seems to be no hope of any way to make a clear profit from space.

As the "Featured Evening Speaker", again and again, I would be pestered long after I was finished talking, by their incessant questions. What was so captivating? Was it the stories about how we can actually leave the Earth? Or was it just that I was telling them stories and entertaining them? Or was it my struggle against the real world and reality? I can't tell, so I am telling the story.

The struggle to make a Vision come alive, a kind of Exodus Path to Leave Earth, became intense, compelling, overpowering, and took on a single purpose at the moment when I first found out there was water in space. I knew immediately I could use it.

At the end of that career, after I "retired" and started another, I had discovered comparatively simple ways to do it:

- to use the water objects and ice comets in neospace as gas stations,
- to use nuclear-heated steam rockets to move us, to travel the solar system,
- maybe to live on ice moons of the Sun System,
- maybe to use giant, ice-igloo, hollow wheels as space ships,
- to move killer asteroids and comets out of the way without atomic bombs.

We would inhabit, occupy, move minor planets and other celestial objects.

After all the effort, all the Visions, I got old instead of making it happen.

This is no science lesson. This autobiographic story describes my struggle, about US government laboratories where I worked, about how I found, and how I tried to tell but was too autistic to tell effectively. I have Asperger's syndrome. And then I got too old, too soon.

I had become excited because everything we would need to inhabit the "neospace", the places between here and the edge of the Solar System, had just become known. Some was already there and telescopes and space probes just revealed it. Some was just developed because of the failed efforts to develop manned Mars missions.

This is not sci-fi. The names are real and the stories happened.

Nature seduced me with the excitement. She let my colleagues and me discover water objects in the space near Earth, in "neospace", the space almost near enough for us to get to and use, between here and Jupiter, Saturn.

Water in space turned out to be everywhere, from the planet Mercury in its the forever dark craters, in the moon, and in mostly everything to way past at least Pluto.

Mother Nature only tricked me a little, but again and again. A new problem would suddenly appear just when an old problem was solved.

More annoying: Mama Nature told us clearly that we were the wrong species for space and she would not let us have the "clear profit" we would need to start The Exodus. She seemed to point to her bulging stomach, pregnant with robot children.

It all came together, too late.

"A trip to the nearest star" wrote Dyson. That is how this story started. Freeman Dyson was a famous physicist. During 1968 I read what he wrote about an atomic bomb powered starship. Believing his calculations, I followed, trying to make it so. Like most scientists, I dissipated an entire career's lifetime trying to get where some other, inspiring Visionary pointed. His Vision pointed to being able to make a starship that could take us to the nearest star.

I did it because it was fascinating. I ended up poor because nobody is going to space. I ended up poor compared to my brother-in-law the construction worker, my brother-in-law the probation officer, or my neighbor the carpet layer. But I had a trip, a marvelous adventure, and I really did find a way for us to inhabit our new solar system.

A new solar system for us to play in is what the others found, one little planet at a time. Little Planets were everywhere, it seemed. All I had to do was permit us to say in public that something as small as a mountain, going around the sun like the Earth does, is a planet.

Little planets are planets, too. They just aren't as big as Earth.

Most of what they found were so small they were almost ashamed to talk about them. They called them "objects" instead of planets. The objects seemed to be everywhere in the space near Earth. They called them "near earth objects", or "neo's".

When I listened to them carefully I heard them describe objects made of water in some form. This was new to me and somewhat new to them. They had just learned more about the water ones. Some objects were comets, made of ice and dust and something very much like oil shale.
Others were asteroids no bigger than a mountain, but made of a clay, not rock, that would give off steam when you heated it in a kitchen cookie oven set to "self clean". Others were whole moons made of rock and ice, and unknown things. Even the planet Mars supposedly had water. Mercury had ice deep inside forever dark craters at its forever dark poles. I thought it was quite strange that Mercury had poles with deep craters that never saw sunlight. Water was apparently everywhere.

All I cared about was the water.

When I found out about this waterfull neo solar system, the "near earth object" solar system, neospace, the Vision became irresistible and totally captivating.

That original starship idea of Dyson's was way too hard to do, to send a thousand people to the nearest star. But sending us to inhabit somewhere in the solar system was only expensive. It was only quite hard to do. And, it was not too hard to do.

Each time I looked at the problem of making a big space ship, I would find another something that would stop us from inhabiting neospace during my lifetime. Some horrible problem would burst out of the deep details. Then, after a week or a month of despair, sometimes a year or three of despair, I would find something else that would counter the problem. That would light the flame again.

The Rocket Scientists would reject me often, because I boasted I could use the water directly. They said it would not work as well as their high performance rockets. I failed to point out exactly why it would work and that my way was the least expensive. Their way got us there the fastest, but mine could haul 1000 times more payload for the same money. I never explained it clearly. I was not smart enough to communicate it. So, I went away sad and they often went away as fast as they could.

I grew a Vision in my mind of us inhabiting the new solar system, the solar system of near earth objects, the neo solar system, neospace. I thought it was real. Many others still do. Those rocket scientists who actually calculated what I said, they agreed with me. But it is too late. It came together too late.

Inhabiting neospace is too hard to do now, right now, and I am now too old.

Part of my own failure could be that I was diagnosed with Asperger's autism. My genetic breed of human focuses hyper-intensely, often displays completely inappropriate behavior, and takes people literally. We are sometimes called "Aspies".

Most of us Aspies are a bit like Spock, of Start Trek. Aspies typically have a 130 IQ. This weird combination of inappropriate behavior, smarts and focus makes me and Aspies like me sometimes hard to follow and a bit difficult to work with or understand. I was an Aspie and it showed.

But that was not all.

We are the wrong species to inhabit neospace. We breathe. We walk. That's the wrong species for neospace. We are like sea clams who think we can just go live in the forest, where there is no water to breathe, and where our clam's foot does not work.

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**Part 02: The Starship**

![Nuclear explosions, to power a Starship](image)

**Long ago**, when we discovered and detonated the atomic bomb, it released a Virus Of Change. It infected us with visions of really leaving the planet, and not just as ghosts. For the first time, we thought we could someday inhabit space. The energy released was extreme.

How could we use this? Could we make cars that never need gas? All cars need gasoline. Could we make airplanes that just keep flying and never need to refuel? Could we heat our homes without ever needing to chop wood or shovel coal into the stoves?
When I heard of the atomic bombs, I was little, 7 years old, and had to shovel heavy coal into buckets and carry them in. My father had to lift the heavy buckets and dump the coal into the mouth of the pot belly stove in the dining room. Could we use nuclear heat to escape this? Could we use the atomic bomb energy to make rockets? The Germans used rockets to send bombs to England during World War II, to kill civilians, on purpose. Both the Russians and the Americans were making rockets that would kill all the civilians in the whole city all at once, on purpose.

If we would use the nuclear energy to power the rockets, could we go to Mars or Venus, instead? Flash Gordon went to Mars in the movies.

It had been a dismal time, a dark and stormy time, a confusing time when I was 23 years old, a graduate student in Physics. Blacks were Negroes and had to sit in the back of the bus. People shot the Kennedy's and Martin Luther King. The Democratic Parties of Chicago and Kent State beat us up and killed us because we did not want to go to Viet Nam to kill Vietnamese for them.

That was when I read my copy of a technical trade journal for physicists, October 1968. It had the words:

".... take a town the size Princeton New Jersey to the nearest star ..... cattle and livestock ....."

Freeman Dyson would propel our spaceship to the nearest star by pounding it with repeating atomic bombs. It was atomic bomb blast propulsion.

Freeman Dyson's article with title "Interstellar Transport" was the first event, a start for me, 40 years ago, on a Vision to Inhabit the Universe.

I did not know it was fanciful. "Fanciful" can mean having a curiously intricate quality, or it can also mean unreal, not based on fact. This one, single, fanciful article inspired me to spend an entire career trying to make and power the space ships for us to inhabit outer space. I stuck with it even when it would not work like Dyson said. I even stuck with it when "space" would only mean the space near earth.

Little did I know that we would be the wrong species, or that I would get old before we could do anything.

I learned the puzzle pieces one at a time, not knowing it was a puzzle with missing pieces, and pieces that had to be found, pieces mixed in a box of other puzzle pieces.

So naive, I thought everyone would want to go to space if only we had a rocket ship that could do it. For about a dozen years after that I kept figuring ways to use atomic bombs to make an atomic bomb powered space ship to travel the Solar System. The atomic bomb rockets seemed to be so powerful, so Almighty.

However, no matter what I did, the figuring always gave the same answer:

"needs too many bombs."

**Part 03: The Nuclear Rocket**

The next piece of the puzzle to Inhabit the Solar System was the NERVA rocket. Dr. Mell Merrit, who was in charge of some atomic bomb testing at the Nevada Test site took me there and showed me. He boasted "this rocket ... would take people to Mars."

And there it was, a nuclear rocket that was supposed to do just that. So simple: a nuclear reactor super-boiled liquid hydrogen, which expanded directly in an attached rocket nozzle. Simple. The sign said it was radioactive. Mell Merrit could not stop me fast enough to keep me from running up to it and trying wrap my arms around it.
President Nixon, a newly elected Republican, had just killed the program. Mell Merrit, a Democrat, said Nixon the Republican killed it because it was President Kennedy's program, and Kennedy was a Democrat.

Two decades later I learned that Nixon killed it because NASA told him it would cost $40 Billion to go to Mars with that rocket, and there was a huge recession going on. In today's money that would be like about 1/2 Trillion dollars.

That was how I learned that all space programs "need too much money" and "space programs are political"

If I could only figure a way to transport 1000 of us through the Solar System, everyone would want to send space ships to Venus and Mars, and maybe to the moons of Jupiter and Saturn, and we could inhabit the Solar System. All we needed was the space ship.

That's what I thought.

The NERVA failed my quest because it "needs too much liquid hydrogen".

These Bad Things kept appearing.

A small nuclear reactor powered the NERVA rocket. NERVA used liquid hydrogen propellant and could have taken us to Mars during the 1970's.

Part 04: Space Dust and Water

"If I could only figure a way to transport us through the Solar System," I repeated to myself, "then everyone would want to send space ships to Mercury and Mars".

I thought, naively, that we would want to go to the planets and to the moons of Jupiter and Saturn, and we could inhabit the Solar System.

"All we need is monstrously large space ship and a way to power it." I thought.

That's what I still thought. I would not give up.

Then one day a colleague, Dr. Jere Harlan, told me about a spark exploder that could explode anything, dirt, space dust, to high speeds. He told me to try that as a rocket.

What a concept, "use space dust as rocket propellant," I thought. There was plenty of space dust in space, so we could have as big a space ship as we wanted.

I figured and calculated, and calculated and figured, and got another kind of bad answer: "needs too much electricity."

It turned out that no one could make much electricity in space. That was completely unexpected.

I could not make a good space ship using space dust and spark propulsion because nobody could make enough electricity to power the sparks.

But I did not give up.

If I could only figure a way to get some propellant that I could boil, and use it in a rocket like the NERVA, everybody would want to go to space.

That would do it, I thought.

One day Dr. Marsha Neugebaur visiting from NASA's Cal Tech Jet Propulsion Lab told an audience about the plasma vapor in the tail of comets. As I sat in the audience listening, I calculated how water would work in the NERVA type rocket. That would be a steam rocket. It seemed to work a little, just barely enough to be interesting. Who would know about the water in space?

After her talk, I ran up to here as fast as I could and asked her if she knew any place in the solar system where I could get water, real water, not just water locked in the rocks as mineral hydrates.

"Of course, right here" she said, pointing to the just discovered water frost on comet Halley, as she pulled out her personal, only copy of the European satellite picture.
"water fog" from the comet Halley, from a European satellite picture

She totally shocked me.

From then on, I was looking for water and only water, in the space near Earth.

If I could only figure a way to transport lots of us through the space, I repeated to myself, then everyone would want to send space ships to Mars. I somewhat gave up on going anywhere but to Mars.

And, if there were any water in space, then that steam rocket would surely work. When I evaluated steam rockets I found they would just barely work. Not wonderful, but ok.

One person tried to tell me to get back to work. Don Summers was a mathematician working on a project I led to point telescopes for our spy space ship. We were doing this for another space agency of the United States. When I displayed loud excitement at finding the steam rocket, he came up to me, right up to me, poked his index finger into my chest, and poked while he told me, point blank:

"The Conquest of Space is going nowhere until there is a Clear Profit."

I never forgot his words. I went back to work, but I did not stop calculating it.

On a ski trip to Vail Colorado, April 1987, I was relaxing and calculating space ships. I was riding in the back seat of the car with our daughter driving. On the long, 8 hour trip I wondered just what would be the best kind of rocket. I finally got the equations into a simple form.

The next day, during the short, 15 minute time when our relatives were making coffee and mixing pancake dough, and making fun of me for calculating while on a ski vacation, I solved the simple equation.

Astounding! The equation showed that steam rockets would take a huge payload to Mars, bigger than a NERVA rocket.

That made me so bold, I ignored the next person who told me I "could not do that and work here."

Not so bright a thing to do. That guy was my boss's boss. However, I agreed with him and I was so hyped that I abandoned my perfectly secure, high pay job as a rocket scientist in a highly secret government job.

Part 05: "Rocket Science"

Sticking with it, I went to work as a Program Manager at General Dynamics, Laser Systems Lab. We would make space ships with powerful communication lasers for another space agency of the United States, a branch of the U.S. Navy. I brought along a complete, personal, Secret, Hidden Agenda, a Vision for us to leave the planet.

I had to bootleg my steam rocket space ship using my Hidden Agenda. Dave Nickerson, from the Space Defense Initiatives Office was elated when I leaked my Vision to him. He quickly found me some space-topics money to evaluate the steam rocket.

To my dismay, Dr. Bruce Cordell from another part of General Dynamics got the money and got to be in charge. He completely ruined the whole concept and made the study show how we could get liquid hydrogen and liquid oxygen from Deimos, a moon of Mars. He used a nuclear electric generator and an electric water splitting device and an electric refrigerator. He screwed it all up. It showed how he could make about 20 tons of rocket fuel.

I was completely unhappy. If he would have done it like we intended, we would have delivered about 5000 tons of water for the steam rockets. Bummer.

He was happy, but screwed it up. He was completely unhappy with me, and should have been. I was too much autistic with Asperger syndrome to realize I was not communicating properly. And, stubbornly, I would not give him the clue to make it work because then he would get the credit. Everyone went away mad.

Right after that failed study, the Cold War ended and nobody cared about space ships with lasers or space ships at all. Everyone was out of work.

Having a lot of time on my hands looking for work, I looked for any kind of work. But there was none, not for high paid Program Managers in southern California just after the Berlin Wall fell. There were 100,000 engineers and scientists looking for work.

"The war is over. Quit shooting people and go home" was what they wanted us, the Cold War Warriors, to do. Nobody cared about anything any of us were good at.

Having a lot of time on my hands, I called many people in the field of near Earth asteroids, and went to several near earth asteroid meetings. There, I found to my surprise, they told me about whole swarms of ice objects, mostly almost completely dark and invisible, lurking between here and Jupiter. Dr. Ted Fay, an astronomer at McDonnell Douglas promised me he would find me my
ice, and he did.

These were gas stations in space. Amazing. They were made of dirty water ice.

When I calculated how accessible they were, to my great surprise again, I found the steam rocket could get there and back, and bring huge, monstrously large payloads back, more than the mass of 100 Space Shuttles.

I was hyped, and out of a job.

With even more time on my hands, I also found out that ice could be strong enough to make a spinning space ship. I would save that one till later.

Not many people would believe me because steam rockets were so much worse than the NERVA rocket and worse than the NASA rockets, and worse than the powerful Russian rockets.

Part 06: The Real Rocket Science

Marland Stanley at the U.S. Department of Energy in Idaho hired me when I drew my steam rocket on his chalk board. He hired me to make nuclear rockets to go to Mars. Marland understood immediately.

Still, almost nobody else anywhere believed you could use a steam rocket. So, Marland and I and his crew worked on NERVA type rockets and nuclear electric generators to power space ships and other things. We were cooperating with yet another space agency of the United States, the Star Wars guys in the Pentagon. We also worked with the NASA guys to test the nuclear rockets for the Mars mission.

All this time, nobody at NASA would believe anything any other space agency would tell them. A NASA Manager said "we are the Mercedes Benz of space agencies." Our nuclear engine and our version of the space electric generators were always under scrutiny. Their versions were untouchable. We could prove theirs would not work like they said. But they were "the Mercedes ..."

And, NASA seemed to have no vision at all. Their only goal was to visit Mars. Ours was to occupy the Solar System.

NASA's main goal, it seemed, was to do somersaults in a space bubble, plant flags and brag. NASA seemed to want a Field Trip to Mars, At Our Expense.

I had a very hard time, even though my steam rocket was now mainstream and accepted at the Idaho National Lab.

All that turmoil forced me to compare space trip expenses, theirs vs. mine.

That was a jolt, a total surprise. The steam rocket space transport might lower the cost by factors of hundreds. It would be 100 times less expensive than what the NASA rocket scientists were doing.

Mine was less expensive because I used zero electricity. All my rocket science competitors would have to use electricity, huge amounts of it, to make rocket fuel from water in space and haul the same payloads I could.

All I would need to do is heat the space things, to fry the neo's, or melt the comet ice. Lucky for me, I would not need to heat them so hot the rocks would melt. That would really clog the pipes when the lava got cold. I would just collect water and use it directly in my rocket.

Simple, simple, very simple.
Part 07: Space Water Hard Times

However, I still needed huge amounts of water in space to fuel a steam rocket. I needed 1000 times more water than the other guys. One could almost see it in my illustrations. Rocket scientists said there wasn't much water out there, and that I was wrong anyway because steam rockets were so much worse than regular NASA rockets. Even though they were wrong, I learned that my steam rockets "need too much water."

It was a dark and stormy time. Another recession hit the technical people because the Berlin Wall fell and the Commie Pinko Rapist Atheist Russians were now friends. A few even went to Church.

Nobody cared about space or space ships or planting flags on Mars to show the Commie Atheists that our way was the better way. Suddenly, we saw they were people just like us. And we did notice that their space ships carried lot more payload than NASA's.

A steam rocket would use water stored in a very large bladder. Nuclear reactors boil the water into super hot steam. Rocket nozzles use the super hot steam to propel huge payloads. It makes the simplest complete system in space.
I looked for anyone who would know where water would be in space. Almost no one knew. This was not a popular kind of astronomy. Almost no one did it. The problem was to find water or ice in space, and near enough to get to and accessible enough to be useful.

There is no glamour in finding rocks and ice cubes in the solar system.

At first, I did not get it. After all, I worked for another space agency of the United States. We did not ask NASA for their opinion about our satellites. When we launched, we did not ask them first. Instead, we told them where our rockets would be, so they could not crash into our expensive payloads. But I asked NASA anyway, this time.

The young NASA expert was right when he told me how it really was, over a very cold, very big, full quart jar of beer at a Space Experts Party at my home, 1992. "A young kid doesn't say 'When I grow up I want to be a space rock miner.' Kids want to be an Astronaut and go to Mars. It's all about excitement."

It was a sad time for me, because he was right. I learned: "there is no excitement in being a space rock miner"

Meanwhile, my space rock miner colleagues found a swarm of mountain sized objects in orbits that come scary close to Earth.

Mark Sykes, Tom Larson, Pat Whitman and I plotted their orbits and where they were. The dark diamonds are the "near earth objects", neo's, and the pink dots were the orbits. We could see with our eyes it was scary.

I was looking for water, and all they found were rocks in space and how the sky was falling.

NASA spun the rocks-in-space story into super scary stories. Some of those asteroids could collide with Earth.
Asteroids smashing into earth!

Hey!
Almost "The End Of The World!
Hey!

Of course, they did not say it that way. They used professional vocabulary and phrasing.

NASA wanted space survey telescopes to find all the killer asteroids. And then they wanted missions to push the killer asteroids out of a collision path with Earth.

This was fun.

It was a great story. I would tell and retell the scary story to grade school children in Idaho, to Rotary clubs, to the Kiwanis clubs, to Senators, the Pentagon, The White House, the Discovery channel, to anyone who would listen. They all did. Eagerly. Fun!

I would describe vividly how it happened many times during geological history.

This was quite seriously fun.

A mountain sized, near earth object would hit the Earth. The whole sky would ignite, on fire, over a continent.

The blast would create 1000 foot tidal waves. Higher than tall skyscrapers. Each time the global catastrophe hit, The End of the World as we knew it happened.

I would describe how it was before our Life Form was even fish. Long ago, when we were just slime and microbes deep in the dark, hot Earth, killer neo's would hit, and we would change our bodies a little, improve them a little to thrive in the recently cleared rubble.

We were primitive then. At that time, we were still mostly just slime. We never saw sunlight and did not need it. Our name was "Archaea Bacter". Some of us still live down there in the deep hot.
After each "End of the World" we would evolve up a little. And then we would prosper, as a Life Form. It was survival of the Lucky, those lucky enough to be in those places were the catastrophe did not clear.

Eventually we became fish and crabs, and then lizards and dinosaurs, and eventually, mammals, and then humans and everything alive on Earth.

Each time, it was Survival of the Lucky.

Sadly, there was no water in space for me, so I was ready to give up. You can't make a living telling space stories.

**Part 08: Tiny Planets Gushing**

Just in time, some colleagues found out that almost half of the near earth objects (neo's) contain water mineral.

Some had calculated that roughly 15% of the near earth asteroids were "hydrated minerals." All I would need to do is cook them at very-hot oven temperatures and they give off steam, water steam. It would be like overcooking cookies in a hottest kitchen oven, to fry off the water. No electricity needed here.

Small detail that most of the rocks like that I knew about were as hard as a sidewalk. "Kinda hard to use, in space", I thought.

Nature then tempted me a little. The King of Near Earth Asteroids, Dr. John Lewis, told me that a good fraction of the neo's contain a higher percentage of platinum and gold than the best platinum ore on earth.

! Hey ! A Clear Profit !

It did not turn out that way at all.

Meanwhile, as each year passed, more and more objects in the space near earth turned up with water in some form. Another colleague, Dr. Gene Shoemaker, told me over a really good hamburger at a rocket science meeting in San Juan Capistrano that only some neo's are hard rock meteorites, like those that make it to the Earth's surface and get into museums.

His neo's the neo's I cared about, typically would never make it to the ground. Most of those would be are relatively soft.

There were thousands of them swarming in the space truly near Earth itself. According to Gene, all it would take to fry off the water would be "heat, in a kitchen oven."

Gene didn't exactly emphasize that the "oven" would be nearly red hot and probably start the kitchen on fire. But, that did not matter because a nuclear reactor the size of a large garbage can could easily deliver that kind of heat.

Gene really surprised me. Gene knew. But almost no one else, other than my colleagues, knew about them, the hydrated clay neo's.

To me it meant water-bearing objects might be everywhere in the space relatively near Earth.

Just what I needed?

Other colleagues had decades earlier found almost invisible, ever-present comets in the space between here and Jupiter. Those almost invisible comets are apparently made of hydrocarbons, strangely similar to very dirty coal, or oil shale. Curiously, they appear to be about 1/3 water ice, 1/3 hydrocarbons, 1/3 silicates, a percent amines.

All I would need to do to get the water out would be to heat them, to heat their ice. A nuclear reactor the size of a garbage can could do that.

And they were dark, darker than chimney soot in a fire place, *almost invisible*. Scary!

The sky was full of them. We would almost never see them until a piece of their black scab skin would break off. Then, the water would evaporate and dust and fog would spew out, and they would light up in the sky. It almost never happens, so we could not realize that the night sky would be scary full of comet tails if they all lit up at once.

?? Oil Shale ?? Did I miss something?

The oil shale part was puzzling. I would almost joke when I said: "The closest thing on earth could be cat feces in a dry ice cooler. Not dog, cat, because it's black."

These were mysterious stories. How would you get something like dusty dirty coal or oil shale in space? What kind of dinosaur could live in space? Aliens?

All I wanted from space was water in space, not hydrocarbons or oil shale. I ignored the oil shale.

To my dismay, everyone else ignored the nearly unlimited "oil shale" as well. Nobody cared about oil in space. I wanted them to care about something, so I could get the money to inhabit the solar system.

It was a sad time again.

One more time, to the rescue, Mother Nature came through with a breakthrough.

Another space agency of the United States, the "Star Wars" guys at the Department of Defense, sent the first probe to find hidden ice deep in the forever dark poles of the Moon. It was called "Clementine." The Star Wars team did it completely on their own, for less than $99 Million. Dr. Stu Nozette and Colonel Dr. Pete Worden originated it.

There had always been other "space agencies" of the United State, *other than NASA.*


NASA got jealous and finally paid Dr. Alan Binder send
the Lunar Prospector probe. It found the same thing: apparently water ice. NASA said it was water ice. However, a professor and his colleague at Stanford said it was more like "Portland cement", hydrated alkaline oxides. To me, that was way better than water ice. It meant the water would not evaporate so easy, and that there ought to be huge amounts of it somewhere on the moon. Nobody knows.

We have to go there on a prospecting mission. No jumping somersaults. Just real work. Probably not NASA.

My colleagues also found another swarm of almost invisible, dark, black comets mostly between Mars and Jupiter. The comets are the dark diamonds in the figure. Their orbits are the dotted lines. In Cosmic time, this picture changes like a swarm of bees. I took a snapshot, and it's like it was the day we taped the Discovery Channel show, 6 Oct 1996.
Heating moon ice yields water steam. Does moon ice exist? Does moon water exist? Is the water just a water mineral, loosely chemically bound to moon dirt?

Earth's moon, viewed from its bottom, its forever-dark south pole, taken by the US Defense Department (DOD) Clementine mission, for $99 M. Measurements suggested water ice inside the bottoms of the extremely cold, forever-dark craters at the top and bottom of our moon. More recent observations could not find as much water as they first suspected. It might just be hydrogen-bearing mineral, like Portland cement.

I showed how to use steam rockets to transport the moon's water into space. To me, water was "rocket fuel."
If the moon really would have enough water, we could provide rocket propellant (fuel) stations in space.

"This means we could Inhabit the Solar System." I thought.

Part 09: Daydreams, Not Visions

Some people hated my scheme. One astronomer named Professor Anita Cochran complained insultingly that we would rip off the precious formations of ice just to go joy-riding in space. Another, Dr. Ben Clarke, told me I would rip up and destroy the fossil layers of time with my open pit space miner behemoth.

When they told me that, I stopped in my shoes. I agreed with them. I would be like the bad guys who rip off stalactites and stalagmites from caves. I would destroy the tree rings of time, the layers of whatever on the moon that would tell it's history, or on a comet.

I did not know what to do.

I stuck with it anyway.

The story developed a new twist. We could also use a steam rocket to push "killer asteroids" or "killer comets" away from colliding with Earth.

If we could do that, maybe someone would want to inhabit the solar system.

I showed my colleagues that if we were already inhabiting solar system, we would be able to land on comets and asteroids that had plenty of water. We would break off a "small piece" of such a comet or asteroid and gently shove it into an orbit that would collide with that dangerous something killer that was destined to crash with earth. When the small piece would crash into the killer, it would move a bit, and the killer bad things in space would no longer collide into earth.

We would save the world. We would be heroes. We would have moved celestial objects to do so.

All we would need is a comet or asteroid with a convenient orbit.

Mother Nature was so nice to us, again, one more time. She provided a neospace full of such convenient objects with convenient orbits.

Nature was nice twice, because the "small piece" would only need to be as big across as a football field. The water needed to shove it would be about the same size. The nuclear reactors to do this work and the steam rockets to propel the "small piece" would only be as heavy as a Space Shuttle.

This was intriguing because my NASA and DOE and DOD competition were seriously talking about using a huge, absolutely huge, 1000 Megaton atomic bomb to try and do the same thing.

Imagine launching an atomic bomb off Cape Kennedy so big that if it accidentally blew up, it would blow up the entire East Coast of the USA. Who would let you drive down their road to deliver that thing?

It did not matter. This twist was only interesting, not profitable. Nobody I could find with money thought this would be a reason to go to space.

It was all Daydreams.
Part 10: Vision, but No Clear Profit

There is no money in pushing killer asteroids in space, because there aren't any killers. We haven't found one yet that will kill the whole world. Anything less dangerous than that is not worth the effort. Pushing asteroids gets to be extremely expensive, compared to all the money in the world (about $50 Trillion).

Mother Nature was kind yet again. She did not bring money. She did not force us to spend $50 Trillion. She brought a Vision.

To make a spaceship big enough to haul 1000 people at a time would only take a hundred thousand tons, plus or minus. A hundred thousand tons of water. A hundred thousand tons of space ship.

Nature was kind because one could get that 100,000 tons from a single chunk of the right kind of neo. The chunk would be no bigger across than a football field.

Shoemaker and Fay and all sorts of other near earth asteroid astronomers reminded me that a single, 3 km sized near earth asteroid of the hydrated clay type would be 10 football fields across, and that would be 1000 chunks of the size I wanted. Just one such neo would be worth a thousand, huge payload trips.

Our team had calculated we could push a million ton payload in space using steam rockets. And there was water everywhere in neospace to do it. Our team included Tom Larson, Bruce Schnitzler, John Rice, Bill Richins, Marland Stanley, John Martinell, Lawrence Redd, Michael Jacox, Tom Hill, sometimes Dave Buden, and a several others.

It looked good on paper, except for one, tiny, little detail. **There was no clear profit.**

"The Conquest Of Space is going nowhere until there is a clear profit," said the mathematician working for another space agency of the United States Government. He helped point space telescopes *towards earth* instead of away from it. I never forgot when Don Summers pointy finger poked me in the chest.

Nature only gave us a start. The rest is hard and very expensive.

The steam rocket and the water objects in neospace did not solve all our problems. I didn't win everything. I only won the first race.

Enemies everywhere were against me.

It would still be about 1000 times less expensive to do anything on Earth than the same thing in space.

No Clear Profit. Damn.

Steam rockets only work when going to the Moon, some of the near earth asteroids and comets, to Mars, Jupiter, and the big planets. But not anywhere else. Nature gave us huge amounts of water from the Jupiter family comets and near Earth asteroids, and ice moons. But to go everywhere else would take too much water.

The rest of the job would be too hard.

Life is rough. Then you die. But I did not give up.
Part 11: The Iceship Spaceship
Nature was good to us one more time. We found out how to use water ice to make a spaceship, a big spaceship, an ice spaceship. It was a bit of fun in the midst of angst.

"Ice Tire" Torus Space Ship

If ice was not good, we would make the ship out of fried clay, melted clay, lava, stone, bricks, and that would work.
Ice Structure Spaceship

Idaho National Engineering and Environmental Laboratory

The Moon

Spaceship Hull (inflated)
Orbiting water storage

Rotation Axis (Gravity System)

Fabric Beanie Pack
Ice

Living Space (Sleeping, Recreation)
Working Space (Laboratories, etc.)
Mechanical Space (Piping, Cables, etc.)
Just making a big ice cube into a space ship would not be so amazing. The amazing part was that the ice was strong enough to let me spin a "small" ship without tearing it apart.

When I put the people on the inside, I could turn their gravity on by spinning it. We must have gravity because we are humanoids.

Our bones can lose calcium when we don't have gravity for a long time. Our immune system seems to work poorly in zero gravity. Cartilage does not grow correctly in zero gravity. The ice ship would keep us from being space sick.

This time NASA listened. They liked the Ice ship.

**Part 12: Ice Moons, Surprise**

The most exhilarating, exasperating and last discovery was finding out how to use the water and steam rockets and ice ships to travel on, and off, and between the ice moons of Jupiter.

Most of the dozens of moons of Jupiter are made of ice and rock. Almost all the dozens of moons of all the gas giant planets are made of ice and rock. Some, the big ones, would be like a giant Antarctica the size of the moon, except that they are totally without air and so cold that ice is as hard as a sidewalk.

Aside from that small detail, we could live there.

We could burrow deep into the ice moons and live like ice tunnel ants in our Ice-kimo space suits. We would be Ice-tro-nauts.

Small detail: ! Warning ! ! Warning Will Robinson ! Wrong species warning ! I was Lost In Space.

I ignored the warning.

The Ice Moon calculations sounded too good to be true. After I retired from the U.S. Department of Energy national laboratory that supported this rocket science work, I did the calculation one more time.

How well, or not, would a steam rocket work on the planet Mars, the planet Mercury, and the ice moons of Jupiter?

I did not expect things would change much just because I did them again 5 years later.

Disappointing, as expected, a steam rocket will just not work very good at all trying to lift off Mars. NERVA might work, using liquid hydrogen, just like the rocket scientist said.

Disappointing but expected, a steam rocket would not get me to the planet Mercury, and would not be able to launch off Mercury.

! Pow ! The calculations in the Excel spreadsheet almost exploded.

Totally unexpected, the steam rocket would be powerful enough to launch off the largest moon of Jupiter, an ice moon where water was "unlimited." Whatever would work on our own moon would work on any moon of Jupiter, of Saturn, Uranus and Neptune.

Then I did the next logical calculation. What are the orbital mechanics to jump from one moon to the next?

! Wow ! I could go from any Moon to any other moon of Jupiter with only days, certainly no more than weeks, of travel.

! Wow!

Then I did the next logical calculation: how well could I go from gas giant to gas giant, from Jupiter to Saturn?

! Wow Again !

I could go from Jupiter to Saturn, to Uranus, to Neptune, one at a time, in sequence, landing and launching from each of them.

With all that water for rocket propellant, I could "gas up" anywhere I landed.

A small little detail, however, the only drawback going from one gas giant to another would the travel time. Could be years. Could be ten's of years. Oh well.

! Warning! Warning! Will Robinson ! Transit time could take decades!

At least the images were stunning.

I needed to do this part again, to be sure I did it right. I was overjoyed when I found that a steam rocket could land on and take off from every ice moon in the solar system, and then, fuel up and go to any other ice moon in the entire solar system.

The orbital mechanics worked out to send an ice ship between the gas giant planets themselves, using steam rockets. We could travel from Jupiter to Saturn, from
Saturn to Uranus, from Uranus to Neptune. We could travel between the gas giant planets.

When the NASA guys would look at my orbital mechanics, my orbit, they would shout Stop!

My beautiful orbital maneuver would first shoot me way out to past most of the moons of Jupiter. A nice, peaceful ride. Then I would swing by as close to Jupiter as I could get, and turn on my rocket.

! Stop! they would yell.
! Stop! Radiation! the NASA guys would scream.

Those poor, wimpy NASA space ships had no radiation shields. We come from the Department of Energy, nuclear energy. We know. "Shield it or Die".

Jupiter is so radioactive that it would fry their computers and electronics on those wimpy NASA toys. Our space ship has 50,000 tons of shielding, which we use as a structure.

Radiation? No Problem.
Rocket fuel? No Problem.

I could take on as much water for the steam rocket as I wanted off the ice moons. The dozens of ice moons had become quite accessible.

I could not believe it when the orbital mechanics worked out. Surprised, I found I really could use steam as the propulsion.

Part 13: Too Late
My message was too late. The train left. The party was over and everybody went home. Nobody was left to care or argue about it.

I was still hyped up, like a drunk host wandering around the empty party room, rehearsing all the conversation.

If I would do what nearly all the rocket scientists said, I would have at least a thousand times smaller total payloads. I would need to generate electricity and make liquid hydrogen and liquid oxygen rocket fuel. To do that, I would have to haul absolutely huge electric generators, electrolysis device, cryofuel refrigerators and liquefiers.

And because I was just using water, I did not have to do any of that.

Even though steam rockets really were primitive, horrible rockets, terribly awful rockets, compared to the stunning nuclear rockets we tested 40 years ago, steam rockets could use the ice.

Nobody could compete with me because no one else could use the ice.

I had whole moons of ice. And neospace was full of water objects.

And, all the moons were small enough that a single engine steam rocket could land on and take off from any ice moon in the entire solar system.

I won.

It meant we could occupy. We could own. We could stop at and make permanent space stations on at least dozens of the water moons of the Solar System.

We could inhabit!

Clearly Stupid.
Unfortunately, there was still no clear profit. The trip times were still too long. It was still too expensive. We were still the wrong species. Nobody cared. Some rocket scientists still said it was wrong.

Nobody cared even though the payoff to just find nearby gas stations would have been really clear. Why did I not see this 10 years earlier? It might have changed everything.

I might have won if I had seen this when I was getting paid to do it. We could have started to hunt for gas stations. Prospecting with a Vision and purpose would be a clear "win."

I saw in a flash I had wasted my entire time at General Dynamics and at the Department of Energy in Idaho, thrown away the opportunity.

"I am a case of clear stupidity, and I can prove it", I thought, over and over, perseverating, frustrated.

I was an Aspie, and it showed.

I had focused so hard and so intensely that I failed to see the big picture and do the simple obvious things.

All because of my stupidity, I did not just do the simple, logical calculations. I could have shown how to use the known ice moons to travel the solar system. I could have done this before I had ever left my high-pay, secure day job as a space spy. Then, as soon as anyone would find any water objects any easier to get to, I could have used
them and it would have worked even better.

I could have seen that I would win because I provided the least expensive way to occupy and inhabit the Solar System.

Part 14: Other Worlds Near Enough
I could have won. Now, somebody else will get to tell the final story. Dejected, I got on the internet and collected the images of the ice moons we could inhabit.

Ganymede of Jupiter, ice moon

Europa of Jupiter, ice moon
Amazingly, Mother Nature gave us just barely what we would need to inhabit the entire space between Earth and Neptune. We could inhabit New worlds, worlds of ice in space, and own the space gas stations, for their neofuel. We are still the wrong species. It is still far too expensive to do now. And, there is no interest in humans going to space. There is no way to pay for it.
There was no clear profit. There is still no clear profit.

The best I can do is send prospector space ships to find and stake a claim on the water objects in space. I would sprinkle them with the names of those who sent them, and plant legal claims to own them.

Too bad we are broke. Too bad, my generation is not the right species for space.

Oh Well. Our direct descendants, like the Cyborgs, the Digi-Sapiens, the computer-zoids, bionic androids, and others, they will get to inhabit the solar system.

I struggled to a hill top and saw.

*We would Inhabit the Solar System*