

Recollections on an Earth from Space

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Introduction



Someone might say, "Tell us the story of the Earth from Space" and I would have to say that, "It is not one story, but a set of stories, that when added together make one story." So then you might say, "Where does it begin"? and I would say, "It has several beginnings and a couple of endings and it is also not yet finished". And you would say, "Sounds complicated" and start thinking about Facebook, or that you are hungry for a hot dog. And I would look at you and say, "You have too short an attention span to hear this story" or as Brian Williams says, "You have the attention span of a gnat". If this story is about anything, it is about patience. You want explosions, and there are a few, but it is really about patience.

But since patience is in such short supply, I will keep the stories very short....

Beginnings

1) A New Earth



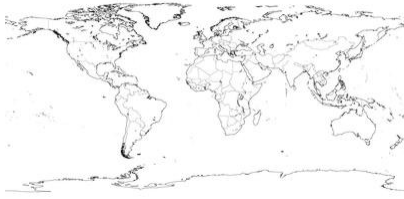
I was 17 give or take. John Uhlig of Columbia Missouri had invited me to a Full Gospel Businessmen's Convention. They had a church-like service. During one of the services I had a vision. I saw the earth hanging against a black sky surrounded with a white light that reached out an earth diameter in every direction. It was extremely beautiful.

2) The Tape



At 23, I was an engineering student at the University of Illinois, I worked as a computer programmer for the Corps of Engineers. My mentors were Joseph Wayne Hamilton and Patrick E. Kane, both master programmers who could tell this story also. We had a PDP 11/70 that ran Unix. One day they found a nine track tape that had fallen behind the tape rack in the Astronomy Building where we worked. It contained a copy of the CIA WDB II program and database. This program enabled one to draw the coastlines of all the continents in many different map projections. I found this fascinating and took the program with me to JPL six years later. There was no internet yet. No downloads. No Google. No PC.

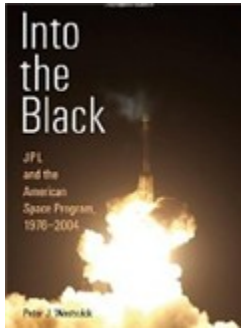
3) The Event Display



At 27, I went to the University of Utah Graphics Lab and got a master's in computer science where I specialized in computer graphics and ray tracing. I was then hired to work at NASA-JPL on the Time Warp operating system. I had [WDB II](#) running on an early Sun Workstation. It had four megabytes of ram. We were working on the Time Warp Project. Mike DiLoretto showed me an event display to simulate the dynamics of Time Warp. A demo of these displays landed me a job as the manager of

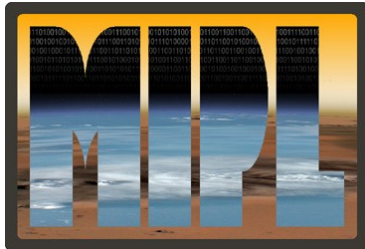
the graphics task for JPL's Strategic Defense Initiative Simulation on the 32 node Mark III Hypercube parallel processor. This was a big step up for me.

4) Simulation87



JPL had been tasked to create a simulation of nuclear war using the hypercube. So a group led by Dave Curkendall did that. My job was to display the results coming out of the hypercube. The meant we needed an earth and rockets and satellite platform animations and all that. I hired Frank Vitz and Steve Gray from Robert Abel and associates, both who later went on to stellar careers in the computer animation industry. We built several displays. The key display was a color rendering of the Earth that showed boost phase, intercept, impact and detonation. We gave demonstrations for a year to heads of state and the military industrial complex. The Iron Curtain fell a year later.

5) MIPL



During the heyday of our simulations, I gave a demo to the staff at JPL's Multispectral Image Processing Laboratory. They did not like the rendering of the earth because it wasn't realistic like the planetary images to which we had become accustomed. I didn't like it either, but it ran in real time, which was the main requirement of simulating a nuclear war. I began to wonder if it would be possible to develop a cloud free realistic rendering of the Earth using weather data. I contacted Will Gould at NOAA and later visited trying to find enough images of the earth without clouds that they could be overlapped to make a composite earth that looked real. I had my assistant Jim Lathrop work on a

program that could read the arcane format of the NOAA nine track tapes. I also had him write a simple ray tracing program that could texture map an image onto a sphere.

5) The Phone Call



One day I got a call from a Santa Monica artist named Tom Van Sant. He was a friend of Caltech physicist Richard Feynman. Tom had done some novel work using mirrors in the desert to cause a glint in LandSat spacecraft imagery that was later used in a movie called, "Ryan's Eye". Tom wanted to make an image of the Earth that was free of clouds. He had heard about me from Will Gould at NOAA. I remember taking the phone away from my ear and looking at the handset. It was one of those moments. Tom was a mover and a shaker. He knew how to get things done. I could hear it in his voice.

6) The Stardent



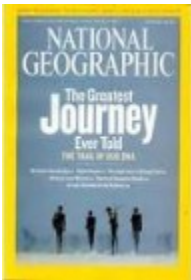
Bill Paduska of Apollo had started a new company in Boston called Stardent. At SIGGRAPH 88 I went to the equipment expo and saw a demonstration of the GS1000. It could move pixels like nothing we had seen before. It used the X-11 windows system as a user interface and had a 128 bit wide data path from video memory to the CPU. It was an amazing technical achievement that was simulated prior to construction on an array of Apollo workstations. I knew at the demonstration that it was the perfect box for the GeoSphere project. I called Tom and told him about it.

6) Nachos



Next to Tom's studio in Santa Monica was a Mexican Restaurant. He held a big dinner meeting and announced the GeoSphere project. Kevin Hussey, Al Hibbs, and various distinguished parties were there. I came and remember that he came by and gave me a double serving of Nachos. On the guest list his assistant hand listed my title as, "Environmentalist". As an engineer who had actually worked for the Corps of Engineers at one time, no one had ever called me that, but I liked it.

7) National Geographic



JoAnne Heckman, then of National Geographic Magazine and John Schneeburger found out about the project and agreed to provide some seed funding, about \$30K if we could come up with some proof-of-concept imagery. I worked day and night creating mosaics using NOAA 4 km data. We then combined them to create small cloud-free sections. It was extremely labor intensive.

8) The Lawyers



So there was this meeting of the heavyweights at JPL. The head of JPL, Lew Allen was there. He was an ex air-force commander who had taken the lab in the DOD direction. The chief lawyer was there. He informed Tom that the image we were working on would be owned by NASA and therefore in the public domain or some such. Tom pushed back from the table and said, "No". I couldn't believe he did that. It was like saying, "No" to the God or something. Of course I was just a peon engineer. Outcome: The project was no longer going to be at JPL.

9) Grand Theft Auto



So this meant that the project was moving off the lab but where? Late one evening we pulled the Stardent, which Tom owned, out of the lab, stuffed it in his big red van, and moved it to my backhouse in Pasadena. Even though it was legal, it totally felt like Grand Theft Auto. JPL was heavily guarded in those days

10) Finally

We finished the project in my backhouse with the Stardent in tow. We being Tom Van Sant, Leo Blume, Eric, Jim Knighton and myself over the next few months. One night I put the landcover over the sea floor and it looked like the earth with the water drained off. I remember how vivid and striking that was. There are many more stories that lurk about this one, but this is a good place to start, and end for now.

We debuted a 4 kilometer cloud free earth on Earth Day of 1990, after a big demonstration at Stardent headquarters in Boston. It was quite an adventure and was the seed for Google Earth. That is a story that Tom knows better than I. The image was published in Sky and Telescope, National Geographic Magazine, Popular Science and I got my picture on the front of the Metro Section of the Boston Globe.